STATE OF OHIO

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER

THE GROUND-WATER RESOURCES OF FRANKLIN COUNTY, OHIO

BULLETIN 30
Columbus, Ohio
1958

STATE OF OHIO
C. WILLIAM O'NEILL, *Governor*

DEPARTMENT OF NATURAL RESOURCES
HERBERT B. EAGON, *Director*

DIVISION OF WATER
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THE GROUND-WATER RESOURCES OF FRANKLIN COUNTY, OHIO

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The geologic classification and nomenclature of this report follow the usage of Ohio, which in some respects differs from that of the U. S. Geological Survey.

DEPARTMENT OF NATURAL RESOURCES

FOREWORD

The availability of adequate ground-water supplies will, in many instances, determine if an area can support new industries and the accompanying increase in population.

In recent years, the large growth of suburban housing and industrial development in Franklin County has created a need for reliable published ground-water information such as is contained in this report. This bulletin has resulted from a study of all available geologic and hydrologic data in Franklin County. It should be of help in planning any installation, large or small, where water is to be supplied by wells.

Franklin County is endowed with a number of ground-water sources capable of substantial yields. Some of the aquifers are undeveloped but will be available when needed by a rapidly growing population and economy. Of equal importance, in a study such as this, is the fact that certain parts of the county can supply only limited quantities of ground water.

Ground-water sources are described in detail in each township and some evaluation is made of their yields. The chemical quality of ground water is discussed in more detail than in previous reports. A multi-colored map, included in this bulletin, permits the user to quickly identify specific areas and to determine their water-bearing properties.

The program of county water resources investigation by the Division of Water is a part of the general cooperative water resources investigation with the United States Geological Survey. State funds used in this investigation have been recognized by the U. S. Geological Survey and were matched in part by federal funds used for other phases of the Ohio ground-water investigation program.

CONTENTS

ILLUSTRATIONS

TABLES

THE GROUND-WATER RESOURCES OF FRANKLIN COUNTY, OHIO

ABSTRACT

Franklin County has an area of 552 square miles and in 1956 had an estimated population of 611,663. The western part of the county lies in the till plains section of the Central Lowlands physiographic province; the eastern part of the county lies in the Appalachian Plateaus province. The Scioto River and two of its major tributaries, the Olentangy River and Big Walnut Creek, drain the county. The normal annual precipitation ranges from 33.8 to 37.14 inches and the mean annual temperature seldom exceeds 53.3°F.

The rocks of the county consist of variable thicknesses of limestone, shale, and sandstone, covered with a blanket of glacial debris. The sedimentary rocks range in age from Silurian to Mississippian.

The bedrock surface prior to glaciation was highly eroded and dissected by streams. The buried erosional features are those of early maturity to old age stage of topographic development. During the Pleistocene Epoch some of the valleys were partly filled with clayey till. Glacial streams cut new channels in the bedrock, some of which were filled with thick permeable outwash deposits. These outwash deposits, where they are exposed at the surface and especially where they underlie perennial streams, are the sources of large quantities of ground water. Specifically, the outwash deposits underlying the southern extremities of Scioto River, Big Walnut Creek, Olentangy River, and Darby Creek, are the best sources of ground water in the county.

Madison and Hamilton townships in the southeast quarter of the county are extensively underlain with thick layers of sand and gravel which can yield as much as 20 mgd.

Ground water for industrial and municipal use is available generally from the Silurian and Devonian limestones in the western part of the county. In some areas the quality of water from these sources is poor, especially from the deeper wells. Shallow wells drilled in specific areas of Norwich, Perry and Washington townships are subject to contamination from the effluent of domestic septic tanks.

The upland areas underlain by shale in Blendon, Jefferson, Mifflin, Perry, Sharon and Truro townships are poor for the development of ground-water supplies. Domestic water supplies in these areas are commonly from drilled, dug wells and cisterns.

INTRODUCTION

The Ohio Division of Water, Department of Natural Resources, and the United States Geological Survey cooperate in the systematic investigation of the ground-water resources of Ohio. Reports on several counties have been published and other investigations are in progress. These reports are to aid in the development of farm, home, public, and industrial ground-water supplies.

Most of the basic data for this report were collected and interpreted by the author, and are the result of field work completed in 1956. Field investigations of the surficial glacial deposits were made by Richard P. Goldthwait who prepared the section of this report entitled "The character and distribution of the glacial and alluvial deposits." Chemical analyses of 46 samples of ground water from wells in Franklin County were made by the U. S. Geological Survey. John C. Krolczyk, Principal Draftsman, Ohio Division of Water, prepared the maps and illustrations of this report.

The investigation and preparation of the report were under the immediate supervision of Alfred C. Walker, Principal Geologist, Division of Water, and under the general supervision of C. V. Youngquist, Chief, Division of Water, Department of Natural Resources. Robert C. Smith, formerly Assistant Chief, Division of Water, gave very valuable advice in the course of this study. The United States Geological Survey is represented in the investigation by Stanley E. Norris, District Geologist, Ground Water Branch. Water samples were analyzed under the immediate supervision of W. L. Lamar, District Chemist, Quality of Water Branch, U. S. Geological Survey. John Hubble, Chemist, Quality of Water Branch, U. S. Geological Survey, assisted in the interpretation of the chemical analyses of the water samples.

Approximately 1400 well records are listed in the report. These records are from the files of the Ohio Division of Water, Columbus. Only data from field measurements, or from the drillers' records, were used in writing this report. The discussion of the geology of the consolidated rocks in Franklin County is based on field studies, well records, and published geologic reports. Specific data on municipal ground-water supplies were obtained chiefly from local officials.

Measurements of ground-water levels in Franklin County were begun on a continuing basis in 1942. Records of water level fluctuations in observation wells in Franklin County have been published annually since 1942 by the U. S. Geological Survey, in a series of water-supply papers entitled "Water levels and artesian pressures in observation wells in the United States." Since 1947 water level records also have appeared in publications of the Ohio Division of Water entitled "Ground-water levels in Ohio." Hydrographs of seven observation wells in Franklin County appear in this report. The dates that recorders were installed, the observation well numbers, as listed in the publications of the Ohio Division of Water, and the well log numbers as they appear in this report are listed, respectively, as follows: 1946, Fr-1; 1949, Fr-1a, 1834; 1946, Fr-3, 1937; 1942, Fr-7, 00-I; 1949, Fr-9, 1391; 1944, Fr-10, 841; 1949, Fr-11, 00-J; 1954, Fr-14, 374.

GEOGRAPHY

LOCATION AND SIZE OF THE AREA

Franklin County (fig. 1) is centrally located within the State. It contains 552 square miles and in size ranks 16th among the 88 counties of Ohio. Franklin County is approximately 26 miles in extent from east to west and 22 miles in extent from north to south, and is bordered by Delaware County on the north, Licking and Fairfield counties on the east, Pickaway County on the south, and Madison and Union counties on the west. Franklin County occupies parts of six topographic quadrangle maps of the U. S. Geological Survey: Dublin, East Columbus, London, Milford Center, West Columbus and Westerville.

TOPOGRAPHY AND DRAINAGE

Most of Ohio (fig. 1) includes portions of two physiographic provinces defined by Fenneman (1938).[1] These are the Appalachian Plateau and the Central Lowlands. Franklin County is naturally divided into these two sections of very different topography by an inconspicuous westward-facing escarpment. This escarpment is not a straight line, but a series of north-south scarps and terraces forming steps by which ascent is made to the Appalachian Plateau proper. Sharp (1932) proposed that the profile of the escarpment zone along the Columbus-Granville Road be divided into a series of three scarps and two intermediate terraces. The lowest and middle scarps are located in Franklin County and the third scarp is in Licking County, to the east. This escarpment zone, which is typical step topography, rises from the Central Lowlands at an altitude of about 800 feet, to the Appalachian Plateau proper, at an altitude of 1200 feet. The lowest scarp rises from 800 to an altitude of 1010 feet. Big Walnut Creek is located at or near the base of this scarp and is separated from the rather inconspicuous middle scarp by a terrace one to two miles in width. The middle scarp changes in altitude from 890 feet, where it crosses Blacklick Creek, to 1075 feet. The highest scarp is located in Licking County, north of Pataskala, where it attains an altitude of 1180 feet in a distance of about two miles.

Regionally, the escarpment is a straight line, relatively prominent in some localities and wanting in others. In Madison Township, north of Canal Winchester, there is a gap in the escarpment approximately four miles wide, formed by a flat-bottomed valley which extends eastward to Buckeye Lake and thence northward to Newark. The valley is similar to the topography of the Central Lowlands in the vicinity of Columbus and it may be regarded as an eastward extension of the Central Lowland into the Appalachian Plateau (Sharp, 1932).

The remaining three-fourths of the county lies within the Till Plains section of the Central Lowlands province. Till Plains (Fenneman, 1938, p. 455) are formed through the complete burial of preglacial features in such a manner as to produce a surface of small relief. Though the county has a flat surface, and is within the glacial boundary, it lacks the numerous lakes and swamps which characterize many glaciated areas. The only departures from an almost featureless surface are in areas adjacent to the streams, in areas of glacial moraines, and in areas of resistant bedrock.

The valleys of the Scioto and Olentangy rivers, Alum, Big Walnut, and Blacklick creeks show a distinct north-south parallel alignment. The Scioto River enters the county from the north and flows in a narrow, vertical-walled limestone channel to the approximate limits of Columbus. The Olentangy River, whose stream bed is 15 feet below the Scioto, and Alum Creek, enter the county from the north and flow southward on relatively broad flood plains up to one-half mile in width. With the exception of two locations, the latter two streams have cut their channels into the unconsolidated glacial deposits. Big Walnut Creek enters the county from the north and its eastern bank is confined by relatively steep-walled shale slopes. Except in one place its west bank is formed of relatively gentle-sloped, unconsolidated glacial material. In the southern part of the county these three streams flow in shallow valleys of small relief (pl. 1).

Darby Creek, which forms part of the western boundary of the county, enters the county in the northwest corner of Pleasant Township and flows southeastward. Except in a few locations, Darby Creek flows on a rather broad floodplain in the unconsolidated materials.

The highest altitude of the county, in the northeast corner of Plain Township, is 1130 feet above sea level. The lowest altitude, at the efflux of the

[1] See list of the references at the end of this report.

Figure I. Map of Ohio, showing location of Franklin County and the physiographic provinces (after Fenneman and Hubbard).

Scioto River from Franklin County, is 665 feet above sea level. In the northern part and in the southwest one-third of the county the valley floors range in altitude from 780 to 890 feet above sea level, hilltops range from 860 to 960 feet above sea level, and local relief seldom exceeds 170 feet. The range in altitude of the valley floors in the north-central and northeastern parts of the county is 710 to 840 feet. The hilltops range from 900 to 1130 feet above sea level. In the south-central and south-eastern parts of the county the valley floors range in altitude from 670 to 760 feet, and hilltops range generally from 690 to 780 feet (locally they are 840 feet) above sea level. Except in the extreme southeast part of Madison Township, local relief does not exceed 50 feet.

CLIMATE

The climate of Franklin County is diversified and the data from three weather stations are listed below. The stations are: Ohio State University, Columbus No. 1, and Valley Crossing. The average temperature and average precipitation are based on a 25 year period, October 1, 1920 to September 30, 1945.

ECONOMIC DEVELOPMENT

Population

Franklin County had a decided increase in population from 1950 to 1956. The estimated population in 1956 was 611,663, an increase of 21.5 percent over 1950. The population of Columbus and its suburbs was 479,996 in 1956. The estimated populations of the principal cities and villages in the county in 1956, and their percentage increase over 1950, are: Grove City 4,882 (109); Hilliard 2,121 (248); Reynoldsburg 2,100 (190); Whitehall 18,098 (271); Worthington 5,865 (174). The urban population in 1956 was estimated at 530,090 and the rural population was estimated at 81,573.

Agriculture

In 1954, 217,469 acres, or 61.5 percent of the land area of Franklin County, was distributed among 2,051 farms reporting. Of the farm land, 174,518 acres were used for cropland, 48,720 acres

	Temperature	Precip.	January Temp.	July Temp.	January Precip.	July Precip.
O.S.U.	53.2°F	37.14″	31.0°F	74.1°F	2.62″	3.80″
Cols. No. 1	53.3	33.82″	30.7	75.9	2.52″	3.37″
V. Crossing	52.3	36.54″	29.9	74.2	2.69″	3.92″

	Average date of last Frost (Spring)	Length of Growing Season	Average date of first Frost (Autumn)
O.S.U.	April 27	169 days	Oct. 13
Cols. No. 1	April 18	185 days	Oct. 20
V. Crossing	April 29	170 days	Oct. 16

The average temperature for Columbus, based on 49 years of record, is 53.1°F; the average precipitation for the same period is 35.7 inches.

Climatic extremes for Franklin County are as follows:

	Precipitation 77 years of record (1878-1955)					Snowfall 71 years of record (1884-1955)		
	Max. Yearly	Min. Yearly	Max. Monthly	Min. Monthly	Max. in 24 hrs.	Mean Total	Max. Monthly	Max. in 24 hrs.
At Columbus	51.30″	21.60″	10.71″	.10″	3.91″	21.7″	29.2″	11.9″
Date of Occurrence	1882	1930	Jan. 1937	Oct. 1924	Sept. 1938		Feb. 1910	Jan. 1910
At Westerville*	53.06″	25.95″	13.86″	.00				
Date of Occurrence	1855	1864	Sept. 1866	Oct. 1874				

* 48 years of record (1854-1901).

for pasture, and 12,090 acres for woodland. Under irrigation were 336 acres. The total value of all farms was $38,845 per farm, or approximately $338.21 per acre, as compared to the 1950 valuation of $216.93 per acre. (This evaluation is based on 80% of the total farms reporting). The gross farm income in 1954 was $12,602,800 of which $6,418,666 were receipts from livestock and livestock products.

The rank and percentage of cash receipts from the sales of farm products in Franklin County are: 1st, Dairy, 20 percent; 2nd, Hogs, 19 percent; 3rd, Wheat, 9 percent; 4th, Greenhouse, 9 percent; 5th, Cattle, 9 percent; and 6th, Soybeans, 8 percent. In 1954, 3,734,000 bushels of corn were produced on 55,000 acres; 750,000 bushels of wheat on 26,400 acres; and 567,000 bushels of soybeans on 22,300 acres. Specialty enterprises, such as truck gardens, greenhouses or nurseries, assured Franklin County 8th and 9th positions respectively for the State in total cash receipts for 1950.

The general trend since 1950 has been a decrease in the number of farms within the county. However, in 1950 there were 354 dairy farms with a market income of $2,178,659 (1949). In 1954 there were 185 dairy farms with an income of $2,038,054.

Industrial Development

Franklin County is primarily an industrial area. In 1955, according to the Ohio Department of Industrial Relations, there were 744 manufacturing establishments employing 74,746 persons. Of this total, 17,120 persons were engaged in the manufacture of transportation equipment. North American Aviation, Inc., was the largest single manufacturer of this type of equipment, employing more than 15,990 persons. The second largest industrial product was machinery. Westinghouse Corporation, Timken Roller Bearing Co. and the Jeffrey Manufacturing Co. employed 9,524 persons of the total of 11,311 employed in this activity. General Motors Corporation employed almost half of the 10,438 workers engaged in the manufacturing of prefabricated metal products, which ranks third in importance within the county. There are many other small industries in the county manufacturing a wide variety of other products such as: printing and publishing, food products, mortician goods and electrical machinery. The total value added of products manufactured in Franklin County in 1954 was $580,089,000.

Mineral Resources

Limestone, sand and gravel, and shale are important mineral resources of Franklin County. Marble Cliff Quarries Company, which quarries the Devonian limestone in an extensive area north-northwest of Columbus, is the sole producer in Franklin County and the largest single supplier of limestone products in the State. Franklin County ranks fourth in the production of limestone in Ohio, and is the second largest producer of sand and gravel. Shale is quarried in the eastern part of the county for use in the manufacture of common clay products. The quarries are in the Bedford shale formation of Mississippian age.

Transportation and Public Utilities

Being centrally located, Franklin County is serviced by an excellent system of highways. Federal Highways 40, 23, 33 and 62 and State Highways 16, 161, 3, 104, 665, 315, 317, 605, 257, 745, 751, 256 and 674 form the principal arteries of road transportation. Nearly all the county and township roads are hard surfaced.

American Airlines, Inc., Trans World Airlines, Inc., Eastern Airlines, Lake Central Airlines and Piedmont Airlines provide Franklin County with passenger and air express service. Three air freight lines serve the area: Aaxico Airlines, Riddle Airlines, and Slick Airways, Inc.

One hundred motor freight lines and 10 motor bus lines serve Franklin County. The Baltimore and Ohio, Chesapeake and Ohio, New York Central, Norfolk and Western, and Pennsylvania railroads furnish Franklin County with passenger and freight service.

GROUND-WATER RESOURCES

PRINCIPLES OF OCCURRENCE, SOURCE AND MOVEMENT OF GROUND WATER

A complete discourse encompassing the principles of ground-water hydrology would not serve a purpose in the report. However, a condensation of some of the basic facts about ground water have been adapted from Meinzer (1923).

Almost all the rocks that underlie the earth's surface contain numerous open spaces, called voids. These voids are the underground receptacles that hold the water that is recovered in part through springs and wells. Such voids are not as large as or in the form of surface lakes or streams, but are the openings or spaces between the grains, or along solution channels, joints, bedding or other structural planes. There are many kinds of rocks, and they differ greatly in the number, size, shape, and arrangement of their voids and therefore in their properties as containers of water. In most rocks the voids are connected, so that water can move through the rocks by percolating from one opening to another; but in some rocks the voids are largely isolated, and there is little opportunity for the water to move freely. The occurrence of water in the rocks of any region depends upon the character, distribution, and structure of the rocks.

The percentage of the total volume of a rock that is occupied by voids is its porosity. If a rock is saturated, that is, all the open spaces are filled with water, the porosity is practically the percentage of the total volume of the rock which is occupied by water. The porosity of a sedimentary deposit depends chiefly on (1) the shape and arrangement of its constituent particles, (2) the degree of assortment of those particles, (3) the degree of cementation and compaction to which it has been subjected since deposition, (4) the removal of mineral matter through solution by percolating waters, and (5) the fracturing or weathering processes to which the rocks have been subjected.

The specific yield of a water-bearing formation is a measure of its capacity to yield water by drainage to wells. Specific retention of a rock is the percentage of its total volume that is occupied by water which is not gravity ground water and which it will yield to wells. The specific yield and specific retention of a rock are together equal to the porosity. The capacity of a water-bearing material to transmit water under hydraulic head is its permeability. Permeability is measured by the rate at which it will transmit water through a given cross section under a given difference of pressure per unit of distance. Most rocks are more or less permeable to water under pressures ordinarily found in rocks reached in drilling, but they differ greatly in their degree of permeability, according to the number and size of their voids and the extent to which these voids open into one another. A bed of silt may have a high porosity but if the voids are small and of irregular shape water cannot move freely through them. Such a formation would have a low permeability and, in most instances, a specific yield of zero. A rock may have relatively few openings and therefore low porosity but, if the openings are larger and interconnected, its permeability and specific yield will be high.

Glacial outwash deposits in the southeast part of Franklin County consist of fairly coarse sand and gravel. These materials have a high permeability and a high specific yield and yield large quantities of ground water. Glacial deposits in the north-central part of the county consist of silt, sand and clay. These deposits may have a high porosity, but their permeability and specific yield are low and they yield only small supplies of ground water. Though it may be desirable to know the porosity of a rock when considering the availability of ground water in a given area, it is more important to know the permeability, for this determines the rate at which water can move to wells or springs.

The upper surface of the zone of saturation in ordinary permeable soil or rock is defined as the water table. If the upper surface is formed of soil or rock less permeable than the underlying materials, the water table is absent and the level to which water rises in a well drilled to the underlying materials is known as the piezometric, or pressure indicating surface. An artesian aquifer is overlain by less permeable beds. Such an aquifer is termed artesian whether or not the hydrostatic pressure is sufficient to lift the water to the surface and produce a flow (Fuller, 1908). According to Meinzer (1923), the pressure in the artesian aquifer must be sufficient to lift the water above the level of the water table.

The water table is not a continuous level sur-

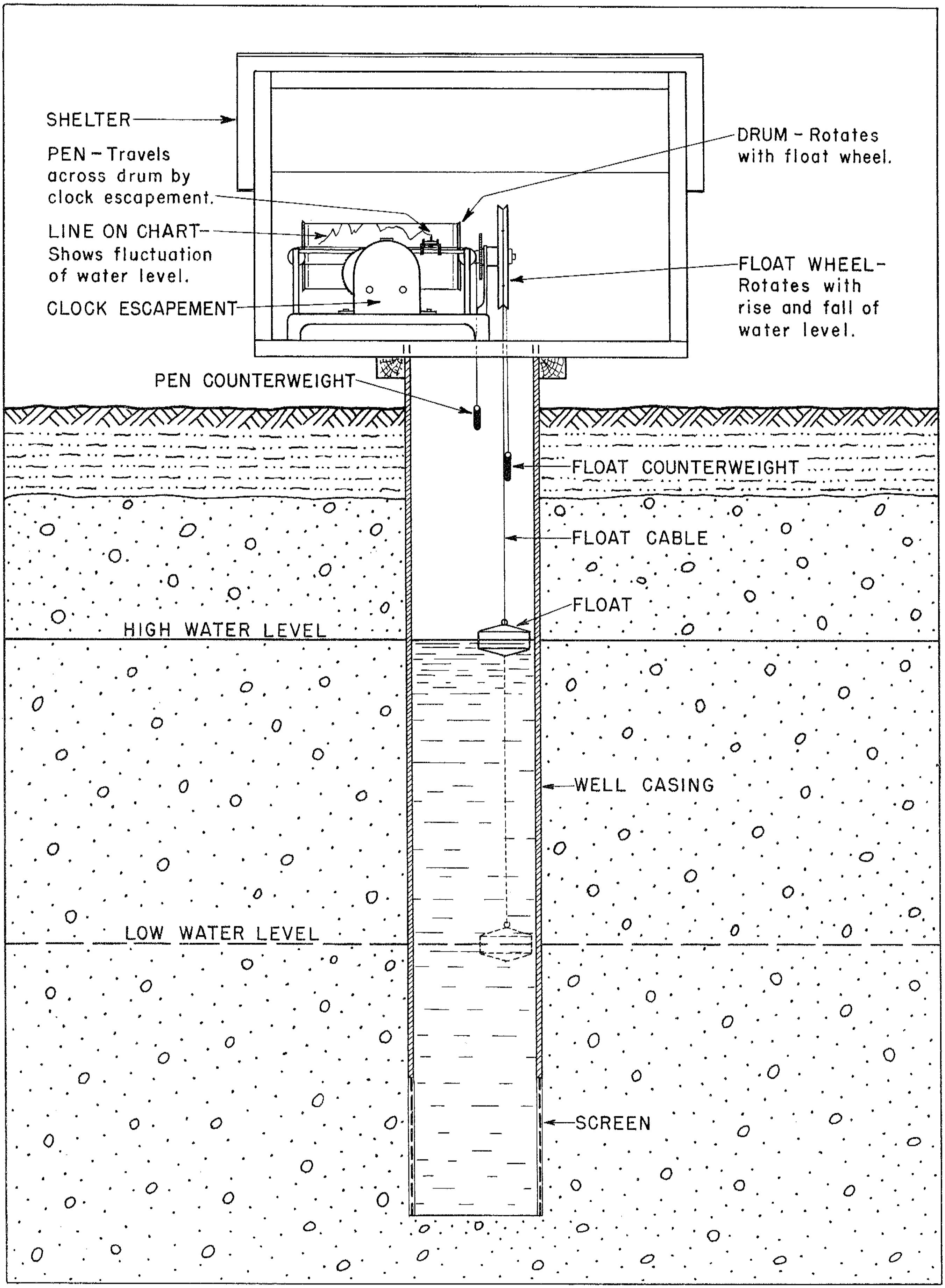


Figure 2. Typical installation of water-stage recorder on an observation well.

face but a series of recurrent levels similar and related to those of the land surface. The topography, climate and character of the underlying rocks principally determine the depth of the water table. Water levels are not constant, but fluctuate from time to time according to the recharge to, or discharge of water from, the aquifer. Changes in the water levels in wells indicate whether the ground-water reservoirs are being depleted or replenished. A device for recording these fluctuations of water levels is the water-stage recorder. A typical installation of this instrument on an observation well is shown on figure 2.

The ultimate source of all recharge, that is, the addition of water to the water-bearing formations, in any area is rain or snow. Usually only a small percentage of the total precipitation percolates into the rock. Much of it is returned to the atmosphere, either by direct evaporation from the land surface or by transpiration by vegetation. Part of the precipitation flows directly to surface streams. The amount of water which percolates to an aquifer depends upon many conditions; the permeability of the soil, the rate or intensity of the rainfall, the topography or the degree of the slope of the land, type and amount of vegetation, previous soil moisture content (that moisture retained in the unsaturated zone), the air temperature and humidity during the period following the precipitation, the porosity of the aquifer, and the amount of storage space available in the aquifer.

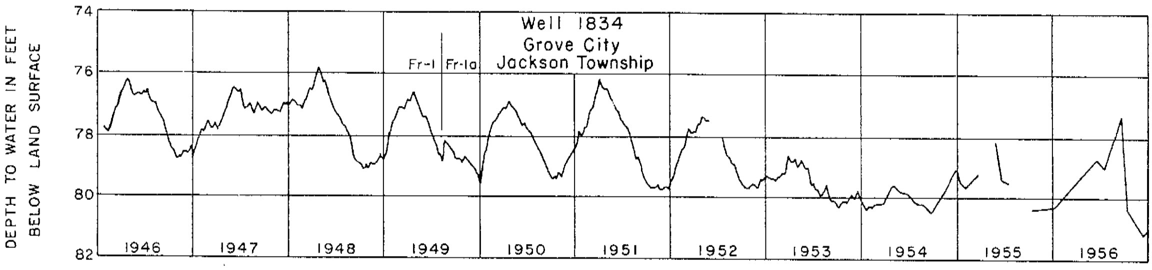
The fluctuations of water levels in aquifers in Franklin County are shown by the hydrographs on figure 3. The records of these wells are tabulated in table 14 and their locations are shown on plate 2. The fluctuations indicate a seasonal emptying and refilling of the ground-water reservoir. The filling occurs when the water derived from rain or snow percolates into the zone of saturation. The discharge of ground water is effected chiefly through ground-water discharge to streams and by evapo-transpiration.

The water table usually begins to rise in the fall, as soon as evaporation and plant growth decline. The water table rises whenever there is a heavy rain, or when the snow melts on ground that is not frozen. There is a considerable variation from one year to another in the time when the principal recharge takes place, owing to the differences in snow and frost conditions as well as to irregularities in precipitation. In the early spring the water table reaches its highest stage, but as soon as the weather becomes warm, and plant growth becomes active, the water table begins to decline, unless temporarily prevented by unusually heavy rains. During the summer, soil evaporation and the demands of vegetation are so great that little or no water percolates downward. Hence the water table usually declines persistently throughout the summer and reaches its lowest stage in the fall. If there is a critical deficiency of rainfall in the recharge period, the highest levels recorded in many wells in the following spring may be lower than the lowest levels of the previous years of record.

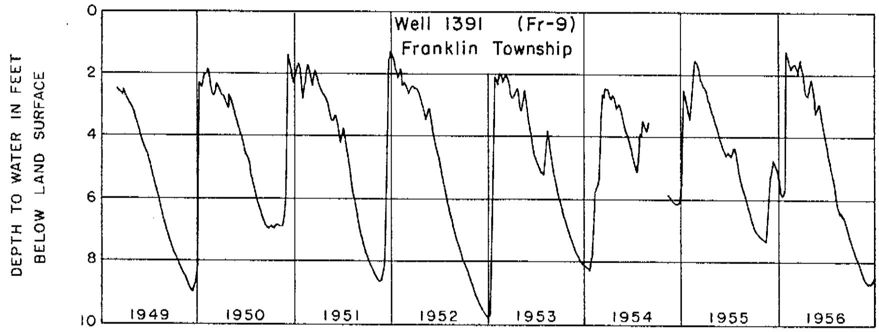
Wherever precipitation percolates to the water table, water goes into storage in the aquifer, the water table is raised, the hydrostatic pressure is increased, and the movement of ground water is accelerated. The flow of ground water is normally from a higher area, favorable for recharge, to some lower area of discharge. Under water-table conditions, the movement of ground water is toward surface streams or lakes. When there is a sudden rise of water in the lakes or streams, such as may be caused by heavy precipitation and floods, ground water flow may be reversed and the water table adjacent to the surface drainage raised.

The hydrograph for the observation well Fr-3 (well number 1937), located near Rees in Hamilton Township, is shown on figure 4. This illustration also shows the profiles of the water table for observation wells Fr-3, Fr-5 and Fr-6 (well numbers 1937, 1935, and 1936, respectively), as described in table 14. This sketch indicates that the ground-water gradient was in the direction of the stream at the beginning and at the end of the observed period. At the time of highest levels, on February 15, the gradient was reversed. The graph (figure 5) shows the relationship between the water levels in Big Walnut Creek and in the observation well, Fr-3, during the high flow period of January, 1950. When the stream is experiencing high flow, or flood flow, the normal gradient is reversed and the aquifer is recharged by the stream. This condition is usually of short duration and normal gradients are restored soon after the stream level falls. The water contributed to the aquifer by the stream is actually bank storage and usually does not represent an addition to available ground water. However, it does demonstrate a hydraulic connection between the stream and the aquifer, indicating potential stream infiltration under pumping conditions (Kaser, 1954).

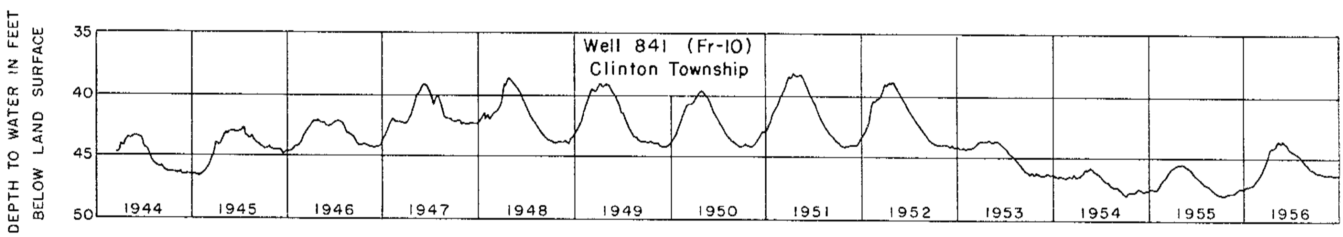
Pumping a well, or a group of wells, close to surface streams lowers the ground-water level below the river level, and reverses the normal ground-water flow. Water then flows from the stream toward the wells. The amount of induced infiltration depends upon the permeability of the



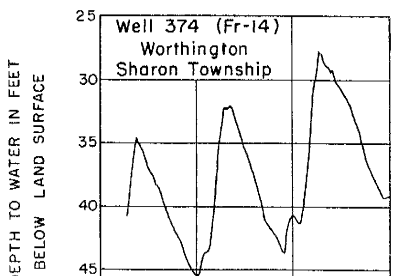
Annual fluctuations are in response to recharge apparently at some distance from the well. The recharge deficiency is clearly shown in the hydrograph for 1953 and 1954, in fact, the trend was almost continuously downward during these periods.



This well is observed by the Surface Water Branch of the U. S. Geological Survey to obtain data relative to the contribution of ground water to Scioto Big Run. Fluctuations of water level in this well are in response to local recharge and discharge. Recharge was nearly normal in 1953 and 1954 indicating that a shallow water table aquifer such as this can be recharged with considerably less than normal rainfall. Autumn water levels in both years were higher than average in contrast to the situation generally in the State.



Water levels in this aquifer seem to have been declining slightly since 1948. Lack of recharge is very noticeable in both 1953 and 1954 but its principal effect seems to have been to depress the peak spring levels. Low levels in those 2 years show the trend declining at about the same rate as the previous 2 years.



The water level in this well responds to natural recharge and discharge, modified to some extent by pumping from nearby wells which supply water to Worthington. The highest level recorded to date was 27.05 ft. below land-surface datum on April 12, 1956 and the lowest was 45.4 ft. below land-surface datum on December 26, 1954.

Figure 3. Hydrographs showing the fluctuation of ground-water levels in Franklin County, Ohio.

river bed, the permeability and thickness of the aquifer, and the distance and hydraulic gradient between the wells and the source of recharge. Where thick permeable deposits of glacial outwash can be recharged from surface streams, 1000 to 1500 gpm can be developed from wells. This relation between surface streams and permeable deposits adjacent to the stream is shown on plate 1.

If discharge is greater than recharge, water levels decline. The long-term sustained yield of an aquifer is therefore limited by the average amount of recharge it receives. Depending upon the storage space available in the aquifer, water can be withdrawn from storage in quantities larger than the average recharge, if the water is replenished during a later period when recharge exceeds the withdrawal, and before the storage is exhausted.

Under water-table conditions, when a well is not being pumped, the water level in the well usually coincides with the water level outside the well. When the well is pumped, the water level in the well is lowered and a differential head is established. Water then flows into the well from all directions and a hydraulic gradient is established toward the well. The amount the water in the well is lowered is called the drawdown. The depression made in the water table, or piezometric surface, assumes the approximate shape of an inverted cone, and is called the cone of depression. The apex of the cone is at the water level in the well while discharge is in progress, the base is the original water level, and the height from the base to the apex is equal to the drawdown.

The cone of depression reaches essential stability in a small area around the pumped well in a relatively short period of time. This initial drawdown is the result of dewatering sediments comparatively close to the well. As pumping is continued, water levels continue to decline as water flows from progressively greater distances. The water level in a well is said to have reached equilibrium when the cone of depression expands until enough water is induced to the well to balance the pumping. If equilibrium is not obtained, the water level near the well will continue to lower indefinitely, but at a decreasing rate, until the cone of depression extends to the limits of the aquifer.

The size, shape and rate of growth of the cone of depression depend upon the rate and duration of pumping, the permeability, thickness, and storage properties of the aquifer. The size and extent of the cone of depression have practical significance with respect to the locations of wells in a well field. Wells too closely spaced in the same aquifer may have a combined yield only slightly larger than the yield from one of the wells alone.

The thickness of the formation does not limit the specific yield of a water table aquifer since the same amount of water is released to the pumped well as the water table is lowered. The thickness of the formation limits the specific yield of an artesian aquifer since the water is not removed by dewatering the aquifer, but through the compaction of the aquifer and associated beds.

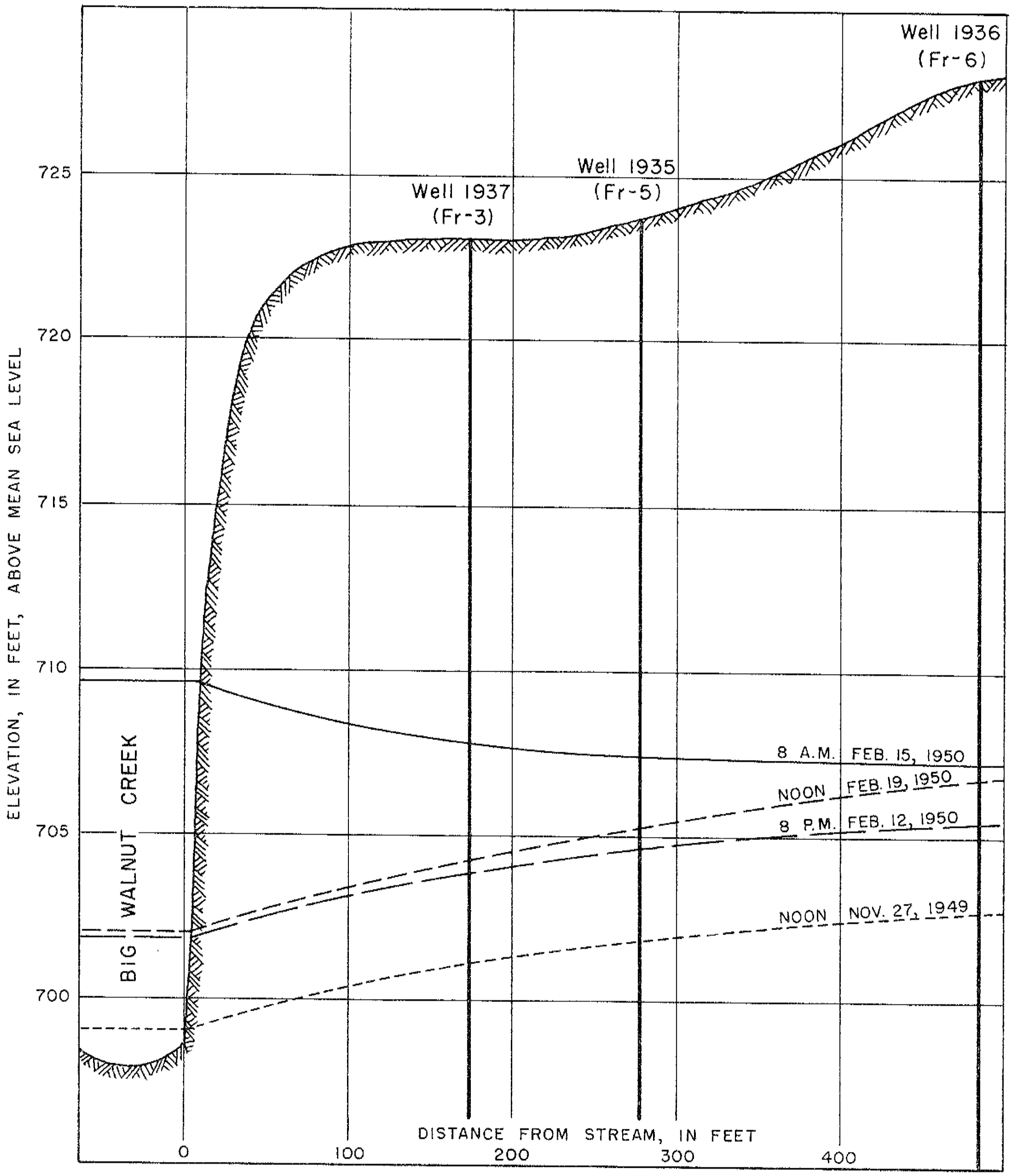
To minimize the drawdown by avoiding excessive entry losses, wells should be screened in the entire thickness of the water-bearing formation and thoroughly developed.

The yield of a well is the rate at which it will yield water after the water stored in the well has been removed. Doubling the size of the casing does not greatly increase the yield, for the yield depends upon the quantity of water available, the thickness and the permeability of the water-bearing formation, and the construction and condition of the well. Table 1 shows the percentage increase in the yield of a well, if all the conditions of the well are the same except the diameter (Johnson, 1947, Bull. 1238).

Table 1

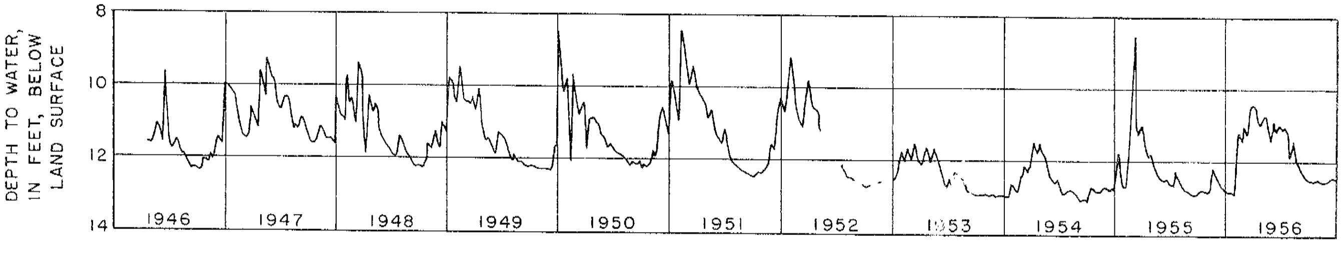
PERCENTAGE INCREASE IN THE YIELD OF A WELL WITH INCREASE IN THE DIAMETER

Well Diameters								
2″	4″	6″	8″	12″	18″	24″	36″	48″
Increase in Percent								
0	10	15	20	25	33	38	48	55
	0	5	10	15	23	28	38	45
		0	5	10	18	23	33	40
			0	5	13	18	28	35
				0	8	13	23	30
					0	5	15	22
						0	10	17
							0	7
								0



Profiles of water table at Rees (Kaser, 1952)

Under normal conditions the ground-water gradient is in the direction of the stream. This is equally true for prolonged periods of low flow in the stream, as shown by the profiles for November 27, 1949, when low flow had been obtained for about two months. However, during a short period of sharp rise in the stream, February, 1950, the gradient was reversed and there was flow into the aquifer. If the aquifer were pumped, infiltration from the stream could be induced.



Ground-water levels in well number 1937, Fr-3, near Rees.

Figure 4. Ground-water fluctuations in relation to the level of Big Walnut Creek at Rees.

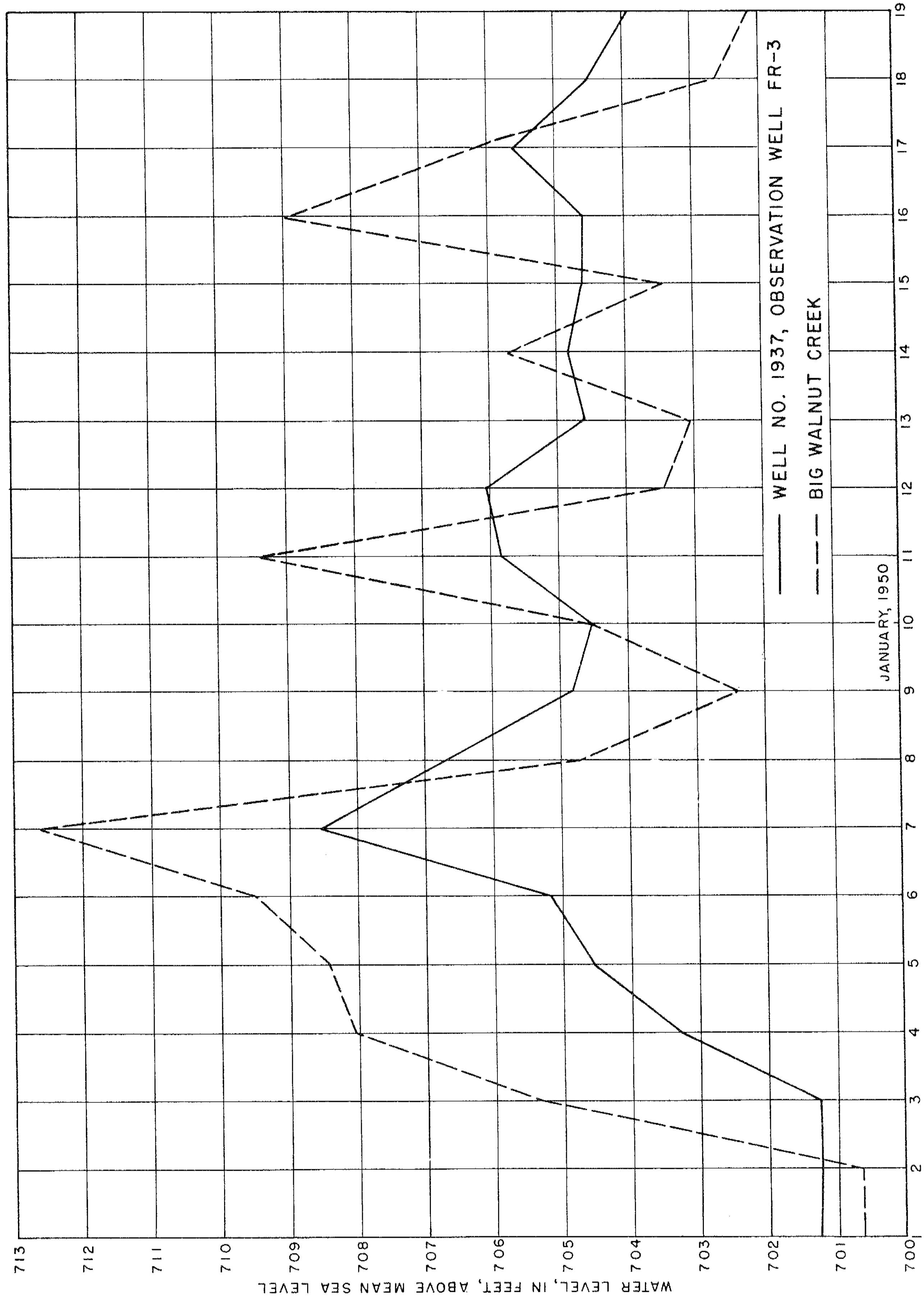


Figure 5. Graph showing water levels in Big Walnut Creek and observation well at Rees.

As the need grows for larger municipal and industrial ground-water supplies, a means for determining the yield of water-bearing formations becomes apparent. In the past it was often the practice to drill water wells regardless of location and the spacing between the wells. In this manner some municipal supplies were derived from a rather large number of wells located on a very small plot. By controlled pumping tests the hydraulic characteristics of aquifers can be evaluated.

The principal hydraulic characteristics of an aquifer are the coefficients of permeability, transmissibility and storage. The property of a formation to transmit water is measured by its coefficient of permeability, defined as the rate of flow of water in gallons per day which will move through one square foot of a given aquifer under a unit hydraulic gradient. The coefficient of transmissibility of the aquifer is defined as the rate of flow of water in gallons per day which will flow through a foot-square vertical column of a given aquifer under a unit hydraulic gradient under prevailing conditions. The property of a formation to yield stored water is measured by its coefficient of storage. This is the quantity of water, in cubic feet, released from storage from a vertical column of aquifer, one-foot square, when the water level is reduced one foot. Under artesian conditions the coefficient of storage is a small quantity, generally 0.00001 to 0.001 cubic feet, representing both the water released from the fine grained materials and that derived by the slight expansion of the water itself as the head falls. Under water-table conditions the coefficient of storage includes this small quantity and also the much larger quantity, generally 0.01, 0.3 or 0.4 cubic feet, representing water that drains by gravity from the top foot of the aquifer unwatered by the one-foot lowering in head (Smith, 1953, p. 9).

The two most common types of pumping tests are the "constant rate" test and the "step draw-down" test. The former is used to determine the characteristics of the water-bearing formation. The "step draw-down" test is usually conducted to determine the characteristics of the pumping well. The methods of collecting and analyzing the data are described by Bruin and Hudson (1955).

GEOLOGY AND WATER-BEARING PROPERTIES OF THE UNCONSOLIDATED DEPOSITS

Character and Distribution of the Glacial and Alluvial Deposits

by Richard P. Goldthwait

It is well established that at four distinctly different times during the last million years glaciers have expanded over northern United States. Whether the first two glaciers covered Franklin County is not certain. Evidence in the form of deeply weathered clayey till south of Cincinnati suggests that one of the early glaciers (probably Kansan) covered the area.

Some of the deeply buried valleys in Franklin County are partially filled with fine sand which probably accumulated in Illinoian time. The sand grains comprise many mineral types, characteristic of glacial deposits. The grains are well sorted and fine in size, showing they were deposited in quiet waters. Covering the fine sand, but spreading over a much wider area under the Scioto lowland, is a sequence of deposits comprising till at the bottom, intervening coarse bedded sand—5 to 100 feet thick—which is overlain by another clay till deposit. Till, often referred to as "hardpan", is a widespread glacial material deposited directly by the ice. In western Ohio till is a heterogeneous mixture containing 15 to 40 percent clay, 20 to 50 percent silt, and 25 to 50 percent sand.

The lower till, referred to above, represents the earliest record of glaciation in Franklin County. The age of this lower till has been determined indirectly. Analysis of radioactive carbon in wood found buried in overlying gravel at Rocky Fork, near Gahanna, indicated a date of more than 37,000 years. Since this gravel was washed out of the till in question, the till must be older than 37,000 years. Considerable evidence indicates that the last glaciation (Wisconsin) was in two stages; the first occurred about 50,000 years ago, and the second about 22,000 years ago. The lower till in Franklin County was probably deposited by the first Wisconsin glacial stage about 50,000 years ago. George Hubbard attributed this till to the Illinoian glacier (Stauffer, 1911).

The sand and gravel deposit between the upper and lower tills is exposed at many places. It is layered and cross bedded, evidence of swiftly moving waters. Drillers' logs of wells in the area, extending south from Worthington to Grove City and east to Canal Winchester, record this sand and gravel at varying depths beneath the surface till. Further evidence that this sand and gravel is only a little younger than the till on which it lies is provided by an absence of weathering, such as a buried soil, between the two deposits. In fact, stringers, or short layers of the lower till, extend diagonally upward into the gravel layers. Thus, it is clear that the glacier which deposited the lower till must have produced floods of meltwater which washed out the sand and gravels. At several places in Franklin County a clay-rich weathered zone lies at the top of the buried sand and gravel, beneath the unweathered surface till. This weathered zone has been leached of its calcium carbonate much like modern soil and is therefore interpreted to mark a period of soil formation, following the deposition of the sand and gravel, that preceded deposition of the overlying till. This period represents the interval between the Wisconsin substages.

The surface till in Franklin County ranges from 3 to 90 feet in thickness. This till is clay and silt-rich, although it also contains many pebbles and even boulders up to five feet in diameter. The pebble types (80 percent or more are dolomite) indicate that the glacier came from the northwest.

Striations on the bedrock indicate the same direction of ice motion as the pebble types. Striations are commonly seen in quarries along the Scioto River where the limestone bedrock crops out extensively. Some striations are as much as three inches wide. These prominent markings indicate a general southerly direction of ice movement. Across the more prominent striations are finer striae which indicate a later movement of the ice in a direction 15° to 20° more to the east. These finer striae represent the last motion of the ice as it became thinner and more lobate in form. Striations are not known on the shallow sandstone-shale escarpment along the eastern edge of the county.

The surface till was deposited by the same ice which left the striations on the bedrock. The surface till has been dated by radioactive carbon analysis of wood. A log found in a sand pocket in the upper till just south of Harrisburg was 21,600 years old. Deposited with the till were masses of sand and gravel. These sand and gravel masses are found in the till as pods or len-shaped masses ten to fifty feet long.

Types of surface deposits

Ground moraine. Glacial deposits are differentiated on the basis of their topographic expression and the materials which compose them. Except in the valleys, and scattered areas east of Alum Creek, most of Franklin County is very gently rolling land underlain by an average of 50 feet of till above the bedrock. Near valleys like that of the Olentangy River, older layers of sand and gravel, till, and fine sand occur beneath this top till, but the surface remains generally smooth. All of this terrain is called ground moraine. It was deposited mostly by the last Wisconsin glacier. The long pebbles embedded in the till generally are orientated parallel to each other and their long axes are in the direction of ice movement.

End moraine. The surface till also forms slightly higher (20 to 50 feet), rolling, hummocky ground. These areas are distributed in two slightly curving belts; the Powell moraine along the northern edge and the Pickerington moraine along the eastern edge of the county. Fragmentary patches of another moraine are along the southern border. End moraines mark the former edge of the Wisconsin glacier, where the ice remained for a century or so during its final retreat. In Franklin County this retreat took place about 16,000 years ago. The end moraines indicate that the ice first melted off the escarpment in the eastern part of the county, then readvanced against that highland to make the Pickerington moraine, and finally melted away to the north, with a second halt near Powell. End moraines generally contain more sand and gravel masses than a ground moraine.

Eskers and kames. Rising above the smooth surface of the ground moraine are hummocky areas underlain by bedded sand and gravel. The surface is characterized by humps (kames) or ridges (eskers) with steep sides. Since this sorted material, mostly coarse gravel, is water-laid, ice must have surrounded each hump or ridge during deposition to confine the meltwater stream which left the deposit. On the map kames and eskers appear as patchy areas. Spangler Hill and most of Hartman Farms, both six miles south of Columbus, are areas where waters piled the gravel fully 50 feet above the original surface. Further evidence of these waters is a channel east of Spangler Hill, where glacial waters escaped to the south as the ice melted.

There is evidence that many of these eskers and kames, especially those in the area extending from Morse Road near Alum Creek south to Brice and Pickerington, were formed in the ice of the next-to-last Wisconsin glacier. Thin clayey till overlies some of these kames and eskers, and in one esker west of Groveport there is a buried weathered layer (soil) under the till cover, indicating that a long period of time intervened before the last Wisconsin ice laid down the top layer of till.

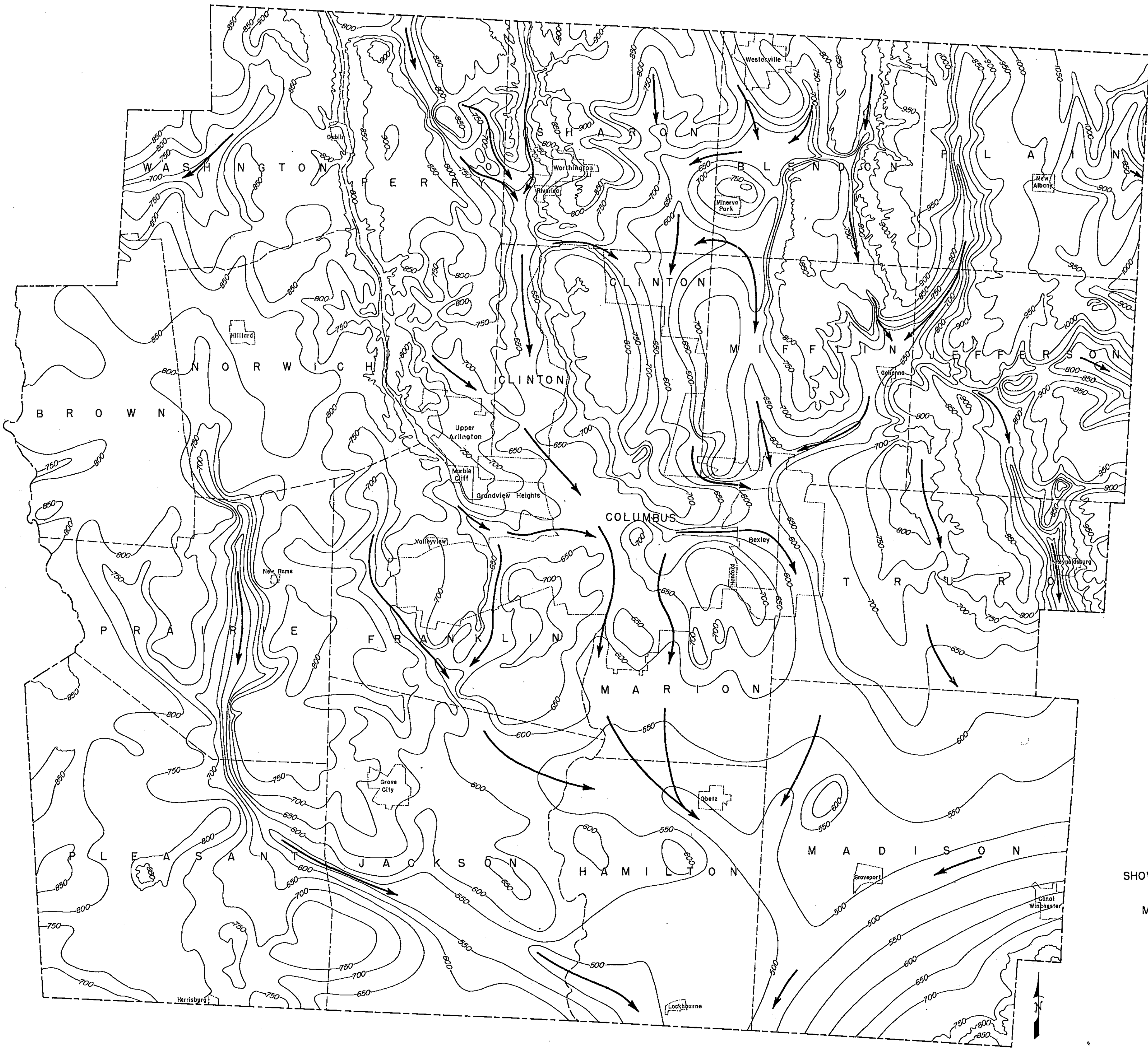
Outwash (valley-train). In the larger valleys in Franklin County, chiefly south of Columbus, are extensive sand and gravel deposits. The top of these deposits form terraces which lie 10 to 20 feet above the river bottoms. Southwestern Columbus is on such a terrace and pits along Route 104 are a source of gravel. The similarity in level of the patches of terrace on opposite sides of the valleys indicates that these surfaces were once continuous across the valleys. Perhaps the Scioto valley-train deposit was finished when the ice edge stood along the Powell moraine. Since then, the Scioto River and its tributaries have cut away half of the original surface gravel.

Lake clays. Lake clay was deposited in a small bedrock basin in Glenmary Ravine, north of Worthington. Water may have been trapped there by a fragment of the last ice. The clay is laminated and well-sorted as is characteristic of lake deposits.

Bedrock Surface and Valleys Filled With Glacial Debris

If it were possible to peel a wide strip of the unconsolidated materials from the bedrock surface in Franklin County, a highly dissected area of low relief would be apparent. The relationship between the present topographic features and the bedrock relief would be evident.

The principal geologic feature, which has controlled the relief since the beginning of the erosional cycle which was interrupted by glaciation, is the escarpment which lies just west of the eastern border of Franklin County. This escarpment, which faces westward and trends north-south, is a series of bedrock steps which rise eastward to the Appalachian Plateau. The initial step in Blendon and Plain townships is capped with the Berea sandstone and a remnant of the Sunbury shale, and reaches a height of 950 to 1000 feet above mean sea level (m.s.l.). The second step, further east in the vicinity of Blacklick Creek, rises to an altitude of about 1050 feet. The second step is not



MAP OF
FRANKLIN COUNTY, OHIO
SHOWING TOPOGRAPHY OF THE BEDROCK SURFACE
AND DIRECTION OF FLOW OF THE
MAJOR PREGLACIAL AND GLACIAL STREAMS

ALTITUDE IN FEET ABOVE SEA LEVEL
CONTOUR INTERVAL 50 FEET

SCALE IN MILES
0 1 2 3 4

Figure 6.

as distinct as the first, owing to the drainage pattern in the area, and is capped with the Lower Cuyahoga sandstone.

The central and western parts of the county, which are in the Central Lowlands province, progressed from physiographic youth to old age through the action of erosional cycles, whereby valleys were carved, tributaries were widened and deepened, and divides were developed. This process, which was repeated more than once, reduced the region by erosion from a low plateau to a lower "grandly rolling" surface before glaciation (Stauffer, 1911, p. 55). Regionally, the bedrock surface complies with Von Engel's (1942, pp. 133-151) description of old age stage of development. The master streams were fully graded and expanded to satisfy every possibility of drainage development. The divides had been lowered and rounded from ridge forms, and the surface sloped upward very gently from the lowlands to the crests of the divides. The ascent from the floodplain to the crest of the divides varies from 15 to 22 feet per mile in the central part, and 43 to 62 feet per mile in the eastern part of the county. The topography of the bedrock surface and direction of flow of the major preglacial and glacial streams are shown on figure 6.

The bedrock surface in the northern part of Franklin County ranges generally in altitude from 600 feet to 850 feet. Remnants of 900 foot hillocks cap the divides. In the southwestern quarter of the county the bedrock uplands are more than 800 feet in altitude with a few 850 foot hillocks. The altitude of the major buried valley in this area is about 550 feet above mean sea level. In the southeastern quarter of Franklin County there is a prominent valley system at an altitude below 500 feet. Divides range up to 650 feet in altitude except in the extreme southeastern corner of the county.

The main buried channel in southeastern Franklin County is known as the Groveport River and has been associated with the "Teays Stage" drainage system (Stout, Ver Steeg, and Lamb 1943, p. 66). The term "Teays Stage" is applied to all the streams correlative with the Teays River, the master river of the system, which flowed across Ohio in a northwesterly direction and drained the southern two-thirds of the State prior to glaciation. The Groveport River, which was a tributary to the Teays, gathered its headwaters in the vicinity of Wooster in Wayne County, and flowed southwest by south to Newark in Licking County. Its course is clearly defined at various points from Wooster to Newark. Its channel is less definite from Newark to Groveport, where it enters the eastward extension of the Central Lowlands. It is surmised that this area of low relief was initially created by the Groveport and Newark rivers and later filled with glacial debris.

In an earlier work Stout, Ver Steeg, and Lamb (1943, p. 66) projected the course of the Groveport River westward through Franklin and Madison counties to a junction with the Teays River in Clark County. The present data, based on well logs from the files of the Ohio Division of Water, rule out a westward course for the Groveport River. As shown in figure 6 the Groveport River flowed southwest across the southeast corner of Franklin County and joined the Teays River in central Pickaway County.

Four tributaries to the Groveport River drained three-fourths of Franklin County. Most of the western half of the county was drained by a stream which had its headwaters in Perry and Norwich townships. This stream flowed southeast across southern Perry Township, thence southward through Columbus, following a course that lay to the east of the present Olentangy and Scioto rivers. It continued its course southward through Hamilton Township, swinging eastward in the vicinity of Rees, where it joined its major tributary from the west. South of Rees and Obetz, the stream joined another major tributary to the Groveport River, that had its headwaters in Delaware County.

The tributary which rose in Delaware County flowed in a southeasterly direction across Perry and Sharon townships, thence due south through Clinton Township, Columbus, and Marion Township. The confluence with the Groveport River was in north-central Pickaway County.

The course of the fourth tributary to the Groveport River was generally south. The stream entered the county in Blendon Township, in the vicinity of Westerville, and flowed to East Columbus along the general course of present day Alum Creek. From this point it swung slightly southeastward, passing through the western portion of Truro Township, and flowed south to join Groveport River in the extreme west section of Madison Township in the vicinity of the Lockbourne Air Force Base.

Major changes in the Teays Stage drainage system resulted from Pleistocene glaciation. There were minor changes in the regional configuration of the bedrock surface. However, during this period there were major changes which resulted from ice encroachment, deposition or stream piracy. The valleys were broadened and deepened considerably, and the hilltops were somewhat rounded by the eroding ice. The preglacial stream, which had flowed southeast through Perry and Sharon townships, changed course southeast of Linworth and continued due south, following a course west of the present Olentangy River. The stream continued its course southward to the Groveport River in channels formerly occupied by preglacial tributaries. The tributary south of Westerville was relocated westward to central Sharon and Clinton townships; the stream then flowed southward in new and old channels to southern Clinton Township. From this point the stream flowed east to its old preglacial channel and continued its course southward to its master stream. The preglacial stream which had occupied the valley of the present Big Walnut Creek abandoned its valley near Gahanna and flowed westward to the preglacial channel of another south-flowing river. A tributary to this stream reversed its course from northwest to southeast, and deepened its channel west of Blacklick and Reynoldsburg to join the master stream in the eastern part of Madison Township.

The principal drainage system for the southwestern quarter of the county gathered its headwaters in Norwich Township, just southwest of Hilliards. Its course was due south, bearing to the east, approximately one and one-half miles south of Galloway in Prairie Township. Its course was then southeast through Pleasant and the southern half of Jackson Townships and it joined the master stream in the north central portion of Pickaway County.

When the glaciers melted, some valleys were filled with coarse sand and gravel; others, especially the deeper valleys, were filled with as much as 250 feet of till. The buried valleys associated with the Scioto, Olentangy and Big Walnut streams are filled with 100 to 250 feet or more of permeable glacial outwash deposits. These deposits are the major potential aquifers in the county. Figure 6 shows the bedrock surface of Franklin County and the major drainage courses prior to and during the glacial epoch. The section of this report on specific areas describes the deposits which fill the buried valleys.

Present valleys are largely postglacial. The Scioto River, from Columbus southward, is a postglacial stream flowing in a valley filled by outwash from glaciers. The Olentangy River, Alum Creek, Big Walnut Creek and a portion of Blacklick Creek are similar to the Scioto River in this respect in their lower courses. Evidence that these streams made their own valleys after glaciation are rock terraces along the Scioto River north of Columbus. The rock floor of the buried valleys is well below the present channels, yet the latter flow on bedrock and, in some instances, in bedrock gorges. Postglacier streams, eroding their channels in bedrock, have the appearance of a youthful valley while those in the drift appear older, yet present stream courses are everywhere the same age. Present streams, especially the Scioto River, are cutting new channels in bedrock at various places in the county. Big Walnut Creek, north and south of Gahanna, Alum Creek and Olentangy River, are eroding new channels at various locations north of the central part of the county.

While many buried systems of drainage exist, not all functioned at the same time. Even though we may recognize two or more sets of drainage beneath the drift, we cannot be sure to which erosion cycle any given buried valley may belong. In mapping the bedrock surface, only those wells were used which furnish data as to the thickness of the drift, or the depth to the underlying bedrock. It is beyond the scope of this report to discuss whether changes in buried valleys were the result of Pre-Illinoian, or later glaciation. The Pre-Illinoian glaciation ended the post-Teays drainage system and deposited glacial debris in its valleys. Pre-Wisconsin drainage was similar to the Teays System because the valleys, though partly filled, were substantially lower than the surrounding areas and still controlled the drainage system.

Occurrence of Ground Water in the Glacial Deposits

The areal distribution of the Pleistocene deposits is shown on figure 7. These surficial glacial deposits in Franklin County are not necessarily significant water-bearing horizons but are mainly important for the effects they have on recharge to the underlying rocks. More than 84 percent of the county is covered with ground and end moraines. These deposits are clayey till, ranging in thickness from less than two feet on the bedrock uplands, to 115 feet or more in the buried valleys. Thin lenses or stringers of sand and gravel are scattered throughout this till. In regions where the ground moraine overlies up to 25 to 30 feet of shale bedrock, (plate 1), dug wells are commonly constructed. End moraines are more favorable than ground moraine deposits for the development of drilled wells for farm and domestic use because they contain more extensive

MAP OF
THE ALLUVIAL AND GLACIAL DEPOSITS OF
FRANKLIN COUNTY, OHIO
AND DESCRIPTION OF THEIR WATER-BEARING PROPERTIES

GEOLOGY BY RICHARD P. GOLDTHWAIT

EXPLANATION

RECENT

ALLUVIAL DEPOSITS
Silt and gravel deposited by the present streams on their flood plains. Because these deposits are thin and generally impermeable, they are not a source of ground water. Wells that penetrate these deposits may encounter valley-train deposits, and yield large ground-water supplies.

PLEISTOCENE (WISCONSIN STAGE)

VALLEY-TRAIN DEPOSITS
Outwash deposits of sand and gravel deposited in the valleys by flooding meltwater from the glacier. These deposits occur above present drainage as gravel terraces and generally do not receive infiltration from major streams. These deposits are very permeable and increase the recharge potential for the underlying formations, which usually consist of valley-train deposits below drainage.

KAMES AND ESKERS
Sand and gravel deposited as hills and ridges. Some of these are covered with thin till or contain till masses. Quantity of water obtainable depends upon the thickness of the material and amount of recharge.

END MORAINE
Generally till, in places stony or sandy, with interbedded sand and gravel lenses. Deposited as hills and ridges at the edge of the glacier. Small farm and domestic water supplies are generally developed from wells in the lenses of sand and gravel.

GROUND MORAINE
Till generally more than 20 feet thick, although bedrock may be exposed in a few places. Meager water supplies in the till, but adequate supplies for farm and domestic use are sometimes developed in the thin lenses of sand and gravel interbedded in the till.

LAKE BEDS
Clay and silt which settled in small lakes near the melting ice edge. These deposits range from 10 to 20 feet thick and are not a source of ground water.

Drainage Channels

Gravel Pit

Figure 7.

layers of sand and gravel. In the extreme northern portion of Perry Township sand and gravel lenses in the Powell moraine comprise an aquifer above the impervious Devonian shale. In Washington Township this moraine provides recharge to the underlying Devonian limestone. This is also true with respect to the moraine in the extreme southwest quarter of Pleasant Township. The discontinuous Pickerington moraine along the eastern edge of Franklin County, in Jefferson and Plain townships, is a source of small farm and domestic supplies.

In areal extent the esker and kame deposits in the county are somewhat limited. These water-laid, stratified deposits of sand and gravel are usually well above drainage and are sources of recharge to underlying deposits. Similarly, outwash gravel terraces provide recharge to underlying valley train deposits.

The preglacial, glacial, and interglacial drainage systems controlled the deposition of sand and gravel deposits in Franklin County. Important sand and gravel aquifers are adjacent to the Scioto River, Big Walnut and Little Walnut creeks, south and southeast of Columbus, and Darby Creek, north of Harrisburg. Wells drilled into these aquifers in these areas, and in Nelson Park, have a potential yield of 1000 to 1500 gpm.

An extensive area south and southeast of Columbus is underlain by a buried outwash plain, perhaps not regionally continuous, but made up of thick deposits of sand and gravel interbedded with relatively thin clayey till. Where these outwash plain deposits are in direct contact with surface water sources, as in the vicinity of Rees in Hamilton Township, large yields can be developed. Where the geologic conditions are not conducive to stream infiltration, these permeable deposits can yield 500 gpm to drilled wells.

Sand and gravel deposits adjacent to the Olentangy River, south of Linworth, shown on plate 1, will yield as much as 250 or more gpm to drilled wells. Deposits in the buried channel adjacent to Alum Creek, south of Westerville and continuing south through Mifflin and Truro townships, will yield 200 gpm to wells. These deposits are covered with thick clayey till which limits the potential recharge.

Two rather distinctive, deeply buried valleys, one in Sharon and Clinton townships, and the other in Prairie, Pleasant, and Jackson townships, contain thin lenses of sand and gravel scattered irregularly in thick glacial till as much as 300 feet thick. Yields of five to 10 gpm are available from the sand and gravel lenses.

In the deeply buried valleys in Washington, Plain and Jefferson townships are lenses or layers of fine sand and silt at depths ranging from 10 to 220 feet. The fine sand deposits store large quantities of ground water; however, it is not commonly recoverable owing to the low permeability of the deposits.

SUMMARY OF STRATIGRAPHY AND STRUCTURE

The consolidated sedimentary strata of late Silurian, Devonian, and early Mississippian ages, and the unconsolidated deposits of the Pleistocene Epoch comprise the two major rock types of Franklin County. The consolidated rock units are beneath the Pleistocene deposits and crop out in the beds of the streams and on steep slopes. The physical characteristics of the deeper sedimentary rocks are known from several deep wells drilled in the county in search of water, oil and gas. Newberry (1873) reported the log of a well drilled at the State House in Columbus. This well was drilled to a depth of about 2780 feet and provides a section extending to the St. Peter sandstone of lower Ordovician age.

Formations found elsewhere in the state were removed in Franklin County by erosional intervals in the Paleozoic Era when this region was above sea level. Their absence is marked by unconformities at the base of the Columbus limestone, Berea sandstone and the "lost interval" between the early Mississippian formations and the glacial deposits. The principal unconformity, between the Bedford shale and the Berea sandstone, eliminates a sizeable portion of the Berea sandstone in southern Franklin County; however, the Bedford shale increases in thickness. The given thickness of these formations is an estimate based on scattered well logs. The regional dip (inclination from the horizontal) of the sedimentary rocks is east by southeast and ranges from 25 to 32 feet per mile. The strata are frequently affected by small folds, or disturbed so that locally the dip is changed (Stauffer, 1911).

The unconsolidated Pleistocene deposits which cover the county are the more important of the two major rock types, with respect to their water-bearing properties (see Plate 1).

The general character and water-bearing properties of the geologic formations are listed in table 2. A more complete discussion is in that portion of the report on the geology and the water-bearing properties of the consolidated and glacial deposits. The areal distribution of the consolidated rocks is shown on figure 8. A generalized geologic section across Franklin County is shown on figure 9.

GEOLOGY AND WATER-BEARING PROPERTIES OF THE CONSOLIDATED ROCKS

Viewing a topographic map of Franklin County we would expect to find a limited geologic column beneath the relatively flat-lying glacial surface. However, the consolidated rocks in Franklin County have a much greater geologic range than those in the majority of the counties in Ohio. The rocks are sedimentary in origin and were deposited during the mid-Paleozoic Era. They range in age from late Silurian to early Mississippian and consist of beds of dolomitic limestone, black shale, and alternating shale and sandstone. (See table 2). During the time the beds were deposited central Ohio was covered by the waters of a shallow inland sea. Calcareous muds were deposited and later compacted and hardened into the Silurian and Devonian limestone. Clay and sand were deposited in muddy seas and developed into the present day Devonian shale and early Mississippian sandstone and shale.

The rock units listed in table 2 are not found everywhere in the county. Some have been removed locally by erosion. The geologic map, (fig. 8) shows the areal distribution of the Silurian, Devonian, and Mississippian rocks. The map and the following discussion of the rock units are based on field studies, well records, and previous reports on the geology of the area. More complete descriptions of the occurrence and distribution of the consolidated rocks in the county are in reports by Stauffer, Hubbard, and Bownocker (1911), Stauffer (1909), Orton (1878), Griggs (1904), Prosser (1912), Lamborn (1938).

Stratigraphic sequence, character and distribution of the rocks

Silurian System

The Bass Islands dolomite crops out in the buried valleys in the western third of Franklin County. There are a few exposures of the Bass Islands dolomite in the valleys of Big Darby and Little Darby creeks in western Pleasant Township. The systemic contact between the Devonian and Silurian rocks is not readily detected in well records, yet the generalized contact has been projected on figure 8.

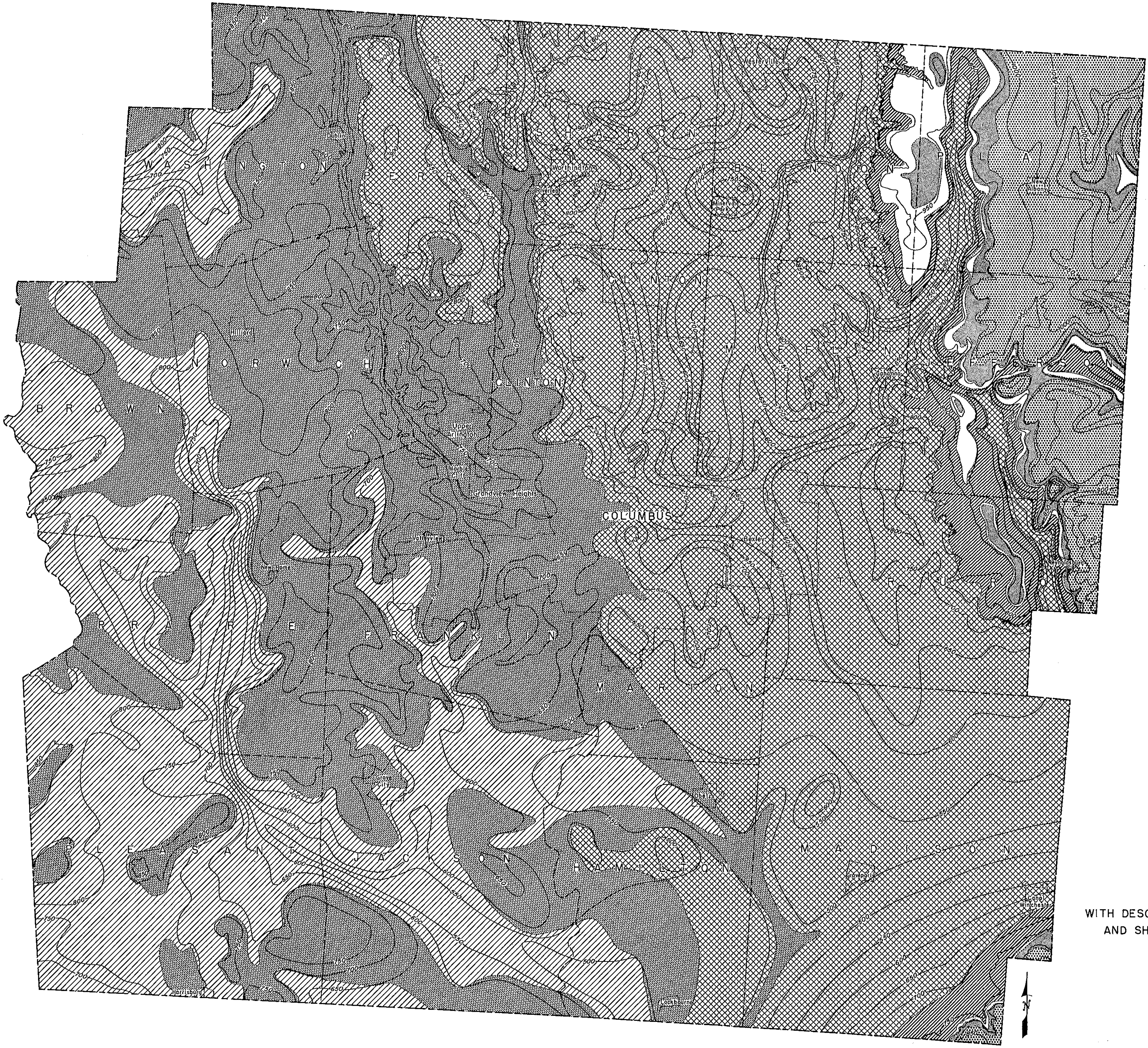
Devonian System

The contact between the Devonian and Silurian systems represents a prolonged erosional period during Paleozoic time. The basal part of the Columbus limestone is conglomeratic, consisting of pebbles of fine grained drab dolomite (Bass Islands) imbedded in a matrix of brown Columbus limestone. A few quartz grains commonly are intermingled with the pebbles. The basal conglomerate was originally mapped as Oriskany sandstone, however, according to Stauffer (1909, p. 26) the basal conglomerate is not continuous and therefore should not be included as part of the Columbus limestone. Carman (1927) associates the quartz grains with the Sylvania sandstone of northern Ohio. The zone is an excellent horizon marker between the Devonian and Silurian systems in the county.

The Devonian system is subdivided into eight formations. They are, in ascending order: Sylvania sandstone, Amherstburg dolomite, Lucas dolomite, Columbus limestone, Delaware limestone, Olentangy shale, and Ohio shale. The Lucas and Amherstburg dolomites are wanting in Franklin County. These formations were presumably removed, or not deposited, during the erosional period of Lower Devonian time.

The lower part of the Columbus limestone consists of rather porous, massive, brown limestone, containing a high percentage of magnesium. At Dublin, the lower part of the Columbus limestone is 41 percent magnesium (Orton, 1878, p. 616). The upper part of the Columbus limestone, which comprises about two-thirds of the formation, consists of light bluish gray limestone containing 81 to 93 percent calcium carbonate.

A complete section of Columbus limestone was made by Griggs (1904, p. 68) during the construction of Griggs Dam located on the Scioto River one and one-half miles north of Marble Cliff. This section measures 110 feet which is about the



EXPLANATION

MISSISSIPPIAN

LOWER CUYAHOGA FORMATION
Series of alternating layers of sandy shale and sandstone. Ample water supplies are available for farm, domestic, and small industrial use. Potential yields of as much as 30 gpm may be expected from the sandstone layers.

SUNBURY SHALE
This argillaceous shale is not considered to be a reliable source of ground water.

BEREA SANDSTONE
Thin to massively bedded sandstone ranging from 5 to 55 feet thick. Yields of as much as 25 gpm may be developed in Blendon, Plain, and Jefferson Townships.

BEDFORD SHALE
Soft argillaceous shale 50 to 90 feet thick. Very poor source of ground water in Franklin County.

DEVONIAN

OHIO AND/OR OLENTANGY SHALE
Carbonaceous shale grading to soft clayey shale. Not a dependable source of ground water in the county. Generally yields less than 2 gpm.

DELAWARE AND/OR COLUMBUS LIMESTONE
The Delaware formation is a thin to massively bedded dense limestone, with some thin shaly layers. Yields of less than 3 gpm may be expected. The Columbus limestone is the principal aquifer in the western half of Franklin County. Industrial supplies may be developed, however, relatively high hardness, dissolved solids, and hydrogen sulfide may be characteristic of water from deep wells.

SILURIAN

BASS ISLANDS DOLOMITE
The Bass Islands dolomite is exposed in Pleasant Township and crops out beneath thick glacial fill in the buried valleys of western Franklin County. It is the most important bedrock acquifer in the county and has a potential yield of up to 400 gallons a minute. As with other limestone aquifers in the county, the degree of mineralization increases with depth.

MAP OF
THE CONSOLIDATED ROCK UNITS IN
FRANKLIN COUNTY, OHIO
WITH DESCRIPTION OF THEIR WATER-BEARING PROPERTIES
AND SHOWING CONTOURS ON THE BEDROCK SURFACE

ALTITUDE IN FEET ABOVE SEA LEVEL
CONTOUR INTERVAL 50 FEET

SCALE IN MILES
0 1 2 3 4

Figure 8.

TABLE 2.

STRATIGRAPHIC SEQUENCE IN THE UNCONSOLIDATED AND CONSOLIDATED ROCKS THAT CROP OUT IN FRANKLIN COUNTY, OHIO

System	Series	Group or Formation	Maximum thickness (feet)	Character of material	Water-bearing properties
Quaternary	Recent			Silt, clay, and sand deposited on the floodplains of the major streams.	Thin and relatively impermeable. Ground-water supplies are small and wells are drilled through these deposits to the underlying glacial deposits or bedrock.
	Pleistocene		350	Thick layers of sand and gravel deposited by glacial meltwaters as surficial valley trains during Wisconsin time, or as deeply buried outwash prior to Illinoian time.	Potential ground-water yields depend upon the thickness, permeability, and source of recharge. Where favorable conditions prevail, wells may yield 1000 to 1500 gpm.
			225	Lenses of sand and gravel, 5 to 50 feet thick beneath thick clayey till, up to 115 feet or more, deposited in buried valleys.	Quantity of ground water available depends upon the thickness and regional extent of the aquifer. If good conditions prevail drilled wells yield as much as 200 gpm.
			60	Lenses of sand and gravel wedged between layers of clayey till of relative thickness. Physical characteristics indicate deposition by swiftly moving waters.	Potential yield may be as much as 25 gpm, depending upon the thickness and regional extent of the aquifer.
			300	Heterogenous mixture of thick till, rich in silt, scattered with thin lenses of sand and gravel, and deposited in buried valleys isolated from present drainage in Franklin County.	Potential ground-water yield depends upon the thickness and number of lenses of sand and gravel. Sufficient supplies for farm and domestic use (as much as 10 gpm).
			85	Thin to thick lenses of fine sand, deposited at various depths (35 to 205 feet) in many of the buried valleys in Franklin County.	Generally not a source of ground water. Fine sand, usually referred to as quicksand, stores large quantities of water. However, water is not recoverable owing to the low permeability of the formation.
Mississippian		Lower Cuyahoga	165	Series of alternating, thin-layered, gray, sandy shale and thin to massive grained, blue to grayish sandstone. Basal five feet, bluish gray shale.	Ample supplies available for farm, domestic, and small industrial use. Potential yields of up to 30 gpm may be expected from sandstone layers.
		Sunbury	35	Black argillaceous, fissile shale.	Poor source of ground water.
		Berea	55	Relatively pure, thin-to massive-bedded, fine-grained sandstone with some layers of arenaceous shale.	Potential yields of up to 25 gpm may be developed. Wells pumped intermittently may yield up to 70 gpm.
		Bedford	90	Soft, gritless, argillaceous shale of red to brown, blue to gray color.	Not a reliable source of ground water.
Devonian		Ohio	450	Blue-black, black or dark brown, carbonaceous and sometimes arenaceous shale grading from massive to thinly laminated shale.	Not a dependable source of ground water in Franklin County.
		Olentangy	30	Soft, argillaceous, blue shale with some argillaceous limestone concretions.	
		Delaware	32	Thin-bedded, blue-gray limestone with some thin shaly layers, iron pyrites and black chert, grading to rather massive layers of limestone.	Small supplies of up to 3 gpm may be developed.
		Columbus	105	Fairly massive and rather pure limestone grading to a rather porous, massive, impure limestone.	The principal bedrock aquifer in the county for farm, domestic, small municipal and industrial supplies. Yields up to 175 gpm.
Silurian		Bass Island	373	Fine-grained, compact, thin to massive, impure, argillaceous limestone.	Most important industrial bedrock aquifer. Yields up to 400 gpm or more, although the ground water is usually highly mineralized.

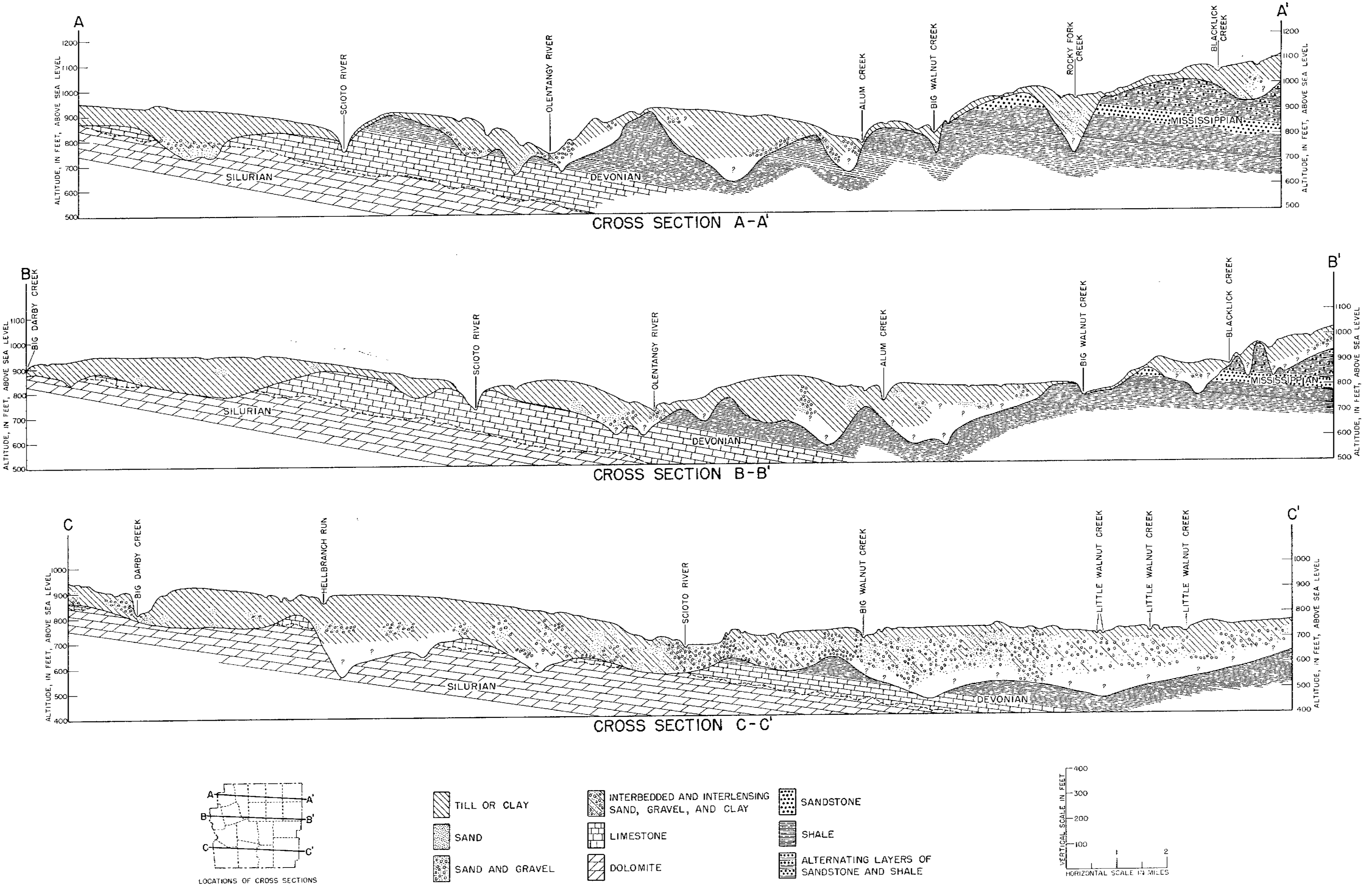


Figure 9. Generalized cross sections showing geology of Franklin County, Ohio.

average thickness of the Columbus limestone in Franklin County. The following is a condensed form of the section and does not include paleontological data.

COLUMBUS LIMESTONE	Ft.	In.
Zone H. "Bone bed"	1	2
Fairly massive bluish gray limestone	9	6
Zone G. Even bedded bluish to gray limestone becoming quite massive	20	4
Zone F. Massive bluish gray limestone cavities in the rock and interior of many fossils are filled with petroleum	5	0
Zone E. Massive bluish gray limestone	18	11
Zone D. Massive grayish-brown limestone with some gray chert	2	6
Gray chert alternating with layers of light brown limestone	6	4
Light gray limestone containing little or no chert	0	6
Zone C. Coral zone with some chert	3	6
remainder covered to level of Scioto River	2	8
Zone B. (From section of well No. 10) Gravel and soil to top of rock	2	7
Massive brown limestone	24	8
Thinner bedded brown limestone	7	2
Zone A. Conglomerate	2	4

Many exposures of Columbus limestone occur along the Scioto River from Columbus northward. The bedrock beneath the glacial drift on the uplands in that area is principally Columbus limestone.

There are two distinctive characteristics which separate the Columbus limestone from the Delaware limestone. The upper limit of the Columbus limestone terminates in the "bone bed" which consists of a layer of fossilized fish remains, six to eight inches thick. This layer is not limited to Franklin County; it may be traced northward to Sandusky (Stauffer, 1909). The second characteristic is the abrupt change from the almost pure organic Columbus limestone sediments to the argillaceous, cherty, blue limestones and calcareous brown shales of the Delaware formation.

The Delaware limestone marks the top of the great limestone beds of Ohio which extend in a broad belt from Pickaway County to the Lake Erie islands. The Delaware limestone has a thickness of 32 feet in Franklin County (Prosser, 1950), and is somewhat variable in its lithologic characteristics. It grades from thin shaly layers, with beds of chert, to fairly massive layers of limestone with very little chert or shale. Numerous exposures north of Columbus along the Scioto River and its tributaries present excellent sections. A portion of the section at Slate Run, located two and one-half miles north of Griggs Dam on the east bank of the Scioto River, illustrates the lithologic characteristics of the Delaware limestone and Olentangy shale (Stauffer 1909, p. 54):

OHIO SHALE	Ft.	In.
Thin bedded black shale obliquely jointed and containing spherical concretions	12	6
OLENTANGY SHALE		
Pale blue, or bluish green, soft argillaceous shale	2	..
Rather indefinite layer of flat irregular limestone concretions	..	6
Pale blue, or bluish green, gritless shale	14	..
Blue limestone containing iron pyrites	..	5
Soft bluish green shale	..	7
Purplish brown shale	..	2
Bluish greenish shale with concretions of iron pyrites	..	4
Purplish brown shale	..	2
Bluish green, marly shale with some thin brown layers	5	5
DELAWARE LIMESTONE		
Zone M. Blue and gray to brown thin bedded limestone with layers of black chert	10	8
Zone L. Not found in place		
Zone K. Uneven bedded brown limestone and layers of chert	4	4
Zones J. and K. Mostly thin, even bedded brown limestone, with layers of black chert	7	4
Zone J. Thin bedded, brown limestone and layers of black chert	2	..
Zone I. Brown shale with thin layers of black chert	6	..

The Olentangy shale is sometimes classed with the Delaware limestone. These two formations represent successive stages in the general change from pure limestone to the strictly clastic deposits that follow. The Olentangy shale is a soft, argillaceous, bluish gray shale which weathers into blue clay. Numerous disc-like argillaceous limestone concretions are distributed near its basal portion and thin layers of impure limestone are interspersed in the middle and upper parts of the formation. Iron pyrite concretions in the Olentangy and Ohio shales adversely affect the chemical quality of the ground water.

According to Lamborn (1938, p. 33) the Olentangy shale, which has a thickness of 30 feet in central Ohio, is the basal phase of the Ohio shale, and should be treated as a member of that formation. These Devonian shales are somewhat similar in their water-bearing characteristics, yet their lithologic characteristics are dissimilar. The Ohio shale is dominantly black or brown, carbonaceous and somewhat arenaceous, grading from a massive structure to thinly laminated or fissile. The Ohio shale is the youngest Devonian unit and forms the bedrock beneath the north central and southeastern part of Franklin County. The exact thickness of the Ohio shale is not known but the author estimates it to be 450 feet in the eastern part of the county. Excellent exposures of the Devonian shales are to be found in the deep valleys of the tributaries to the Olentangy River between Columbus and Worthington. Along Alum and Big Walnut creeks, in the eastern part of the county, sections of the Ohio shale also may be seen.

Mississippian System

The youngest rocks in Franklin County are in Plain, Jefferson, Blendon, Truro and Madison townships. Four formations of the Mississippian Systems are recognized. They are, in ascending order: Bedford shale, Berea sandstone, Sunbury shale and Cuyahoga sandstone and shale formation. A composite section of the outcrops occurring along Rocky Fork Creek, from its union with Big Walnut Creek below Gahanna to the upper part of the tributary which flows thru New Albany, illustrates the lithologic characteristics of these formations (Stauffer, 1911, p. 30).

	Ft.	In.
CUYAHOGA FORMATION		
Thin bedded sandstones and some bluish colored shales. This portion of the section is exposed along the tributary flowing through New Albany	50	0
Soft bluish shale	5	0
SUNBURY SHALE		
Covered interval, most of it belonging to the Sunbury shale	10	0
Fissile black shale, iron stained and somewhat decomposed	25	8
BEREA GRIT		
Rather massive sandstone layers, many in lenticular beds, some showing ripple-marks. A layer of marcasite lies on top	17	6
Layers of fine grained sandstone, from a fraction to ten inches in thickness, and well ripple-marked. Some layers are much contorted in places, and contain local beds of shale	8	6
Arenaceous gray shale, which grades into sandstone upstream	12	0
Concretionary layer, which is thought to form the limiting layer of the Berea	1	0
BEDFORD SHALE		
Soft argillaceous blue shales, becoming arenaceous towards the top	38	8
Soft argillaceous gray mottled shales	8	0
Soft fissile red to chocolate brown shale. These layers weather rapidly into a stiff clay	25	6
Soft argillaceous blue shale, quite fissile and much jointed	15	6
Argillaceous blue shale	2	0
Dark bluish brown, rather soft shale	0	4
OHIO SHALE		
Black shale prominently jointed and much iron stained	5	0
Covered reading (aneroid reading)	5	0
Black shale	10	8
Black shale with several layers of "Cone-in-cone" to level of Big Walnut Creek	8	10

(The above section is partially condensed and does not include paleontological data.)

The Bedford shale, which is the oldest formation of the Mississippian system, rests conformably on the Ohio shale. The Bedford shale is a soft, gritless, laminated, argillaceous shale of gray or brown color, weathering to yellow or red clay. Lamborn (1938) states that the thickness varies from 60 to 90 feet. There are excellent exposures of Bedford shale along Big Walnut Creek north of Central College and at Taylor in Jefferson Township, where it is quarried for brick manufacture.

The contact between the Bedford shale and Berea sandstone is unconformable. A specific characteristic of the Berea sandstone, although local, is the contorted zone at the base of the formation. In the Gahanna-Rocky Fork region it consists of layers ranging from six inches to three feet in thickness. Orton (1878, p. 640) describes the contorted zone as looking "like masses of mud to which a rolling motion had been given before they were solidified." Prosser (1902) believes this concretionary zone to be the base of the Berea sandstone.

The thickness of the Berea sandstone varies over a wide range from north to south in the county. An estimate of the thickness of the Berea sandstone is 55 feet in the north, tapering to about five feet in the south. In the preparation of figure 6 the author used a combined thickness of 105 feet for the Bedford shale and the Berea sandstone. The Bedford shale decreases in thickness to the north; and the Berea sandstone thins to the south and becomes more shaly. The Berea sandstone is described by Stauffer (1911) as being the earliest persistent sandstone formation in central Ohio. It is a rather fine grained, gray to buff-colored rock deposited in layers of varying thickness which become more massive towards the top. The occurrence of marcasite in the extreme upper layer is quite persistent.

The contact between the Berea sandstone and the overlying Sunbury shale affords an excellent horizon marker in Franklin County. The break between the relatively pure, thin to massive, layered sandstone and the black fissile shale is distinctively sharp and is easily noted in well records. Too few exposures of complete sections limit the description of the lithology and thickness of the Sunbury shale in Franklin County. The log of well No. 1183 reveals 36 feet of the Sunbury shale.

Prosser (1904) states that the lower 50 feet of the Cuyahoga formation in central Ohio (at Lithopolis and Blacklick) is correlative with the Buena Vista sandstone member of southern Ohio. Hyde (1953) states that, in the vicinity of Lithopolis, the Buena Vista sandstone member must be 100 feet or more above the base of the Cuyahoga formation. It is beyond the scope of this report to attempt to resolve this disagreement. In this discussion, the term Lower Cuyahoga will be used for the so-called Buena Vista.

The contact between the Sunbury shale and the Lower Cuyahoga formation is not distinct. The Sunbury shale is a black argillaceous fissile shale, while the basal five feet of the Lower Cuyahoga formation is predominantly bluish gray shale. The Lower Cuyahoga formation in Franklin County is approximately 120 to 165 feet thick. It consists of an alternating series of thin-layered, gray sandy shales, and thin to massive fine grained blue to grayish sandstones. Few exposures of the Lower Cuyahoga formation are recognized in Franklin County. A distinctive exposure is located near Blacklick in a recently reopened quarry. Small sections are exposed along Blacklick Creek and in the extreme northeastern corner of Jefferson Township.

The Occurrence of Ground Water in the Consolidated Rocks

The source of approximately one-third of the ground water pumped in Franklin County, is the consolidated rocks. The yields in some areas are adequate for small municipal and industrial supplies.

The Silurian and Devonian limestones in the western half of Franklin County are the most uniformly productive of the consolidated rock aquifers in the county. The principal source of ground water for domestic, farm, and small industrial use is the lower part of the Columbus limestone. The Delaware limestone yields smaller quantities of ground water. Drillers encountering the Delaware limestone usually drill through this formation into the Columbus limestone for water.

The author believes that there is not one particular or distinct zone, but several zones or series of fractures, joints, and crevices which contribute to the yield of a typical limestone well. The size or permeability of each opening depends upon the soluble chemical constituents of the limestone. The depth of wells drilled into the Devonian and Silurian limestones governs their yield. The Delaware and Columbus limestones together yield as much as 175 gpm. The Delaware and Columbus limestones together with the Bass Islands dolomite yield as much as 400 gpm.

Figure 10 illustrates the relationship between precipitation and water levels in a limestone aquifer in Columbus. The natural fluctuations of the water level in this well are modified by pumping for cooling and air conditioning. The water level follows a declining trend during the summer months when the greatest amount of water is being pumped. Recovery takes place during the remainder of the year and the graph indicates that a continual downward trend has not occurred in the period of record.

The Olentangy and Ohio shales of the Devonian system comprise 40 per cent of the bedrock in the county. Yields of as much as 3 gpm have been developed from wells drilled in the uppermost weathered parts of these formations. Few wells yield appreciable supplies from the deeper fractured zones within the shale.

The Bedford shale, which is the oldest Mississippian unit in Franklin County, is a poor source of ground water. Small supplies (as much as 2 gpm) are often developed in the weathered, fractured zone near the upper surface of the formation.

The Mississippian rocks, namely the Berea sandstone and Lower Cuyahoga formation, which crop out in the northeastern part of the county, yield sufficient ground water for farm, domestic and small industrial use. Yields of wells are roughly proportional to the number of water-bearing sandstone beds encountered.

The most productive wells in the Berea sandstone are in the extreme eastern part of Blendon Township and in the western part of Plain Township. As shown on plate 1, these areas, and the north central part of Jefferson Township, are the only areas where supplies sufficient for farm, domestic and small industrial use are available from the Berea sandstone. Like most Mississippian sandstone beds, the Berea sandstone grades from massive layers of sandstone to thin bedded sandstone and shales. It thins from approximately 55 feet in the north, to 5 feet in the southern part of the county. Yields from 27 representative wells range from 9 to 70 gpm. The

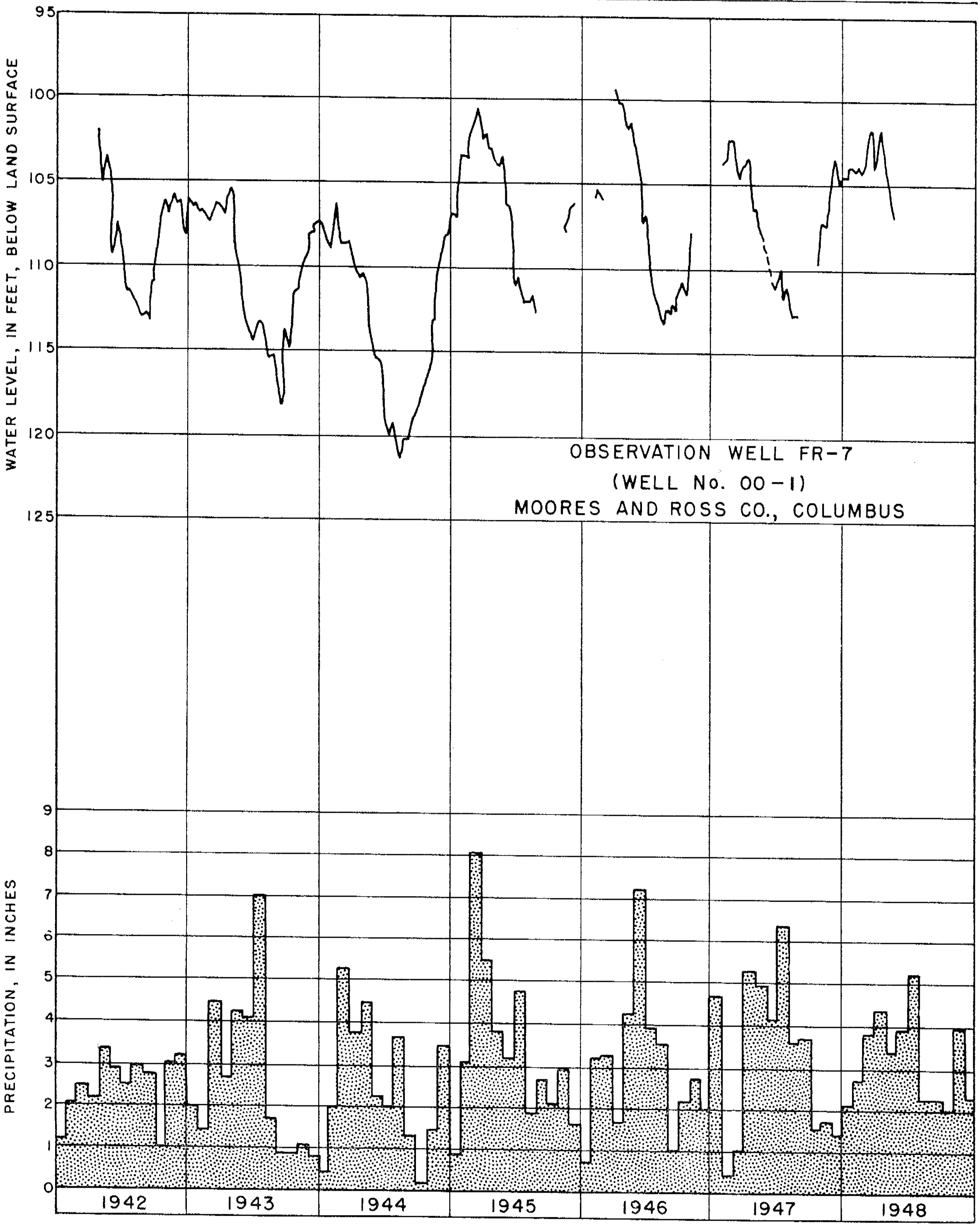


Figure 10. Graphs showing water levels in a limestone aquifer in Franklin County and monthly precipitation in Columbus (Kaser, 1950)

average yield is about 17 gpm.

Logs of wells (No. 534, Plain Township and No. 1183, Jefferson Township) illustrate the variation in the thickness of the Berea sandstone from north to south.

No. 534

Depth in feet		
from	to	
0 -	13	Clay
13 -	28	Sunbury shale
28 -	70	Berea sandstone

No. 1183

Depth in feet		
from	to	
0 -	57	Clay
57 -	102	Lower Cuyahoga formation
102 -	138	Sunbury shale
138 -	143	Berea sandstone
143 -	157	Bedford shale

Small yields, three gpm or less, are reported for wells developed in the shaly members of the Berea sandstone and the Lower Cuyahoga formation. Reported yields from the Lower Cuyahoga formation generally range from 3 to 30 gpm. The average yield, from 71 representative wells, is 13 gpm.

METHODS OF RECOVERY OF GROUND WATER

Most ground-water supplies in Franklin County are from drilled wells. Small-diameter drilled wells have a limited storage capacity and are not adequate in some areas in the county. In such areas, where relatively impermeable glacial till overlies the shale bedrock, properly constructed dug wells, with their larger storage capacity, supply household requirements.

Formerly, dug wells were excavated by hand with pick and shovel, and lined with stone, tile or brick. Such wells are approximately 4 feet in diameter and 25 to 30 feet deep and usually have poorly constructed walls which allow surface water to flow into them and contaminate the supply. A more modern method of constructing a dug well is through the use of a "clam shell" with which a pit is dug below the water table after which the pit is lined with sections of perforated concrete pipe usually 3 to 4 feet in diameter. The ground around the well is dug out to a depth of a few feet and backfilled with concrete or clay grout to eliminate surface water contamination.

Driven wells consist of a pointed screen or well point attached to a 1 to 3 inch-diameter pipe which is driven into a water-bearing formation. This type of well can be used only in areas underlain by loose, unconsolidated, and highly permeable material in which the water table is fairly shallow, usually less than 25 feet below the land surface.

Percussion and hydraulic-rotary drilling rigs are used to develop ground-water supplies. The former type is the most commonly used in Franklin County. Drilling is done by means of a string of drilling tools operated on the end of a rope or cable. The tools are raised and dropped regularly to produce a cutting and crushing action at the bottom of the hole. The crushed rock at the bottom of the hole is periodically washed with water, creating a slurry. When drilling in unconsolidated materials, the casing is often driven into these loose materials beyond the depths reached by the drill bit. The loose material inside the casing is then removed by the bailer. Caution must be practiced if this method is used, for it is quite possible that small lenses of water-bearing sand and gravel may be sealed off. Drilled wells are finished either as an open end pipe, or with the lower part of the casing perforated or screened; perforated casing is preferred by the well drillers in Franklin County.

If a 12-inch diameter well is finished with an open-end, the pipe has 113 square inches of opening or intake area for the water to pass through. If this same well is finished with a perforated pipe 30 feet long, the maximum amount of intake area is 682 square inches. However, if a 12-inch diameter well is finished with 30 feet of well screen, up to 7000 square inches of intake opening is available.

A well screen should be designed to allow water to pass from an aquifer into a well with a minimum of interference. The size of the slot openings of the screen will depend upon the characteristics of the water-bearing materials. If the slot openings are too small or too few in number, the water will lose pressure as it flows into the well, and the pumping level of the well will be lowered. The cost of pumping the well will be much higher owing to the increased pumping lift. Therefore, to reduce the velocity and drawdown in a pumping well, it is essential to have the maximum open area per square foot of screen surface. The selection of the metal from which the screen is made depends upon the quality of the water. A water high in carbon dioxide may be corrosive to iron and low carbon steel and these metals also make poor screens in wells which may be treated with acid for the elimination of incrustants.

Drillers seeking a supply from the consolidated rocks generally set the casing on the top of the solid (unweathered) bedrock and continue to drill the well as an "open hole" until a sufficient supply is encountered. Most of the drilled wells in Franklin County have 4 to 6 inch diameter casings, and range from 25 to over 450 feet in depth. Larger diameter wells, commonly ranging from 8 to 16 inches, are drilled for municipal and industrial supplies.

Large-diameter wells and horizontal wells, or collectors, are a combination of dug and drilled wells in the sense that an orange peel, clam shell or bailer is used to dig the well; casing or caisson and well screens are necessary to finish the construction. Some large wells for municipal and industrial supplies, are constructed through the use of caissons up to 72 inches in diameter which are settled in place by removing the loose unconsolidated materials inside the caissons. When the water-bearing formation is encountered a smaller casing is inserted and the annular space between the two casings is gravel packed. The larger caisson is then raised, exposing the aquifer to the gravel packed well and screen. Large supplies are developed by this method of well construction through the increase of the effective diameter of the well and the use of larger openings or slots in the screen. An incidental purpose of gravel or sand packing is to control the entrance of fine sand.

Horizontal wells or collectors are caissons 15 to 20 feet in diameter which are settled to the bottom of the water-bearing formation by the removal of the unconsolidated material inside the caisson. Near the bottom of the aquifer slotted pipes or screens are forced out horizontally in several directions.

Inverted wells have been drilled in Franklin County for the disposal of waste water, or to return water to the ground. Waste water has been returned successfully to the limestone deposits in Franklin County. Water derived from wells developed in glacial materials, is often returned to a sand and gravel formation. The return wells must be periodically surged, in order to wash out the fine sand and iron sediment which adheres to the face of the sand and gravel formation.

Several types of pumps are used in Franklin County. The majority of them are lift, ejector or submersible types, powered by electricity, and capable of delivering as much as 10 gpm. Most dug wells are equipped with handpumps. Large industrial and municipal supplies are delivered by deep-well turbine pumps some of which are capable of pumping 1500 gpm.

The yield of a well, where stated in gallons per minute (gpm) in table 14, may be either the rated capacity of the pump, or the estimated yield based on the driller's bailing test. If a well is bailed dry, the capacity is smaller than the driller's reported yield. If the water level remains relatively stationary, the well may have a larger yield than the driller reported. The yield of a well is not necessarily the maximum yield of the well. The maximum yield of a well, as herein defined, is the rate at which the well will yield water without excessive drawdown (that is, without lowering the water level below the screen or to the bottom of the well). The maximum yield of a well can be determined by a pumping test. In many instances the yield of a well is expressed in terms of specific capacity. The specific capacity of a well is its rate of yield per unit of drawdown. It is determined by dividing the yield by the drawdown that results from that yield, and it is usually expressed in gallons a minute per foot of drawdown.

UTILIZATION OF GROUND WATER IN FRANKLIN COUNTY

In 1955 an average of 19.3 million gallons of water a day (mgd) was pumped from wells by industries and municipalities in Franklin County. The total yearly pumpage of ground water by industries and municipalities amounted to more than 6.25 billion gallons. Use of ground water in rural areas for domestic and farm purposes is estimated to exceed 2.5 mgd. All the industrial ground-water supplies are obtained from the consolidated rocks. Most of the municipal supplies are pumped from glacial outwash deposits.

Data on the principal industrial ground-water pumpage in Franklin County are shown in table 3. Records of approximately 1400 farm, domestic, industrial and municipal wells are listed in table 14 (appendix). Table 14, together with figure 14, which shows the graphic logs of these wells, contains nearly all the data on which this report and several of the accompanying maps are based. The location of the wells is shown on plate 2.

Table 3

PRINCIPAL INDUSTRIAL USE OF GROUND WATER IN FRANKLIN COUNTY[1]

INDUSTRY	M.G.D. (Average)
Air Conditioning	.903
Chemical & Fabricated Chemical Products	.970
Fabricated Metals	1.627
Food and Kindred Products	8.252
(Dairy)	(.969)
(Ice)	(3.297)
(Meat Packing)	(1.952)
(Processing)	(2.034)
Primary Metals	.643
Miscellaneous	1.521
	13.916

Use of surface water for industrial purposes in Franklin County averages about 117.703 mgd.

[1] Industries which pump more than .03 mgd.

Use by Industries

Ground water is used for many purposes in Franklin County. Pumpage by individual companies ranges from a few thousand gallons a day to more than 1.5 mgd. Food processors are by far the largest users of ground water in the county. The City Ice and Fuel Company uses more than 3.25 mgd at its five plants. The largest individual user is the Capital City Products Company which pumps more than 1.5 mgd. The Walnut Generating Station near Groveport pumps approximately 0.7 mgd. This plant was initially designed to use surface water; however, ground water is used during the summer to supplement the surface supply.

Nearly all the industrial wells in the county are used for cooling. The temperature of water from wells in Franklin County averages about 54°F, or about 2° to 3° above the mean annual air temperature of 51.4°F.

Use by municipalities

Of the 26 incorporated municipalities in Franklin County, 8 have public water supplies. Canal Winchester, Grove City, Groveport, Hilliards, Reynoldsburg and Worthington have ground-water supplies; Columbus and Westerville supplement their surface-water supplies with groundwater. Columbus furnishes water to Bexley, Gahanna, Grandview, Upper Arlington, Whitehall, Hanford, Marble Cliff, Minerva Park, Riverlea, Valleyview and a portion of Worthington. In June of 1957, Grove City received its entire water supply from Columbus and negotiations were in progress for Worthington to rely upon the Columbus supply. In addition to these suburbs, Columbus furnishes water to homes in the vicinity of New Rome, west of Columbus. Homes in Darbydale, Harrisburg, Lockbourne, New Albany, Obetz, Urbancrest and Dublin are supplied by private wells. The municipal ground-water supplies are discussed in some detail in the section of this report describing the ground-water conditions in specific areas.

Use for domestic, stock, and irrigation purposes

The recent growth in the population and industry of Columbus has caused individuals to migrate to the country. This has greatly increased the number of small diameter wells drilled for domestic purposes. Average per capita use is estimated to be 75 gallons a day. Adequate ground-water supplies are generally available in the county, except in parts of Blendon, Clinton, Jefferson, Mifflin, Perry, Plain, Sharon and Truro townships. Wells drilled in these areas, as shown on the ground-water resources map, plate 1, have small yields. Dug wells and cisterns are often constructed to supplement the supply.

Farm use of ground water is mostly for watering stock. Surface streams, farm ponds, drilled wells and dug wells, provide for these water needs. With the ever increasing value of land in Franklin County, water used for agricultural purposes will diminish and the use of water for suburban and industrial development will increase.

Ground water is not used extensively for irrigation in Franklin County. In Truro Township 18 acres are irrigated by a dug well, 18 feet deep, which has a reported yield of 300 gpm. Drilled wells are used to irrigate an estimated 240 acres of specialty crops, such as soy beans, sweet corn, etc. There are a rather large number of specialty crop farmers and truck gardeners who use surface water for irrigating strawberries, vegetables, and horticultural products. The principal grower, Arthur L. Smith, irrigates 350 acres southeast of Columbus in Madison Township. His principal sources of water are Alum and Big Walnut creeks. Mr. Smith's irrigation system is equipped with two pumps, rated at 1000 gpm and 600 gpm, and pumped from 1 to 10 hours a day, depending upon the rate of precipitation. It may not be necessary to develop maximum quantities in order to supply irrigation for short periods. As shown in table 4 (Anderson, 1950, p. 37), 400 gpm are necessary to irrigate 10.61 acres in a 12 hour period to a depth of 1 inch.

Table 4.

IRRIGATION CHART

Gallons per minute	Cubic feet per second	Cubic feet per minute	Number of Acres covered in twelve hours of pumping							
			1 inch in depth	2 inches in depth	3 inches in depth	4 inches in depth	6 inches in depth	8 inches in depth	10 inches in depth	12 inches in depth
20	.0446	2.675	.529	.2645	.1765	.1324	.0883	.0663	.0529	.0442
50	.1112	6.680	1.328	.6640	.4425	.3320	.2213	.1660	.1328	.1105
100	.2225	13.370	2.960	1.3250	.8830	.6625	.4420	.3313	.2650	.2210
150	.3345	20.050	3.980	1.9910	1.3280	.9950	.6640	.4975	.3980	.3320
225	.5020	30.050	5.970	2.9850	1.9900	1.4920	.9940	.7470	.5970	.4975
300	.6680	40.010	7.960	3.9800	2.6550	1.9900	1.3270	.9950	.7960	.6630
400	.8910	53.400	10.610	5.3050	3.5350	2.6520	1.7700	1.3280	1.0610	.8840
700	1.5600	93.500	18.580	9.2800	6.1800	4.6400	3.0950	2.3200	1.8580	1.5480
900	2.0008	120.400	23.850	11.9500	7.9600	5.9700	3.9800	2.9750	2.3850	1.9900
1200	2.6750	160.500	31.820	15.9200	10.6100	7.9500	5.3050	3.9750	3.1820	2.6500
1600	3.5650	213.500	42.350	21.2000	14.1500	10.6100	7.0750	5.3050	4.2350	3.5350
3000	6.6800	400.500	79.500	39.7500	26.5000	19.8800	13.2500	9.9400	7.9500	6.6250
4500	10.0300	602.000	119.300	59.7000	39.7500	29.8500	19.9000	14.9400	11.9300	9.9500
6000	13.3600	802.000	159.100	79.6000	53.0000	39.7500	26.5200	18.8900	15.9100	13.2600
7000	15.6100	936.000	185.700	92.8000	61.9000	46.4500	30.9500	23.2000	18.5700	15.4700
8500	18.9500	1137.000	225.500	112.8000	75.2000	56.3500	37.6000	28.1900	22.5500	18.7900
10000	22.2500	1337.000	265.000	132.5000	88.3000	66.2500	44.2000	33.1500	26.5000	22.1000
14000	31.1500	1871.000	371.000	185.5000	123.7000	92.7500	61.8000	46.3500	37.1000	30.9500

1 Acre foot = 1 acre covered to a depth of 1 foot = 43,560 cubic feet.
1 Cubic foot/sec. = 1.98 Acre feet.

GROUND WATER CONDITIONS IN SPECIFIC AREAS

Ground-water conditions in Franklin County, are shown on the map, plate 1. This map illustrates the potential yield of the aquifers. Yields vary from place to place and it is important for the contractor of a subdivision, an industrialist, or an individual to determine the amount of water necessary for his purpose and then to locate his project in an area which will fulfill his requirements for water.

The following section is a summation and an explanation of the well log data and the ground-water conditions map as they pertain to each township in the county. The map was prepared from the records of wells listed in table 14, and from the graphic logs shown on figure 14. Columbus is considered separately. The areal extent of Columbus is based upon the most recent map (1952). Since 1952, Columbus has annexed parts of Clinton, Franklin, Marion, Mifflin, Perry, and Truro townships. The townships are discussed alphabetically. However, they are listed in the records of the well logs, table 14, in order proceeding from east to west and from north to south, beginning with Washington Township in the northwest quarter of the county. The well logs are numbered in like manner, beginning with number one in Washington Township and are listed in each successive township, beginning with an even 100, e.g. Perry Township, well log number 101.

The quality of the ground water is not fully discussed in this section, but is summarized, if important. A detailed discussion of the analyses, shown in table 14, is given in the section on the chemical characteristics of ground water. The analyses are shown in tables 5 and 6.

The yields of wells listed for each specific area are based partly upon the driller's reported yield which is generally determined from a bailing test. The reported yield is not necessarily the exact yield of the well. Some wells may produce more, others less, depending upon the geologic conditions which occur in a specific location. The potential yields, as reported by the author, are a means of estimating the quantity of water available to wells drilled in the county.

BLENDON TOWNSHIP

Except at the eastern edge of Blendon Township, the bedrock is the Ohio and Bedford shales. More than half of the area is overlain by clayey till averaging less than 30 feet thick, and water is obtained from the upper weathered part of the underlying shale. Yields of 2 or less gpm are developed from the best wells drilled in these materials. Dug wells and cisterns are used as a supplementary source of supply. Yields, as much as 5 or more gpm, can be developed from lenses of sand and gravel. Reported yields from wells in the Berea sandstone, along the eastern edge of the township, are as much as 18 gpm.

Buried valleys south and east of Westerville, and those along the western edge of the township, contain lenses of sand and gravel, thinly scattered in layers of clayey till. The logs of wells 408, 429 and 430 illustrate the thickness of the till and the character of the lenses of sand and gravel. The till is from 130 to 300 feet thick. The sand and gravel deposits are generally deeply buried and receive recharge slowly. Yields of 5 to 10 gpm, sufficient for farm and domestic supplies, are developed from wells in these sand and gravel lenses.

Industrial or small municipal supplies may be developed from wells drilled in the buried valleys adjacent to and beneath Alum Creek. The glacial deposits which fill these valleys range from less than 100 feet thick north of Westerville to approximately 225 feet thick in the southern portion of the valley. The ground-water potential of this area has never been tested, however, wells drilled south of Route 161 in Mifflin Township have reported yields of 350 gpm. The estimated yield of wells drilled adjacent to Alum Creek is 200 gpm.

Westerville

Alum Creek is the principal water supply for the 5,197 residents of Westerville. Water is stored in a reservoir of 20 million gallons capacity. The supply is supplemented by a dug well 35 feet deep and 20 feet in diameter, which yields 105 gpm. The water is pumped into the creek whence it is pumped into the lime-soda treatment plant.

The average consumption for January, 1957, was 0.486 mgd; for August, 1956, it was 0.395 mgd. This fluctuation in water use is caused by varying water demands at Kilgore, Inc., which uses an average of 0.070 mgd. Plans call for a 200 million gallon reservoir to provide for future expansion of this community.

BROWN TOWNSHIP

The principal aquifers in Brown Township are the Columbus limestone and Bass Islands dolomite. The distribution of these rock units is shown on figure 6. Wells in the upper 40 feet of the carbonate rocks yield 10 to 25 gpm. Yields of 400 gpm may be developed from deeper wells, although the percentage of hardness, dissolved solids, and hydrogen sulphide are also greater.

Bedrock ranges from 50 to 105 feet below the surface in the northern half of the township. The glacial deposits above the bedrock are clayey till. With the exception of one well (No. 603) which was developed in the glacial deposits, farm and domestic wells are developed in the upper 30 feet of the carbonate rocks.

The depth to bedrock ranges from 120 to 170 feet in the southern part of the township. The glacial materials which fill the tributary buried valleys consist of layers of sand and gravel, up to 20 feet thick, interbedded in till. Reported yields from these sand and gravel lenses average 10 gpm.

CLINTON TOWNSHIP

The major buried valleys are two north-south channels which parallel the east and west boundaries of Clinton Township. The western channel underlies the Olentangy River valley and the area to the west (pl. 1). The thickness of glacial debris in this valley ranges from 100 to 150 feet. The logs of wells 819 and 826 show relatively thick sand and gravel deposits in which are interbedded thin to thick layers of clay. These permeable deposits can be recharged by infiltration from the Olentangy River and will yield 250 or more gpm. These glacial deposits, together with the underlying Devonian limestone are potential sources of large ground-water supplies. Yields of 400 gpm can be developed, as is illustrated by the record of well No. 840.

The glacial deposits in the area west of the buried western channel consist of sand and gravel interbedded in thick clayey till. Adequate supplies for farm and domestic uses, and perhaps small industrial supplies, up to 25 gpm, are available from the sand and gravel or the underlying Devonian limestone. East of the buried valley, in the vicinity of the Olentangy River, the bedrock is the relative impermeable Devonian shale. Glacial deposits east of the buried valley consist of thin lenses of sand and gravel between thin layers of clay. Yields of 5 to 10 gpm, sufficient for small farm and domestic use, are available in the area. The shale upland east of this area is overlain with thin deposits of clayey till. Meager supplies of about 2 gpm are obtained from dug wells.

The other major buried valley is located in the eastern half of Clinton Township. The log of well 804 indicates that the depth to the Ohio shale is 226 feet. This log further illustrates that the glacial materials which fill this valley are clayey till. Depth to bedrock at the center of the valley, based on the contours on plate 1, is estimated at 300 feet. The logs of wells 802 and 805 show the irregular characteristics of the water-bearing zones which range from 48 to 190 feet in depth. Wells may yield 5 to 10 gpm depending upon the thickness of sand and gravel encountered.

The eastern boundary of Clinton Township is underlain with glacial deposits which yield domestic and farm supplies at depths less than 110 feet. Aquifers are lenses of sand and gravel, a few feet in thickness from which yields of as much as 20 gpm can be obtained. The extreme northeast corner of Clinton Township is underlain by deposits similar to those beneath Alum Creek. Well 811 had a reported yield of 350 gpm.

COLUMBUS

Ground water in Columbus is used primarily for cooling by industries, theatres, restaurants, etc. Supplies ranging from 20 to 500 or more gpm are required for these purposes.

The principal water-bearing beds which have yielded adequate quantities of ground water are the Devonian and Silurian limestones. Of the 96 wells in Columbus analyzed for this report, 71 were drilled into these limestones. As shown on plate 1, the area adjacent to the Scioto and Olentangy Rivers is covered with glacial debris. This glacial debris ranges from 6 to 186 feet.

Yields for some industrial requirements are available from glacial deposits adjacent to the Olentangy and Scioto rivers. The logs of wells 1433 and 1454 illustrate the fact that relatively thick layers of sand and gravel deposits lie beneath thin clay and are directly above the limestone. From recharge from the two rivers, these deposits have a potential yield exceeding 250 gpm. Combined development of the outwash deposits and the limestone should yield more than 400 gpm.

Not all of the wells drilled adjacent to the rivers have high yields; however, through test drilling and pumping tests, sites for industrial water supplies can usually be located. Wells may produce more than 400 gpm from the limestone. Water from limestone can be unsatisfactory for some uses owing to high hardness, dissolved solids, sulphates and hydrogen sulphide. Wells 1464 and 1469 (table 5) indicate the quality of water from limestone aquifers.

Wells developed in the limestone in the western part of Columbus yield as much as 270 gpm as shown by the logs of wells 1429 and 1430. The logs of these wells revealed 53 and 11 feet, respectively, of limestone and did not indicate that the water was excessively mineralized.

The north-south buried valley, discussed in the sections on Clinton and Sharon townships, continues beneath the northeast quarter of Columbus. The glacial debris which fills this valley consists of 218 or more feet of clay till interbedded with thin lenses of sand and gravel about 1 foot thick.

Glacial drift, which overlies the Devonian shale and limestone in the center of Columbus, averages about 130 feet thick and consists of lenses of sand and gravel up to 67 feet thick (the log of well 1478); however, the average thickness of gravel is less than 23 feet. These gravel lenses have a potential yield of 25 gpm. The writer believes that these deposits are somewhat limited in their lateral extent and receive a limited amount of recharge as a result of the heavy surface runoff in populated areas. In this area 13 of 21 wells were developed in limestone at depths ranging from 194 to 342 feet. The remainder of the wells were developed in sand and gravel above the bedrock.

The area east of Alum Creek is underlain by an extension of the buried valley that underlies Mifflin and Truro townships. The log of one industrial well, No. 1452, shows a yield of 200 gpm. The writer believes that the average potential yield from a well drilled in this area is 150 gpm. The logs of wells 1452 and 1485 indicate that the glacial materials in this buried valley are layers of clayey till, 65 to 100 feet thick, interbedded with layers of sand and gravel up to 42 feet thick. The permeable glacial deposits are not extensive and test drilling and pumping tests are necessary to locate adequate industrial supplies.

Excellent ground-water supplies are available in the area adjacent to the Scioto River south of Columbus, and in the Nelson Park well field adjacent to Alum Creek in the eastern part of Columbus. Wells 1449 and 1451 penetrate extensive, permeable beds of sand and gravel as much as 89 feet thick beneath thin clayey till. These gravels have potential yields exceeding 1500 gpm. The relationship of the pumped wells at Nelson Park and the ground water levels is shown in figure 11.

Well 1447 west of Nelson Park encountered 27 feet of sand and gravel at a depth of 61 feet. A pumping test of this well indicated a yield of 500 gpm. Permeable glacial deposits are somewhat limited west of this location, as shown by the logs of wells 1442 and 1446, although these deposits thicken to the east in the vicinity of Nelson Park (Well 1450). Potential yields from drilled wells in this area and in a similar area in the south and southwest parts of Columbus, are estimated to be 500 gpm. Limited data are available to map these permeable deposits accurately. Only through test drilling and pumping tests will the exact yield of this aquifer be known.

As shown on plate 1, a ridge of Devonian shale underlies the northern half of Columbus. Remnants of this ridge are also in evidence in the southeastern part of the city. Of the 25 wells analyzed in these areas, 21 were drilled through 9 to 210 feet of Devonian shale with an average depth of 97 feet to the underlying limestone. The average depth of these wells is about 250 feet. Glacial drift above the shale ranges from 8 to 131 feet, with an average thickness of 57 feet. The logs of only four wells revealed scattered lenses of sand and gravel in the clay till. Less than 2 gpm can be expected from these glacial deposits, so the vast majority of the wells drilled in this area are developed in limestone.

Reported yields from this bedrock aquifer are as much as 650 gpm, but the chemical quality of the water from well 1466 (table 5) reveals excessive sulphates, hydrogen sulphide, and hardness, rendering the water from this aquifer in this area unsuitable for most industrial uses.

The Columbus water supply is surface water from Griggs and O'Shaugnessy dams on the Scioto River, and the recently constructed Hoover Dam on Big Walnut Creek. In order to supplement the supply until water from Hoover Dam could be used the city drilled four wells and constructed a lime-soda treatment plant at Nelson Park, in 1949. The original plan was to pump these wells from May through October to supplement the supply during the low-flow in the Scioto River. Two additional wells have been drilled, and these six wells have been pumped continuously since May, 1953. In 1952, during the months of July and August, these wells were pumped at the rate of over 8 mgd. In 1956, the average pumpage during the summer months was about 5.25 mgd as compared with an average of 4.50 mgd for the entire year.

The hydrograph of Observation Well Fr-11 (fig. 11), located near the well field, illustrates the ground-water level in relation to the pumpage. The trend for 1956 is leveling since the wells reduced their heavy pumping. In 1952 and 1953, there was a deficiency of rainfall and therefore a decrease in recharge. The extent of the aquifer is not known; it may extend north or south from the well field. Upon the completion of the Hoover Dam Reservoir and the construction of adequate feed lines to the municipal system, the Nelson Park plant will be abandoned. Table 6 shows the chemical quality of water at Nelson Park. The

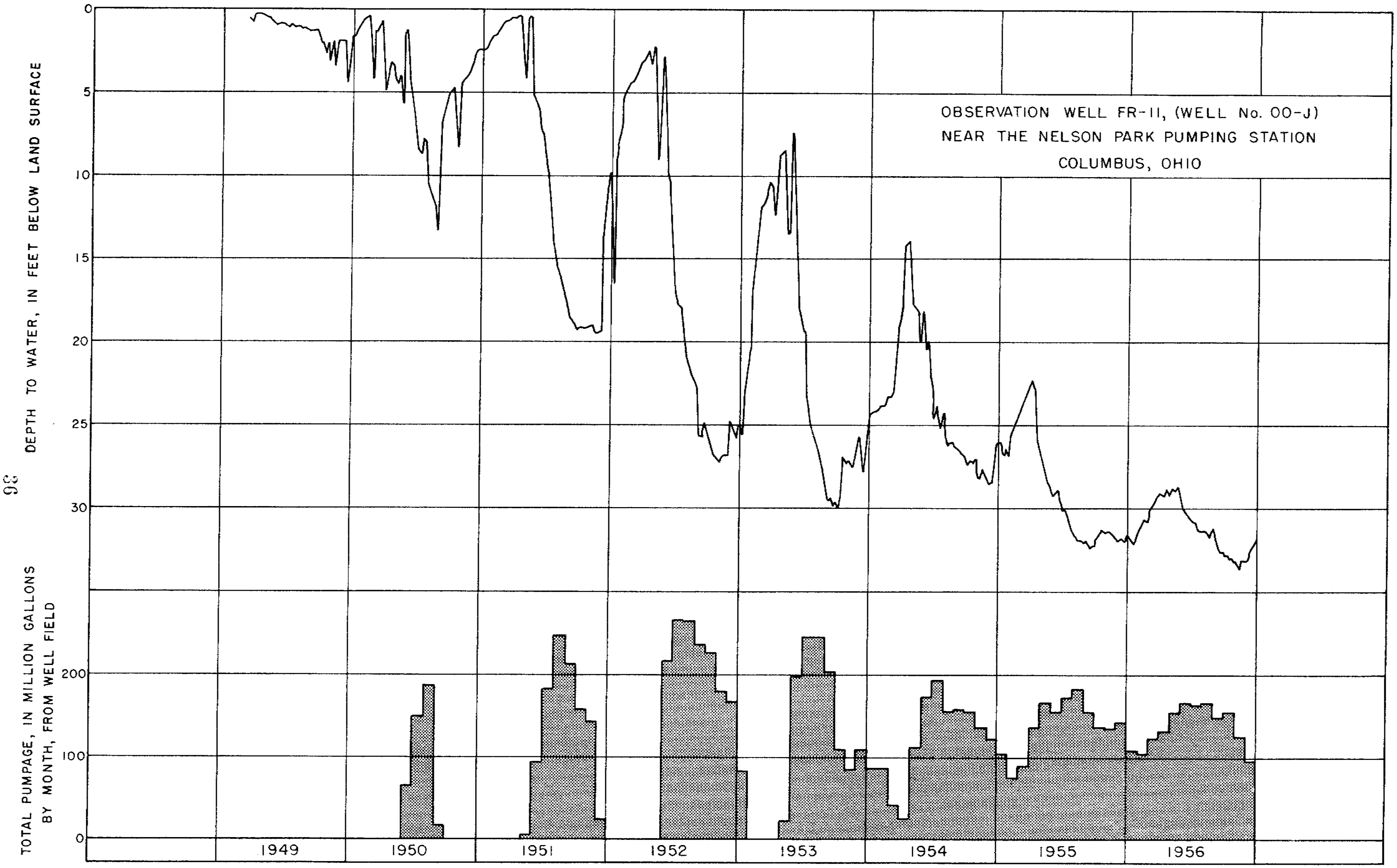


Figure 11. Ground-water level fluctuations in relation to pumpage at the Nelson Park Pumping Station, Columbus, Ohio.

cost of treatment of this water is more than double the treatment costs of water from the Scioto River.

The City of Columbus furnishes water to Bexley, Gahanna, Grandview Heights, New Rome, Upper Arlington, and Whitehall. A contract has been signed whereby Columbus will furnish the entire supply of water for Grove City, and negotiations are in progress for Columbus to furnish Worthington's water supply.

FRANKLIN TOWNSHIP

Geologic conditions are favorable for the development of large ground-water supplies in Franklin Township. Ground water for domestic and industrial needs may be developed in glacial and bedrock deposits beneath the township. The entire township is underlain with Devonian and Silurian limestone. Sixty-three of the 90 wells investigated in Franklin Township were in limestone. In some wells thick layers of sand and gravel were encountered above the limestone. Reported yields from industrial bedrock wells range from 226 to 500 gpm at depths of as much as 400 feet. Generally speaking, the deeper limestone wells have higher yields than shallow ones. Any advantage gained by drilling a deep well is offset, however, by an increase in mineralization with depth in the limestone.

As shown on figure 14, the glacial debris in more than half of Franklin Township is clayey till. The majority of the wells are drilled to limestone which yields adequate supplies for domestic use at shallow depths. Some farm and domestic wells are developed in scattered lenses of sand and gravel which occur in the till.

The most distinctive feature of the bedrock surface is the buried channel in the western part of the township. This valley is filled with 150 to 175 feet of sand, gravel and clay. The logs of wells 1333, 1367 and 1368 illustrate the character of these aquifers. Yields of as much as 30 gpm have been reported; however, the author believes that the yield from the glacial deposits which fill this valley is more typically 20 gpm. The logs of wells 1306 and 1336 are not typical of the area. These wells encountered 159 and 114 feet of clayey till, respectively.

Large industrial supplies of ground water may be developed adjacent to the Scioto River in the southeast quarter of the township. The logs of wells 1388 and 1390 show the characteristics of the bedrock and glacial outwash aquifers. Yields of 1000 to 1500 gpm may be available from properly constructed large-diameter wells. No industrial wells have been drilled in the outwash gravels beyond the influence of recharge from the Scioto River. Such wells would possibly yield up to 500 gpm.

A small area in the northeast part of the township offers possibilities for the development of large supplies of ground water. The glacial outwash deposits range from 15 to 93 feet in thickness and consist of sand and gravel interbedded in or underlying clayey till. The logs of wells 1324, 1325 and 1326 illustrate the range in character of these glacial deposits. Well 1325, drilled for the American Aggregates Company had a reported yield of 200 gpm. Larger industrial supplies are available close to the Scioto River. Supplies of 400 gpm may be developed from glacial deposits or limestone. The effect of the effluent from the Columbus water treatment plant will limit the recharge available from the Scioto River, locally.

HAMILTON TOWNSHIP

Extensive sand and gravel deposits of glacial origin supply most domestic and industrial wells in Hamilton Township. The sand and gravel deposits underlie 8 to 90 feet of clayey till, and have an average thickness of 44 feet.

Table 14 shows the logs of 55 wells investigated in Hamilton Township. Six of these wells encountered shale bedrock at depths ranging from 96 to 210 feet. The estimated total thickness of these glacial deposits is about 290 feet. The logs of wells 1928, 1930, 1951, and 1952 illustrate the relatively thick layers of sand, gravel, or sand and gravel interspersed in thin layers of clayey till. The log of well 1949 indicates that these layers of permeable material are as much as 88 feet thick. The extent and thickness of these deposits are conjectured owing to the lack of data. The depth of domestic wells ranges from 30 to 118 feet and averages 61 feet.

The outwash deposits adjacent to the Scioto River and Big Walnut Creek are the best sources of ground water in Franklin County. Large perennial yields may be obtained by induced infiltration. The report of a pumping test submitted by Ranney Method Water Supplies, Inc., to the City of Columbus, in April 1946, indicated that 20 mgd could be developed from wells drilled into sand and gravel deposits near Rees. The report states that the well was pumped for 48 hours at a rate of 290 gpm. The maximum drawdown measured was 1.62 feet. The specific capacity of this well was calculated as 178 gpm/ft. of drawdown. The coefficient of transmissibility for these glacial outwash deposits was calculated to be 260,000 gpd/ft., and the coefficient of permeability was calculated to be 5,750 gpd/sq. ft.

Yields of wells that do not receive recharge by induced infiltration are related to the saturated thickness and areal extent of the sand and gravel deposits. Where these permeable sand and gravel deposits are not subject to infiltration from surface streams, yields in excess of 500 gpm can be developed. Well 1950, drilled at Lockbourne Air Force Base, was pumped at the rate of 350 gpm with a drawdown of 25 feet, giving a specific capacity of 14 gpm/ft. of drawdown.

Two buried channels exist in the township. They are indistinctly defined owing to lack of drilling data. Devonian shale and the Devonian and Silurian limestones underlie the glacial deposits. Because large quantities of ground water are available above the bedrock, there has been no need to drill to these formations. Undoubtedly large quantities of ground water are available from the limestone aquifers, but the water would be too highly mineralized for present industrial use.

JACKSON TOWNSHIP

The most striking feature of the bedrock topography in Jackson Township is the buried valley which enters the west central part of the township south of Grove City, and continues its course in a southeasterly direction to the southeastern boundary of the township. No wells penetrate the full thickness of the valley fill; however, the depth to the limestone is estimated to be 200 to 300 feet. Most of the wells drilled within the limits of this valley and its adjoining tributaries encounter thick clay with scattered lenses of sand and gravel 1 to 14 feet thick. The depth of the majority of the wells drilled in this area ranges from 147 to 166 feet. The logs of wells 1823, 1835 and 1850 exemplify the characteristics of the valley fill. These deep water-bearing lenticular deposits yield 5 to 10 gpm, sufficient for farm and domestic needs. Larger quantities of ground water may be available if greater thicknesses of sand and gravel are present at depth. If not, the underlying limestone should provide as much as 400 gpm.

The bedrock upland area, on each side of the buried channel, is covered with glacial debris ranging from 85 to 171 feet thick, as indicated by the well logs shown on figure 14. A few logs of wells in this area reveal lenses of sand and gravel, up to 15 feet thick, above the limestone bedrock or scattered in the overlying clayey till. The logs of wells 1805, 1824 and 1864 illustrate these conditions. Farm and domestic wells are sometimes developed in small lenses of sand and gravel, although the majority of the wells are drilled to limestone. Some wells are more than 200 feet deep. Supplies of 400 gpm are available from the limestone.

Wells drilled in the area that lies between the principal north-south road in Jackson Township and Route 104 to the east, shown on plate 1, may yield as much as 25 gpm. The depth to bedrock for 25 well logs, ranges from 84 to 173 feet. The average depth of these wells is 128 feet. Glacial materials overlying the limestone consist of layers of clayey till interbedded with layers of sand and gravel from 5 to 85 feet thick. The logs of wells 1830, 1839, 1848, and 1872 are representative in the area. Many of the wells drilled in this township penetrate permeable fine-grained sand which may facilitate recharge to the underlying limestone. These glacial deposits appear to be relatively extensive although they are not suitable for industrial pumpage. The limestone is an excellent aquifer for domestic and industrial supplies up to 400 gpm.

No wells prove that 1500 gpm is available from the permeable outwash deposits adjacent to the Scioto River, although they probably are favorable for induced infiltration. The area adjacent to the above region and immediately to the west is overlaid with extensive sand and gravel deposits beyond the influence of recharge of the Scioto River. The log of well 1868 indicates 104 feet of sand and gravel above bedrock. No industrial wells have been drilled in the area; however, the geologic conditions are similar to those in Hamilton Township, where yields of 500 gpm are obtained.

Grove City

The municipal supply for Grove City was established in 1922. The original supply was from two drilled wells, 10 and 6 inches in diameter, respectively, developed in sand and gravel at a depth of 168 feet. In 1945 a third well was developed in sand and gravel, at a depth of 164 feet. This well is 10 inches in diameter and had a static level when drilled of 104 feet. It was pumped at 250 to 300 gpm on a 12 hour test with a drawdown of 13 feet.

In 1952, well 1874 was drilled to a depth of 295 feet. This well is 10 inches in diameter, is developed in the Bass Islands dolomite and has a rated capacity of 250 gpm. Well 1833 was drilled in 1954 to a depth of 472 feet and has a rated capacity of 500 gpm. In 1946 the average consumption was 0.075 mgd and the maximum was approximately 0.135 mgd. In January of 1956 the average consumption was 0.305 mgd and in August and September it was 0.359 mgd.

In June of 1957, Grove City began to receive its entire water supply from Columbus. The reason for this changeover and the abandonment of its present plant is the cost of treating water derived from the limestone. It was reported that the water from the sand and gravel well and well 1874 combined has a hardness of 951 parts per million. The water from wells 1874 and 1833 combined has a hardness of 1231 parts per million.

The chemical analyses of water from wells 1874 and 1833, shown in table 5, show large amounts of sulphates, dissolved solids, hydrogen sulphide and high hardness. The records of these wells show that there is an increase in the yield with depth; they also show an increase in mineralization which is related to the depth of penetration of the limestone.

JEFFERSON TOWNSHIP

Ground-water conditions in Jefferson Township are complex, as shown on plate 1. The aquifers yield 2 to 500 gpm, and consist chiefly of glacial deposits of sand and gravel and Devonian and Mississippian shales and sandstones.

The southwest quarter of the township is underlain with Devonian and Mississippian shales. The thickness of the glacial debris above these shales ranges from 6 to 72 feet, and the average yield of wells is less than 2 gpm. In some instances drilled wells encounter deposits of sand and gravel above the shale. In these instances, yields of 5 gpm, may be developed. The logs of wells 1163 and 1167 exemplify these conditions.

There are three buried valley systems in Jefferson Township. A part of the major valley system of eastern Franklin County, developed prior to the present drainage system, dissects the northwest quarter of the township. The main valley was developed in the Ohio and Bedford shales prior to and during the glacial epoch. It is filled with 200 to 250 feet of glacial deposits, consisting of thin lenses of sand and gravel, 8 to 22 feet in thickness, interbedded in clayey till. None of the wells drilled in this valley reach bedrock. Yields are ample for farm and domestic use.

Within the confines of this buried valley, as shown on plate 1, there are areas underlain by fine sand and silt. The exact thickness of this sand is not known, although it is known to exist at various depths, and is interbedded with thin layers of clayey till. Logs of wells 1191 and 1192, report various thicknesses of sand; however, it is presumed that these deposits are local and do not occur as a continuous sheet. Drilled wells commonly are developed above the fine-grained sand.

Another drainage system, in the south-central part of the township, was eroded into the non-water-bearing Devonian and Mississippian shales. The main valley is filled with approximately 190 feet of glacial debris consisting of interbedded and interlensing layers of sand, gravel and clay. Well 1189 was developed in these materials between 50 and 78 feet. A pumping test of well 1189 revealed a yield of 500 gpm with a drawdown of about 50 feet. Well 1190, drilled 300 feet from well 1189 yields 269 gpm. Areas along the margin of this buried valley are underlain with approximately 120 feet of clayey till interbedded with irregular lenses of sand and gravel as much as 10 feet thick. The average depth of wells drilled in this area is 66 feet, and the average yield is 10 gpm. The logs of wells 1157, 1178 and 1181 illustrate these conditions. It should be noted that logs 1170, 1172, 1173, 1174 and 1190 reported layers of fine sand, commonly termed "quicksand", 27 to 70 feet in thickness, with lenses of sand and gravel above or below. Similar conditions exist in this buried valley in Truro Township to the south. The lack of wide-spread well data prevents accurate mapping of these fine-grained deposits; however, the probable area in which drilled wells may encounter these deposits is shown on plate 1.

A third drainage system, one that existed prior to the present system of drainage, was in the extreme east-central part of the township. The bedrock in which this stream eroded its channel extends from the Bedford shale to the Lower Cuyahoga formation. The Bedford shale, in the central part of the valley, is covered with approximately 285 feet of glacial deposits. The log of well 1151 typically reveals lenses of sand, ranging from 3 to 23 feet thick, interbedded in thick clay. Although this particular well was drilled to a depth of 245 feet and reported as dry, other wells in this area yield sufficient water for domestic and farm needs (well 1125). Well 1194 encountered 176 feet of fine sand and silt. Wells 1147 to 1151 were drilled through beds of fine sand, ranging from 19 to 85 feet thick. These wells illustrate the discontinuity of the glacial deposits which fill this valley. Some wells have been developed in the underlying sandstone bedrock or in permeable materials above the layer of fine sand. If wells are specially constructed, farm and domestic supplies can be developed in this fine sand.

The bedrock formations in the main buried valley and its tributaries are the Berea sandstone and sandstone and shale of the Lower Cuyahoga formation. Wells drilled in these valley areas yield ample ground-water supplies for farm and domestic use from glacial deposits or the bedrock.

In the areas not underlain with buried valleys—the north-central part and the southeast quarter of the township—ground water is obtained from the Berea sandstone and from sandstone and shale of the Lower Cuyahoga formation.

The Berea sandstone is the principal aquifer in an area immediately east of the major buried valley in the northwest part of the township. The sandstone, as illustrated by wells 1156 and 1180, ranges from 43 to 55 feet in thickness and yields as much as 40 gpm. The average yield, as reported from seven wells, is 15 gpm. The average depth of these wells is 66 feet. The Berea sandstone is not uniform in its physical characteristics, and yields of wells have a wide range. The quality of water from the Berea sandstone is discussed in another section of this report.

The sandstone and shale of the Lower Cuyahoga formation comprise the principal aquifer in the upland area of the township. The average depth to bedrock in 15 wells is 36 feet; the range of thickness of the glacial cover is 3 to 95 feet. These wells have an average yield of 15 gpm, and individual wells yield as much as 25 gpm. As in nearly all areas of this nature, some logs may report thin lenses of sand and gravel above the bedrock. These deposits contribute to the recharge of the bedrock aquifers and in themselves often provide an adequate supply for farm and domestic use. Logs of wells 1122, 1146 and 1162 illustrate these conditions.

The quantity of water available from the Lower Cuyahoga formation depends upon the number and thicknesses of sandstone layers. Some wells do not yield a sufficient supply; however, wells drilled deeper thru the Sunbury shale to the underlying Berea sandstone yield an adequate supply for farm, domestic or small industrial demands.

MADISON TOWNSHIP

The glacial deposits in Madison Township are the best aquifers in Franklin County. Wells in Madison Township yield up to 1500 gpm from glacial outwash deposits which range from an estimated 100 to 325 feet thick. These deposits are blanketed with clayey till as much as 117 feet thick. Except in the southeast corner of the township, only two wells investigated are drilled to the Ohio shale. The average depth of farm and domestic wells is 55 feet. The average depth to water in these wells is 20 feet.

The potential yield from wells drilled adjacent to Big Walnut Creek and its tributaries, Alum, Blacklick and Walnut creeks, is about 1500 gpm. The aquifers can be recharged by induced infiltration from surface waters. This is based on data from wells near Rees in Hamilton Township, and from well 2015 drilled for the Columbus and Southern Ohio Electric Company. Well 2015 was drilled in 1940 and was reported to yield 1140 gpm. Well 2049 was drilled to determine the depth to bedrock and the physical characteristics of the glacial deposits. The log of well 2049 reveals layers of sand and gravel, 148 feet in aggregate thickness, divided laterally by three layers of clayey till, each being 1 to 10 feet thick. If this well is typical of the area, yields of at least 500 gpm probably are available from wells that do not receive stream infiltration. Where the glacial outwash deposits are comparatively shallow, less than 125 feet in thickness, yields of at least 200 gpm can be expected.

In the extreme southeast corner of the township yields are limited to farm and domestic supplies. The glacial drift which overlies the Devonian and Mississippian shales is clayey till which may be as much as 20 feet in thickness. The Lower Cuyahoga formation which caps the highlands yields only small quantities of ground water. Most drilled wells yield less than two gpm and dug wells are common. A few drilled wells yield 5 gpm from permeable glacial deposits above the Ohio and Bedford shales.

Canal Winchester

The water supply for the Village of Canal Winchester is municipally owned and was installed in 1917. The present supply consists of three drilled wells, two of which are eight inches in diameter, and 50 and 80 feet deep, respectively. The yield is 75 gpm—the capacity of the pumps. The third well, drilled in 1953, is 10 inches in diameter and 78 feet in depth. This well was test pumped in 1953 at the rate of 350 gpm. The capacity of the pump is presently 100 gpm.

The village is principally a residential community having small residential concerns consisting of a glass decorating factory, a machine tool company and a canning factory. The average consumption of the metered consumers is approximately 0.090 mgd. Larger quantities, ranging up to 0.172 mgd, were used in 1953 during the prolonged dry period. Adequate supplies are available for future expansion; however, the treatment facilities are limited to the capacity of the filters which is 0.450 mgd. The chemical quality of the raw and treated water is shown in table 6.

Groveport

The Village of Groveport is a small residential community, with no large industries. There are 554 metered consumers who use an average of 0.120 mgd, although peak pumpage was 0.285 mgd, in 1955.

The water supply is municipally owned and is from two eight-inch diameter drilled wells each approximately 90 feet deep. Each well is pumped with a deep well turbine pump which has a capacity of 200 gpm. The water is treated for iron removal. The village lies within an area of abundant ground-water resources; however, the present municipal distribution system is inadequate, containing 60 percent of four-inch diameter, or smaller pipe.

MARION TOWNSHIP

The potential yields of wells in Marion Township range from less than 2 gpm to an estimated 1500 gpm. Glacial deposits in the buried valleys are estimated to range in thickness from 43 feet to 210 feet and to consist of lenses of sand and gravel interbedded in clayey till. The glacial deposits are similar to those in Hamilton and Madison townships. The fill in the buried valley beneath the Scioto River ranges from 120 to 210 feet in thickness and consists of sand and gravel lenses separated by thin layers of till. Logs of wells 1623 and 1625 report 36 to 75 feet of sand and gravel underlying 5 to 35 feet of clayey till; well log 1644 reveals 84 feet of layered sand and gravel. Wells drilled near the Scioto River have an estimated potential yield of 1500 gpm, if recharged by induced infiltration. The logs of wells 1623 and 1630 are the only wells which reveal large yields in the township; however, wells in Hamilton and Madison townships drilled into similar water-bearing beds yield large supplies of ground water for industry.

Because of the limited amount of quantitative data available relative to these outwash deposits, the yield is estimated. Wells located beyond the influence of recharge from the Scioto River may yield 500 or more gpm. Logs of deep industrial wells reveal that the thickness of the water-bearing materials is 77 and 51 feet, as shown by logs of wells 1629 and 1630. Well 1630 was drilled for the Chesapeake and Ohio Railroad and reportedly had an initial yield of 1800 gpm and a specific capacity of 22.7 gpm per foot of drawdown.

Wells drilled in the area which includes Steelton, Valley Crossing, and Bannon may yield 200 or more gpm. The thickness and character of the glacial overburden is shown by the logs of wells 1607, 1608, 1610 and 1651, on figure 14. The log of well 1607 reveals thick clayey till above the bedrock; but the log of well 1608—a return well—drilled near well 1607, reveals 70 feet of sand and gravel above shale bedrock. The logs of two wells drilled for Swift and Company, wells 1610 and 1651, also reveal variable thicknesses of water-bearing materials. The log of well 1651 reported a yield of 500 gpm, but the variable characteristics of the glacial deposits in the area, in general, indicate that the potential yield from properly constructed drilled wells is more likely to be 200 gpm. To assure adequate supplies for industrial use, test drilling and pumping tests are recommended.

In an isolated section in the north-central part of the township small quantities of ground water are obtained. The glacial overburden above the Ohio shale ranges from 46 to 142 feet in thickness. These glacial deposits are clayey till, interbedded with relatively thin layers of sand and gravel. Well logs 1615 and 1616 show variable thicknesses of sand and gravel; however, logs of wells 1603 and 1611 reveal only clay till above the shale bedrock. Yields of 5 gpm may be expected from lenses of permeable materials above the shale. Generally, yields less than 2 gpm are developed, and many home owners rely on dug wells.

In the extreme northeast part of the township are relatively thin permeable deposits beneath a perennial stream. Wells drilled adjacent to this stream may yield 300 gpm from induced infiltration.

Wells in the northeast quarter of the township yield ample supplies for farm, domestic and small industrial needs. Logs of the majority of the wells indicate layers of sand and gravel, 2 to 70 feet thick, interbedded in clayey till 8 to 90 feet thick. The average depth of the wells is 108 feet and the reported yields range from 5 to 26 gpm. Larger yields are available from industrial-type wells. The bedrock is limestone and shale, as shown on figure 6. Industrial wells yielding up to 400 gpm may be developed in the limestone, but the quality of the water may be poor.

MIFFLIN TOWNSHIP

Except in the extreme northeast corner, the bedrock in Mifflin Township is the Ohio shale. The thickness of the glacial deposits ranges from less than seven feet, in the north-central part of the township, to an estimated 225 feet in the principal buried valley in the southwest quarter of the township. The estimated yield of wells ranges from less than two gpm, in approximately 40 percent of the area, to 1500 gpm in a small area in the extreme southwest quarter of the township. The average depth of drilled wells is 71 feet.

Wells drilled in the upland area, northwest and southeast of Gahanna, yield up to five gpm from relatively thin lenses of sand and gravel scattered irregularly through clayey till, which has an average thickness of 21 feet. Wells yield up to two gpm from the upper, weathered part of the Ohio shale. The average depth of wells in this area is 69 feet. Water supplies are available from the glacial deposits above the shale, or from the upper 10 feet of the shale. Deeper wells merely provide underground storage for peak pumping periods. The logs of wells 904, 909 and 933 are typical of the area. Many householders depend upon drilled wells for drinking and cooking water, dug wells for their sanitary facilities, and cisterns for laundries.

In the extreme northeast corner of the township sandstone of the Lower Cuyahoga formation and the Berea sandstone are sources of supply for farm, domestic, and possibly for small industrial needs. The average yield from the Berea sandstone in northeastern Franklin County is 17 gpm.

The glacial drift, which covers the area between the edge of the buried upland and the axis of the buried valley, ranges from 28 to 170 feet thick. The majority of wells drilled in these deposits yield an average of 7 gpm from an average depth of 74 feet. The average depth to the underlying Ohio shale is 39 feet. The majority of the drilled wells analysed obtain ample domestic supplies from lenses of sand and gravel, scattered in thin to thick clayey till. Wells 901, 961, 987, and 1006 are typical. Well 940 was drilled to a depth of 170 feet and the log reveals variable thicknesses of sand, gravel, and clay. This well was reported to be dry; however, a well drilled within 40 feet of it reported a yield of 8 gpm at 38 feet.

Wells drilled in the principal buried valley and along the margins of the north-south buried valley have a potential yield of 25 gpm. Of all the wells investigated, only well 993 was drilled to bedrock. The other wells average 72 feet deep and yield 6 to 25 gpm. The clayey till above the water-bearing sand and gravel ranges from 10 to 155 feet in thickness; logs of the wells reveal a range of 5 to 48 feet for the thickness of the aquifers. Well logs which illustrate the physical characteristics of these deposits are 915, 941, 965 and 998, shown on figure 14. Supplies sufficient for farm, domestic, or small industrial use are available. Larger supplies may be available from the buried valley deposits in the vicinity of Gahanna.

The western half of Mifflin Township is underlain by a north-south buried valley. The glacial deposits in this buried valley consist of lenses of sand and gravel interbedded in thick clayey till. Logs of wells 919, 1011 in Mifflin Township and of well 1452 in Columbus reveal at least 23 feet of sand and gravel below 80 feet. The sand and gravel deposits may yield as much as 200 gpm. Larger yields may be obtained in areas along Alum Creek if the stream is in contact with the permeable materials. The average thickness of the relatively impermeable clayey till that overlies the principal aquifer is about 80 feet. Recharge is limited by this thick till. Although large initial yields have been reported, it is the author's opinion that the practical yield of wells developed in these aquifers is not more than 200 gpm.

Wells drilled in the small area adjacent to Alum Creek and north of Columbus, may yield 1500 gpm. Logs of wells drilled just south of this area in Columbus (wells 1449 and 1451 in Nelson Park) reported yields ranging from 100 to 2250 gpm. The logs of these wells reveal the thickness of these permeable materials. Well 1014, drilled for the convent of St. Mary of the Springs, did not penetrate the entire thickness of the aquifer, yet yielded 400 gpm with a specific capacity of 11.4 gpm per foot of drawdown.

Gahanna

The unincorporated village of Gahanna receives its water supply from Columbus. The village is a small residential community having no large industries. In 1955 the average consumption was estimated to be about 0.070 mgd and the maximum 0.150 mgd. Recent agreements between officials of Columbus and Gahanna indicate that future expansion for this community will not be limited by lack of water.

NORWICH TOWNSHIP

Glacial deposits and the underlying limestone yield sufficient ground-water for farm, domestic, and small municipal and industrial needs in Norwich Township. Approximately 12 percent of the drilled wells are developed in glacial deposits. These aquifers are lenses of sand and gravel interbedded in clayey till. They have an average depth of 79 feet and range in depth from 44 to 117 feet. Logs of wells 706, 722, 748 and 755 reveal 70 to 110 feet of impermeable material above thin lenses of sand and gravel. Potential yields of 10 gpm may be obtained from these deposits.

A small buried valley, located approximately one-half mile north of Fishinger Bridge, is filled with glacial debris ranging from 10 to 115 feet thick. These glacial deposits thicken to the west. The logs of wells 712, 713, 728, 731 and 735, as shown on figure 14, reveal thick layers of sand and gravel at relatively shallow depths, ranging from 25 to 60 feet. The reported yield from these wells do not exceed yields from similar glacial aquifers in the township. The author believes that drilled wells in this area can yield as much as 25 gpm.

Yields from the limestone are greater where permeable glacial deposits overlie the bedrock. Drilled wells, which encountered permeable deposits interbedded in the clayey till or at the bedrock surface, were approximately half to one-third as deep in the limestone as wells drilled through clayey till into the limestone. Wells developed in the limestone have an average depth of 107 feet, ranging from 44 to 210 feet for domestic supplies, to 300 feet or more for industrial wells. Yields from limestone aquifers increase with the depth of the well. Municipal or industrial supplies are developed at depths of 158 to 300 feet (wells 724 and 762). Potential yields of 400 gpm may be developed from properly constructed drilled wells, but the hardness, sulphates, dissolved solids and hydrogen sulphide content increase with depth. This is discussed further in the section of this report devoted to the quality of ground water.

Wells developed in limestone bedrock may yield an adequate quantity of ground water for many purposes, but, wells constructed in areas where the bedrock is exposed at the surface, or beneath shallow cover, may yield contaminated water. In an area adjacent to the Scioto River, as shown on the bedrock contour map, plate 1, the depth to bedrock ranges from 1 to 30 feet except in small buried tributary valleys. The material above the creviced or weathered limestone is impermeable clayey till which does not suffice as a purifying agent for the effluent from septic tanks and filtration beds. Therefore the upper part of the limestone is likely to be contaminated with effluent waters from sanitary facilities.

The majority of the wells drilled in this area are four inches in diameter. If such wells are contaminated, new wells should be drilled, or the old wells should be reamed and the casing driven deeper. If the contaminated well is six inches in diameter, a four inch casing can be set and grouted in place to seal off the contaminant. With the influx of suburban homes in this area, precautions should be taken to eliminate present or future contamination through the use of six inch wells. A temporary means of solving the problem is to chlorinate the well water. Large suburban developers should be encouraged to install community sewage disposal plants to avoid future contamination.

Hilliards

The water supply for the village of Hilliards is municipally owned. The installation was started in 1942 but was not completed until 1948. Ground water is supplied by two 10-inch diameter wells, 158 and 325 feet deep. Well 724, drilled in 1942, yields 125 gpm; well 768, drilled in 1954, yields 165 gpm.

Water from well 724 has a hardness of 453 parts per million; water from well 768 has a hardness of 1024 parts per million. The average daily pumpage in 1943 was 0.008 mgd; in 1956, the average daily pumpage was 0.300 mgd. This increase in water use resulted from a large increase in population. A new well was started in January 1957 and the lime-soda treatment plant is being expanded for the present and future growth.

PERRY TOWNSHIP

The principal aquifer in Perry Township is limestone. Of the 151 wells analysed, 56 percent obtain adequate supplies in the limestone which lies at an average depth of 67 feet. The logs of wells 136 and 242 reveal that the limestone bedrock outcrops or lies beneath 140 or more feet of glacial debris. Wells range in depth from 57 to 250 feet. Domestic wells yield up to 30 gpm; irrigation and industrial wells yield 200 to 400 gpm. Logs of wells 167, 229, 243 and 251, as shown in table 14, exemplify the geologic conditions.

Some wells in Perry Township are developed in sand and gravel in or adjacent to buried valleys. Logs of wells 182, 184, 219 through 222 reveal deposits of sand and gravel 9 to 43 feet thick. Data are not available to map these deposits accurately though they may be part of the permeable glacial deposits in the small buried valley in Norwich Township. These deposits increase the recharge to and yield from the underlying limestone.

The quantity of ground water available for industrial use depends upon the number of cracks and crevices in the limestone. Wells drilled to progressively greater depths yield correspondingly larger quantities of ground water. Some wells are drilled to depths of 300 or more feet; however the degree of mineralization of the water increases with the depth drilled into the limestone. Water from well 253, drilled to a depth of 110 feet in limestone, could not be used for domestic purposes owing to its hardness and sulfate content. This water is not typical of wells in the area. Well 253 was probably drilled into a local bed of gypsum.

The Olentangy and Ohio shales cap the bedrock highlands in Perry Township. The thickness of the glacial drift above these formations ranges from 3 to 108 feet and averages about 49 feet. Of the 62 wells analysed in this upland area, 16 were developed in sand and gravel interbedded in clayey till. Logs of wells 108 and 152 reveal lenses of sand and gravel 4 to 29 feet thick. Another source of water is the weathered part of the shale which may yield as much as 5 gpm. Where thick clay till overlies the shale, a yield of 2 or less gpm may be expected. A supply of this size may be adequate for farm and domestic use if storage facilities are provided. The third potential aquifer is the underlying limestone. Of the 62 wells analysed, 22 were drilled through seven to 96 feet of shale, or through an average of about 56 feet of shale. These wells were drilled 2 to 154 feet into limestone.

A buried valley in the northeast quarter of the township is filled with 150 to 200 or more feet of clayey till 68 to 145 feet thick, interbedded with sand and gravel layers ranging from four to 32 feet thick. The average depth of wells in this buried valley is 110 feet. A few wells are drilled from 3 to 35 feet into the limestone bedrock. Yields greater than 25 gpm are available from the limestone.

Logs of wells drilled adjacent to the buried valley, in the vicinity of Linworth, reveal permeable layers of sand and gravel between thick layers of clayey till or above the weathered shale. These sand and gravel beds range from less than one foot thick to 36 feet thick and yield up to 25 gpm. Of 14 wells in the area, five were drilled into the underlying shale. A yield of 25 gpm was reported for well 193.

PLAIN TOWNSHIP

A buried valley in the western half of Plain Township is filled with 150 to 200 or more feet of glacial debris, consisting of layers of silt, sand and gravel of variable thickness, interbedded in clayey till. Plate 1 shows the area where fine sand, designated by drillers as "quicksand," may be present. The records of wells in table 14 reveal the wells which penetrated an average thickness of 22 feet of fine sand, at an average depth of about 35 feet. Although these layers of fine sand contain water, it is difficult to develop a water supply. Wells commonly are developed in the thin lenses of sand and gravel beneath the "quicksand," at depths ranging from 40 to 132 feet. The average depth of these wells is about 85 feet, although they may range from 31 to 136 or more feet, depending upon the depth at which fine materials are encountered. Wells 507, 535, and 580 penetrated thick layers of "quicksand" at depths ranging from 80 to 205 feet. Wells which encounter layers of sand and gravel in this valley fill yield up to 10 gallons a minute. If small deposits of sand and gravel are encountered above or below the fine sand, the well should yield an adequate supply for domestic use. The upper layer of fine sand is presumed to be continuous from north to south, however, few data are available as a basis for mapping the lower layer of fine sand.

The bedrock highlands adjacent to the buried valley are capped with the Sunbury shale and the Berea sandstone. The Berea sandstone yields adequate supplies for farm, domestic and small industrial use. The average depth of 19 Berea sandstone wells is 58 feet; the wells range from 43 to 75 feet deep. The average yield is 20 gpm and the range is from 4 to 50 gpm. Wells 547, 563, and 588 exemplify these conditions. The water from the Berea sandstone contains significant amounts of iron, hydrogen sulphide, and the water is relatively hard, as shown in table 5.

Except in the buried valley area in the east-central part of the township, the principal aquifer in the eastern half of Plain Township is the Lower Cuyahoga formation. This formation is separated from the Berea sandstone by approximately 30 feet of Sunbury shale. The average depth to bedrock of the 37 wells analysed is 29 feet. The glacial debris above the bedrock is clayey till with interbedded lenses of sand and gravel, 2 to 5 feet thick. Logs of wells 553, 555, and 556 show 10 to 16 feet of gravel above the bedrock. Only two wells were developed in glacial deposits (wells 552 and 557). The average depth of the wells is about 59 feet; the wells range in depth from 17 to 118 feet. Of 34 wells in this area, a range in yield of 3 to 20 gpm and an average yield of 14 gpm were reported. Yields from the Lower Cuyahoga formation depend upon the thickness of the layers of sandstone that are penetrated.

The buried valley in the east-central part of the township, east of New Albany, contains about 300 feet of glacial debris, including a lense of fine sand, 13 to 48 feet thick lying at an average depth of 49 feet (see logs of wells 576 and 544). Wells in this area yield up to 10 gpm. The log of well 545 reveals fine sand from 75 to 100 feet. The average depth of wells in these buried glacial deposits is about 86 feet. If an adequate supply is not developed from the glacial deposits, 20 or more gpm may be developed from the Lower Cuyahoga formation or from the Berea sandstone. The bedrock is the aquifer for 12 percent of the wells analysed in this area. Wells 513 and 528 were developed at 89 and 118 feet, respectively.

PLEASANT TOWNSHIP

The buried valley which is discussed in the sections on Prairie and Jackson townships, underlies the northeast quarter of Pleasant Township. A smaller buried valley underlies the southwest quarter of the township. These buried valleys are filled with an estimated 250 to 300 feet of glacial debris consisting primarily of clayey till interbedded with thin lenses of sand and gravel. Few data are available to show the physical characteristics of these deposits below a depth of 130 to 163 feet; however, the logs of well 1732 and 1735, as shown on figure 14, illustrate the characteristics of these materials to the depth of 216 feet. Yields of 20 gpm have been reported from wells in the glacial deposits. Except at the sites of wells 1715 and 1749, the interbedded lenses of sand and gravel average less than five feet thick with many well logs showing only one or two feet of permeable deposits. Approximately 30 percent of the wells drilled in the principal buried valley are developed in the limestone bedrock. These wells generally are drilled about 20 feet into the limestone.

Recent excavations for a gravel pit, north of Harrisburg, reveal extensive shallow sand and gravel deposits. These glacial materials were deposited beneath, and adjacent to, Darby Creek. No data are available which reveals the thickness or extent of these deposits. Yields from wells developed in this area may exceed 500 gpm, if the wells receive recharge from stream infiltration.

The principal aquifer in areas not underlain by buried valleys is limestone, though 16 percent of the 43 wells analyzed in this area are finished in sand and gravel. The thickness of the glacial drift ranges generally from 30 to 143 feet. The deposits are clayey till with interbedded lenses of sand and gravel. Domestic wells are drilled to an average depth of 110 feet, 16 feet in limestone. Yields satisfactory for farm and domestic use are available at these depths. Industrial supplies may be developed at greater depths. Ground-water yields increase with the depth drilled into the limestone, but the hardness, dissolved solids and hydrogen sulphide also increase. There are no industrial wells in Pleasant Township; however, wells drilled elsewhere in the county indicate a maximum potential yield of 400 gpm from the deeper limestone aquifers. The chemical quality of water from industrial wells developed in limestone aquifers is shown in table 5.

PRAIRIE TOWNSHIP

A distinctive geologic feature of Prairie Township is a deep north-south buried valley. This valley is filled with 330 or more feet of glacial debris, consisting of thin lenses of sand and gravel and layers of sand, 8 to 60 feet thick, interbedded in thick clayey till. The majority of the domestic wells within, or adjacent to, this buried valley yield adequate supplies from lenses of sand and gravel or from the underlying limestone. Logs of wells 1240, 1247 and 1253 indicate the characteristics of these glacial deposits. Wells drilled in the deeper parts of the buried valley yield up to 10 gpm. Logs of some wells drilled fairly close to the buried valley report yields of 25 gpm from glacial aquifers. Data are insufficient to map these areas, although the author believes that such wells tap permeable deposits in buried tributary valleys.

Adequate water supplies for farm and domestic use are available from the limestone. The average depth to bedrock is 118 feet and most wells are drilled about 20 feet into the limestone. Deeper wells, evidenced by the log of well 1534, yield more ground water from the limestone. These limestone wells have a maximum potential yield of 400 gpm, but the hardness, dissolved solids and hydrogen sulphide content of the water may also increase with depth.

SHARON TOWNSHIP

The bedrock in Sharon Township is Devonian shale and limestone. The preglacial streams cut through the shale into the limestone which is a favorable aquifer in the western part of the township.

The buried valley, near the Olentangy River, is filled with 150 or more feet of glacial debris. These deposits are composed of thick lenses of sand and gravel interbedded with thin lenses of clayey till. Logs of wells drilled along the axis of this valley reveal layers of sand and gravel 12 to 16 feet thick at relatively shallow depths. Although no logs are available of wells which penetrate the deeper deposits, these deposits are presumed to be connected with the Olentangy River and therefore should have a potential yield of 250 or more gpm. Wells drilled through these permeable deposits into the underlying limestone should produce up to 400 gpm. Test drilling and pumping tests are recommended to locate large ground-water supplies.

The northeastern part of this buried valley is beyond the influence of recharge of the Olentangy River. Logs of wells 362 and 341, drilled in this area, reported 33 and 52 feet of sand and gravel, respectively, beneath 12 to 40 feet of clayey till. Drilled wells may develop 25 gpm from these glacial deposits; however, if sufficient ground-water supplies can not be obtained from the glacial deposits, adequate supplies for farm, domestic and small industrial needs are available from the underlying limestone. Yields exceeding 400 gpm, are available at depth in the limestone, but the water from such wells generally has high hardness and contains large quantities of dissolved solids and hydrogen sulphide, as is shown in table 5.

Impermeable shale forms the bedrock walls of the tributary buried valley south of Worthington. Glacial deposits in this valley consist of lenses of sand and gravel, 4 to 10 feet thick, underlying 15 to 50 feet of clayey till. Wells should yield up to 25 gpm from these deposits, as is illustrated by the log of well 366. The average depth of the wells drilled in this area is 54 feet.

North of the buried valley, on and adjacent to the floodplain of the Olentangy River, glacial deposits will yield as much as 300 gpm. These deposits range from 35 to 75 feet in thickness and consist of lenses of sand and gravel in clayey till. These sand and gravel deposits range from 3 to 61 feet thick, as shown by the logs of wells 322 and 343. Reported yields of wells drilled in this valley range from 70 to 340 gpm. Extensive drilling and pumping tests are recommended to locate large supplies of ground water.

Devonian shale is the bedrock west of the Olentangy River, in Perry Township. The glacial material above this impermeable formation is approximately 20 feet thick and consists chiefly of clayey till. Less than 2 gpm can be expected from wells drilled in the till, unless some permeable sand and gravel is encountered at the surface of the weathered bedrock and then 5 gpm is generally the maximum yield. Most of the wells drilled in this area tap limestone which lies at an average depth of 122 feet. Although adequate quantities of water are developed at about 150 feet, hardness, dissolved solids and hydrogen sulphide contents are high in the limestone aquifers.

The Ohio and Olentangy shales cap the bedrock highlands in the north-central and northeastern quarter of Sharon Township. The glacial debris above these formations is clayey till, ranging from 3 to 115 feet thick, with an average thickness of 33 feet. Of the 26 wells investigated for this report 23 percent were drilled through an average of 188 feet of Devonian shale to the underlying limestone, although well 349 penetrated 245 feet of Devonian shale. While less than 2 gpm are developed from shale, the log of well 313, drilled into the limestone reported 12 gpm. The principal difference between this area and the area west of the Olentangy River is that in the former the shale is much thicker and the quality of the ground water is poorer. The records of wells 348 and 313 reveal these conditions.

The east and southeast part of the township is underlain by a buried valley, filled with 300 or more feet of clayey till and thin lenses of sand and gravel. The average depth of wells drilled in this valley is 126 feet. The logs of wells 351 and 357, figure 14, range from 54 to 208 feet in depth. Deposits of sand and gravel, four feet thick underlie approximately 115 feet of till. Drilled wells may penetrate thick till barren of sand and gravel above the shale. Logs of wells 352, 353 and 354 illustrate this condition; however, other wells drilled nearby are developed in sand and gravel. The sand and gravel has a potential yield of less than 10 gpm. Data are insufficient to map in detail the geologic conditions in the extreme northeast quarter of the township; however, 150 to 200 gpm can probably be obtained from deposits adjacent to Alum Creek.

Worthington

Worthington obtains its water supply from three wells west of town in glacial outwash deposits east of the Olentangy River. Village well number one (well 343 in this report) was drilled adjacent to the treatment plant and has been abandoned. Village wells number two and three were drilled in 1935 and 1938 and are 53 and 73 feet deep, respectively. These 12 inch wells have a reported yield of 250 to 300 gpm. Village well number four (well 373) was drilled in 1952 and yields 250 gpm.

The average consumption in 1953 was 0.195 mgd, as compared to 0.230 mgd in 1956. In August, 1956, the average consumption was about 0.314 mgd, although in January, 1957, the average consumption was 0.229 mgd. An emergency supply from Columbus is maintained for periodic flushing of the lines. In August, 1956, 13,677 gallons were pumped daily from this source and 7,871 gallons were pumped daily in January of 1957. Negotiations are now in progress between Columbus and Worthington whereby Columbus will furnish Worthington's entire supply. The chemical analyses for the untreated and treated water is shown in table 6.

TRURO TOWNSHIP

The most significant geologic feature of Truro Township is the bedrock upland which separates two buried valleys. This divide is capped with Bedford and Ohio shales which underlie 3 to 85 feet of glacial debris. One-third of the 20 wells investigated in this area penetrate 3 to 11 feet of sand and gravel above the relatively impervious shale. The log of well 1580 reports 25 feet of gravel. The remaining wells penetrate till above the weathered surface of the shale bedrock. If permeable materials are encountered above the shale, 5 or more gpm can be produced. However, if clayey till lies directly on the shale a supply of less than 2 gpm can be expected. Dry wells are not uncommon; many homeowners rely upon dug wells and cisterns for their supply.

An isolated bedrock hillock is in the northeast quarter of the township. The material above the bedrock, as shown by the log of well 1506, is clayey till from which yields of less than 2 gpm can be expected. The glacial debris, adjacent to the bedrock divide, is composed of lenses of sand and gravel interbedded with clayey till. The till which lies above these permeable deposits ranges from 10 to 100 feet thick. Three-fourths of the wells drilled in this area develop up to 10 gpm at an average depth of 50 feet. Eight of the 29 wells analysed encountered an average of 58 feet of clayey till, with scattered lenses of sand and gravel above shale bedrock, and were drilled from 1 to 192 feet into shale. Four of the 29 wells revealed clayey till above the shale and reported yields of less than 2 gpm. Logs of wells 1574 and 1575 reveal 38 to 50 feet of fine sand above the shale. Data are insufficient to reveal the exact extent of the fine sand. Plate 1 illustrates the approximate extent of this fine sand zone. Wells drilled in this area encounter 10 to 30 feet of fine sand at a depth of about 20 to 85 feet. Some sand and gravel is encountered beneath the sand, as shown by the log of well 1560.

The buried valley beneath Blacklick Creek is filled with about 210 or more feet of thick lenses of sand and gravel beneath 30 to 44 feet of clayey till. These conditions are illustrated by the logs of wells 1516, 1590 and 1591. Few well logs indicate the characteristics of these deposits below 84 feet. Well 1590 was pumped for 24 hours at 170 gpm and had a drawdown of 8.5 feet and a specific capacity of 20 gpm per foot of drawdown. Well 1591 has a specific capacity of 23.4 gpm per foot of drawdown. Yields of 500 gpm can be developed in this area as shown on plate 1. Domestic wells average 17 gpm but have attained yields of 33 gpm at depths from 40 to 89 feet. Fine-grained sand is encountered in this valley at two levels. The upper sand is about 24 feet thick and lies beneath 8 to 44 feet of clayey till. The lower sand averages 41 feet in thickness and is from 35 to 55 feet below the surface.

The buried valley in the western part of Truro Township is filled with lenses of sand and gravel, 5 to 50 feet thick interbedded with about 115 feet of clayey till. The 28 wells investigated in this area range from 23 to 120 feet deep and have reported yields of as much as 25 gpm. Well 1501, drilled for the Columbus General Depot in 1931, had an initial reported yield of 400 gpm; additional wells drilled at this location yield 250 gpm. Wells 1011 and 1012 in Mifflin Township, drilled for industrial use, yield less than 100 gpm. Well 1549, drilled to 120 feet, yields 60 gpm from 45 feet of sand and gravel. It is the author's opinion that there are thick lenses of permeable deposits in this valley which may yield as much as 200 gpm. These deposits may or may not be extensive and the amount of recharge available is limited to the amount of rainfall which percolates into the aquifers through relatively thick clayey till. Wells drilled to bedrock may encounter extensive permeable materials from which greater yields are available. If water for industry is required, a test drilling and pumping test program should be undertaken to locate large supplies of ground water.

The bedrock upland east of Reynoldsburg is the Lower Cuyahoga sandstone and shale. The glacial debris above the bedrock is clayey till and ranges from 20 to 70 feet thick. The four wells investigated in this area are 75 to 100 feet deep and yield about 18 gpm. Wells drilled in this area should develop adequate supplies from the bedrock for farm, domestic and small industrial needs.

Reynoldsburg

The original water supply for the village of Reynoldsburg was from wells drilled into Mississippian-age sandstones in the extreme eastern part of the village. In 1948 a new supply was developed adjacent to the west bank of Blacklick Creek, west of the village. Additional wells have been developed in this well field. Logs of wells 1516, 1590, and 1591 reveal the character of these glacial outwash deposits. The average consumption in 1956 was 0.150 mgd with a maximum consumption of 0.175 mgd. The chemical analysis for well 1590, as shown in table 6, exemplified the chemical characteristics of the ground water from the glacial deposits in the buried valley.

WASHINGTON TOWNSHIP

The dominant geologic feature, which disrupts the general continuity of the limestone bedrock surface in Washington Township, is the deep buried valley which trends southwest through the township and extends into Madison County. The valley is filled with 250 or more feet of glacial debris, consisting of till interbedded with thick lenses of fine-grained sand and thin lenses of sand and gravel (see figure 12). In the aggregate these unconsolidated deposits are 10 to 177 feet thick.

The thick lenticular sand deposits, logged by some drillers as "fine sand or quick-sand", appear to be present at as many as six horizons. The logs of wells shown on figure 14 reveal these deposits at altitude of 933, 894, 865, 833, 804 and 767 to 723 feet. The ground-water map, plate 1, illustrates the areal extent of these deposits. These sand beds seem to be quite similar to those found in Prairie, Plain, Jefferson and Truro townships. Wells drilled in this buried valley are developed in thin lenses of sand and gravel above or below the fine-grained sand. These permeable deposits can yield as much as 10 gpm. Wells which do not encounter adequate supplies in these glacial deposits may be drilled into limestone. Domestic wells are drilled to an average depth of 33 feet into limestone and yield 10 or more gpm.

The upland area is capped with approximately 56 feet of clayey till interbedded with thin lenses of sand and gravel. Limestone is the aquifer in 76 percent of the 26 wells investigated. The average depth of the limestone wells is about 96 feet. Average penetration is 69 feet where the limestone is capped with clayey till. Where sand and gravel occurs above the limestone, the average depth penetrated is 57 feet. No doubt the sand and gravel increases the recharge to the limestone.

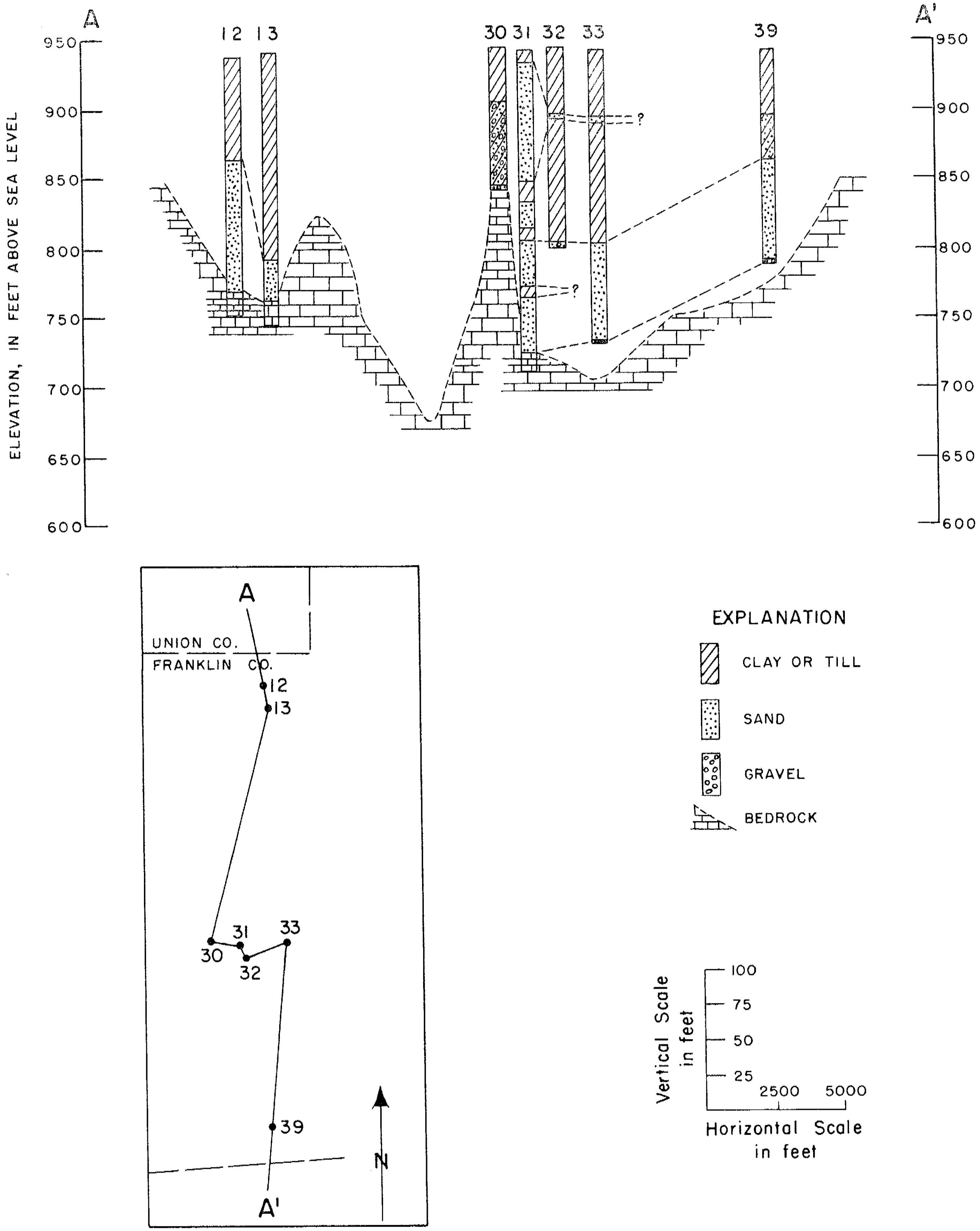


Figure 12. Cross section showing character of material filling buried valley in Washington Township, Franklin County, Ohio

CHEMICAL CHARACTER OF THE GROUND WATER

RELATIONSHIP OF QUALITY TO UTILIZATION OF GROUND WATER IN FRANKLIN COUNTY, OHIO

Water vapor condensed from clouds, or precipitation which occurs high above the earth, is practically pure. As it falls through the atmosphere, it absorbs oxygen, carbon dioxide, dust, and smoke. Rain water is soft but somewhat corrosive since it is saturated with oxygen and carbon dioxide. If collected from clean surfaces and stored in clean tanks, it is usually considered to be the purest form of natural water. Bermuda and Gibraltar are notable regions where rain water has proven to be a reliable source for domestic purposes.

The instant rain water enters the pore spaces of the soil or rocks, the water comes in contact with many substances, both organic and inorganic, and active chemical action begins. Some are soluble in water; others, such as those causing alkalinity and hardness, are soluble in water saturated with carbon dioxide absorbed from the atmosphere, or from decomposing organic matter in the soil. Decomposing organic matter removes the dissolved oxygen from the percolating waters and such water, saturated with carbon dioxide, dissolves iron and manganese from the soil and rocks. In this manner, the more soluble materials are dissolved and carbonates of lime, iron, manganese and alkalies are formed. Hydrogen sulfide often occurs in ground water and is associated with the absence of oxygen, the decomposition of organic matter, or oxidation and hydrolysis of metallic sulfides—such as the iron sulfide minerals, pyrite and marcasite.

The chemical quality of ground water in Franklin County is ascertained from the analyses of water from 45 wells, listed in table 5, representing the principal aquifers. Analyses of the public ground-water supplies in Franklin County are given in table 6. The U. S. Geological Survey analyzed 45 samples; the Ohio Department of Health analyzed 13 samples. These analyses show only the inorganic chemical characteristics and are not indicative of the bacteria content of the water.

The suitability of water for a specific use may be ascertained through the relation of its determined quality characteristics to the accepted quality criteria for the use under consideration. The values used to define suitability, or acceptability, of ground water for various uses are based upon the best information currently available. These values are general approximations, yet serve as a guide in order to judge the suitability for a specific use. Criteria are unofficial, but recognized values or limits of quality, and the particular circumstances of each individual case must be determined before the suitability of a specific supply can be made properly. The rule of reasonableness should be employed in applying quality criteria to ground water for a specific use.

Standards are official limits of quality established by regulation. To safeguard the quality of water used by interstate carrier, the United States Public Health Service has promulgated a set of standards which have been incorporated as quality criteria by the Ohio Department of Health and are applied to each specific public supply. They are used for purposes of reference and comparison only. According to these standards, the chemical substances contained in drinking water should not exceed the concentrations shown in table 7. This table may be used also as a guide for comparing the chemical quality of ground water used for domestic supplies. However, the sustained bacterial quality, rather than the inorganic chemical content, is the most important criterion of purity for domestic ground-water supplies.

The utilization of ground water depends upon the quantity obtainable, the chemical and physical quality, and the specific use. A brief discussion of the basic mineral constituents of ground water is advisable to clarify the analyses listed in tables 5 and 6.

The standard units for listing the dissolved mineral constituents in water in the United States are parts per million (ppm), and grains per gallons (gpg). The water analyses in this bulletin are tabulated in parts per million (ppm) and equivalents per million (epm). A quantity expressed in parts per million is a measure of the weight of the concentration of a dissolved constituent as compared to the weight of a million parts of water. Results in parts per million can be converted to grains per gallon by dividing the former by 17.12. An equivalent per million is a

Table 5.

ANALYSES OF WATER FROM REPRESENTATIVE WELLS IN FRANKLIN COUNTY, OHIO
(Chemical Constituents given in parts per million)
(Analyzed by Quality of Water Branch, U. S. Geological Survey)

Well No	Source	Date	pH	Specific Conductance at 25°C (Micromhos)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na + K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Hydrogen Sulfide (H_2S)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$ Total	Hardness as $CaCO_3$ Noncarbonate
476	Glacial Outwash Deposits	6- 5-53	7.0	906	12.0	3.0	.04	113	41	23.6	374	155		21.0	.4	.8	600	452	145
1451	do	5- 8-52	7.6	885	20	2.3		126	43	15.1	440	139		8.0	.7	.2	594	490	129
1950	do	6- 6-51	7.2	695	19	2.0		101	31	9.2	460	20		3.5	.3	.2	401	380	3
1954	do	6- 4-53	7.4	637	9.4	2.2		92	31	3.4	308	93		4.5	.2	.8	397	356	104
2062	do	10-26-50	7.3	597	11.0	.26		90	28	2.6	342	56		2.2	.1	4.2	353	340	60
2056	do	6- 4-53	7.4	637	16.0	.75		71	30	14.1	356	24		2.8	1.4	.6	390	302	10
550	Lower Cuyahoga Formation	4- 1-53	7.2	640	9.3	.17	.21	82	35	7.3	362	57		4.8	.2	.4	379	348	101
1184	do	4- 1-53	7.4	816	19.0	1.00	.03	98	41	28.0	470	84		1.9	.4	.6	496	412	27
414	Berea Sandstone	4- 1-53	5.8	621	12.0	.86	.68	50	33	24.7	98	102		40.0	.1	81.0	371	260	180
474	do	12-29-56	6.8	571	19.0	2.8	.21	69	26	18.0	257	98	(Odor)	4.3	.3	.0	364	279	68
1118[a]	do	4- 1-53	7.4	762	17.0	.80		80	32	46.9	471	37		7.5	.2	.2	460	330	0
1156	do	4- 5-55	7.0	1070	22.0	.39	.18	130	49	46.3	436	250	3.4	5.2	.2	.1	718	528	169
441	Bedford Shale	6- 5-53	7.2	920	10	.50		74	54	56.2	462	122		12.0	.4	8.2	560	408	29
475[b]	Ohio Shale	9- 9-55	7.2	1960	16	.31		293	110	65.7	432	904		7.5	.7	.0	1612	1184	830
1534	Bedford-Ohio Shale	6- 4-53	7.6	2080	8.9	.47		41	18	447.2	700	390		100.0	1.4	12.0	1360	178	0
40[c]	Columbus Limestone	9-17-56	7.2	823	11	.13		103	39	12.6	424	117	.2	3.5	1.4	.6	530	455	108
215	do	2-18-51	7.4	250	7	6.0		69	17	1.2	238	37		2.5	.0	3.6	269	244	49
252	do	8- 3-56	7.2	953	12	.59	.07	71	34	113.1	542	85	1.7	11.0	1.0	.7	595	317	0
253	do	10-14-56	6.9	2610	21	4.5	.31	481	166	28.3	555	1410	.3	3.7	1.0	.2	2390	1880	1430
1401	do	5-26-53	7.7	2060	8.3	1.6		330	120	33.1	390	1017	.1	11.0	1.6	.1	1802	1320	1001
1419	do	6- 4-53	7.6	910	11	.81	.04	64	28	107.9	468	114	6.6	6.8	.7	.6	574	274	0
1464	do	8- 6-52	7.3	1820	13	1.0		260	87	65.3	342	735	3.2	66.0	1.4	.0	1486	1010	730
1466	do	8- 6-52	7.1	1930	15	.40	.08	286	106	52.5	430	758	5.5	65.0	.9	.1	1496	1150	798
1467	do	8- 6-52	7.1	1530	16	.86		214	69	66.9	356	547	1.1	48.0	.6	1.0	1194	820	528
1468	do	8- 6-52	7.4	1320	12	.40		176	60	44.7	292	464	.2	38.0	.7	2.7	942	685	245
1476	do	8- 6-52	7.3	1650	17	.25		196	74	92.7	462	501	.9	72.0	.6	.4	1230	795	416
1491	do	5-25-53	7.4	2080	13	1.2		294	139	74.2	454	942	22.0	38.0	1.4	.1	1716	1305	933
1494	do	6- 4-54	6.8	1570	12	1.2		231	81	29.8	338	598		36.0	1.5	.1	1157	912	632
1498	do		7.2	1060	14	4.3	.13	132	54	28.8	400	232	.3	27.0	.4	.1	718	552	224
1499	do	3-20-57	7.1	2160	11	.23	.16	371	101	48.3	389	1060	7.3	1.5	1.4	.1	1800	1350	1040
00-B	do	8- 6-52	7.1	1890	18	1.6	.05	240	79	121.0	392	594	3.0	137.0	.5	.4	1428	925	604
00-D	do	8- 6-52	7.5	2010	14	.54	.05	302	119	50.1	369	854	12.0	71.0	1.2	1.0	1666	1245	943
00-E	do		7.4	1810	13	4.0	.05	274	75	77.0	349	742	.3	64.0	.8	.2	1482	995	710
1439	Columbus-Bass Islands[d]	5-25-53	7.6	2060	11	.36		322	101	60.4	330	984	.1	30.0	2.0	1.9	1770	1220	950
1441	do	5-25-53	7.3	2640	11	.77		472	136	49.2	334	1451	.7	45.0	1.8	.1	2462	1740	1522
1457	do	9- 4-53											20.0						

[a]Analysis includes 24.0 ppm Copper
[b]Analysis includes 2.4 ppm Lithium
[c]Analysis includes 33.0 ppm Strontium
[d]Columbus Limestone-Bass Islands Dolomite

Table 5. (continued)

Well No.	Source	Date	pH	Specific Conductance at 25°C (Micromhos)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na + K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Hydrogen Sulfide (H_2S)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$ Total	Noncarbonate
1833	Columbus-Bass Islands[d]	10-23-54	7.0	2460	10	.36		424	124	56.8	316	1219	3.6	84.0	2.3	.4	2077	1568	1309
1874	do		7.4	1360	11	.32		184	79	32.6	306	563		2.1	2.5	2.7	1069	785	534
00-A	do	6- 4-53	6.7	3190	9.6	.79		540	194	61.9	354	1835	42.0	68.0	2.0	.2	3132	2150	1861
00-C	do	8- 6-52	7.6	2510	12	.12		398	149	80.4	310	1335	29.0	63.0	1.8	.1	2192	1610	1357
00-F	do	8- 6-52	7.0	2700	11	.71		392	141	81.2	293	1243		153.0	1.6	.4	2168	1560	1321
00-G	do	5-25-53	7.6	981	13	.58		135	47	12.0	378	229	.0	14.0	1.1	.1	662	530	220
00-H	do	5-25-53	7.3	1000	14	9.9	.13	112	30	69.9	326	207	24.0	50.0	.4	.1	647	402	134
41	Bass Islands Dolomite	3- 8-55	7.5	774	11	.12		108	39	12.8	426	79		2.5	1.7	.1	464	429	81
1739	do	5-25-53	7.5	777	14	2.3	.08	102	41	10.9	438	75		3.2	1.0	.0	462	426	122

[d]Columbus Limestone-Bass Islands Dolomite

Table 6.

ANALYSES OF WATER FROM PUBLIC SUPPLIES IN FRANKLIN COUNTY, OHIO
(Chemical constituents in parts per million)
(Analyzed by the Ohio Department of Health)

Municipality and Source	Sample from	Treatment	Date	pH before treatment	pH after $CaCO_3$ treatment	Silica (SiO_2)	Total Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Carbonate (CO_3)	Bicarbonate (HCO_3)	Free CO_2	Chloride (Cl)	Fluoride (F)	Total solids	Hardness as $CaCO_3$ Total	Noncarbonate
Canal Winchester	Waterworks raw		11-21-56	7.6	7.3	18	2.7	0.12	104	32	0	0	16	4	0.2	441	392	72
Glacial Outwash Deposits	Waterworks tap	Lime-soda	11-21-56	8.7	8.1	13	0.33	0.02	35	24	13	0	0	3	0.3	274	188	61
Columbus-Nelson Park[e]	Waterworks raw		6-23-53	7.1	--	17	3.0	0.00	122	55	0	459	--	12	.4	614	530	154
Glacial Outwash Deposits	Waterworks tap	Lime-soda	6-23-53	9.8	--	11	.07	0.00	19	12	27	0	--	11	.7	289	97	47
Grove City	Waterworks raw		1-17-56	7.35	7.3	12	0.7	0.07	197	77	0	0	24	12	1.8	1218	808	527
Columbus-Bass Islands[d]	Waterworks tap	Zeolite	1-17-56	7.2	7.3	12	0.3	0.0	53	18	0	57	32	26	2.3	1535	208	0
Groveport	Waterworks raw		11-10-55	7.45	7.4	18	3.3	0.08	90	27	0	2	24	1	0.1	396	338	0
Glacial Outwash Deposits	Waterworks tap	Zeolite	11-10-55	7.6	7.8	16	0.1	0.01	13	4	0	302	17	3	0.1	446	48	0
Hilliards	Waterworks raw		1-26-55	7.4	7.15	12	0.7	0.14	177	53	0	0	26	4	1.4	948	658	323
Columbus-Bass Islands[d]	Waterworks tap	Lime-soda	1-26-55	8.4	8.2	12	0.1	0.0	42	46	5	0	0	5	1.1	749	292	144
Reynoldsburg	System tap[f]	Chlorine	6-11-56	7.6	7.3	15	1.5	0.06	86	32	0	0	16	5	0.30	423	346	31
Glacial Outwash Deposits	Waterworks tap[g]		11-15-55	7.4	7.3	16	1.2	0.05	77	27	0	0	28	3	0.25	363	304	13
Worthington	Waterworks raw		11-21-56	7.75	7.4	12	1.15	0.14	141	45	0	0	10	109	0.55	802	536	251
Glacial Outwash Deposits	Waterworks tap	Zeolite	11-21-56	8.15	7.9	12	0.02	0.02	30	11	12	160	4	114	0.55	770	120	0

[d]Columbus Limestone-Bass Islands Dolomite
[e]Analyzed by the Quality of Water Branch, U. S. Geological Survey
[f]Well 1516
[g]Well 1590, emergency supply

unit chemical equivalent or combining weight of a constituent present in a million unit weights of water. One equivalent per million of a cationic constituent, such as calcium, magnesium, sodium, or potassium, will combine with an equivalent per million of an anionic constituent, such as bicarbonate, sulfate, or chloride. These concentrations of the constituents are directly comparable and are useful, since waters differing widely in concentration, but similar in chemical character of composition, may be grouped together. In this report an equivalent per million is computed by dividing the concentration of a constituent in parts per million by the chemical combining weight.

Table 7

LIMITING CONCENTRATIONS OF MINERAL CONSTITUENTS FOR DRINKING WATER

United States Public Health Service Drinking Water Standards, 1946

Constituent	Upper limit of concentration in parts per million
Turbidity	10 (Silica scale)
Color	20 (Cobalt scale)
Iron (Fe) and Manganese (Mn)	0.3
Lead (Pb)	0.1
Fluoride (F)	1.5
Selenium (Se)	0.05
Hexavalent Chromium	0.05
Arsenic (As)	0.05
Copper (Cu)	3.0
Zinc (Zn)	15
Magnesium (Mg)	125
Chloride (Cl)	250
Sulfate (SO_4)	250
Phenolic Compounds	0.001 as phenol
Total solids	500 *
Alkalinity (when lime-soda softened)	Hardness + 35 ppm, as Calcium Carbonate
Phenolphthalein alkalinity	15 + .04 (total alkalinity)
pH	10.6
Normal Carbonate alkalinity	120

* Criteria of 500 ppm, although a standard, as great as 1000 ppm, if water of lower mineral content is not available.

The principal constituents in samples of water from Franklin County have been graphically plotted to scale on figure 13 in equivalents per million. These samples are from 24 wells representing the principal water-bearing strata. The cations (positive ions) are shown adjacent to the anions (negative ions) from bottom to the top.

pH.—The pH value of a water is a measure of its net alkalinity or acidity as determined by the hydogen-ion concentration. The pH index is a logarithmic value. Thus, a difference of one unit in its size equals a 10 fold difference in the H-ion concentration (acid) or a 10 fold difference in the OH-ion concentration (alkaline), as the case may be. If the water has a pH value below 7.0, it is said to be acid; if the pH is above 7.0, it is alkaline in its reaction. A pH of 7.0 indicates a neutral solution. Knowledge of the pH value is important to determine the corrosive or incrusting nature of the water.

Specific conductance.—The specific conductance of water is a measure of its capacity to conduct an electric current. It varies with the concentration and degree of ionization of the constituents in solution, and with the temperature of the water. It is a measure of the ionized salts in solution. The range of the specific conductance may determine the type of crop that can be irrigated. Table 12 is intended as a criteria for this type of farming.

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 10 to 30 parts per million. Silica affects the usefulness of water as it contributes to the formation of boiler scale. It should be noted that for each $\frac{1}{64}$th of an inch of scale the final consumption of fuel will increase about two percent (Johnson, 1951, Bull. 1237).

Iron (Fe).—The limitation of 0.3 parts per million, which the current federal drinking water standards specify, is based on considerations of appearance rather than on considerations of health. Drinking water containing several parts per million of iron are freely and widely accepted without deleterious physiological effects.

If exposed to the air, water that contains more than a few tenths part per million of iron soon becomes turbid with the insoluble compound produced by oxidation. This excessive iron stains enameled ware, fixtures, clothing and fabrics washed in such water.

Certain types of anaerobic bacteria, such as crenothrix, occur in waters containing iron and change the dissolved iron to an insoluble form to produce a slimy semi-solid mass that plugs water-bearing formations in the vicinity of the well, or the well screen. Chlorine can be used to inhibit the growth of crenothrix bacteria.

Manganese (Mn). — Manganese is generally more troublesome when present than iron because it is more difficult to remove. It is objectionable

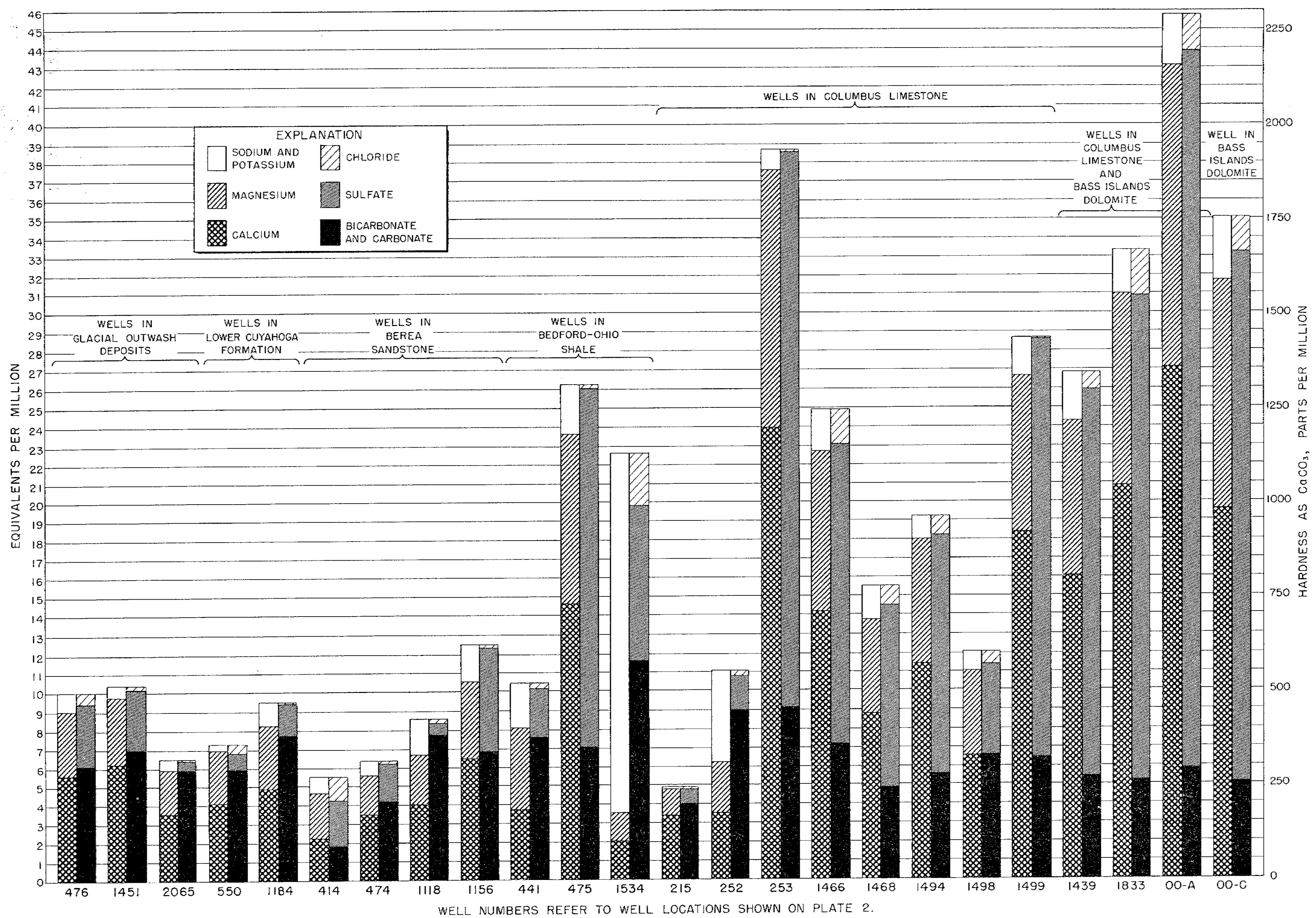


Figure 13. Chemical analyses of ground water from wells in Franklin County, Ohio.

to the laundry and textile industries because of its staining characteristics. Its presence can be recognized by small black specks which settle on the fabrics being laundered.

Calcium (Ca).—Calcium is dissolved from practically all rocks and is the basic constituent of limestone. It is a cause of hardness, boiler scale, and incrustation of water-bearing formations and well screens.

Magnesium (Mg). — Magnesium is another hardness-producing mineral. Natural waters dissolve magnesium from dolomites and dolomitic limestones. The effects of magnesium are somewhat similar to those of calcium. Waters that contain much magnesium in combination with chlorides are likely to be corrosive, especially in steam boilers and in other heating equipment. High concentrations of magnesium salts have cathartic effects. However, the human body develops a tolerance which negates the laxative effect and permits the use of water high in magnesium content for public use. The federal drinking standards of 125 parts per million for waters used on common carriers, prevents the exposure of travelers who normally consume waters of low mineral content, and thus had no opportunity to develop a tolerance for higher mineralized waters.

Sodium and potassium (Na + K). — Ground water from humid regions such as Ohio generally contain only small quantities of sodium and potassium. Recent discoveries, (Bills, 1949) reveal that the sodium content of food and water may be harmful to people suffering from high blood pressure. These findings indicate that 200 mg. of sodium may be sufficient to cause this physiological reaction. This quantity does not usually occur except in areas of highly mineralized springs not used for public consumption. Yet, if waters are softened through sodium cation exchangers, the sodium content of the treated waters will increase and should be carefully checked.

Moderate quantities of Na + K have little effect on industrial supplies, although more than 50 or 100 parts per million of the two may require careful operation of steam boilers to prevent foaming. Large quantities of sodium salts may also be injurious to soils and crops. (See table 12.) The ratio of alkali bases, i.e., sodium and potassium to alkali earth bases, (calcium and magnesium), is of particular importance for the maintenance of permeability of soils used for irrigation purposes (A.W.W.A., 1950, p. 63).

Carbonate and bicarbonate (CO_3 and HCO_3).—Carbonates and bicarbonates occur in water largely through the action of carbon dioxide, which enables the water to dissolve calcium and magnesium salts. Carbonates are less prevalent than bicarbonates. Much water from limestone contains 200 to 400 parts per million of bicarbonate. Untreated water containing such a large quantity is unsatisfactory for boiler and condenser use.

Sulfate (SO_4).—Sulfate is dissolved in large quantities from gypsum ($CaSO_4.2H_2O$) and sodium sulfate. It is also formed by the oxidation of decomposed sulfides, such as pyrite and marcasite in shale and limestone. The federal drinking water standards suggest a maximum of 250 parts per million. High concentrations of sulfate in water can be cathartic, although the concentration of SO_4 which will have laxative effects varies with the tolerance of the victim. The presence of sulfate in water that contains much calcium and magnesium cause a formation of hard scale in steam boilers and also can increase the cost of softening the water. Table 8 illustrates the water quality limits for boiler feed water (Moore, 1940, p. 263).

Table 8

WATER QUALITY LIMITS FOR BOILER FEED WATER

(Allowable limits, in parts per million)

	Pressure, in pounds per square inch			
	0-150	150-250	250-400	Over 400
Turbidity	20.0	10.0	5.0	1.0
Color	80.0	40.0	5.0	2.0
Oxygen consumed	15.0	10.0	4.0	3.0
Dissolved oxygen[a]	1.4	0.14	0.0	0.0
Hydrogen sulfide (H_2S)	5.0[b]	3.0[b]	0.0	0.0
Total hardness as $CaCO_3$	80.0	40.0	10.0	2.0
Sulfate-carbonate ratio (A.S.M.E. Na_2SO_4:Na_2CO_3)	1:1	2:1	3:1	3:1
Aluminum oxide Al_2O_3)	5.0	0.5	0.5	0.01
Silica (SiO_2)	40.0	20.0	5.0	1.0
Bicarbonate (HCO_3)[a]	50.0	30.0	5.0	0.0
Carbonate (CO_3)	200.0	100.0	40.0	20.0
Hydroxide (OH)	50.0	40.0	30.0	15.0
Totals solids[c]	3000-500	2500-500	1500-100	50.0
pH value (minimum)	8.0	8.4	9.0	9.6

a Limits applicable only to feed water entering boiler, not to original water supply.

b Except when odor in live steam would be objectionable.

c Depends on design of boiler.

Hydrogen sulfide (H_2S).—Sulfur exists in water as sulfate, or sulfide, originating from contact with pyrite and other sulfurous minerals, or from the decomposition of sulfates by biological action. Hydrogen sulfide is about twice as soluble as carbon dioxide and, when dissolved in water, its presence is usually noted by a noxious odor resembling that of rotten eggs.

Many metals are rapidly attacked by relatively high concentrations of sulfides. Resistant alloys, such as stainless steel and brass, which are usually effective as an oxidizing medium, are subject to attack by water containing sulfide. Hydrogen sulfide, even in small amounts, reacts as an acid and may be corrosive to iron even in the absence of oxygen, although the rate of the attack on iron, nickel and copper is accelerated when oxygen and carbon dioxide are present. Greensand zeolites are damaged by the continuous exposure to the mineral of a water containing sulfide. As little as 2 parts per million of sulfide, expressed as hydrogen sulfide has been known to destroy the zeolite material in a few months (Powell, 1954, p. 365). Hydrogen sulfide can be removed by oxidation by aeration and filtration, or oxidation by chlorination. Lowering the pH value of the water greatly reduces the size of the aerating equipment required.

Chloride (Cl).—Chloride has little effect on the suitability of water for ordinary use, unless present in such high concentration as to make the water impotable. The federal drinking water standard for chloride is 250 parts per million. Waters which have 100 parts per million chlorides may impart a salty taste to some persons; to others, 700 parts per million may cause no noticeable salty taste. The combined content of chlorides and hardness of 400 parts per million may result in a salty taste. Physiological effects do not occur until much higher concentrations, approaching those of sea water, are reached.

Excessive amounts of calcium, magnesium, iron, and chloride in water adds to the non-carbonate hardness and is highly corrosive. Certain industries require water relatively free of these salts.

Fluoride (F).—Fluoride in water occurs only in small quantities. A knowledge of the fluoride content of water used by children when consumed before the formation of the permanent teeth is important. Disfigurement and mottling of teeth occurs when the fluoride content of potable water exceeds 1.5 parts per million, and becomes pronounced when the content exceeds 3.0 to 6.0 parts per million. A minimum fluoride quantity, approximately 1.0 part per million, seems desireable for the disposition of fluorine in the enamel, as a protection against dental caries (Hirsch, 1950, p. 5). If the fluoride content is as high as 4 parts per million, about 90 percent of children drinking such water have mottled teeth (Dean, 1936).

Nitrate (NO_3).—Nitrate in water is a final oxidation product of nitrogenous organic materials. In the early history of water analyses, these nitrogenous compounds, associated with the nitrogen cycle, disclosed information pertinent to the interpretation of the sanitary quality of a well. An excess of 10 parts per million indicates organic pollution. Evidence discovered in recent years has disclosed that the use of high-nitrate content waters in the preparation of food for infants may be responsible for the development of cyanosis (blue baby), a morbid condition in which the surface of the body becomes blue owing to insufficient aeration of the blood. A maximum nitrate level has not been established, owing to the variable conditions under which cyanosis is developed. Constant use of water having a high nitrate concentration may prove fatal. The Ohio Department of Health's criterion is approximately 10 ppm.

Dissolved solids.—The residue of evaporated water at 180°C consists primarily of the mineral constituents listed in table 5. Water containing less than 500 parts per million of dissolved solids is suitable for domestic consumption and most industrial uses. Water containing more than 1000 parts per million of dissolved solids is unsuitable for most uses, except in areas where the presence of highly mineralized waters prevents the use of better water. These permissible concentrations are based entirely upon the limits of adaptability to waters of high mineral content. The recommended values are intended to obviate the physiological effects otherwise noted.

Hardness.—Hardness is a direct measure of the calcium and magnesium salts in solution: bicarbonates, carbonates, sulfates, chlorides and, infrequently, nitrates, iron, manganese and aluminum. Calcium hardness and magnesium hardness distinguish between the kinds of salts present. Carbonate and noncarbonate hardness each refer to the types of compounds in which calcium and magnesiums are combined. Water is classified according to hardness in table 9.

Table 9

CLASSIFICATION FOR THE DEGREE OF HARDNESS

Class	1	2	3	4
Hardness ppm..........	0-55	56-100	101-200	201-500+
Degree of hardness..	Soft	Slightly hard	Moderately hard	Very hard

In the past it has been customary to classify hardness as temporary or permanent. Currently used and more descriptive terms are carbonate and noncarbonate hardness. Water containing carbonate or temporary hardness is partially softened by boiling, while water containing noncarbonate, or permanent hardness is not reduced by this method. Noncarbonate hardness is due to calcium sulfate or calcium chloride, which remains soluble when water is heated and must be converted to carbonates by treatment with soda ash. Therefore, the chemical requirements for the treatment or softening of carbonate and noncarbonate hardness, or for calcium and magnesium hardness may be different. Table 10 illustrates this classification of hardness (Powell, 1954, p. 87).

Table 10
TYPES OF HARDNESS

Classification	Carbonate hardness	Noncarbonate hardness
Calcium hardness	Calcium bicarbonate	Calcium sulfate
	Calcium carbonate	Calcium chloride
Magnesium hardness	Magnesium bicarbonate	Magnesium sulfate
	Magnesium carbonate	Magnesium chloride

Soap and soap products have long been used to increase the cleansing action of water. Before soap of the common sodium and potassium types can cut dirt and suspend it in lather for removal by rinsing, it will replace calcium and magnesium in carbonate compounds in the water to form an insoluble precipitate. Thus soap must precipitate the dissolved minerals—soften the water—before suds can remain permanently. This precipitate gave rise to the term "hard" water. Use of soap as a softener is not only expensive but is also inconvenient. Softening the water in itself will much more than pay for the savings in soap costs, and will also greatly reduce the formation of scale in boilers, hot water heaters, piping, and fixtures. These scale deposits waste fuel, reduce flow rates, and increase the cost of repairs. Flow rate reduction is often serious, for it requires only one-quarter inch of scale to reduce the capacity of the usual three-quarter inch house line to one-ninth of the original capacity.

Recently synthetic detergents have been perfected and are partially replacing soap. The cleansing action of soap is best in warm, soft, and slightly alkaline waters. Synthetic detergents are equally effective in neutral and acid solutions, and also in cold hard water without softening it. Use of these detergents will certainly affect the economics of water softening insofar as it pertains to soap wastage.

Quality of Water for Industry

Water satisfactory for one industry will not necessarily suffice for another. The desirable quality of industrial water, in terms of maximum permissible concentrations of various constituents, is shown in table 11 (Moore, p. 271). Owing to the large number of industrial uses of water and varied requirements, it is desirable to consider water quality in general terms for groups of related industries. Quality requirements for boiler make-up water are more exacting than those listed in table 11, and are presented in table 8.

Quality of Water for Irrigation

Before passing judgment on the suitability of a particular ground-water supply to be used for irrigation, certain conditions should be considered. The quality of the irrigation water, irrigation practices, and drainage conditions are involved in salinity and alkalinity control. There are natural modifying conditions, such as soil permeability, temperature, humidity and rainfall, which should be considered also.

The chemical characteristics of irrigation water that seem to be most important are: (1) total concentration of soluble salts; (2) proportion of sodium to other principal cations (magnesium, calcium, and potassium); (3) concentration of boron; and (4) bicarbonate concentration as related to the concentration of calcium plus magnesium.

Table 11.

WATER QUALITY FOR INDUSTRIAL USES
(Allowable limits, in parts per million)

Use	Turbidity	Color	Odor and taste	Iron as Fe	Manganese as Mn	Total solids	Hardness as $CaCO_3$	Alkalinity as $CaCO_3$	Hydrogen sulfide	Miscellaneous requirements	
										Health	Other
Air conditioning..	..	..	Low	0.5[a]	0.5	..	..	..	1.0	..	No corrosiveness or slime formation.
Baking...........	10	10	Low	0.2[a]	0.2	..	..	..	0.2	Potable	
Brewing											
Light beer......	10	..	Low	0.1[a]	0.1	500	..	75	0.2	Potable	NaCl less than 275 parts per million-pH 6.5-7.0.
Dark beer.......	10	..	Low	0.1[a]	0.1	1,000	..	150	0.2	Potable	NaCl less than 275 parts per million-pH 7.0 or more.
Canning											
Legumes.........	10	..	Low	0.2[a]	0.2	..	25-72	..	1.0	Potable	
Carbonated Beverages...........	2	10	Low	0.2	0.2	850	250	50-100	0.2	Potable	Organic color plus oxygen consumed less than 10 parts per million.
Confectionery.....	..	..	Low	0.2[a]	0.2	100	..	..	0.2	Potable	pH above 7.0 for hard candy.
Cooling..........	50	..	..	0.5[a]	0.5	..	50	..	5.0	..	No corrosiveness or slime formation.
Food, general.....	10	..	Low	0.2[a]	0.2	..	..	..	..	Potable	
Ice..............	5	5	Low	0.2[a]	0.2	..	50	..	..	Potable	SiO_2 less than 10 parts per million.
Laundering........	..	..	..	0.2[a]	0.2	..	50	..	..	..	
Plastics, Clear...	2	2	..	0.02[a]	0.02	200	..	..	..	..	

[a]Limit given applies to both iron alone and the sum of iron and manganese.

The total concentration of soluble salts in irrigation water can be expressed in broad terms as electrical conductivity. This is the specific conductance expressed in table 5 as micromhos at 25°C. The range of the specific conductance therefore affects the type of crop that may be cultivated. Water having a conductivity of more than 2250 micromhos is not commonly used for irrigation. Salt-sensitive crops, such as strawberries and green beans, etc. (truck crops), are adversely affected by irrigation waters having a range of 250 to 750 micromhos.

Table 12

SALT CONTENT OF IRRIGATION WATER AS AN INDEX OF QUALITY*

Scale of Electrical Conductivity (Micromhos/cm)	0	1,000	3,000
Parts per million	Up to 600	600-800	More than 800
Rating of water	Excellent to good	Good to injurious	Injurious to Unsatisfactory

* Adapted from "Diagnosis and Improvement of Saline and Alkali Soils", U. S. Department of Agriculture, Regional Salinity Laboratory, Riverside, California.

Quality of Water from Various Aquifers

The analyses shown in table 5 represent the principal aquifers in Franklin County. The hardness, iron and manganese content is shown in table 13, which can be used as a comparison of the quality of various aquifers in the county.

All water derived from drilled wells in Franklin County should be softened. Most water supplies from the glacial deposits should also be treated for the removal of iron. The Lower Cuyahoga formation yields water of nominal iron content, although water from the Berea sandstone should be treated for iron and hydrogen sulfide. Analyses of ground water from the Columbus and Bass Islands limestone indicate high specific conductivity, iron, sulfate, dissolved solids, hardness, and often exceedingly high percentages of hydrogen sulfide. Higher concentrations of these chemical constituents are believed to be generally the results of the depth drilled in the limestone. High mineralization has been reported in Perry and Washington townships in water from depths of less than 100 feet. The analysis for well 253 indicates a total hardness as $CaCO_3$ of 1880 ppm, 1430 ppm noncarbonate hardness, and 1410 ppm sulfate. These wells are undoubtedly developed in limestone which is impregnated with gypsum.

The principal causes of the poor quality for nonindustrial usage of ground water from limestone in Franklin County are the degree of hardness, high sulfate, and hydrogen sulfide. The latter induces corrosion, while the former induces incrustation. The various tables in this report serve as a guide for industrial utilization of ground water from these formations.

It is beyond the scope of this report to discuss the various methods of treating ground water for industrial or domestic purposes.

Table 13

HARDNESS, IRON, AND MANGANESE CONTENT OF GROUND WATER IN FRANKLIN COUNTY

(in parts per million)

Aquifer	Number of Samples	Hardness				Iron (Fe)		Manganese (Mn)	
		Total		non-carbonate					
		Range	Average	Range	Average	Range	Average	Range	Average
Glacial Deposits	6	302- 490	386	3- 145	75	.26-3.0	1.75		.04
Lower Cuyahoga Formation	2	348- 412	380	27- 101	64	.17-1.0	.58	.03-.21	.12
Berea Sandstone	4	260- 528	349	0- 180	104	.39-2.8	1.21	.18-.68	.27
Bedford—Ohio Shale	3	178-1184	590	0- 830	286	.31- .5	.43	—	—
Columbus Limestone	17*	244-1350	844	0-1040	527	.13-6.0	1.64	.04-.31	.05
Columbus—Limestone Bass Islands Dolomite	11	402-2150	1129	81-1861	765	.12-9.9	1.48	.08-.13	.10
*Well 253	Total Hardness 1880; non-carbonate - 1430.								

SUMMARY OF GROUND-WATER CONDITIONS IN FRANKLIN COUNTY, OHIO

The economic development of ground water depends on the quantity and quality available from various aquifers. Ground water obtainable from one aquifer may be adequate to satisfy the demands of large industrial needs, however, may not be used economically as small industrial or domestic supplies. More than three-fourths of Franklin County is underlain with aquifers which satisfy the needs of small and large industrial demands.

The glacial outwash deposits in the south and southeastern parts of the county, and the limestone in the western half of the county are the principal aquifers which can supply large industries. The glacial deposits are recharged by the Scioto River, Big Walnut, Alum, Blacklick, and Little Walnut creeks. Drilled wells near these streams have a potential yield of 1000 to 1500 gpm. Such large demands are satisfied through induced stream infiltration. Permeable sand and gravel deposits not subject to recharge from these surface streams have a potential yield of 500 gpm or more.

To develop the maximum yield of ground water to meet industrial demands, a test drilling and pumping test program should be made to ascertain the location of the more permeable glacial deposits.

The second area which yields ground water in sufficient quantity for industry is the western half of Franklin County. Yields of as much as 400 gpm can be developed from the limestone in this area usually at a depth greater than 300 feet. Wells drilled in Columbus yield industrial supplies from the limestone; however, the hardness, dissolved solids, sulphate and often hydrogen sulfide content generally increases with the depth of the well. If in the future the cost of treating this mineralized water should become less than that of purchasing municipal water, these aquifers would become economically suitable as industrial supplies.

Industrial ground-water supplies can be developed in five relatively isolated areas in the county. Wells developed in sand and gravel deposits in the buried valley in Truro and Jefferson townships have a potential yield of as much as 500 gpm. This valley, which extends from Reynoldsburg northward beyond Blacklick, is filled with scattered lenses of thick permeable glacial outwash. Productive wells are indicative of these spotty conditions and further test drilling is recommended which may reveal extensive industrial ground-water horizons.

The Nelson Park well field was developed to supplement the Columbus water supply. At the present rate of pumping, the water level in these wells should be more or less stabilized and should not continue to decline as it has in previous years. The estimated potential for wells in this area is 1000 or more gpm. Further test drilling to the north and to the east of this well field may reveal a much larger area for the development of industrial supplies than is shown on Plate 1.

North of Harrisburg, in Darby Creek valley, shallow permeable deposits have a potential yield of 500 gpm or more. No data are available which reveal the extent of these deposits. Test drilling and pumping tests may reveal much larger yields for industrial use.

The unconsolidated deposits which fill the buried valley near the Olentangy River should yield as much as 250 gpm. Greater yields may be developed from shallow wells which are recharged by induced infiltration from the river. These areas are not shown on the map, owing to their limited lateral extent.

The buried valley adjacent to Alum Creek and beneath the extreme eastern section of Columbus should be test drilled to determine the extent of the permeable deposits beneath the clayey till. The estimated potential yield of this area is 200 gpm.

Yields of as much as 25 gpm can be developed from the marginal areas adjacent to the principal buried valleys. These permeable glacial deposits of limited extent overlie shale and/or limestone bedrock, thereby increasing the potential yield for a specific location. The preglacial valley in the vicinity of Linworth, and the marginal area adjacent to the Scioto and Olentangy rivers are typical of these conditions. Similar valleys exist northwest of Briggsdale in Franklin Township, beneath the central part of Columbus, and the buried valley which passes through Gahanna.

The north-south buried valley in the western part of the county in the vicinity of Galloway is quite similar to the buried valley in the north-central part of Sharon and Clinton townships. These valleys are filled with thick clayey till interbedded with thin lenses of sand and gravel and have a potential yield of 5 to 10 gpm adequate for farm and domestic supplies. The bedrock beneath the valley to the west is limestone and that to the east is shale.

Small industrial supplies are available from the Lower Cuyahoga formation and the Berea sandstone, which are the principal aquifers in the northeast part of the county. Wells developed in these formations, yield as much as 70 gpm from intermittently pumped wells, although their maximum continuous yield is less than 30 gpm.

Less than 2 gallons a minute are developed in the shallow drift areas that overlie the Mississippian and Devonian shale in Blendon, Clinton, Jefferson, Mifflin, Plain, Sharon, and Truro townships. Homeowners often rely upon cisterns and dug wells to supplement their supplies.

Fine-grained sand, "quicksand", exists at various horizons in the deeper tributary buried valleys in Washington, Plain, Jefferson and Truro townships. Domestic and farm supplies are usually developed above or below these deposits.

Concentration of suburban development along the Scioto River, adjacent to the Griggs Reservoir, has caused pollution of the shallow aquifers. In Norwich, Washington, and Perry townships, where the weathered limestone lies beneath a few feet of till, the effluent from septic tanks and leaching tile fields has contaminated many domestic wells. Homeowners rely on chlorinators to purify their ground-water supplies. It is the author's recommendation that in areas where these geologic conditions exist, central water and/or sanitary systems should be constructed for subdivision developments.

The present use of ground water in Franklin County is by no means a criterion of the potential use for the area. Approximately 10 percent of the water needs of the county are supplied from wells. Three-fourths of the county is underlain with excellent aquifers which have not been tapped for municipal or industrial use. Future test drilling and pumping tests in these areas will raise considerably the estimated yield of these aquifers.

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TABLE 14

RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO

Explanation and symbols:

Number	The number of the well shown on the map, plate 2.
Owner or name	The name of the land owner or tenant at the time the well was drilled.
Elevation of well	Determined approximately from topographic maps of the United States Geological Survey.
Depth to bedrock	Depth to the surface of consolidated rocks, based on driller's log of well.
Character of material	Geologic material in which water was obtained, or in which well was terminated, based on driller's log of well; g, gravel; s, sand; un, undifferentiated glacial debris, may be sand and/or gravel, or till; ls, limestone; sh, shale; ss, sandstone.
Geologic horizon	Refers to the geologic age of the deposits; S, Silurian; D, Devonian; M, Mississippian; Q, Quaternary.
Water level	The depth below land surface of the static water level in the well, as reported by the driller; m, water level measured in the well.
Date	Date of determination of the static water level.
Rate	The rate, in gallons per minute, at which the well was pumped or bailed.
Drawdown	The amount of lowering of the water level in the well as a result of the withdrawal of water at the rate indicated.
Type of well	Dg, dug; Dr, drilled.
Type of pump	DwE, deep well electric; DwH, deep well hand; SwE, shallow well electric; SwH, shallow well hand; SwG, shallow well gasoline; TE, turbine electric.
Diameter of well	Approximate inside diameter of well, or casing.
Use	A, abandoned; AC, air conditioning; C, cooling; D, domestic supply; I, industrial; Irr., irrigation; O, observation well; P, public supply; RR, railroad; S, stock; T, test well.

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed: Character of material	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date	Yield: Rate (g.p.m.)	Yield: Drawdown (feet)	Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
WASHINGTON TOWNSHIP															
1	G. F. Allard	912	68	85	ls	D	14	7- 7-51			Dr		4	D	
2	Ed. Willbarger	898		66	s & g	Q	12	7-12-51			Dr		4	D	
3	H. L. Masters	885	8	90	ls	D	35	7-20-48			Dr		5	D	
4	Vernon Zimpfer	895	4	111	ls	D	60	6-24-52		15	Dr		4	D	
5	J. Newlun	895	47	101	ls	D	23	1948			Dr		4	D	
6	Distlehorst	895	76	80	ls	D	38	1947			Dr		4	D	
7	Broom	895	48	125	ls	D	42	12-30-48	15		Dr		4	D	
8	O. L. Eagle	892	33	135	ls	D	45	3-23-49	5	5	Dr		4	D	
9	Oscar Adkins	885	19	74	ls	D	59	1948			Dr		4	D	
10	George W. Quillin	835	1	100	ls	D	42	8-17-49			Dr		4	D	
11	Earl Pinney	942	50	76	ls	D	56	10-13-53			Dr		4	D	
12	Emery Windle	938	170	187	ls	S	15	2-25-53			Dr		4	D	Fine sand above limestone aquifer.
13	Liggett	941	180	195	ls	S	18	1948			Dr		4	D	Fine sand above limestone aquifer.
14	Earl Kreuz	922	80	123	ls	D,S	18	12-23-48	10		Dr		4	D	
15	John McKitrick	882	47	76	ls	D	16	3-31-51			Dr		4	D	
17	Village of Dublin	822	2	99	ls	D	56	7-12-51			Dr		4	P	
18	W. B. Adams	835	1	110	ls	D	25	4-29-48	12		Dr	DwE	6	D	
19	James Vowell	948		93	s & g	Q	19	1949			Dr		4	D	
20	E. D. Harshbarger	936		179	g	Q	65	8- 7-50	5		Dr	DwE	4	D	
21	Alvin Rings	925	65	75	ls	D	68	3-28-51	10		Dr		4	D	
22	Ralph Fisher	916		64	g	Q	20	4- 3-52			Dr		4	D	Fine sand above gravel aquifer.
23	L. N. Burroughs	917		53	g	Q	20	1948			Dr		4	D	
24	Lewis Delay	914		62	g	Q	15	6-27-51			Dr		4	D	Fine sand above gravel aquifer.
25	James Richards	874		42	s & g	Q	15	5- 7-53			Dr		4	D	
26	John Geese	872	40	100	ls	D	1	5-19-48			Dr		4		
27	Sam Frantz	826	12	97	ls	D	48	9-20-51			Dr		4	D	
28	Anthony Anderia	806	35	77	ls	D	28	9-25-51	10		Dr		4	D	
29	Walter Reckless	795	2	116	ls	D	24	7-25-50			Dr		4	D	
30	Fred Horch	945	105	127	ls	S	35	8-24-51	7		Dr		4	D	
31	Raymond Temple	943	220	233	ls	S	211	12- 5-53			Dr		4	D	Irregular layers of fine sand from 10 to 220 feet.
32	Olney Ball	944		144	s & g	Q	26	1949			Dr		4		
33	Leonard Tuller	943		213	g	Q	20	3-30-51			Dr		4	D	Thick fine sand above gravel aquifer
34	Fred Elmann	910		72	g	Q	12	1948	25		Dr	SwH	4	S	
35	Pat Groves	902		40	s & g	Q	3	9-12-51			Dr		4	D	
36	H. J. Upperman & Sons	914	107	195	ls	D,S	8	8- 1-51			Dr		6		
37	John Finch	916	65	73	ls	D		7- 9-51	20	19	Dr		4	D	Fine sand above limestone aquifer
38	White Acres Farm	921	65	90	ls	D	14	10- 5-50	25	4	Dr		6	D	
39	John Kramer	942		153	g	Q	24	4-18-55	20	18	Dr		4	D	
40	Roy Lovell		6	120	ls	D					Dr		4	D	Analysis given in text.
41	R. B. Redett			230	ls	S	24	3- 8-55			Dr		4	D	Analysis given in text.
PERRY TOWNSHIP															
101	Lloyd Runkele	805	5	105	ls	D	81				Dr		6	D	
102	J. R. Solensky	855	58	101	ls	D	41				Dr		4	D	
103	M. F. Zimmerman	910		148	g	Q	95	1948	5		Dr	DwE	4	D	
104	Robert Porter	925	144	147	ls	D	101	6- 1-54			Dr		4	D	
105	James Amon	915	106	112	ls	D	80	5-12-55			Dr		4	D	
106	Carl Nielson	930		80	g	Q	30	1948			Dr		4	D	
107	Henry Shuster	936	69	106	sh	D	22	1950	5?		Dr		4		
108	Taylor	922		33	g	Q	18	1948			Dr		4	D	
109	John J. Thomas	872	29	84	ls	D	56	1-16-53			Dr		4	D	
110	Young	885	23	50	sh	D			2		Dr		4		
111	J. G. Hackbrath	901	44	54	sh	D	30	8- 4-52			Dr		6	D	
112	Harold Holdern	901	25	50	sh	D		10-25-49	3		Dr		4	D	
113	Charles Smith	904		97	s & g	Q	82	12-23-53			Dr		4	D	
114	Mary Reese	898	96	129	ls	D	86	1952			Dr		4	D	
115	Amos L. Funk	892	14	78	sh	D	66	8-21-54			Dr		4	D	
116	Charles R. Petree	890	78	100	sh	D					Dr		4	D	
117	Everett Antrim	844	42	101	sh	D	44	11-19-54	2		Dr		4	D	
118	Nervin Fountain	835	1	98	ls	D	54	1951			Dr		4	D	
119	David Jameson	906	27	42	sh	D	15	11- 3-53			Dr		4	D	
120	Omar Walters	907	36	72	g	Q	52	11- 4-52	8		Dr		4	D	
121	Tilt Thurman Smiley	903	41	77	s & g	Q	26	11- 9-53	7		Dr		4	D	
122	Milton Smiley	901	27	92	sh	D	10	1948			Dr		4	D	
123	Richard L. Hamilton	901	103	138	ls	D	97	1953			Dr		4	D	
124	Leonard Cosgray	901	18	59	sh	D	20	1951	8		Dr		4	D	
125	Clyde Stout	898	13	65	sh	D	11	12-11-53	2		Dr		4	D	
126	Dan Wilcox	891		72	s & g	Q	22	9-13-50			Dr			D	
127	L. Updike	898	20	84	sh	D	78	1950			Dr	SwE	4	D	
128	H. E. Lobdill	893	11	72	sh	D	5	6-12-51	8		Dr		4	D	
129	James S. McVey	858		61	g	Q	43	1948			Dr		4	D	
130	Jerry Stilson	831	10	178	ls	D	90	3-21-55	5		Dr		4	D	
131	A. N. Dingle	836	10	75	sh	D	9	8-18-50			Dr		5	D	
132	Amos Baxter	847		100	s & g	Q	80	10-18-51			Dr		4	D	
133	Dan Sells	813	10	101	ls	D	77	1950			Dr		4	D	
134	Howard Biggs	859	18	105	ls	D	73	9-29-52			Dr		4	D	
135	Brad Wilson	850	28	128	ls	D	85	1950			Dr		5	D	
136	Homer Lyne	872	1	100	ls	D	64	1950			Dr		4	D	
137	Majorie Coffindaffer	905	10	40	sh	D					Dr	DwH	6	D	
138	C. A. Hartsook	902	10	101	ls	D	8	1942			Dr			S	
139	C. T. Willman	908	3	26	sh	D	6	10-19-54			Dr		4	D	
140	Morgan S. Wright	906	21	59	sh	D	20	1948			Dr		5	D	Inadequate supply.
141	Ossing	908	40	78	sh	D	4	1950			Dr		4		Inadequate supply.
142	Leonard Delewese	908	26	89	sh	D					Dr		4		Inadequate supply.
143	Allen McGregor	904	17	207	ls	D	165	1948			Dr		4	D	
144	Lyman Smith	892		53	g	Q	11	1948			Dr		4	D	

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed: Character of material	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date	Yield: Rate (g.p.m.)	Yield: Drawdown (feet)	Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
PERRY TOWNSHIP (continued)															
145	Frank Sebring	880	83	94	s & g	Q	66	6- 2-54			Dr		4	D	
146	R. E. Brown	853	115	118	s	Q	95	6-18-54			Dr		4	D	
147	Paul Quick	849		104	s & g	Q	25	5- 3-55			Dr		4	D	
148	Russell	848	82	105	ls	D	67	1950			Dr		4	D	
149	Columbus Electric Co.	850	98	137	ls	D	80	11-18-53	6	50	Dr		5	D	
150	Linworth Farmer's Exch.	844		134	s	Q	80	9-23-48	12		Dr	DwE	6	P	
151	Russell	839	80	175	ls	D	80	1948			Dr		4	D	
152	Harris Water Consultants	831		98	s & g	Q	76	6-15-50	8		Dr		4	D	
153	Clyde Roberts	790		74	g	Q	30	7- 1-51	10	4	Dr		4	D	
154	Henry Gabel	798	110	121	ls	D	82	8- 8-54	20	10	Dr		4	D	
155	Clyde Rogers	820	99	100	s & g	Q	54	5- 7-51	5		Dr		4	D	
156	Glen C. Russell	821		79	un	Q	57	3-27-51			Dr		4	D	
157	Gene White	815	4	130	ls	D?S?	80	11- 7-47			Dr		4	D	
158	Harry T. Schwartz	825	4	82	ls	D	62	6-11-49			Dr		4	D	
159	Wm. Lane	898	9	79	sh	D	8	10-25-52			Dr		4	D	Insufficient supply.
160	Don Scott Field (OSU)	903	30	280	ls	D,S	131	8-30-48			Dr		6	A	
161	William Hauissen	893	28	72	sh	D	15	3-11-55	5		Dr		4	D	
162	Paul Karon	882		75	s & g	Q	10	4-23-52			Dr		4	D	
163	R. J. Trippy	862		52	g	Q	12	1951	16		Dr		4	D	
164	F. A. Tietzel	863	45	212	ls	D	156	3- 4-55	10		Dr		4	D	
165	S. L. Friesland	873	54	66	sh	D	22	7-19-54	5		Dr		4	D	
166	Frank Bauer	783	6	86	ls	D	27	1949			Dr		4		
167	Herman Schneelmilch	810	2	172	ls	D,S	50	10-24-49	30		Dr		5	D	
168	Roy Haddox	874	15	125	ls	D	107	11- 9-54			Dr		4	D	
169	J. M. Davis	881	14	72	sh	D					Dr		4	D	Insufficient supply.
170	J. Pasicka	884	32	70	s & g	Q	17	11- 4-52			Dr		4	D	
171	George Byrd	893	9	74	sh	D	10	12- 1-53	3		Dr		4	D	
172	Leo & Ada Harris	891	7	184	ls	D	135	6-17-54	5	49	Dr		6	D	
173	Kenneth McQuaid	887	15	172	ls	D	124	3-27-51			Dr		4	D	
174	M. W. Doyle	878	25	70	sh	D	3	1948			Dr		4	D	
175	L. W. Smith	861	25	85	s & g	Q	12	11-20-54	5	68	Dr		4	D	
176	Clyde Tanner	873	18	81	ls	D	18	6- 5-49	2	52	Dr	DwE	4	D	
177	B. Chaney	878	20	56	sh	D	8	5-14-54			Dr		5	D	
178	Bob Hill	891	18	28	sh	D					Dr		4	D	
179	Dave Shapiro	885	43	92	sh	D	14	8- 5-53			Dr		4	D	
180	John McKitrick	894		86	g	Q	40	1949			Dr		4	D	
181	Charles Goodall	890	26	95	sh	D	12	2-17-55	2		Dr		4	D	
182	Carrie Forinash	894		99	s & g	Q	66	9-19-50			Dr		4	D	
183	Beetham	893	125	157	ls	D	28	6-30-50			Dr		4	D	
184	F. R. Johnson	890		57	g	Q	12	6-28-51	5		Dr		4	D	
185	Clyde E. Harper	885	46	59	sh	D	23	12- 1-53	8		Dr		4	D	
186	B. W. Morris	887		117	s & g	Q	103	7-12-54			Dr		4	D	
187	Clyde Tanner	888	76	166	ls	D	135	4-30-55	10		Dr		4	D	
188	Arthur Evans	892	92	171	ls	D	143	1- 3-48			Dr		4	D	
189	D. M. Bozz	883		55	s & g	Q					Dr		5	D	
190	Donald W. Cheserman	868	31	100	sh	D		1-28-54	1		Dr		4	D	
191	Ed. Holden	870		46	s & g	Q		4- 1-48	15		Dr		4	D	
192	Allen Williams	872	45	91	g	Q					Dr			D	
193	Gabels Dairy	878		35	s & g	Q	12	1948	25	14	Dr		6	I	
194	Fred Gabel	864	33	70	s	Q					Dr		4	D	
195	James Toczik	813	57	65	sh	D	47	4-25-55	4	13	Dr		4	D	
196	Wilson	839	86	90	s	Q	50	3-20-54	5	30	Dr		4	D	
197	Ervin Woods	837	68	130	ls	D	20	1951	4		Dr		5	D	
198	English	846	55	96	sh	D	8	8-31-49			Dr		4	D	Insufficient supply.
199	C. Tornes	837	56	61	s & g	Q	31	4- 8-55	8	15	Dr		4	D	
200	E. C. Grau	843	63	66	s	Q	14	11-30-49			Dr		4		
201	O. D. Dewitte	833	4	96	ls	D	28	8- 9-49			Dr		4	D	
202	Charles Hill	775	3	105	ls	D	33	6-30-53			Dr		6	D	
203	Wm. Brown	858	67	140	ls	D	98	1951			Dr		4	D	
204	F. T. Potter	860	65	139	ls	D	95	11-24-54			Dr		4	D	
205	Forrest J. Irwin	864	62	116	ls	D	102	5-24-52	5		Dr		4	D	
206	C. J. Hall	853	110	149	ls	D	84	1948			Dr		4	D	
207	L. E. Johnson	883	91	175	ls	D	140	8-31-53	10		Dr		4	D	
208	H. H. Reinhardt	882	120	137	ls	D	127	3-26-54	16		Dr		4	D	
209	John D. Krouse	876	121	158	ls	D	122	1949			Dr		4	D	
210	Perry Twp. Trustees	873	100	165	ls	D	135	1950			Dr		6	P	
211	John Doyer	875	120	180	ls	D	100	1952	10		Dr		4	D	
212	Dr. Robert Thomas	884	113	225	ls	D	125	3-20-54	15		Dr		6	D	
213	Skyway Broadcasting Co.	870	133	170	ls	D	127	1949			Dr		6	P	
214	Clyde Billingsley	853	101	140	sh	D	88	2- 3-53			Dr		4	D	Insufficient supply.
215	R. L. Ashbury	810	2	121	ls	D	76	9- 7-49			Dr	DwE	6	D	Analysis given in text.
216	C. C. Swart	800	3	122	ls	D	52	6-24-52			Dr		4	D	
217	Cecil P. Roberts	850	98	124	ls	D	89	1950			Dr		4	D	
218	Royal S. Buchanan	835	90	126	ls	D	90	2-22-54	20	3	Dr		4	D	
219	David Geese	850	105	125	ls	D	36	1949			Dr		4	D	
220	F. Erin	854	130	141	ls	D	100	6- 4-52	10		Dr		4	D	
221	Lockwood	857		126	s & g	Q					Dr		4	D	
222	Carl Wunderlich	868	86	138	ls	D	111	1948	12		Dr	DwE	5	D	
223	Fred Howard	868	96	150	ls	D	130	6- 6-51			Dr		4	D	
224	George Christensen	869	130	157	ls	D	133	10-21-53			Dr		4	D	
225	Clarence Saltzgaber	875	50	189	ls	D	136	11-27-49			Dr	DwE	4	D	
226	Santo Del Matto	872	50	160	ls	D	142	10-19-54	10		Dr		5	D	
227	Oscar Thomas	863	108	176	ls	D	130	8-23-50	16		Dr		4	D	
228	OSU Golf Course	837	100	205	ls	D	100	8- 1-39	12		Dr	DwH	6	P	
229	OSU Golf Course	810	83	122	ls	D	72	1942	375	5	Dr	TE	12	Irr.	
230	OSU Golf Course	862	92	162	ls	D	120	1948			Dr	DwH	6	P	
231	Ray Wunderlich	873	91	200	ls	D		11- 9-54	7	4	Dr		6	D	
232	L. D. Harrison	847	82	110	s	Q	70	4- 2-54	15	20	Dr		5	D	
233	Alban H. Gulcher	800	40	93	ls	D	50	3-22-46	50	10	Dr	DwE	6	D	
234	Hamilton Hedges	828	48	111	ls	D	55	1951			Dr		4	D	
235	S. Lakin	805	37	109	ls	D	40	9-26-49	10		Dr		4	D	

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed		Water level		Yield		Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
					Character of material	Geologic horizon	Below land surface (feet)	Date	Rate (g.p.m.)	Drawdown (feet)					
PERRY TOWNSHIP (continued)															
236	Clarence Yost	830	73	104	ls	D	58	10-14-48			Dr	DwE	4	P	
237	Wm. F. Bohannan	835	101	123	ls	D	88	7- 7-50	10		Dr		6	D	
236	Lewis A. Chapin	842	91	97	ls	D	83	4-10-50			Dr		4	D	
239	Motter	835		142	g	Q	107	1948			Dr		4	D	
240	Harold Bean	851	139	147	ls	D	113	6-16-51			Dr		4	D	
241	C. L. Knowles	859	115	147	ls	D	120	10- 3-50			Dr		4	D	
242	St. John	850	140	160	ls	D	120	11-30-51			Dr		4	D	
243	OSU Golf Course	822	96	163	ls	D	30	4-15-46	200	10	Dr	TE	8	Irr.	
245	Moore	808	18	111	ls	D					Dr				
246	Miles Theaters	802	3	117	ls	D	60	6-27-49			Dr		4	P	
247	G. L. Puttick	830	118	129	ls	D	20	1948			Dr		5	D	
248	Eugene A. Hay	835	74	107	ls	D	92	1-15-53			Dr		6	D	
249	Arthur Hughes	841	76	106	ls	D	90	8-27-51			Dr		4	D	
250	Scioto Country Club	810	72	104	ls	D	55	7-17-40	200		Dr	TE	10	Irr.	
251	Scioto Country Club	801	41	250	ls	D,S	74	5-10-49	400	144	Dr	TE	10	Irr.	
252	Roy Haddox		89	211	ls	D		1956			Dr		4	D	Analysis given in text.
253	C. Romeo		35	107	ls	D	72	7-27-56			Dr		4	D	Analysis given in text.
SHARON TOWNSHIP															
301	H. Sisson	828	35	114	ls	D	30	1949			Dr		4		
302	Ivan Bales	775	60	80	ls	D	50	1948			Dr		5	D	
303	Mt. Air Water Board	765	37	53	ls	D	12	1949	20		Dr		5	P	
304	Don Dill	900	24	85	sh	D	55	4-20-53	1	25	Dr		5	D	
305	State Dept. of Highways	885	51	187	ls	D	19	1950			Dr		4	P	Water contains hydrogen sulphide.
306	Miller	922	8	55	sh	D	11	6-30-54	1		Dr		4	D	
307	B. White	932	20	180	sh	D	45	3-10-53	3		Dr		5	D	
308	Charles Crowner	933	111	122	g	Q	35	1949			Dr		5	P	
309	Walter Lintner	825	14	172	ls	D	89	7-30-51	10		Dr		6	D	
310	Julia Karshner	790	5	158	ls	D,S?	55	1948	5		Dr			D,S	
311	York Temple Country Club	760		38	s & g	Q	6	1946	125	18	Dr	TE	10	Irr.	
312	Michael McClory	830	57	209	ls	D	118	1949	5		Dr	DwE	5	D	
313	R. D. McDonald	892	12	285	ls	D	150	8-21-52	12	5	Dr		5	D	
314	Frank Johnson	892	8	56	sh	D		7-10-51	6?		Dr		4	D	
315	Flossie Edington	875	53	75	sh	D	30	2-19-51	3	25	Dr		6	D	
316	Raymond Sunderland	910	8	323	ls	D	180	6- 7-54	10		Dr				Water hard and contains hydrogen sulphide.
317	P. R. Merrill & Assoc.	906	26	104	sh	D	74	11-23-49	4		Dr		6	D	
318	I. M. McCampbell	927	53	107	sh	D	10	12-15-50			Dr		4	D	
319	Orville Keys	925	38	131	sh	D	120	6-30-51	8		Dr		5	D	
320	Don E. Campbell	903	145	147	s	Q	80	12-22-49	6		Dr		5	D	
321	Ralph Wightman	895		144	g	Q	80	1949			Dr		4	D	
322	Josephinium College	767	57	53	s & g	Q	9	1948	70		Dr	TE	8	P	Lower 10 feet of casing perforated. Reported capacity, 300 gpm.
323	Robert Zimmerman	830	10	147	ls	D	80	4-11-51			Dr		4	D	
324	Eyerman	830	11	160	ls	D	70	9-20-50	5		Dr		4	D	
325	George Parkinson	795	18	53	sh	D					Dr		5	D	
326	Tatman	915	20	51	sh	D					Dr		4	D	
327	Lenley	895	13	96	sh	D	10	1948			Dr		8	D	
328	A. R. Smith	881	15	247	ls	D	130	7-26-50			Dr		5	D	
329	Bach	902	36	102	sh	D					Dr		4	D	
330	George Clark	912	115	125	sh	D					Dr		4	D	
331	C. M. Aleshire	918	23	100	sh	D	20				Dr		5	D	
332	Cramer	918	149	164	sh	D					Dr		4	D	
333	Charles Millner	922		58	g	Q	23	1947			Dr		4	D	
334	Elmer Sanders	903		126	g	Q	59	6-19-53			Dr		4	D	
335	George Seaborough	881	85	89	s	Q	50	6-12-52	10		Dr		5	D	Lower 5 feet of casing perforated.
336	Jay Grandstaff	882		119	s & g	Q	65	1947			Dr		4	D	
337	Lester Bailey	892		136	s	Q	68	8-12-50	6		Dr		4	D	
338	H. Malahan	893		144	s	Q	96	8-27-51			Dr		5	D	
339	John Broslin	810	48	50	sh	D	30	10- 5-50	15?		Dr		5	D	
340	Paul Filing	787		60	g	Q	45	1949			Dr		4	D	
341	Elmer Shuster	775		64	s & g	Q	40	1950			Dr		4	D	
342	Village of Worthington	710	39	39	sh	D					Dr		6	A	Supply insufficient to meet demand.
343	Village of Worthington	790		61	g	Q		8-31-40	340		Dr		12	P	Analysis given in text.
344	F. J. McIntyre	784	91	120	ls	D	55	2- 5-54			Dr		6	D	
345	Loy	862		34	g	Q	30	1948			Dr	DwH	4	D	
346	Leland S. Chapman	845	53	85	sh	D	45	1948			Dr		4	D	
347	Eugene Quellette	852	52	108	sh	D	25	6- 5-52			Dr		4	D	
348	E. M. Bates	898	9	200	sh	D	17	8-26-53	1		Dr		4	D	Insufficient supply.
349	Harding Sanitarium	900	20	265	sh	D					Dr			P	Devonian limestone at 265 feet.
350	Paul R. McGee	889	36	68	sh	D	16	7- 3-54	3	49	Dr		4	D	
351	N. E. Schickler	889		54	s & g	Q	16	1-18-54	8	29	Dr		5	D	Lower 2 feet of casing perforated.
352	Paul J. Filing	888	158	170	sh	D	50	11-10-53	1		Dr		4	D	
353	M. C. Clifton	898	122	130	sh	D	40	8- 8-53	3	80	Dr		5	D	Lower 2 feet of casing perforated.
354	Robert Willis	897	23	90	sh	D	16	2-16-54			Dr		5	D	
355	H. A. Morgan	920	21	104	sh	D	9	1948	6		Dr	DwE	4	D	
356	Harry Holmes	915	140	140	un	Q	15	1949			Dr		5	D	
357	Lewis R. Weber	911	208	208	un	Q					Dr		4	A	
358	Robert Sines	892		170	g	Q	96	3-20-54	10		Dr		5	D	Lower 2 feet of casing perforated.
359	J. L. McCloskey	885	139	140	sh	D	88	4- 2-54	10		Dr		5	D	Lower 2 feet of casing perforated.
360	S. Panning	880		80	s & g	Q	50	8- 5-53	10		Dr		5	D	Lower 2 feet of casing perforated.
361	Charles Footer	801		48	g	Q	22	1948			Dr		4	D	
362	A. J. Boyer	786		73	s & g	Q	50	1-18-54			Dr		4	D	
363	City of Columbus	735		30	s & g	Q					Dr		7	A	Test hole, casing pulled.
364	City of Columbus	738		38	un	Q					Dr		2	A	Test hole, casing pulled.
365	State of Ohio	801	3	12	sh	D					Dr		2	A	Test hole, casing pulled.
366	Edward Vollrath	827		50	g	Q	27	6-29-52	25		Dr		6	D	
367	State of Ohio	860	98	109	ls	D					Dr		2	A	Test well, casing pulled.
368	Edward Tracy	800		74	s & g	Q	35	1950			Dr		4	D	

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed		Water level		Yield		Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
					Character of material	Geologic horizon	Below land surface (feet)	Date	Rate (g.p.m.)	Drawdown (feet)					
SHARON TOWNSHIP (continued)															
369	Wm. M. Inskeep	782	89	130	ls	Q	64	1948			Dr		4	D	
370	H. D. Schneemilch	770		66	s & g	Q	24	6-25-51			Dr		6	D	
371	H. R. Miller	700	69	73	ls	D	25	9-26-49	8	5	Dr	DwE	4	D	
372	Wyandotte Country Club	885	25	163	sh	D	50	1948			Dr	TE	8	Irr.	
373	Village of Worthington			46	s & g	Q	4	3-14-51	250	57	Dr		12	P	
374	Village of Worthington	790		50	g	Q	m	1-20-57			Dr		8	O	Water-level recorder installed March, 1954. (see text Fr-14) (m38.8)
BLENDON TOWNSHIP															
401	Westerville Creamery	862		56	g	Q	46	5- 8-54	50		Dr		8	I	Lower 4 feet-screened.
402	John H. Flint	880		94	g	Q	50	9-22-52			Dr		4	D	
403	L. J. Emerick	895	97	98	s	Q	23	10-17-50	3	55	Dr		4	D	
404	Charles Henry	895		125	s	Q	29	2-17-53	10	5	Dr		4	D	Lower 2 feet of casing, perforated.
405	Holcher	891		55	s & g	Q	12	11-31-53		10	Dr		4	D	
406	Sarver	925	25	90	sh	D	20	2-28-54	10?		Dr		4	D	
407	Walker	820		74	g	Q	35	8- 6-51	10		Dr		4	D	
408	A. M. Courtwright	865		105	g	Q	17	1948	7		Dr	DwE	5	D	
409	Carl McVay	860	132	325	sh	D	12	5- 3-52			Dr		5	D	
410	Max Backus	879		123	g	Q	75	7-31-53	10		Dr		4	D	
412	Paul Burnard	910	21	70	sh	D	12	11-28-47	5	4	Dr	DwE	6	S	
413	Clifford Moore	905	27	122	sh	D	14	3-15-55	1	108	Dr		5		Insufficient water supply.
414	W. D. Kahler	1001	4	55	ss	M					Dr		4	D	Aquifer-Berea sandstone. Analysis given in text.
415	Kahler	862	85	129	sh	D	75	4-30-51	2	54	Dr		4		
416	J. F. Tuby	867	55	95	sh	D	50	4-21-52	10?		Dr		5	D	
417	Clifford Moss	866		61	g	Q	48	10-14-52	5	5	Dr		4	D	
418	K. V. Noble	831	50	68	s	Q	21	8-14-51	5	6	Dr		5	D	
419	Steele	844	72	94	sh	D	30	10-22-51	4	44	Dr		4	D	
420	Charles Dolle	852	30	125	sh	D	18	1949	10?		Dr		6	D	
421	K. W. Wilder	870	44	90	s	Q	70	9-24-49	5		Dr		5	D	
422	Hummel	875	32	80	sh	D	66	7- 7-48	1		Dr		4	D	
423	Carl Miller	880		110	s & g	Q	73	12-15-50	10		Dr		4	D	
424	Chas. Chapman	875		114	g	Q	79	2- 5-49	5		Dr		4	D	
425	E. Fickell	878	27	79	s	Q	14	4-27-53			Dr		4	D	Insufficient water supply.
426	George Sheridan	955	8	30	sh	M	10	7-20-51	2	15	Dr		8	D	Well bailed for 2 hours.
427	Robert Masters	960	46	75	sh,ss	M		9- 8-48	12		Dr		6	D	
428	Timken Roller Bear. Co.	980	30	80	sh,ss	M	10	1950			Dr	DwH	6	P	
429	Smith	878		155	g	Q	60	1950	10		Dr			D	
430	E. J. Alkire	879		114	s & g	Q	68	4-26-54	10		Dr		5	D	
431	Smith	874		124	s & g	Q	74	9- 3-53	10		Dr		4	D	
432	Joe Delgreco	830		158	g	Q	89	7-30-49	15		Dr	DwH	4	D,S	
433	S. M. Steele	820		48	s	Q	12	4-18-49	9	20	Dr		5	D	
434	Gillispie	859	94	94	s & g	Q	53	6- 1-54		3	Dr		6	D	Casing perforated 77 to 84 feet.
435	Earl Emery	844		40	s & g	Q	33	3-31-54	10		Dr		6	D	
436	R. J. Lane	882	14	54	sh	D	12	9-28-54			Dr		6	D	
437	Lowell Ulry	891	36	81	sh	D	51	10-26-48	1		Dr		4	D	Domestic supply not available.
438	Dan Waterman	891	63	70	sh	D	62	11-22-54			Dr		6	D	
440	A. W. Waterman	865		69	s & g	Q					Dr		4	D	
441	Laird Chambers	960	28	65	ss,sh	M	40	11- 4-48	5	25	Dr		5	D	Well pumps dry at 5 gpm. Analysis given in text.
442	Furie	884		175	s & g	Q	92	1950			Dr		4	D	
443	G. G. Schmittle	835		50	s & g	Q	15	8- 5-52			Dr		4	D	
444	Biddle	796		125	s & g	Q	70	1950			Dr		5	D	
445	J. P. Meyers	851	44	97	sh	D	40	11-23-51			Dr		4	D	
446	L. W. Eastwood	853		60	s & g	Q	44	1948			Dr	DwE	4	D	
447	C. H. Behling	876		102	s & g	Q					Dr		4	D	Gravel packed-95 to 102'.
448	R. H. Rhodes	875		149	g	Q	51	1948			Dr		5	D	
449	R. L. McCalla	869		97	g	Q	82	6-12-54	9		Dr		5	D	
450	Carl Presley	858	95	142	s	Q	62	1950	7		Dr		5	D	Well drilled to 142 feet in shale, pipe pulled to 76 feet in sand.
451	Mike Hudyk	859	65	80	sh	D		1952	1		Dr		5	D	Lower 5 feet of casing, perforated.
452	Wilson Rucker	855	54	80	sh	D	40	3- 5-55	1	40	Dr		4	D	Insufficient water supply.
453	Vogt. Richardson	851		88	s & g	Q	27	1950			Dr		4	D	
454	Walter Masters	820		72	s & g	Q	10	4-15-50	8		Dr		4	D	
455	Charles Plummer	805		108	g	Q	25	8- 1-48	5		Dr		4	D	
456	Millard Barron	794		31	s & g	Q	8	3-12-54	10		Dr		5	D	
457	M. L. Schirtzinger	790		39	g	Q	m	7-29-48			Dr	SwE	4	D	(m6.3)
458	Buck Holtz	940	10	75	ss	M	20	1949			Dr		4	D	
459	P. L. Woods	978	9	48	ss	M	5	9-28-50	18	3	Dr		4	D	
460	B. N. Conley	868		100	s & g	Q	80	5-29-52	10		Dr		5	D	
461	Daisy Brown	870		131	g	Q	70	9- 9-52	5		Dr		4	D	
462	Lustron Corp.	817		144	s & g	Q	75	3-15-49	5	3	Dr	DwE	5	D	
463	T. D. Reese	840	8	70	sh	D	18	1948	1		Dr		10		
464	Paul S. Wyatt	840	9	76	sh	D	8	1-19-54	1		Dr		4	D	For all purposes-dry.
465	Joe Gereneser	815	17	40	sh	D					Dr		5	D	
466	R. C. Hidglin	821	20	63	sh	D					Dr		4	D	
467	Ray Phalen	815	60	90	s	Q	20	12- 8-52	1		Dr		5	D	
468	Arthur Grubbs	820		27	g	Q	17	5-20-48	5	2	Dr	DwH	4	D	
469	England	973	22	60	ss	M	21	1-23-54		4	Dr		4	D	
470	Lewis Stevens	930	30	96	sh	M	84	11-21-48	1		Dr		4	D	Insufficient water supply.
471	Wm. J. Miller	815	7	67	sh	D					Dr		4	D	
472	Walter Ranek	852	6	70	sh	D	14	4-30-52	2	12	Dr		5	D	
473	City of Columbus	830	52	52			14	10-29-49			Dr			A	Test well.
474	Kaufman Estate	975	8	67	ss	M	8	12-29-56	70	48	Dr		10	P	Capacity 70 gpm for short periods of pumping. Yields 30 gpm for prolonged pumping periods. Analysis given in text.
475	Harry L. Cook		38	67	sh	D	11	6- 5-55	2	56	Dr		6	D	Analysis given in text.
476	Mrs. V. M. Sammons			40	g	Q	7	6- 5-53			Dr		8	P	Analysis given in text.

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed		Water level		Yield		Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
					Character of material	Geologic horizon	Below land surface (feet)	Date	Rate (g.p.m.)	Drawdown (feet)					
PLAIN TOWNSHIP															
501	R. E. Hogue	1002	3	60	ss	M	15	3-11-54	21	3	Dr		5	D	
502	John Witten	1034	12	58	ss	M	5	4- 1-52	15		Dr		5	D	
504	W. E. McReynolds	1123	42	85	ss	M	14	7-12-52	15		Dr		4	D	
505	Homer Walton	1122	52	88	ss	M	8	12-12-51	20		Dr		4	D	
506	Charles Bailey	1001	5	45	ss	M	15	10- 1-49	15	3	Dr		4	D	Aquifer - Berea ss.
507	John C. Wilkin	991		68	g	Q	m	6-28-48	5	46	Dr	DwE	4	D	Fine sand at 44 feet. (m15.9)
508	Charles E. Easter	998	25	75	ss,sh	M	32	9-28-49	3	8	Dr		4	D	Aquifer - Berea ss.
509	L. B. Hill	1038	10	25	ss	M	6	5-13-30	15	2	Dr		4	D	
510	Lawrence Hensley	1051	14	51	ss	M	11	9- -49	15		Dr		4	D	
511	W. K. Brown	1070	12	49	ss	M	6	7-24-51	18		Dr		4	D	
512	Ed. Richards	1073		62	un	Q	7	9- 6-51	10?	4	Dr		4	D	Fine sand at 11 feet.
513	T. M. Irvine	1072	78	89	ss	M	22	11-19-53	9	10	Dr		5	D	
514	Bill Holland	1121		191	g	Q	33	8-22-52	10	6	Dr		4	D	
515	Paul Burrell	1123	85	95	ss	M	16	7-22-54	10		Dr		5	D	
516	Joe Williamson	1032	15	43	ss	M	11	6- 1-54	15		Dr		4	D	
517	King Remley	1103		51	s	Q	m	6-24-48	10	4	Dr	DwE	4	D	Fine sand at 35 feet. (m14.2)
518	L. E. Bevelhymer	973		49	s	Q	5	9-14-50	6	18	Dr		4	D	Fine sand at 35 feet.
519	James Miller	970		31	s	Q	2	9-12-50	12		Dr		4	D	
520	Albert Vesner	982	20	62	ss	M	18	2-24-51	18		Dr		4	D	
522	Farm Management & Inc.	1011	8	57	ss,sh	M	14	3-27-52	6	2	Dr		5	D,S	
523	Carpenter	1023	26	41	ss	M	24	11-10-48	10		Dr		6	D	
524	Franklin E.U.B. Church	1027	13	46	ss	M	8	8- 2-50	15		Dr		4	D	
525	Eugene Gray	1045	23	50	ss	M	8	7-28-49	15		Dr		4	D	
526	Carrol C. Dean	1058		74	s	Q	15	8- 1-49	6	13	Dr		4	D	
527	Harold C. Medley	1092	51	88	ss	M	15	4-11-51	20		Dr		4	D	
528	F. S. Wheeler	1022	99	118	ss	M	18	8- -48	10		Dr		4	D	Fine sand at 40 feet.
529	George Waulk	1105		72	s & g	Q	20	9-12-52	10		Dr		5	D	
530	James Carpenter	1098		75	s	Q	20	4-18-51			Dr		5	D	
531	L. B. Hill	1104		102	s	Q	13	8-27-51	6	5	Dr		4	D	
532	Julius Fisher Jr.	987	10	62	ss	M	22	12-11-51	15		Dr		5	D	
534	Adrian Kalee	991	13	70	ss	M	19	1949	12		Dr		4	D	
535	J. M. Seamahorn	967	205	210	un	Q	10	1951			Dr		4	D	Fine sand at 168 feet.
536	Ault	970		72	g	Q	11	5-30-53	10		Dr		4	D	Fine sand at 28 feet.
537	Calvort Leroy	983	20	48	ss	M		1951	60		Dr		5	D	
538	Francis Drake	978	15	50	ss	M	13	1941			Dr	DwE		D,S	
539	Howard Dickens	1037	54	78	ss	M	16	6-27-53	10	9	Dr		4	D	
540	C. F. Miller	1037	19	49	ss	M	9	6-19-51	18		Dr		4	D	
541	Leonard Dorn	1060		66	g	Q	6	6-10-53	9	8	Dr		5	D	Fine sand at 44 feet.
542	Wm. Kellett	1062		71	s	Q	6	12- 5-49	15	4	Dr		4	D	
543	E. T. Nixon	1083	26	89	g	Q	15	6- 9-52	20		Dr		4	D	
544	Luther Norris	1082		100	s	Q	30	6-13-52	6	20	Dr		5	D	Fine sand at 52 feet.
545	H. A. Lampton	1089		100	s	Q	21	5- 5-51	10		Dr		4	D	Fine sand at 75 feet.
546	A. S. Kindler	962	24	57	ss	M	m	6-30-48			Dr	DwE	4	D	Water contains hydrogen sulfide. (m9.9)
547	D. Ranney	960	50	75	ss	M	18	9-10-53	35	30	Dr		4	D	
548	Ralph Sandborn	972	15	55	ss	M	15	8-30-51	10	6	Dr		5	D	
549	R. W. Leeper	997	7	39	ss	M	11	7-28-50	12	2	Dr		4	D	
550	Maynard Doran	1004	10	28	ss	M	m	7- 1-48			Dr	SwE	4	D	Analysis given in text. (m9.5)
551	Henry Lewis	1007	8	31	ss	M	17	9-24-51	4		Dr		4	D	
552	T. A. Ayars	1028		22	g	Q	9	5-12-50	10		Dr		4	D	
553	Floyd Thompson	1032	18	49	ss	M		4- 1-49	12		Dr		4	D	
554	W. R. Thompson	1034	35	55	ss	M	23	7- 8-51	18	1	Dr		4	D	
555	Ralph Margaum	1035	25	53	ss	M	20	4- 5-59	12		Dr		4		
556	Ulry & Stagg	1032	28	53	ss	M	24	8- 3-48	15		Dr		4	P	
557	O. R. Mash	1041		75	s & g	Q	10	1-30-53	10	30	Dr		5	D	
558	Donald C. Welch	1080		97	s	Q	20	8-27-52	14	2	Dr		4	D	Fine sand at 32 feet.
559	W. C. Hendren	1103		94	s & g	Q	35	12-22-52	12	55	Dr		5	D	
561	Gail Woods	982	11	45	ss	M	21	9-30-50	18		Dr		4	D	
562	P. L. Woods	975		66	s	Q	20	1-29-52	12	2	Dr		5	D	
563	Wilbur Stone	973	45	56	ss	M	20	10- 5-53	50		Dr		4	D	
564	P. G. Scott	972	5	65	ss	M	8	5- 1-53			Dr		4	D	
565	John Stickney	1072	71	76	g	Q	26	2- 6-51	10		Dr		4	D	
566	Willis Doran	1082		102	g	Q	28	8- 9-51	6	32	Dr		4	D	
567	Ben Oyer	1083		46	un	Q					Dr		5	A	Insufficient supply.
568	O. E. Rowe	973		48	g	Q	21	4-21-54	10		Dr		4	D	
569	Donald Graham	971	14	45	ss	M	4	5-21-51	18	8	Dr		4	D	
570	H. J. Ballard	972	19	45	ss	M	8	7-26-50	18		Dr		4	D	
571	Ed. L. Nechvatal	982	29	43	ss	M	14	11- -48	6	6	Dr		4	D	
572	John Devore	985	16	17	ss	M	9	8-24-50	10		Dr		4	D	
573	Henry Fegh	1082		68	g	Q	28	10-22-51	10	10	Dr		5	D	
574	W. B. Farley	1076		124	g	Q	72	4-21-52	5		Dr		4	D	
575	Robert Wilderman	1081		122	s	Q			20		Dr		5	D	
576	Hackworth	1080		136	g	Q	45	1942			Dr	DwE	4	D	Fine sand at 93 feet.
578	Herman Ballard	972	8	43	ss	M	3	5-11-49	15		Dr		4	D	Fine sand at 29 feet.
579	Earl Dogue	968		138	s & g	Q	16	12-20-50	12	4	Dr		4	D	Lower 2 feet of casing, perforated.
580	A. K. Ackerman	959		140	s	Q					Dr		5	A	Fine sand 80 to 140 feet. Insufficient supply.
581	George Wickiser	973	15	73	ss	M	35	9-10-51	20		Dr		5		
582	E. J. Yank	1022	24	45	ss	M	9	5-28-53	20		Dr		4	D	
583	Huntington Carlisle	1025	15	62	ss	M	19	7-13-51	18	2	Dr		4	D	
584	P. G. Holobaugh	1045	65	75	sh	M					Dr		5	D	
585	Earl Lucas	1078		75	s & g	Q	29	8-14-51	6	8	Dr		4	D	
586	George Hattle	952		130	un	Q					Dr			A	Fine sand at 35 feet. Inadequate supply.
587	H. C. Wolfe	952		69	s & g	Q	24	11- 6-53	12	4	Dr		4	D	
588	H. L. Harbold	955	19	60	ss	M		1952	4		Dr		5	D	
589	G. A. Marsh	1025	10	55	ss	M	9	7-20-49	18		Dr				
590	Fred Carson	1030	32	49	ss	M	27	1946			Dr	DwE	4	D	
591	Emma Fuller	1029	10	35	ss	M	15	1950	5	18	Dr			D	

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed		Water level		Yield		Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
					Character of material	Geologic horizon	Below land surface (feet)	Date	Rate (g.p.m.)	Drawdown (feet)					
PLAIN TOWNSHIP (continued)															
592	Frank Seacy	1030	16	43	ss	M	11	6-24-52	10		Dr		5	D	
593	W. R. Shannon	1060	95	114	ss	M	20	4- 8-52			Dr		4	D	
594	Carl Kroninger	1076		71	g	Q	28	11-16-51		15	Dr		5	D	
BROWN TOWNSHIP															
601	Skaggs	945	60	89	ls	D					Dr	DwH	4	D	
602	Beach Walker	937	105	143	ls	S	41	10- -49			Dr	DwE	4	D,S	
603	C. R. Arnold	948		90	g	Q		10- 7-50	20		Dr	DwE	4	D	
604	Harry Spring	950	100	108	ls	D	22	7-14-49	12	12	Dr	DwE	4	D	
605	John Walker	947	93	112	ls	D	18	5-12-53	20		Dr		4	D	
606	R. E. Evans	915	59	82	ls	S	15	12- 9-47	25		Dr	DwH	4	D,S	
607	Marvin Scholl	946	107	120	ls	S	22	5-25-54	20	6	Dr		4	D	
608	Ira Clark	945	108	120	ls	S	90	1950			Dr		4	D	
609	Jonas Derrer	900	60	69	ls	S	10	6-16-48	16		Dr	SwE	4	D,S	
610	Marbuger	921	138	173	ls	S	34	7-14-51	6	39	Dr		5	D	
611	Carl Shiller	935	109	159	ls	S	54	9- 7-53	15	1	Dr		4	D	
612	Melvin Wilkinson	933		80	g	Q	34	4-20-54	10		Dr		4	D	
613	Ed. Kindler	943		99	g	Q	28	1949			Dr		4	D	
614	Girl Scout Camp	903	42	70	ls	S		1948			Dr		6	P	Flowing well.
615	Robert Russ	923	86	105	ls	S	45	9-30-50	20		Dr		4	D	
616	G. A. Hiltbruner	925		123	s & g	Q	37	8- 1-51		8	Dr		4	D	
617	Kenneth Geyer	928	82	89	ls	D	16	5-19-54	25	2	Dr		4	D	
NORWICH TOWNSHIP															
701	Carl F. Denn	880	25	108	ls	D	18	1948			Dr	DwE	4	D	
702	Harold Steele	819	25	106	ls	D	44	4-26-51			Dr		4	D	
703	Leonard F. Ruhl	833	24	96	ls	D	36	5-17-51			Dr		4	D	
704	Earl E. Cline	837	20	89	ls	D	17	7- 8-53			Dr		4	D	
705	J. C. Huber	790	21	115	ls	D	35	6-25-48			Dr	DwE	5	D	
706	C. Carr	936		117	g	Q	17	10-21-50	16		Dr		4	D	
707	Glen Young	941	64	78	ls	D	24	5-31-54	15	12	Dr		4	D	
708	Ted Keltonbach	918	49	87	ls	D	34	10-13-51			Dr		4	D	
709	Anson Smith	918	75	85	ls	D	23	3- 2-53	30	3	Dr		4	D	Capacity - 20 gpm.
710	Weaver	914	68	87	ls	D					Dr	DwE	4	D,S	
711	Clarence Kaiser	902	16	62	ls	D	12	11-10-51	33	13	Dr		5	D	
712	Horton Blake	861	57	76	ls	D	16	11- 6-48	10	16	Dr	DwE	4	D	Well pumped for 6 hours.
713	Karl Williams	852		75	s & g	D	2	6-18-52		13	Dr		4	D	
714	Charles Swoboda	863	37	89	ls	D	34	7-13-50			Dr		4	D	
715	Meyers Farm	820	2	100	ls						Dr				
716	Chas. F. Johnson	837	97	116	ls	D	40	1950			Dr		4	D	
717	Wolfe	820	50	86	ls	D	62	1949			Dr	DwE	4	D	
718	Charles Baker	821	29	125	ls	D	40	9-28-53			Dr		4	D	
719	Walter Reeb	815	18	166	ls	D	65	11- 7-50	20	90	Dr		5	D	
720	Bill Stoner	822	5	110	ls	D	54	11- 4-50	15	35	Dr		5	D	
721	Fahy	818	49	87	ls	D	53	5-23-51	10		Dr		4	D	
722	Clarence Latham	942		107	s & g	Q	48	2-22-51			Dr		4	D	
723	E. H. Humberstone	931	77	128	ls	D					Dr		4	D	
724	Hilliards Waterworks	927	70	158	ls	D	10	9- -42	125	32	Dr	TE	10	P	Analysis given in text.
725	Wm. M. Roop	904	34	55	ls	D	18	3- -53			Dr		4	D	
726	Paul Filing	898	40	48	ls	D	16	5-19-54			Dr		4	D	
727	Eva Walker	894	49	72	ls	D	18	6-30-53	25		Dr		4	D	Capacity 8 gpm.
728	Vernon Robb	860	111	126	ls	D	23	6- 1-49	10		Dr	DwH	4	D	
729	John Russell	864	94	119	ls	D	35	5-25-54	5	3	Dr		4	D	
730	John H. Parks	855	90	96	ls	D	21	7- 5-53	25	9	Dr		4	D	
731	Helen May	845		44	g	Q	16	9- 1-49			Dr		4	D	
732	C. E. Omerod	845	50	95	ls	D	21	1949			Dr		6	D	
733	Herbert McCain	842	3	91	ls	D	32	12- 3-51			Dr		4	D	
734	Lester P. Perry	832	51	96	ls	D	17	8-27-49	20		Dr		4	D	
735	Wolfe	828		55	g	Q	26	1948			Dr		4	D	
736	Edna Schackles	818	19	95	ls	D		12- 8-48	20		Dr		5	D	
737	Howard Tuttle	815	60	126	ls	D	27	1949			Dr	DwE	5	D	
738	L. C. Lawson	817	20	85	ls	D	48	9- 3-52	10		Dr		4	D	
739	Ed. Riebel	820	25	93	ls	D	56	1949			Dr	DwE	4	D	
740	Harry Antrim	827	6	124	ls	D	76	10-13-53	4		Dr		4	D	
741	E. F. Spangler	820	34	92	ls	D	20	4-22-48	10		Dr	DwE	5	D	
742	Mack Stewart	802	1	106	ls	D	44	4-10-53			Dr		4	D	
743	Mack Stewart	828	20	120	ls	D	60	3-23-54			Dr		4	D	
744	Mack Stewart	824	3	120	ls	D	59	2-23-54			Dr		4	D	
745	Mort Weber	923	70	210	ls	D,S					Dr				
746	Delmar Sparks	860	68	81	ls	D	20	9-28-54			Dr		4	D	
747	Tom Cantrel	848	45	109	ls	D		1952	12		Dr		4	D	
748	Castle	936		70	g	Q	9	5-23-49	5		Dr	SwH	4	D	Well bailed for 2 hours.
749	Culp	940	127	149	ls	S					Dr				Log from 0-127 not reported.
750	Clarence D. Weeks	933	102	147	ls	D	32	2- 9-49	15	10	Dr	DwE	4	D	
751	Frank Hagerman	933		67	g	Q	22	1947			Dr	DwH	4	D	
752	Mae Greathouse	920	57	64	ls	D	33	1948			Dr	DwH	4	D	
753	J. H. Siders	921	60	64	ls	D	24	1948			Dr	DwH	4	D	
754	Rogers	920	62	90	ls	D	45	1948			Dr	DwE	4	D	
755	Wm. Rogers	852	97	97	g	Q	32	7-16-30			Dr			D	
756	Wally Flunck	840	22	92	ls	D					Dr			D	
757	Marble Cliff Quarries	840	21	98	ls	D					Dr		6		
758	John Wildt	943	121	141	ls	D?S?	27	11-11-50	20	12	Dr		4	D	
760	C. O. Durbin	936	90	142	ls	D,S	25	1949			Dr	DwE	4	D,S	Log from 0-90 not reported.
761	O. E. Post et al	850	72	84	ls	D	27	3-15-49	6	15	Dr	DwE	4	D	
762	City of Columbus	836	63	300	ls	D,S	12	1-24-52			Dr		12	P	
763	Marble Cliff Quarries	803	6	134	ls	D,S	99	2- -30			Dr		8		
765	Harrison	941	120	123	ls	D	56	1949			Dr		4	D	
766	Richard Geyer	899	73	93	ls	D	11	1948			Dr	DwE	4	D	

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed: Character of material	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date	Yield: Rate (g.p.m.)	Yield: Drawdown (feet)	Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
NORWICH TOWNSHIP (continued)															
767	O. E. Post et al	858	52	85	ls	D	32	4-22-49	6	17	Dr	DwE	4	D	
768	Hilliards Waterworks	928	930	325	ls	S,D	35	12-16-54	165	5	Dr		10	P	Analysis given in text.
CLINTON TOWNSHIP															
801	E. B. Chandler	885		128	g	Q		1948	6		Dr	DwE	5	D	
802	A. L. Munishurst	888		140	s & g	Q	75	9- -54	10		Dr		5	D	Lower 5 feet of casing perforated.
803	C. P. McKibben	885		55	s & g	Q	19	9- -48	6		Dr	DwH	5	D	
804	R. A. Brown	893	226	235	sh	D	80	10-16-53	5	155	Dr		5	D	Lower 2 feet of casing perforated.
805	John Center	882		190	s & g	Q	116	11- 6-50	5		Dr	DwE	4	D	
806	J. I. Grandstaff	898		150	g	Q	80	4- -48			Dr		4	D	
807	General Maintenance and Engineering Co.	815	20	112	sh	D	30	10- 9-53	10?	70	Dr		6	P	
808	DeSantes Brothers	780	112	161	ls	D	58	1949			Dr		6	D	
809	Orr Zimmerman	760		62	s & g	Q	28	1948			Dr		4	D	
810	Arthur Evans	740		72											
811	Big Bear Stores	879	180	450	ls	D	175	5- -54			Dr		8	I	Return well.
812	Francis Burt	785	90	125	ls	D					Dr		4	D	
813	William Lechner	815	156	163	ls	D	80	8- -52	10		Dr		4	D	
814	H. A. Smith	805		97	g	Q	77	6-17-42	10		Dr			D	
815	Ajax Construction Co.	734		41	s & g	Q	12	1948	60		Dr	DwE	4		
816	Farm Garden Store	731	52	110	ls	D	10	12- 7-50			Dr				
817	Western Mutual Fire Insurance Co.	733	72	125	ls	D	16	3- 1-53	30		Dr		6	AC	
818	Paul Lehman	743	75	100	ls	D	10	2- -53	10		Dr		4	D	Developed capacity 20 gpm.
819	State Highway Patrol	735	58	67	ls	D	9				Dr	DwE	5	P	
820	Donald W. Bowen	730	60	89	ls	D	11	11-17-49			Dr		4		
821	C. L. Alkire	740		75	s	Q	22	1948			Dr		4	D	
822	Ohio State University	790	100	118	ls	D	60	8-14-39	25		Dr	DwE	6	P	O.S.U. well #1.
823	Gulf Oil Co.	829		123	g	Q					Dr	DwE			
824	Ohio State University	770	116	175	ls	D	43	8- -38	300	68	Dr	DwE	12	P	O.S.U. well #2.
825	J. S. Warner	826	126	215	ls	D	118	6- -54	150		Dr		8		
826	Clinton Township Fire Department	752		67	s & g	Q	47	10- -48			Dr		4	P	
827	Ohio State University	750	70	170	ls	D	28	2-24-49	300	3	Dr	DwE	12	P	
828	Ohio State University	734	116	118	ls	D	64	8-22-36			Dr			A	Test well.
829	Ohio State University	750	96	162	ls	D	26	4-10-46	375	24	Dr	DwE		P	
830	Farmer's Fertilizer Co.	849	200	365	ls	D	168	1942			Dr	TE	8	I	Water contains hydrogen sulfide.
831	John Buck	830		77	s & g	Q	51	7-17-48	5		Dr	DwE	5	D	
832	Hygrade Milk Co.	810	158	190	ls	D	104	1946	100		Dr	TE	6	I	
833	Ohio Plate Glass Co.	752		68	g	Q	48	5- -54			Dr		6	I	
834	Lambert & Jones Co.	740	83	83	g	Q	32	7- -46	5		Dr	DwE	6	D	Lower 10 feet, perforated.
835	City of Columbus	723		62							Dr		7	A	Test well.
836	National Electric Coil Company	735	85	105	ls	D	40	12-15-50	.300		Dr	TE	10	I	
837	American Zinc Oxide Co.	848		120	s & g	Q	95	1935	100		Dr	TE	8	A	Water contains hydrogen sulfide.
838	I. K. Robinson	838	200	217	sh	D	90	5- 6-55	5		Dr		4		
839	Farmer's Fertilizer Co.	847	207	400	ls	D	173	12-26-52	280		Dr		10	I	
840	Olentangy Driving Range	725	58	68	ls	D	10	7-14-55	350		Dr		16	C	Lower 20 feet screened.
841	Ohio State University	775		75	g	Q	m	1-20-57			Dr		4	O	Water-level recorder installed February, 1944. (see text Fr-10) (m46.4)
MIFFLIN TOWNSHIP															
901	Paul Donavan	856		113	g	Q	85	8-20-51	6		Dr		4	D	
902	Frank Carson	851		87	g	Q					Dr	DwE	5	D	
903	Moyer Hylton	768		28	s & g	Q	4	5- 4-51	8		Dr		6	D	
904	Heer Sr.	828	36	102	s & g	Q	30	2-21-53	3	50	Dr		6	S	
905	Charles F. Johnson	864	7	50	sh	D	4	10- 9-52	4	45			6	D	
906	John Ray	864	33	37	s & g	Q	10	1-28-54	10	24	Dr		5	D	Lower 2 feet of casing perforated.
907	Lawrence Cramblit	859	7	42	sh	D	4	9-27-52			Dr		6	D	
908	Al Sietz	857	44	57	sh	D	13	1- 6-54	5	24	Dr		4	D	
909	Al Sietz	855	23	67	sh	D	14	1- 8-54	3	30	Dr		4	D	
910	City of Columbus	805	27	35	sh	D					Dr			A	Test well #1.
911	City of Columbus	812	38	38	sh	D	13	10-27-49			Dr			A	Test well #2.
912	C. Brafford	802		46	un	Q	32	5- 6-49	5	5	Dr		4	D	
913	Franklin Co. Engineering	905	20	83	sh	D	15	5-20-50	3		Dr		8	P	
914	Cook	872		160	s & g	Q	85	12- -48	20	10	Dr	DwE	5	D	
915	Gray	860		168	un	Q					Dr	DwE	5	D	
916	H. L. Osborn	872		139	s & g	Q	90	1950			Dr		5	D	Lower 4 feet of casing perforated.
917	Joseph Brede	871		105	s & g	Q	75	11-29-41			Dr		4	D	
918	E. E. Denune	860		113	g	Q	88	1- -46			Dr			D	
919	Winding Hollow C. C.	852		93	g	Q	m	8-24-42	200		Dr	TE	8	Irr.	(m58)
920	T. C. Blanchard	798		34	s	Q	7	1949			Dr	SwH	7	D	Lower 3 feet of casing perforated.
921	Eugene H. Pierce	848	10	115	sh	D	2	1-10-52	10?		Dr		4	D	
922	W. C. Murray	849	6	125	sh	D	6	7-24-51			Dr		4	D	Inadequate supply.
923	L. B. Middleton	847	35	75	sh	D	16	9-14-51			Dr		4	D	
924	O. C. Rogers	838		29	s & g	Q	m	7-20-49			Dr			D	(m6.4)
925	Dora Rupp	832	18	100	sh	D					Dr		5	D	
926	Meese	835	16	90	sh	D	10	3-26-47			Dr		5	D	
927	F. C. Amos	845		95	g	Q	75	11-13-52			Dr		4	D	
928	Dale Herschler	822		71	g	Q	40	5-23-46	12	10	Dr	DwE	5	P	
929	Agler	813		96	s & g	Q	50	12- 2-53	20	15	Dr		5	D	Lower 4 feet of casing perforated.
930	Kuhns	801		60	g	Q	36	10-24-47			Dr		4	D	
931	John Pasicka	812		80	s & g	Q	53	3-21-53	18		Dr		4	D	
932	Homer C. White	838		42	s	Q	20	7-10-53	6	14	Dr		5	D	Lower 3 feet of casing perforated.
933	J. Kaufman	844	8	255	sh	D	6	9- 5-53			Dr		4	D	Gas and salt water reported at 245 feet.

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed: Character of material	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date	Yield: Rate (g.p.m.)	Yield: Drawdown (feet)	Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
MIFFLIN TOWNSHIP (continued)															
934	Myrl Stamt	834	12	60	sh	D	3	7-16-54	3		Dr		4	D	
935	John Wilt	835	10	40	sh	D	5	8- 7-52			Dr		6	D	
936	Gene Archer	831	20	40	sh	D		1952	3		Dr		5	D	
937	H. L. Brehm	820		71	g	Q	m	7-27-49			Dr	DwE	6	D	(m19.2)
939	D. L. Ward	822		60	s	Q	10	6- 6-52	10		Dr		5	D	
940	E. L. Reeder	814	170	170	un	Q					Dr		4	A	Insufficient supply.
941	J. R. Kelley	818		93	s & g	Q	8	9- 3-54			Dr		4	D	
942	E. R. Nuff	820		72	s & g	Q	6	1949			Dr		6	D	Lower 3 feet of casing perforated.
943	L. A. Hessler	815		73	s & g	Q	57	1949			Dr		4	D	
944	Edward A. Granick	812		67	s & g	Q	53	11-25-52			Dr		4	D	
945	Grube - Bridgeview Golf Course	778		55	s & g	Q	38	7-15-52	25		Dr		8	P	Lower 8 feet of casing perforated.
946	Pete Gallo	812		82	s & g	Q					Dr		4	D	
947	R. E. Butin	792		60	s & g	Q	37	8-22-51	10		Dr		4	D	
948	M. Wagner	789		66	s & g	Q	40	8-25-52	10		Dr		5	D	Lower 5 feet of casing perforated.
949	Mifflin Twp. School	803		75	g	Q	43	8-20-51	22	2	Dr		8	P	Lower 8 feet of casing perforated.
950	E. C. Miller	820		97	s & g	Q	65	10- 6-51	10		Dr		5	D	Lower 5 feet of casing perforated.
951	Earl Miller	820		41	s & g	Q	15	1950			Dr		5	D	Lower 2 feet of casing perforated.
952	Earl Zealer	835	10	85	sh						Dr		4	A	Inadequate supply.
953	John Palmer	832	17	45	sh	D	5	1949	1		Dr		5	D	Lower 3 feet of casing perforated.
954	Les McDaniels	833	20	43	sh	D	11	11-12-51		30	Dr		5	D	
955	T. R. Mason	830	24	96	sh	D	15	10-13-48	48?	20	Dr		8	D	Lower 4 feet of casing perforated.
956	James Dumfee	825	10	50	sh	D	5	4-20-54	6?	2	Dr		6	D	
957	Hiram Mills	828	30	52	sh	D	7	8-29-51	1		Dr		5	D	
958	James F. Siders	830	52	71	s	Q	18	1950			Dr		4	D	
959	Earl Linard	827	17	60	sh	D	7	9-16-50	3		Dr		5	D	
960	Chapman	825	22	60	s	Q	5	11- 2-50	5		Dr		5	D	Lower 3 feet of casing perforated.
961	G. W. Carson	822		115	s	Q	20	1-19-50	12	2	Dr		4	D	
962	Dave Stygler	820		80	un	Q					Dr		4	A	For all purposes - dry.
963	Vernie L. Koker	825		94	g	Q	25	6-12-54	7	13	Dr		4	D	
964	James P. King	821		51	s & g	Q	18	11-24-52	10		Dr		5	D	
965	Clarence Rapp	823		50	s & g	Q	14	9-10-48	6	25	Dr		6	D	
966	Jacobs	811		108	s & g	Q	45	12-15-52	10		Dr		5	D	
967	D. C. Archibald	810		95	s	Q					Dr		4	D	
968	Ed. Criters	805		45	s & g	Q	20	1948			Dr	DwE		D	
969	Gillilland	802		41	g	Q	6	6-21-52			Dr		4	D	
970	Hanna	815		84	s & g	Q	30	2-29-52	10		Dr		4	D	
971	Clemans	772		58	s & g	Q	12	8- 8-50			Dr		5	D	
972	Thad Byers	820		110	s & g	Q					Dr	DwE	6	D	
973	C. V. Paale	817		52	s & g	Q	40	10-30-50	5		Dr		5	D	
974	Geo. Reibel	828	43	64	s & g	Q	43	5-10-64	2	7	Dr		4	D	Well bailed for 1 hour.
975	Ernest McDole	825	42	69	sh	D	12	4-23-52		33	Dr		4	D	
976	T. E. Graradi	824	20	52	sh	D					Dr		5	D	
977	Hilton Ayers	826	18	50	sh	D	7	8-28-51	1		Dr	SwH	5	D	
978	Emerson Mays	822	18	65	sh	D				65	Dr		4	D	
979	Harlan Bickle	820	46	70	sh	D					Dr	DwH	5	D	
980	Jacob Foust	822	20	110	sh	D					Dr	DwH	6	D	
981	Walter Moore	819	76	78	s	Q					Dr		5	D	
982	James Bashman	818	62	68	s	Q	3	6-13-53			Dr		5	D	Lower 4 feet of casing perforated.
983	Wm. Whaley	801		57	s & g	Q	8	8-30-51	25		Dr		5	D	
984	E. J. Wiles	807		70	un	Q	15	9-13-51	2		Dr		5	D	
985	C. L. Hampp	814		85	un	Q	12	7- 4-51			Dr		5	D	Gravel packed 43-85 feet.
986	B. A. Grundefinger	815	40	65	un	Q		11- 1-50	2		Dr		5	D	Lower 3 feet of casing perforated.
987	Louis Clapper	815		50	s & g	Q	20	3- 7-51	10	1	Dr		8	D	Lower 3 feet of casing perforated.
988	Hugh Boggs	818	39	60	sh	D	21	2- 7-53			Dr		5	D	Lower 4 feet of casing perforated.
989	Wm. Conrad	817		79	s	Q	15	7-15-49	9		Dr				
990	H. J. Piehler	810		63	s & g	Q	23	11-14-47	12	25	Dr		5	D	
991	Oscar Albert	814		78	g	Q	27	5-26-51			Dr		4	D	
992	Waller	818		62	g	Q	41	1948			Dr		4	D	
993	Huffman & Wolfe Co.	812	97	98	s & g	Q					Dr		6	I	Lower 10 feet screened.
994	Stanford Ackley	810		133	s & g	Q	57	10-23-53	10	65	Dr		5	D	Lower 2 feet of casing perforated.
995	Gagel	818		102	s & g	Q		1949	6		Dr		4	D	
996	C. W. Linge	811		66	s & g	Q	42	1949			Dr		6	D	Lower 3 feet of casing perforated.
997	Albert Beard	811		53	s & g	Q	26	1949			Dr		5	D	Lower 3 feet of casing perforated.
998	Jack Moore	812		70	s	Q	18	10- 5-53	25	27	Dr		4	D	
999	Alvin Durban	810		59	s	Q	20	6-28-50			Dr	SwH	5	D	Lower 3 feet of casing perforated.
1000	John Bischel	776		110	un	Q	20	11-18-54	6	75	Dr		4	D	
1001	W. E. Black	775	20	88	s	Q	8	6-18-48	2		Dr		6	A	Supply inadequate.
1002	John Britton	793	15	40	sh	D	12	5-26-50	2		Dr		5	D	
1003	Albin Peatelbach	788	20	100	sh	D			1		Dr		5	D	
1004	Joseph Lisska	786		28	s & g	Q	5	2-27-51	10		Dr		8	P	Lower 4 feet of casing perforated.
1005	T. Sullivan	800		96	s						Dr		5	D	Lower 10 feet, packed with pea gravel.
1006	P. L. Pfleager	815		98	g	Q	60	11- 6-47			Dr		4	D	
1007	A. A. Michaelson	803		72	s & g	Q	50	4-11-52			Dr		4	D	
1008	Donald Geren	800		78	s & g	Q	24	9-10-48	12	24	Dr		5	D	Lower 3 feet of casing perforated.
1009	A. J. Archer	784	67	72	sh	D	20	9- 1-49			Dr		4	D	
1010	Carl D. Harvey	804		64	s & g	Q	42	11- 9-53			Dr		6	D	Lower 10 feet of casing perforated.
1011	Arrow Sand & Gravel Co.	792		90	s & g	Q	33	1942	100	10	Dr	DwE	8	I	
1012	Earl Fisher	798	90	94	s	Q		3- -54	25		Dr		6	D	
1013	Curtis-Wright Corp.	805	49	51	s & g	Q	13	9- -42			Dr			A	Test hole.
1014	St. Mary of the Springs	755		61	s & g	Q	20	8-15-56	400	35	Dr		12	AC	
1015	Roland Morgan	955	8	55	ss	M	8	8- 1-56	9	12	Dr		4	D	Aquifer - Berea ss.
JEFFERSON TOWNSHIP															
1101	R. G. Gast	912	11	75	sh	M	27	9- 8-53	6	14	Dr		4	D	
1102	Kenneth Erlin	948		78	g	Q	15	6- -48	10	5	Dr		4	D	
1103	P. S. Miseroll	1010	35	75	ss	M	33	8- -48	6		Dr	DwE	5	D	
1104	C. L. McKee	1005	6	110	ss,sh	M	6	6-23-53	16		Dr		5	D	

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed		Water level		Yield		Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
					Character of material	Geologic horizon	Below land surface (feet)	Date	Rate (g.p.m.)	Drawdown (feet)					
JEFFERSON TOWNSHIP (continued)															
1105	Herman Engler	1010	24	60	ss	M	m	7- 9-48	30	8	Dr	SwE	6	D	(m3.9)
1106	S. D. Hayman	1055	26	67	ss,sh	M	10	4- 3-51	18		Dr		4	D	
1107	W. M. Lawler	1052	87	95	ss,sh	M	15	10- -50	20		Dr		5	D	
1108	F. R. Ice	1058	87	101	ss	M	12	7- 7-52	5	11	Dr		4	D	
1109	George Ross	1066	95	98	g	Q	18	6-28-52	20	20	Dr		4	D	
1110	Neva Mann	1072	67	86	ss,sh	M	21	6-13-53	10	7	Dr		4	D	
1111	Paul Shieldon	1065	170	187	sh,ss	M	20	6- 4-51	3		Dr		4	D	
1112	W. J. Charles	1076		80	g	Q	40	11-10-51	5	72	Dr		5	D	
1113	Thad Erlenbach	907		79	g	Q	27	10- 1-51	6	7	Dr		4	D	
1114	Burdett Spaeth	940	25	72	ss	M	m	7- 6-48			Dr	DwE	8	D	(m27)
1115	Nathan Beck	950	8	64	ss	M	38	10- -49	12		Dr		5	D	
1116	H. Vorys	960	18	77	ss	M	55	10- 8-53	10		Dr		5	D	
1117	W. A. Brown	957		33	s	Q	14	7-22-52	12	2	Dr		4	D	Lower 18 feet of casing perforated.
1118	R. C. Boehnke	960	20	70	ss,sh	M	15	1950	12	2	Dr	DwE	5	D	Analysis given in text.
1119	C. R. Stillings	990	12	48	ss	M	12	10-28-52	18	2	Dr		4	D	
1120	Ray H. Priest	1003	24	30	ss	M	7	5-19-51			Dr		5	D	
1121	Leo A. Stith	1000	21	61	ss	M	m	7- 7-48	15		Dr	SwH	4	D	(m17.3)
1122	L. E. Sawyers	1000	80	100	ss,sh	M	36	1950			Dr		4	D	
1123	Richard Hudt'	1000	18	40	ss,sh	M	18	6- -50	20		Dr		5	D	
1124	Hobert Fry	979	10	40	ss,sh	M	13	10-25-51	6		Dr		5	D	
1125	Ora E. Holzaphal	994		63	g	Q	4	3-30-54	10	10	Dr		4	D	
1126	James P. Mellott	1000		70	g	Q	10	7-11-52	20	20	Dr		4	D	
1127	Elva Croak	1009	24	60	ss,sh	M	18	11-19-53	25?		Dr		5	D	
1128	Kenneth Johnson	1009	56	85	ss	M	13	4-27-51	18		Dr		4	D	
1129	F. M. Johnston	1010	66	80	ss	M	17	11-17-50	18	3	Dr		4	D	
1130	Charles B. Jones	1024	10	55	sh	M	20	11-18-52	10?		Dr		5	D	
1131	John Hamilton	1075		82	g	Q	60	5-10-53	10	10	Dr		4	D	
1132	Ralph Clark	1066		90	s & g	Q					Dr		4	D	
1133	T. J. Scott	1074	77	90	sh	M	26	10-15-51	1		Dr		5	D	
1134	John Altmaier	840		93	g	Q	38	7- -49	12	48	Dr		8	D	Lower 3 feet of casing perforated.
1135	Fred Todd	934	15	40	ss	M	14	8-23-52	7		Dr		5	D	
1136	Jeffrey	862		93	s & g	Q	30	2-14-51	10	15	Dr		4	D	
1137	W. Frank Morris	915	51	123	sh	D	55	2-23-51	2	68	Dr		4	D	Pumped dry in 1 hour.
1138	John Vorys	910	8	60	ss	M	12	11- 1-52	12	4	Dr		4	D	
1139	Ray Waller	955	52	57	sh	M	11	10- 6-53	10	25	Dr		5	D	
1140	Norman Johnson	962	16	37	ss	M	7	1950	4	10	Dr			D	
1141	Jesse Sager	986		51	s & g	Q	22	1948	20	4	Dr	DwE	6	D	
1142	Wayne Windon	972		55	g	Q	25	9- -48	6	30	Dr		5	D	Lower 3 feet of casing perforated.
1143	Edward Gease	974		85	s	Q	29	11-23-53	5	15	Dr		4	D	
1144	R. F. Havens	972	20	35	sh	M					Dr		4	D	
1145	Arthur Vorys	980		67	s & g	Q	26	3-16-44			Dr		6	D	
1146	Hilyard	992	18	48	ss	M	14	2- 2-54	10		Dr		5	D	Lower 4 feet of casing perforated.
1147	Forest Tatman	1002		110	s	Q					Dr		4	D	
1148	Gillisper	1038		55	s	Q			3		Dr		5	D	Lower 5 feet of casing perforated.
1149	Elmer McKinley	1026	174	174	s	Q					Dr		5	A	Insufficient yield.
1150	Selbert Dresback	1020		100	s & g	Q	65	10- -48	6		Dr				
1151	Wm. N. Cass	1035		245	un	Q					Dr		4	A	Test well, unsuccessful.
1152	Fred W. Robinson	1066		110	s	Q	40	12- 8-52	5	40	Dr		5	D	Lower 5 feet of casing perforated.
1153	N. C. Farber	812	73	285	sh	D					Dr		4	A	Insufficient yield.
1154	N. C. Farber	815		72	g	Q	48	10- 2-48			Dr		4	D	
1155	Mary H. Souder	910	37	37	g	Q			125		Dr	SwG	8	Irr.	Well flows during wet seasons.
1156	Frank Lenard	920	20	63	ss	M	19	4- 2-55	40	20	Dr		5	D	Analysis given in text.
1157	Leo B. Atha	900		61	g	Q	12	12-18-51	10	6	Dr		5	D	Developed capacity 15 gpm.
1158	Homer A. Souders	974	15	60	sh,ss	M	25	1- 3-53	10		Dr		5	D	
1159	Tom Aitkens	972	15	85	ss,sh	M	12	9- 7-46	40?		Dr		7	D,S	
1160	Elmer Wetnell	976	86	91	ss,sh	M	20	7- 7-53	4		Dr		5	D	Lower 5 feet of casing perforated.
1161	S. M. Morrison	1021		92	s & g	Q	70	10-24-53	10		Dr		5	D	Lower 3 feet of casing perforated.
1162	H. J. Pfeiffer	1015		65	s & g	Q	40	10-18-50	5		Dr	DwE	5	D	
1163	Harry Kroegel	812	18	53	g	Q	20	5-12-50	2		Dr	DwE	5	D	Lower 3 feet of casing perforated.
1164	F. H. Walford	805	22	65	sh	D					Dr		5	D	
1165	George Yeager	830	12	55	sh	D,M					Dr		4	D	
1166	Alice M. English	880	72	80	sh	D,M					Dr		5	D	
1167	Alna Mason	902	6	57	sh	M	10	12- 8-51	10?	12	Dr		6	D	
1168	K. C. Stires	899	7	65	ss,sh	M	18	10-15-50	1	46	Dr		4	D	Insufficient yield.
1169	Jameson Black	898		33	s & g	Q	16	7- 3-51			Dr		5	D	
1170	David M. Earl	902		98	s	Q	92	9-25-48			Dr		4	D	
1171	P. Coleman	902		48	s	Q	14	1948			Dr		4	D	
1172	N. C. Sixton	905		60	s	Q	15	10-25-50			Dr		5	D	
1173	Lawrence Lacy	902		100	s	Q	35	10- -48			Dr		4	D	
1174	A. C. Wagner	942		120	s & g	Q		1954	10		Dr		5	D	Lower 4 feet of casing perforated.
1175	Pearl Horn	950		50	s & g	Q	8	8-27-49			Dr		5	D	Lower 3 feet of casing perforated.
1176	Claude Wengert	950		77	g	Q	55	1948	6		Dr		4	D	
1177	Elizabeth Pizzurro	786	8	40	sh	D	15	9- 3-51	3		Dr		8	D	
1178	T. A. Ford	886		40	s & g	Q	9	11-13-50			Dr		4	D	
1179	Joe's Corners	887		37	g	Q	30	12- 1-49	3	10?	Dr		6	D,P	Lower 3 feet of casing perforated.
1180	F. G. Sumbert	920	5	80	ss	M	9	8- 2-52	10	3	Dr		5	D	
1181	Lewis Geiger	955	110	160	sh	M	40	1-30-52	1	110	Dr		5	D	
1182	B. C. Hensel	968	7	116	ss,sh	M	43	1-26-54			Dr		4	D	
1183	Wayne Ketner	965	57	157	ss,sh	M	16	9-25-48	7	34	Dr		5	D	
1184	Abraham H. Kanter	980	35	40	ss,sh	M	17	11-20-49			Dr		6	D	Analysis given in text.
1185	W. E. Wray	1005	75	99	ss,sh	M	18	10- -50	25		Dr	DwE	5	D	
1186	Brooks Westfall	1014	130	183	ss,sh	M					Dr		5	A	Insufficient yield.
1187	W. F. Gieseck	1023		70	s & g	Q	24	8-13-53			Dr		5	D	Lower 5 feet of casing perforated.
1188	Ed. Fravel	1028		84	s & g	Q	26	4-20-53			Dr		5	D	Lower 3 feet of casing perforated.
1189	Stewart A. Burkland, Jr.	892		76	s & g	Q	10	5-17-55	400	39	Dr		12	T	Rated capacity 500 gpm.
1190	H. G. Dill	890		183	s & g	Q					Dr		6	T	Rated capacity 269 gpm.
1191	Spike Meharry	885		150	s	Q	42	7-31-56	20	75	Dr		5	D	
1192	J. P. Baker		105	125	s	Q					Dr		6	A	
1193	C. J. Pierce	885		100	s & g	Q	19	7-13-56	9	2	Dr		5	D	
1194	L. F. Harris	1032	198	234	ss	M	69	6-14-56		146	Dr		5	D	Fine sand and silt 22-198 feet.
1195	Sam Morrison	1005	120	154	sh	D	68	8-29-55	10	4	Dr		5	D	

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed: Character of material	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date	Yield: Rate (g.p.m.)	Yield: Drawdown (feet)	Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
PRAIRIE TOWNSHIP															
1201	Central Ohio Breeders	930		76	g	Q	23	3- 1-48	25		Dr	DwE	6	S	
1202	Central Ohio Breeders	930	74	99	ls	D	25	11- 4-48			Dr	DwE	4	D	
1203	St. James Lutheran Church	937	137	155	ls	S	50	3- 5-53	20	5	Dr		4	D	
1204	John Lieb	932	106	156	ls	D,S					Dr	DwE	6	D,S	
1205	Hosea Parker	921	130	148	ls	D,S	45	3-18-53	20	4	Dr		4	D	
1206	Carl Krieger	904		72	g	Q	58	10-21-47			Dr	DwE	4	D	
1207	H. E. Cunningham	892	70	115	ls	D,S	18	6-14-48			Dr	DwE	4	D,S	
1208	Homer Friend	925		73	g	Q	54	8-24-52			Dr		4	D	
1209	Joseph O'Hara	921	103	106	ls	S	56	8-25-48			Dr	DwE	4	D	
1210	L. E. Sawyers	917	80	100	ls	S	36	3- 7-50			Dr		4	D	
1211	O. D. Leach	905		99	g	Q	29	12-27-47	25		Dr	DwH	4	D	
1212	George Jennings	920		106	g	Q	36	2-21-48	20		Dr	DwE	4	D	
1213	Joe Murnane	916	96	100	ls	D	32	7- 3-50	20	3	Dr	DwH	4	D	
1214	O'Brian	910	100	115	ls	D,S?					Dr		4	D	
1215	Walter Weber	922		80	g	Q	22	11-14-49	20		Dr	DwE	4	D	
1216	Charles Williams	924		85	g	Q	65	7-11-49	30	2	Dr		6	D	Lower 3 feet of casing perforated. Well bailed for 4 hours.
1217	Wm. G. O'Harra Sr.	925	98	136	ls	D	33	8-29-50	20	8	Dr	DwE	4	D	
1218	Riebel's Farm Equipment Company	925	123	129	ls	D	39	2-18-48	20	6	Dr	DwE	4	P	
1219	O. G. Riebel	933	169	184	ls	D,S	54	6-23-53	15	4	Dr		4	D	Well bailed for 2 hours.
1220	L. R. Warall	890	91	123	ls	D	30	3-22-48			Dr	DwE	5	D	
1221	Charles Miller	892		86	g	Q	37	5- 8-50	20	45	Dr	DwH	4	D	
1222	Prairie Twp. Bd. of Ed.	922	142	170	ls	D,S	40	7-26-50	30		Dr		6	D	
1223	Charles Kaiser	924	145	147	ls	D	40	4-26-51	20		Dr		4	D	
1224	W. W. Goety	915	123	140	ls	D	60	11-18-49	5	24	Dr	DwH	4	D	
1225	Wm. Hess	922	119	124	ls	D	40	9-24-49	20	4	Dr	DwE	4	D	Well bailed for 1 hour.
1226	Wm. Hamilton	915	110	118	ls	D	38	9- 2-49	20		Dr	DwE	4	D	Well bailed for 1 hour.
1227	Wm. Jones	904	145	148	ls	D	50	4-30-48	20	10	Dr	DwE	5	D	Well bailed for 1 hour.
1228	P. Parke	894	120	122	ls	D	63	11- 6-46	30	5	Dr	DwE	5	D	
1229	George Fornick	895	135	156	ls	D	50	9-15-48	16		Dr	DwE	4	D	
1230	Andrew Sutherland	897	141	192	ls	D,S?	50	8-23-52			Dr		4	D	
1231	Phillip Gray	894	130	133	ls	D					Dr	DwE	4	D	
1232	James Whitson	895	114	126	ls	D	43	8-31-48			Dr	DwE	4	D	
1233	Darby Dan Farms	925	109	134	ls	S	53	5-12-51	20		Dr	DwE	4	D	
1234	Allen Holeman	920	112	123	ls	S	35	6-21-50	20		Dr	DwE	5	D,S	
1235	Fred Kaistz	911	112	116	ls	S	26	4- 4-51	20	4	Dr		4	D	
1236	Beacon Light Golf Course	912	130	192	ls	D,S	30	11- 8-47	80	30	Dr	TE	6	Irr.	Well bailed for 5 hours,
1237	Carl Hamilton	909	87	94	ls	D	18	5-20-49	20	11	Dr	DwE	4	D	
1238	Floyd C. Thomas	892	98	103	ls	D	46	5- 8-49			Dr	DwE	4	D	
1239	Agnes Greyton	885		49	s	Q	20	12- 4-47	1	29	Dr	DwH	6	D	Complete drawdown at 1 gpm.
1240	Arthur Tyler	900		73	g	Q	20	5-25-49	20		Dr	DwE	4	D	
1241	R. J. Dinsmore	912	190	250	ls	S	70	9- -48			Dr	DwE	4	D	
1242	Joe Reinhart	885		98	g	Q	60	5-26-50	20		Dr	DwE	4	D	
1243	Gordon Rausch	901	110	115	ls	D	44	7- 6-50	20	6	Dr		4	D	
1244	John Peseka	895		162	g	Q	17	10- 8-50	6	5	Dr	DwE	4	D	Well bailed for 2 hours.
1245	R. H. Schellhaus	902	137	150	ls	S	30	8-19-48	16	15	Dr	DwE	4	D	
1246	R. A. Trickel	890		111	g	Q	15	6- 7-48			Dr	SwE	4	D	
1247	J. C. Harper	894		152	g	Q	9	3-16-51	30	11	Dr		4	D	
1248	Don Smith	889		109	g	Q	15	1-18-51	20		Dr		4	D	
1249	Ivan Rings	878		95	g	Q	17	5-20-48			Dr	SwE	4	D	
1250	John Paseka	903	120	129	ls	S	32	6-18-52	5	25	Dr		4	D	
1251	John Ball	916		123	g	Q	45	8-11-53	15	1	Dr		4	D	
1252	Paul D. Kunz	892		92	s & g	Q	41	1-21-48			Dr	DwE	4	D	
1253	James M. Phillips	923		222	g	Q	45	2-18-56	15	5	Dr		4	D	
1254	Lincoln Lodge	918	127	133	ls		50	6-25-56	300	30	Dr		10	P,AC	
FRANKLIN TOWNSHIP															
1301	Hartley	835		72	g	Q	12	2-23-49	20		Dr	SwE	4	D	
1302	Wassermuth	830	35	114	ls	D	72	8-30-49			Dr		4	D	
1303	James Malholm	786	2	125	ls	D	m	11- -29			Dr			D	(m70)
1304	Marble Cliff Quarries Co.	824	54	165	ls	S					Dr			D	
1305	Marble Cliff Quarries Co.	787	4	128	ls	D					Dr			D	
1306	Schirtzinger	835		160	g	Q	39	9-11-53			Dr		4	D	
1307	C. Hugh Lathem	843	131	138	ls	D	21	4-21-49	20	7	Dr	DwE	4	D	Well bailed for 1 hour.
1308	J. Heiser	843		133	s & g	Q	65	3- -51			Dr		4	D	
1309	Bennett	820		42	g	Q	1	5-14-48			Dr	SwH	4	D	
1310	L. M. Seipel	821	36	70	ls	D	30	1-21-48			Dr	DwE	4	D	
1311	Arthur Withers	762	70	80	ls	D	45	4-10-53	20		Dr		5	D	
1312	W. Eugene Tinapple	882	63	124	ls	D	35	8- 4-52			Dr		4	D	
1313	Post	840		45	s & g	Q	24	9- 5-49			Dr		4	D	
1314	Paul Kuder	833	96	96	ls	D	26	5-13-51			Dr		4	D	
1315	Thompson	832	96	101	ls	D	17	8-18-49	25	13	Dr	DwH	4	D	Well bailed for 2 hours.
1316	R. W. South	820	52	52	s	Q	12	5-14-49			Dr	DwE	4	D	
1317	John Bartels	822	95	113	ls	D	30	8- 1-52	3		Dr		4	D	
1318	E. A. Captain	800		36	g	Q	16	7- -49			Dr		4	D	
1319	Charles Chapman	720	52	80	ls	D	37	4-11-50	20	20	Dr	DwE	4	D	
1320	State of Ohio	742	21	34	ls	D	70	7-17-52			Dr		5	I	
1321	Anna Vanport	700	49	49	ls	D	15	10-12-48			Dr	DwH	4	D	
1322	Arrow Sand & Gravel	710	78	94	ls	S					Dr				
1323	Dennison Engineering Co.	730	20	110	ls	D	18	3-20-51			Dr	TE	8	I	
1324	Grandview Inn	720	15	110	ls	D	m	3-21-51			Dr		8	C	(m25.7)
1325	American Aggregates	722		35	g	Q	18	3-20-51	200		Dr	DwE	6	I	
1326	City of Columbus	710	93	107	ls	D					Dr		5	A	Test well.
1327	City of Columbus	710	70	70	ls	D					Dr		7	A	Test well.
1328	City of Columbus	710	61	61	ls	D					Dr		6	A	Test well.
1329	Westinghouse Elec. Co.	867	146	400	ls	D,S	37	11- 5-51	367		Dr		12	I	

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed: Character of material	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date	Yield: Rate (g.p.m.)	Yield: Drawdown (feet)	Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
FRANKLIN TOWNSHIP (continued)															
1330	Standard Oil Co.	874	95	102	ls	D	38	7-31-52	33		Dr		4	P	
1331	Topy Realty Co.	842	130	325	ls	D	6	7- -48	226		Dr			I	
1332	Standard Oil Co.	834	80	146	ls	D	18	6-16-51	40		Dr	DwE	6	I	
1333	Hadad Const. Co.	832		87	g	Q	17	7-19-50	30		Dr	DwE	4	P	
1334	Estella Lewis	825		120	s & g	Q					Dr		4	D	
1335	Robert Johnson	858	163	165	ls	S	50	6- 4-51			Dr		5	D	
1336	Frank Dire	870	114	120	ls	D	5	9-11-49	3	3	Dr		5	D	
1337	Charles Weber	873	100	107	ls	D	60	5-28-48	16	5	Dr	DwE	4	D	Well bailed for 1 hour.
1338	Glen C. Coffin	848	72	82	ls	D	32	11-17-52			Dr			D	
1339	C. W. Underwood	812	98	155	ls	D,S	55	11- -51			Dr		4	D	
1340	Lawrence Schroeck	810		62	s & g	Q	28	9- -49			Dr		4	D	
1341	J. T. Angus	785		72	g	Q	17	8-11-48			Dr	DwE	5	D	
1342	Clyde Williams	780		72	g	Q	30	6- 7-48			Dr	DwE	5	D	
1343	M. H. Herderick	780		59	g	Q	25	7- 7-48			Dr	DwE	5	D	
1344	Donald Parker	773	115	130	ls	D	20	8- -52	10		Dr		4	D	
1345	Charlotte Bapst	765		69	g	Q	49	10- -48			Dr		4	D	
1346	Speakman	762	100	103	ls	D	43	7-19-52			Dr		4	D	
1347	L. H. Walters	770	81	88	ls	D	35	11-18-46	30		Dr	DwE	5	D	Well bailed for 1 hour.
1348	Morris	768	62	80	ls	D	39	12- -45			Dr	DwE	6	D	
1349	F. Cassel	770		90	g	Q	30	9-14-48			Dr	DwE	4	D	
1350	Distlehorst Milk Co.	729	30	63	ls	D	22	5-13-51	75		Dr		6	I	
1351	Columbus Plastic Product Co.	743	49	118	ls	D	47	9-30-49	450		Dr		12	I	
1352	Greenlawn Cemetery	717	3	185	ls	D	10	1940	500		Dr	TE	12	Irr.	
1353	Lomerson	740	52	80	ls	D					Dr	DwE	4	D	
1354	Harry Lyle	720	37	47	ls	D					Dr		5	D	
1355	E. L. Becker	718	3	51	ls	D	11	2-17-50			Dr		8	D	
1356	Campbell Packing Co.	700		27	g	Q	11	3-18-50	7	2	Dr		8	I	
1357	Pool	702		32	s & g	Q	10	7- -48			Dr	DwE	6	P	
1358	Marion Thompson	815		103	g	Q	55	2- 1-54	5		Dr		4	D	
1359	John Landis	839	114	115	ls	D					Dr	DwE	5	D	
1360	Frank Shaub	790	85	90	ls	D	9	11- 2-50	40	3	Dr		6	P	Well bailed for 1 hour.
1361	Charles Clifton	831	102	109	ls	D	60	5-28-53	5	38	Dr		4	D	
1362	R. D. McClure	818	103	108	ls	D	53	5-27-49	16		Dr		4	D	
1363	William Brooks	800	101	118	ls	D	44	2- -50			Dr		4	D	
1364	W. Edwards	811	134	137	ls	D	40	5-31-51			Dr		5	D	
1365	Floyd Michels	790	100	109	ls	D	44	5-27-53			Dr		5	D	
1366	Earl Leibrock	765		85	s	Q	50	9-16-49	15	10	Dr		6	D	Lower 3 feet of casing perforated.
1367	J. E. Bartoe	774		112	s & g	Q	55	8-10-53			Dr		4	D	
1368	Earl L. Brown	784		86	s & g	Q		3- -50	20		Dr		4	D	
1369	Glenn Scott	735	96	105	ls	S	11	11- -48	12	20	Dr	DwE	5	D	Well bailed for 1 hour.
1370	C. W. McCoppin	735	48	53	ls	D	40	8-10-48	15		Dr	DwE	5	D	
1371	Erwin L. Stueber	760		78	g	Q	39	11- 9-48			Dr	DwE	4	D	
1372	Allen Milk Co.	746	70	105	ls	D,S	38	6-16-53			Dr		4	D	
1373	C. L. Reiser	755	70	78	ls	D	25	4-17-49			Dr		5	D	
1374	J. R. Devore	737	67	85	ls	D	52	8-24-51			Dr		4	D	
1375	Carl Bawyer	734	64	70	ls	D	20	7- -50			Dr		4	D	
1376	Davis	750	51	68	ls	D	40	4- -49	4		Dr		4	D	
1377	McCarsey	758	47	69	ls	D	40	5-19-53	15		Dr		5	D	
1378	Woodrow Buckler	734	57	60	ls	D	35	9-18-53	15		Dr		4	D	
1379	Cecil Baum	731		39	s	Q	10	9- 1-50			Dr		4	D	
1380	Henry Huffman	742	75	109	ls	D					Dr	DwE	5	D	
1381	Dave May	732	37	45	ls	D					Dr	DwE	4	D	
1382	G. O. Atkinson	730		34	g	Q					Dr		5	D	
1383	Norman Lewis	728	22	43	ls	D					Dr	DwH	5	D	
1384	E. W. Golay	708	8	26	ls	D					Dr		5	D	
1385	J. B. Workman	705	11	28	ls	D	27	4-26-50			Dr		4	D	
1386	W. J. Neil	702	12	30	ls	D					Dr	DwE	4	D	
1387	J. R. Brant	710		75	g	Q	50	4- 8-49			Dr	DwE	4	D	
1388	Cols. Sewage Plant	700	94	126	ls	D	1	7-18-38	198	18	Dr		8	A	
1389	Don M. Casto	775	157	230	ls	S	45	5-31-55	50	35	Dr	DwE	8	P	Well pumped for 48 hours.
1390	Cols, Sewage Plant	700		52	g	Q	21	8- -43	200		Dr		10	P	
1391	McKlusky	770		25	un	Q	m	1-20-57			Dg		54	O	Water-level recorder installed March, 1949 (see text, Fr-9). (m8.14)
CITY OF COLUMBUS															
1401	Greendale Ice Cream Co.	815	10	250	ls	D	90	6- -48	17		Dr		6	C	Analysis given in text.
1402	Beechwold Theatre	784	17	287	ls	D,S	70	10-17-40	400		Dr		8	AC	Water contains hydrogen sulfide.
1403	Third Church of Christ Scientist	781	43	200	ls	D	70	10- -51			Dr		8	AC	
1404	Wolfe Residence	826	30	234	ls	D	104	5-21-37			Dr		6	AC	
1405	R. H. Jenkins	822	53	137	ls	D	81	7- 7-53			Dr		6	AC	
1406	Louis A. Voisinet	813	20	150	ls	D,S	90	4-10-54			Dr		5	AC	
1407	Paul Davis	800	15	105	ls	D	75	11- 8-48	10		Dr		6	D	Used as a "Heat Pump" well.
1408	Mountview Addition	845	72	165	ls	D		6- -41	150		Dr		8	AC	
1409	S. M. Hanley	822	55	173	ls	D,S	90	10- 9-52	20		Dr		6	AC	
1410	Frank M. Babbitt	837	100	180	ls	D	115	11-10-54			Dr		6	AC	
1411	E. J. Cahill	851	109	144	ls	D	114	4-28-54			Dr		5	AC	
1412	Soul's Harbor	852	114	158	ls	D	117	1- 8-54			Dr		6	AC	
1413	J. I. Walters	840	132	141	ls	D	105	9-24-48			Dr		4	D	
1414	F. Y. Construction Co.	839	125	250	ls	D,S	90	9- -48	110		Dr		8	AC	Water contains hydrogen sulfide.
1415	Isaly Dairy Co.	775	42	127	ls	D	100	1936	150		Dr		10	C	Water contains hydrogen sulfide.
1416	Hudson Theatre	845	8	300	ls	D,S	151	8- 3-39	70		Dr		8	AC	
1417	Columbus Auto Parts Co.	846	33	133	sh	D	20	12-19-51			Dr		8	I	
1418	Model Dairy	862	93	400	ls	D,S	m	3-31-51			Dr			C	Contains hydrogen sulfide. (m151.3)
1419	Linden Theatre	857	218	350	ls	D					Dr			AC	Analysis given in text.
1420	Big Bear Stores	723	72	115	ls		19	10- 1-50	250	50	Dr		10	AC	
1421	Hennicks Restaurant	753	93	135	ls	D	35	3-18-42			Dr		6	AC	

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed: Character of material	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date	Yield: Rate (g.p.m.)	Yield: Drawdown (feet)	Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
CITY OF COLUMBUS (continued)															
1422	State Theatre	748	103	240	ls	D	150	1942			Dr		10	AC	Water contains hydrogen sulfide.
1423		820	43	300	ls	D					Dr				
1424	Penn. Railroad Co.	815	49	60							Dr		6	A	Test well #2 of 1927.
1425	Farmers Co-op Dairy	830	162	304	ls	D					Dr		6	C	
1426	Cannata Celery Co.	832	20	365	ls	D	180	12- 3-53	100		Dr		8	C	
1428	Culters Self Service	796	96	136	ls	D	92	2-23-48			Dr		8	AC	Capacity-100 gpm.
1429	Tri-Village Shopping	795	84	137	ls	D	93	7-10-50	270	20	Dr		8	AC	Pumped for 8 hours.
1430	Columbus Metal Prod. Inc.	740	77	88	ls	D	40	3- 7-49			Dr		8	I	Capacity 150 gpm.
1431	Welch Plastic & Mfg.	725		61	g	Q	30	3- 7-49			Dr		8	I	Capacity 75 gpm.
1432	Cols. Show Case Co.	736	73		ls	D		1937	55		Dr		8	I	
1433	Drilling Research Inc.	715	68	116							Dr		13	T	Test well.
1434	City National Bank & Trust	715	91	170	ls	D	38	3-24-50	100		Dr			AC	Water contains hydrogen sulfide.
1435	Rainbow Cleaners	742	77	77	s & g	Q	60	8- 7-54	20	10	Dr		6	C	
1436	Capitol City Products	730	101	125	ls	D	70	5- -50	400	5	Dr		16	I	Water contains hydrogen sulfide.
1437	Jeffrey Mfg. Co.	777	148	225	ls	D	130	11- -53			Dr		8	I	
1438	Jeffrey Mfg. Co.	777	131	200	ls	D	90	6- 2-50			Dr		12	I	Capacity-500 gpm.
1439	Hamilton Milk Co.	775	142	287	ls	D,S	99	11-15-35			Dr		10	C	Analysis given in text.
1440	D. L. Auld & Co.	768	50	350	ls	D,S	76	8- -50			Dr		12	I	Water contains hydrogen sulfide.
1441	Timken Roller Bearing Co	798	31	500	ls	D,S	105	12- -51			Dr		10	I	Analysis given in text.
1442	Diebel & Shank Mfg.	838		207	un	Q		1954	2		Dr		12	A	
1444	City Products Co.	823	120	330	ls	D	140	7- -52			Dr		8	I	
1445	Diamond Milk Co.	817		114	g	Q	77	11- 3-42			Dr		12	C	
1446	Diamond Milk Co.	815	115	216	ls	D	137	6- 8-38			Dr		8	C	
1447	Norfolk & Western #7	795	123	131	s & g	Q	52	10-23-54	100	5	Dr		8	RR	Pumped for 4 hours. Capacity 600 gpm.
1448	McNally Lumber Co.	800	60	85	sh	D					Dr		8	A	Insufficient yield.
1449	Nesbitt Bottling Co.	758		101	g	Q	10	1949	100		Dr		8	I	
1450	Norfolk & Western #5	767	122	125	s & g	Q	46	7-24-54			Dr		8	A	Test well.
1451	City of Columbus	756	116	117	s & g	Q	8	11-11-49	1500		Dr		26	P	Analysis given in text. Yield-2250 gpm.
1452	Ralston Steel Car Co.	808		106	g	Q	47	1942	200		Dr		10	I	
1453	Norfolk & Western #3	758	125	154							Dr		8	A	Test well.
1454	City of Grandview	725	22	79							Dr				Test core.
1455	Grandview Swimming Pool	718	35	45	ls	D					Dr			P	
1456	E. R. Kissinger Co.	755	117	130	ls	D	71	12-19-51			Dr		6	I	Water contains hydrogen sulfide.
1457	M & R Dietetics	790	186	310	ls	D,S	118	4-24-47	1000		Dr		12	C	Analysis given in text.
1458	City Products Corp	762	118	215	ls	D	93	2- -53			Dr		10	I	Capacity-350 gpm.
1459	Moores & Ross Dairy	780	79	81	s & g	Q	60	1941			Dr		12	A	No industrial water.
1460	Cameo Theatre	810	171	327	ls	D	112	3- 3-27			Dr		8	AC	Water contains hydrogen sulfide.
1461	Smith Chemical Co.	715	79	91	ls	D	23	2-17-50	50	2	Dr		8	I	Pumped for 8 hrs.
1462	Dixie Theatre	720	78	97	ls	D					Dr		8	C	
1463	Franklin Brewery	730	87	165	ls	D	50	1949			Dr		10	I	
1464	A & P Warehouse	722	82	160	ls	D	63	1948	80		Dr		10	I	Analysis given in text.
1465	Franklin County Veterans Memorial	735	59	59	ls	D					Dr				
1466	Columbus Bolt Works	730	87	200	ls	D	60	5- 3-44	650		Dr		10	I	Analysis given in text.
1467	Uptown Theatre	740	101	200	ls	D	61	1937			Dr		8	AC	Analysis given in text.
1468	Moby Store		90	100	ls	D					Dr			AC	Analysis given in text.
1469	Union Clothing Co.		101	205	ls	D	50	1937	600		Dr		10	A	Formerly used for air conditioning.
1470	LeVeque Lincoln Bldg.	745	130	190	ls	D		1927						A	
1471	Huntington Bank Bldg.		105				42				Dr		8	A	
1472	F & R Lazarus	750	90	243	ls	D,S	55	1942			Dr		12	A	Water very sulfurous. All wells abandoned in 1950.
1473	B & T Metals	740	68	25	g	Q	10				Dr		12	I	Water returned in limestone well.
1474	Morehouse-Fashion		144	180	ls	D		1936			Dr			A	Test well.
1475	Grand Theatre Bldg.		140	205	ls	D	80	1936	250		Dr		8	A	Formerly used for air conditioning.
1476	Schoedinger Funeral H.	760	127	200	ls	D		1935	65		Dr		6	C	Analysis given in text.
1477	Freckers Ice Cream Co.	783	130	300	ls	D,S	126	3-18-49			Dr		8		Used as return well.
1478	Yardley Plastic Co.	793	163	255	ls	D	135	2- -54	250	35	Dr		10	I	Pumped for 8 hours.
1479	United Provision Co.	796	155	300	ls	D	120	1948			Dr		6	I	Capacity-45 gpm. Water contains hydrogen sulfide.
1480	Diebel Shank Mfg. Co.	755	38	40	s & g	Q	20	7-20-54	20	2	Dr		6	C	Pumped for 8 hours.
1481	Diebel Shank Mfg. Co.	753	34	42	sh	D		7-19-54	5		Dr		6	C	
1482	Harmony Farms Inc.#1200	752	50	55	sh	D	19	1954			Dr			A	Test well.
1483	Kroger Baking Co.	792	155	342	ls	D	80	1-26-50		130	Dr		6		Used as return well.
1484	Edwards Drugs	810	120	135	ls	S	28	1948	15		Dr		6	AC	
1485	Industrial Platers Inc.			142	un	Q	93	6- 3-55	150	30	Dr		8	I	
1486	Southwood Poultry Shop	725	6	60	ls	D	28	1948			Dr		8	I	
1487	Universal Concrete	734	58	112	ls	D	80	11-15-53	50		Dr		8	I	
1488	August Wagners Brewing	750	103	194	ls	D	163	8-10-35			Dr		8	I	
1489	Cols. Anvil Forging Co.	743	86	86	s & g	Q							8	I	
1490	Cols. Dental Mfg. Co.	782	120	280	ls	D	100	12- 6-36			Dr		8	C	Water contains hydrogen sulfide.
1491	Reeb's Restaurant	786	110	260	ls	D	108	1951	25		Dr		6	AC	Analysis given in text.
1492	Deckard's Drugs	770	60	275	ls	D	45	6-16-41	20		Dr		6	A	Water contains hydrogen sulfide.
1493	Jewish Rec. Center	760	45	46	g	Q	12	5- 6-50	40	24	Dr		8	AC	Pumped for 10 hours.
1494	Markham Theatre	742	76	159	ls	D	49	4- 9-37			Dr		8	AC	Analysis given in text.
1495	Big Bear Store	757	137	230	ls	D	111	11-12-55			Dr		8		Return well.
1496	U. B. Church	748	70	215	ls	D					Dr		6	AC	Water contains hydrogen sulfide.
1497	Ideal Theatre	749	58	213	ls	D	77	6-12-42			Dr		6	AC	Return well.
1498	Cook and Son	748	78	225	ls	D	80	7-19-51			Dr		6	AC	Analysis given in text.
1499	Ohio State Fairgrounds	835	120	330	ls	D	131	3-22-57	125	4	Dr		8		Analysis given in text.
00-A	Main Theatre			437	ls	D,S		1939			Dr			AC	Analysis given in text.
00-B	Southern Theatre			214	ls	D		1937			Dr		6	AC	Analysis given in text.
00-C	Educational Press			228	ls	D,S		1936	225		Dr		8	AC	Analysis given in text.
00-D	Freckers Restaurant			180	ls	D		1943	180		Dr		6	AC	Analysis given in text.
00-E	Roberts Store			300	ls	D		1938	500		Dr		8	AC	Analysis given in text.
00-F	Broad Theatre			245	ls	D,S			400		Dr		12	AC	Analysis given in text.
00-G	Ranco, Inc.			180	ls	D,S			200		Dr			AC	Analysis given in text.
00-H	Rutherford Funeral Home			320	ls	D,S			20		Dr			AC	Analysis given in text.
00-I	Moores & Ross Co.		120	269	ls	D,S	100	5- 8-41			Dr		10	O	Water-level record from April, 1942 to May, 1948. (see text Fr-7).

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed: Character of material	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date	Yield: Rate (g.p.m.)	Yield: Drawdown (feet)	Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
TRURO	TOWNSHIP														
1501	Columbus General Depot	795		95	g	Q	35	2- -31	400	21	Dr	TE	12	I	
1502	R. H. Evans	791	8	115	sh	D					Dr		4	D	Insufficient supply.
1503	Leigh Koebel	808	12	50	sh	D	7	4- -50	3		Dr		8	D	
1504	F. E. Robertson	822	20	30	s,sh	Q,M	8	12-13-48	15?	10	Dr		4	A	
1505	J. C. Isselstein	870	28	64	sh	M	7	4- -50	1		Dr		4	D	
1506	O. Bennett	885	70	118	sh	M					Dr		4	D	
1507	H. E. Stouffer	913		73	s & g	Q	36	1-.5-53			Dr		5	D	
1508	Ed. Carr	930	70	100	ss	M	30	7-10-48	40		Dr	DwE	6	D	
1509	C. J. VanSchoick	950	20	90	ss	M		1951	6	17	Dr	SwE	5	D	Flowing well.
1510	A. Shaheen	784		95	s & g	Q	35	6-16-53	15		Dr		5	D	
1511	O. A. Springborn	793		35	s & g	Q	10	7-15-49	6	15	Dr	DwE	5	D	
1512	Sterling Smith	840	28	90	sh	M	25	12-18-48			Dr	DwE	8	D	Insufficient supply capacity 12 gph.
1513	Robert Gassett	885		95	s	Q	15	6- -50			Dr		5	D	
1514	H. T. Swisher	880		60	s	Q	18	1949			Dr	SwE	6	D	
1515	F. W. Wolf	894		73	g	Q	27	10-14-48			Dr	DwE	4	D	
1516	Village of Reynoldsburg	860		55	s & g	Q	12	7-20-48	100	20	Dr	TE	10	P	Well #4.
1518	George Igel	922	40	85	ss	M	30	7-18-50			Dr	DwH	5	D	
1519	Columbus Realty Co.	780		40	s & g	Q	18	11- -52	10		Dr		5	D	
1520	Interstate Industry	785	67	100	sh	D					Dr		7	A	Inadequate supply.
1521	Walter Gray	787		32	s & g	Q	5	6- 5-48	12	15	Dr		5	D	
1522	O. A. Springborn	790		27	s & g	Q	8	11-10-47	8	17	Dr	DwE	5	D	
1523	Chapman	785		40	g	Q	18	11- 8-48			Dr		4	D	
1524	J. S. Trago	788		54	s & g	Q	20	1949			Dr	DwH	4	D	
1525	I. W. Lacher	785	30	35	sh	D	m	8-10-49			Dr		6	A	(m13.2)
1526	J. B. Schoppelrei	790	31	45	sh	D	15	8-18-50			Dr		5	D	
1527	Porter Flowers	787	37	38	g	Q	10	8- 6-48	6	12	Dr		8	D	
1528	Miles Drive-in Theatre	788		39	s & g	Q	13	8- 1-48	23		Dr		5	A	
1529	Don Davis	792	39	40	s & g	Q	27	3-10-54	10		Dr		6	D	
1530	P. B. Realty Co.	820	66	112	g	Q	73	9- -48			Dr		6	D	
1531	Frank Petroschka	808		26	g	Q	9	7- -49			Dr		4	D	
1532	Vernon Perry	819	35	48	sh						Dr		5	D	
1533	C. H. Marce	835		24	s & g	Q	10	8-22-51	15		Dr		8	D	
1534	Dalton	855	12	90	sh	M	12	8- 3-48			Dr	DwE	8	D	Pumps dry at 2 gpm. Analysis given in text.
1535	J. W. Whittington	840	42	80	sh	M	40	4- -50	2		Dr		4	D	
1536	E. D. Nance	885	50	110	sh	M					Dr		5	D	
1537	J. Evan Williams	890		60	un	Q	18	12-12-48	3		Dr	DwE	7	D	
1538	Frank Ontko	884		67	s & g	Q	58	7- 2-46	20		Dr	DwE	4	D	
1539	Petty	903	25	54	sh	M	19	12-11-47	3?	2	Dr	SwE	6	D	
1540	Al Haft	875		57	s & g	Q	26	9-25-48	10		Dr	DwE	6	S	
1541	Evans Market	860		75	g	Q					Dr	DwE	6	D	
1542	Nelson Morris	865		89	s	Q	20	7-30-48	33	24	Dr	DwE	6	D	
1543	H. G. Bourne	886	56	65	sh	M	27	7- -49			Dr	DwE	6	D	
1544	Ralph Smurr	892	17	135	sh				1		Dr		5	D	
1545	Phillip Noto	896	50	75	ss	M	50	11- -50	10		Dr	DwE	5	D	
1546	Fred Feucht	915		74	s & g	Q	52	4-20-48			Dr	DwE	6	D	
1547	H. C. Mann	922	45	237	sh	M					Dr		5	A	Insufficient supply.
1548	Elizabeth Solman	928		76	s & g	Q	50	2- -50	4	12	Dr	DwE	5	D	
1549	Paul Offenburg	777		120	s & g	Q	16		60		Dr	TE	8	Irr.	
1550	Kempfe	778		44	g	Q	12	3- 4-48	12	4	Dr		6	D	
1551	Robert Pein	781		48	g	Q	22	11-30-49			Dr	DwH	6	D	
1552	Ben Morse	790	85	90	sh	D					Dr		5	A	Insufficient supply.
1553	Jess Hamilton	802	21	26	g	Q	m	8-16-49	6	3	Dr	SwH	4	D	(m6.3)
1554	Maynard Price	803		36	s & g	Q	10	6-10-52	10	10	Dr		5	D	
1555	Orville Young	808		26	s & g	Q			10		Dr		5	D	
1556	F. R. Powell	841		30	un	Q	12	11- 4-52	5		Dr		4	D	
1557	Ray Welsh	811	3	55	sh	M	14	7- 2-51	1	41	Dr		6	D	Pumped dry in 1 hour at 50 gph.
1558	Lloyd Cory	824	38	58	sh	D	18	3-29-48			Dr	DwH	5	D	Water reported to contain salt.
1559	Cols. Metropolitan Park	890	72	132	sh	M	12	7- 2-48	10		Dr	DwH	6	P	
1560	David Nessley	886		103	s & g	Q	50	3- -50			Dr	DwE	5	D	
1561	LaCompt	853		45	s & g	Q	22	3- 9-54	10		Dr		5	D	
1562	N. Hickman	868		104	s	Q	30	4- -50			Dr		4	D	
1563	Herman J. Winkle	774		56	s & g	Q	22	8- 2-49			Dr		5	D	
1564	Ralph Arnett	779		23	g	Q	12	8-20-48			Dr		4	D	
1565	Mel Gornall	767		124	s	Q	36	8-28-53	11	18	Dr		5	D	
1566	M. F. Gornall	768		68	g	Q	12	1- 3-49	7	8	Dr		5	D	
1567	Fred Kellmier	775		45	s & g	Q	12	6- 7-49			Dr	SwH	5	D	
1568	J. B. Jobson	772		39	s & g	Q	17	5-28-49			Dr	SwH	5	D	
1569	Erwin Petzinger	769		104	s & g	Q					Dr		5	D	
1570	J. Binns	771		27	s & g	Q	20	8-28-48			Dr		4	D	
1571	Stanley Barrett	768		52	s & g	Q	22	3-28-53	10		Dr		6	D	
1572	Eileen Murphy	765		42	g	Q	14	6- -49			Dr		5	D	
1573	Farm Bureau	770		58	g	Q	12	10-28-47	15	5	Dr		6	P	
1574	L. C. Wetzel	782	70	104	s	Q	24	3-28-49	10	15	Dr	DwE	6	D	
1575	Charles E. Davey	755	58	65	s	Q	18	4- 8-54	10	10	Dr		5	D	
1576	Parle Rawn	800	115	115	un	Q					Dr		5	A	Insufficient supply.
1577	Fred Tussing	800		31	g	Q	5	8-17-49			Dr		5	D	
1578	Len Tussing	800		50	s	Q	14	11-10-53	25		Dr		5	D	
1579	Victor & Mary Smith	825		58	s & g	Q	28	2-22-54	10	4	Dr		4	D	Well bailed for 2 hours.
1580	Thomas Zipf	761		37	g	Q	23	11-24-51	6		Dr		5	D	
1581	Kletrovets Jr.	759		40	g	Q	25	11-18-52	7		Dr		4	D	
1582	P. C. Meyers	765		36	g	Q	15	4- 2-50	5	2	Dr	DwH	6	D	
1583	Fred Gierhart	760		34	g	Q	12	10-27-48	10	12	Dr	DwE	4	S	
1584	Fred Gierhart	761		37	s & g	Q	12	5-15-48	25	12	Dr		6	D	
1585	Ray Richards	790		32	s & g	Q	23	11- -49			Dr		4	D	
1586	C. N. Fanchui	791		88	s & g	Q	22	2-18-52	20	15	Dr		5	D	
1587	B. Wibber	793		48	s	Q	24	10-10-53	10	6	Dr		5	D	
1589	J. H. Motz	770		95	s & g	Q	15	11-16-48			Dr	DwE	4	D,S	
1590	Village of Reynoldsburg	858		84	g	Q	7	11-12-55	170	9	Dr		6	P	Analysis given in text.
1591	Village of Reynoldsburg	857		84	g	Q	8	12- 1-55	289	12	Dr		8	P	Analysis given in text.

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed: Character of material	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date	Yield: Rate (g.p.m.)	Yield: Drawdown (feet)	Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
MARION TOWNSHIP															
1601	King	753		34	g	Q	17	6-23-49	15	3	Dr	DwE	5	D	
1603	Federal Glass Co.	747	142	142	sh	D					Dr			I	Test well #5.
1604	Bonney Floyd Co.	748		82	g	Q	39	9-27-40	150		Dr	DwE	8	I	Test well #1.
1605	S. L. Grundstein	751		138	s & g	Q			5		Dr	DwH	5	D	
1606	Owens-Illinois Co.	764		127	g	Q	73	2- -51	90		Dr	DwE	6	I	
1607	Ohio Wax Paper Co.	768	152	300	ls	D	95	7- 5-39			Dr		10		
1608	Yardley Industries	765	161	375	ls	D,S	103	12- -51			Dr		8	I	Return well.
1609	Vetters Locker Plant	760	120	125	s	Q	65	9- 1-53	15		Dr		6	I	
1610	Swift & Co.	760	137	160	g	Q					Dr			I	
1611	Charles G. Dill	767	52	67	sh	D					Dr		8	D	
1612	E. E. Brockmeyer	772	43	115	g	Q	42	6- -48	3	15	Dr		5	D	
1613	Ed. Bunno	772	85	125	sh	D					Dr	DwE	6	D	
1614	Ned W. McCloughlin	772		78	s & g	Q	36	7-27-43			Dr	DwE	4	D	
1615	J. Eubanks	772	103	122	sh	D					Dr	DwE	5	D	
1616	J. E. Green	773	48	56	sh	D					Dr	DwE	4	D	
1617	T. M. Cunningham	772	150	158	s	Q	40	10-30-48	5		Dr	DwH	5	D	
1618	Ohio Packing Co.	775		89	g	Q	12	8-30-27	60		Dr	DwE	26	I	
1619	Paul Kennedy	765	77	104	sh	D	28	7- -49	6		Dr		5	D	
1620	E. G. Bucksieb	740		90	s & g	Q	32	1-17-48	13	40	Dr	TE	6	I	
1621	E. G. Bucksieb	750		64	s	Q	22	8-11-49	26	6	Dr	DwE	6	D,S	
1622	E. G. Bucksieb	752		95	g	Q	36	10-15-49	12	12	Dr	DwE	5	P	
1623	Columbus Packing Co.	728	71	71	g	Q	13	4- -27	800		Dr		38	I	
1624	Buckeye Steel Casting	735		65	s & g	Q	m	6-22-51	800	5	Dr	TE	26	I	(m49.5)
1625	Hill Distributing Co.	732	137	145	ls	D	55	2- -48			Dr		6		Return well.
1626	Orian Co.	735		80	s & g	Q	30	1948	50	2	Dr	TE	6	I	Well bailed for 4 hours.
1627	American Rolling Mills	734	148	148	ls	D					Dr			I	Test well #4.
1628	Teeters Packing Co.	728		104	s & g	Q	32	3-18-50	100		Dr	TE	8	I	
1629	Keever Starch Co.	728		127	s & g	Q	16	4-29-31			Dr	DwE		I	
1630	C & O Railroad	732		130	s & g	Q	40	3- 7-28	1800	79	Dr			RR	
1631	Charles Heslop	793		140	g	Q	70	4-10-52	5		Dr		4	D	
1632	Harvey & Holley	772		145	g	Q	55	5-27-47	12		Dr	DwE	6	P	
1633	Emil Alexander	761		100	g	Q	41	5-14-48	6	5	Dr	DwE	4	D	Well bailed for 3 hours.
1634	Atlantic Motor Freight	766	135	136	s	Q					Dr		5	A	Well bailed for 3 hours. Insufficient supply. Fine sand 90 to 135 feet.
1635	Arthur Hertenstein	765		118	s & g	Q	55	10-11-51	10		Dr		5		
1636	Marion Twp. School	760	190	195	sh	D					Dr		8	P	Well considered to be dry.
1637	Anthony Capocciama	764		103	g	Q	60	9-22-53	5		Dr		4	D	
1638	R. E. Sayre	764		95	un	Q	45	10-16-48			Dr	DwE	4	D	
1639	I. L. Bordner	760		163	s	Q	43	6-27-49	5	7	Dr	DwH	4	D	Well bailed for 2 hours.
1640	Bud Noble	762		110	g	Q	64	4-12-49	6		Dr	DwE	5	D	
1641	Leonard Wagner	773		52	g	Q	45	6- 1-48			Dr	TE	8	D,Irr.	
1642	Beth Jacob Cemetery	762		109	s	Q	45	3-24-50			Dr	DwH	5	P,Irr.	
1643	Glassburn	725		53	s & g	Q	17	4-12-48			Dr		4	D	
1644	H. H. Oakes	715		84	s	Q	20	3-22-50	12	4	Dr	DwE	4	D	Well bailed for 2 hours.
1645	Joe Marinello	728		95	s	Q	60	11- 1-48			Dr	DwE	4	D	
1646	C. C. Webb	730		40	s & g	Q					Dr		4	D	
1647	Jonathan Arr	746		123	s & g	Q	34	2-25-48	3	5	Dr	DwH	4	D	
1648	Charles S. Mason	748		69	s & g	Q	35	3- -48			Dr		5	D	
1649	Walter Starr	769		150	un	Q					Dr		4	A	Well reported to be dry.
1650	Swartz	764		102	s & g	Q	50	10-22-53	15	25	Dr		5	D	Well bailed for 3 hours.
1651	Swift & Co.	762		118	s & g	Q	69	9-19-54	500	19	Dr		12	I	
1652	P. S. Truesdell	755		67	s & g	Q	51	2- 2-54	150	5	Dr		10	I	
PLEASANT TOWNSHIP															
1701	Edward Shellhaus	992	60	74	ls	S	35	9-16-48	16		Dr	DwE	4	D	
1702	Paul Vawter	922	72	84	ls	S	45	6-16-48			Dr	DwH	4	D	
1703	Lem Gardner	919	80	95	ls	S	60	10- -51			Dr		4	D	
1704	H. L. Heinzelman	914	116	144	ls	S	72	7-20-49			Dr	DwH	4	D	
1705	May Meyers	890		73	g	Q	13	3-22-49			Dr	SwE	4	D	
1706	Neff	880		72	g	Q	58	3- -50			Dr		4	D	
1707	Harold Stone	865		55	g	Q	42	6- 5-48			Dr	DwH	4	D	
1708	Okey Rice	845	50	81	ls	S	25	5-15-50			Dr		4	D	
1709	Paul Hartman	905	95	122	ls	S	70	3- -50			Dr		4	D	
1710	Mel Pieifier	921	120	130	ls	S	63	12-12-53	10	7	Dr		4	D	Well bailed for 1 hour.
1711	Arthur Goldhart	868	135	148	ls	S	58	5-20-50	20		Dr	DwE	4	D	
1712	Harry Montgomery	892	110	116	ls	S	50	4-20-51	20	60	Dr		5	D	
1713	Wm. Galle	892	118	126	ls	D	61	3-18-48	16	10	Dr	DwH	5	D	
1714	Harry Baumgartner	893	129	131	ls	D	50	4- 3-51			Dr		5	D	
1715	Grooms	895		168	s & g	Q	80	1951			Dr		5	D	
1716	Francis Redding	942		77	s & g	Q	40	3-24-54	10		Dr		5	D	
1717	Joe Murnane	944	96	100	ls	S	32	7- 3-50	20	3	Dr	DwH	4	D	
1718	E. Maier	830	30	70	ls	S			5		Dr	DwH	4	D	
1719	Robert Haensel	925	130	160	ls	S	60	3- -50			Dr	DwE		D,S	
1720	Oscar Haensel	922	143	153	ls	S	60	6-10-48	16		Dr	DwE	4	D	
1721	J. T. Belmont	894		120	s & g	Q	80	4- 1-49	20	5	Dr	DwE	4	D,S	Well bailed for 2 hours.
1722	J. B. Roach	948	140	162	ls	S	40	8-18-49	20	15	Dr	DwE	4	D	Well bailed for 1 hour.
1723	Margaret Snyder	919	106	128	ls	S	55	2-21-50			Dr	DwE	4	D,S	
1724	John Brown	921	90	126	ls	S	55	2- 9-53	20	27	Dr		4	D	
1725	Joe Kessler	830	63	68	ls	S	12	8- -50			Dr		4	D	
1726	Wm. C. Murray	816	33	53	ls	D,S	16	7-26-52	25	9	Dr		4	D	
1727	Seymour McKinley	918		105	s & g	Q	48	8- 6-52			Dr		5	D	
1728	Earl Smith	805	30	60	ls	S	20	6-11-52	15		Dr		4	D	
1729	Jake Armentrout	875		72	g	Q			5		Dr	DwH	4	D	
1730	Allen McDowell	870	131	136	ls	S	84	2-16-48			Dr	DwH	4	D	
1731	Russell Wilkins	878	100	110	ls	S	50	4-15-53			Dr		4	D	
1732	E. W. Emmelhainz	884		216	s & g	Q	89	10- 6-53			Dr		4	D	
1733	R. Stiebes	883	118	125	ls	D	80	1951			Dr		4	D	

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed: Character of material	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date	Yield: Rate (g.p.m.)	Yield: Drawdown (feet)	Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
PLEASANT TOWNSHIP (continued)															
1734	J. P. Gantz	882	130	143	ls	D	85	1- -50	30	2	Dr	DwE	5	D	
1735	Cunningham Farm Mgt.	950	163	192	ls	S	80	2- 6-50	18		Dr	DwE	4	D	
1736	Martha G. Brewer	869	92	100	ls	D	75	1-20-50	10		Dr		4	D	
1737	Seymour McKinley	850	124	144	ls	S	92	11- -49	15		Dr	DwH	4	D,S	
1738	Sam Keil	835	53	95	ls	S	18	4-28-48	24		Dr	DwE	4	D	
1739	Erwin K. Priver	865	122	124	ls	S	53	5- 8-50	15		Dr	DwE	4	D	
1740	G. R. Wagner	820	38	51	ls	S	20	2-21-49			Dr	DwH	4	D	Analysis given in text.
1741	Gene Rogers	862	126	162	ls	S	82	11-22-48			Dr		4	D	
1742	A. Runkle	857		108	s & g	Q					Dr		4	D	
1743	J. Haimerl	870	103	109	ls	D	79	1- 2-53			Dr		4	D	
1744	Ray George	878	132	142	ls	D	84	8- 4-49	10		Dr	DwE	4	D	
1745	Leslie Temple	878	115	115	ls	D	50	6- -46	5		Dr	DwE	4	D	
1746	Dan Hessler	875		101	g	Q	65	5- 8-48	20		Dr	DwE	4	D	
1747	Sadie's	862	117	123	ls	D	83	12- 1-53	20		Dr		4	D	
1748	O. C. Belt	865		145	g	Q					Dr			D	
1749	Bill Whitling	863		97	g	Q	83	9- -51	8		Dr		4	D	
1750	Mike English	863	136	175	ls	D,S	85	8- 2-50			Dr		4	D	
1751	Brant	835	62	75	ls	D,S	55	10- -49			Dr		5	D	
1752	Jap Ritter	805	82	103	ls	S	19	5-13-48	20		Dr	DwE	4	D	
1753	Jim Semore	862	100	108	ls	D	15	7- -50			Dr		5	D	
JACKSON TOWNSHIP															
1801	Wm. M. McDonald	864	105	113	ls	D	71	6-13-53			Dr		4	D	
1802	Ollie Bettinger	890		122	g	Q	63	6- 7-50	20		Dr	DwE	4	D	
1803	A. J. Trapp	886	117	121	ls	D	70	10-20-48	4	20	Dr	DwE	4	D	Well bailed for 4 hours.
1804	Earl Weinhart	869	135	141	ls	D	70	10-26-48	16		Dr	DwE	4	D	
1805	Maurice Fancher	835	83	88	ls	D	46	7-14-48	12		Dr	DwH	5	D	
1806	McClure	815	125	160	ls	D		8- -41			Dr			D	
1807	Frances Price	803	156	159	ls	S	85	10-15-47			Dr		4	D	
1808	Elmer Brucklemyer	810	187	192	ls	S	40	11-24-48			Dr	DwE	4	D	
1809	V. A. Barbee	818	167	205	ls	S	85	3-16-54	15		Dr		4	D	
1810	E. G. Molt & Son	780	128	137	ls	D?S?	68	9-12-48	6	5	Dr	DwE	5	D	Well bailed for 3 hours.
1811	R. E. Carruthers	790		102	s	Q	40	3- -50			Dr		4	D	
1812	C. R. Underwood	752		31	g	Q	6	11- 7-47	4		Dr	SwE	5	D	
1813	R. Ferral	760		93	s & g	Q	53	2-12-52			Dr		5	D	
1814	K. Bowers	755		39	g	Q	15	5-10-49			Dr	DwE	4	D	
1815	Lewis Greenwalt	745		107	g	Q	50	9- -49	10		Dr	DwH	5	D	
1816	Russell Wilson	743		77	g	Q	28	6-11-48	4	12	Dr	DwH	5	D	
1817	J. A. Cline	747	84	92	ls	D	45	6- 1-53	15	10	Dr		5	D	Well bailed for 1 hour.
1818	Ed. Thompson	875	155	180	ls	D	80	1940			Dr	DwE	5	D,S	
1819	Charles S. Main	856	173	175	ls	D	30	4-15-48			Dr	DwE	5	D	
1820	J. W. Johnson	840		131	s	Q	67	9- 1-48			Dr	DwE	4	D	
1821	J. Finch	838		83	s & g	Q	50	10- -49			Dr	DwH	4	D	
1822	H. W. Ballow	823	140	146	ls	D	51	6-18-52			Dr		4	D	
1823	H. D. Morgan	832		168	s & g	Q	98	11- -50			Dr		5	D	
1824	Raymond Graul	878	171	208	ls	D,S	88	11-20-53	8	8	Dr		4	D	Well bailed for 2 hours.
1826	G. Haimerl	866	141	143	ls	D	120	6- 4-49	4		Dr	DwE	4	D	
1827	Rush Thomas	877	164	215	ls	D,S	100	9- -52	10		Dr		4	D	
1828	Melvin P. Girbert	870	150	160	ls	D	100	11- 9-53	15	4	Dr		4	D	Well bailed for 2 hours.
1829	Orley Kelly	872		120	g	Q	100	6-12-49	10	3	Dr	DwE	4	D	Well bailed for 3 hours.
1830	Fred Rosenaur	864	174	205	ls	D,S	120	8- -52	15		Dr		4	D	
1831	Charles Fletcher	858	150	161	ls	D	105	4-15-48	5		Dr	DwH	4	D	
1832	Harold Spindler	862		161	g	Q	110	3- 9-48	12		Dr	DwE	4	D	
1833	Village of Grove City	853	163	472	ls	D,S	140	10-24-54	500		Dr	DwE	5	P	Analysis given in text.
1834	Otto Priver	818		162	g	Q	m	1- 8-50			Dr	DwE	4	O	Water-level recorder installed August 1949 (see text Fr-1a). (m79.6)
1835	Fuhrman	812		147	s & g	Q	80	1951			Dr		5	D	
1836	Harry D. Redding	785	133	135	ls	D	50	8-15-52	10	50	Dr		5	D	Well bailed for 1 hours. Capacity 6 gpm.
1837	Seth Huntley	782		53	g	Q	47	3- 6-48			Dr	DwE	4	D	
1838	Jacob Rings	770	157	163	ls	D,S	80	9- 2-53	15		Dr		4	D	
1839	Herman Willing	775	160	165	ls	S	70	11- 1-48			Dr	DwE	4	D,S	
1840	Peters	743		101	g	Q	52	9- 3-46	4	3	Dr	DwH	5	D	
1841	Jack Miller	720		47	s & g	Q	12	8- 7-49	5		Dr	SwE	4	D	
1843	Earl F. Angenstus	866		127	s & g	Q	60	10- 2-53	15	20	Dr		5	D	Well bailed for 2 hours.
1844	E. Glassburn	863		120	s & g	Q	94	4-10-53			Dr		4	D	
1845	Carl Schuler	864		105	s & g	Q	55	6- -45	7		Dr	DwE	4	D	
1846	Jack Osburn	862	140	160	ls	D	110	7- -45	7		Dr	DwE	4	D	
1847	Chester McNarray	858	172	172	ls	D					Dr		4	D	
1848	Thomas Dean	838		165	s & g	Q	90	7- 3-48	5	17	Dr	DwH	5	D	
1849	C. Seymour	830		166	g	Q	100	11-12-48	4	10	Dr	DwE	4	D	Well bailed for 3 hours.
1850	Charles Wright	825		164	g	Q	83	11-15-48	20		Dr	DwE	4	D	
1851	Marshall Bros.	808		62	g	Q	40	6-19-49	10	3	Dr	DwE	4	D	Well bailed for 2 hours.
1852	Guy Reed	770		121	g	Q	81	1950	10		Dr		4	D	
1853	Walter Eberhard	755		76	g	Q	25	10- 7-50	25	15	Dr	DwE	5	D	
1854	E. Willing	752	110	167	ls	D,S	60	12-27-48			Dr	DwH	4	D	
1855	Walter Willing	748	132	240	ls	D,S	48	2- 9-52	15	22	Dr		4	D	Well bailed for 2 hours.
1856	J. L. Carruthers	722		44	g	Q	12	4- -50			Dr		4	D	
1857	H. Morgan	700		41	g	Q	12	3-20-50			Dr		4	D	
1858	A. R. Johnson	808		55	s	Q	15	5-23-48			Dr	DwH	5	D	
1859	James O'Conner	808		71	s	Q	25	3- -50			Dr		4	D	
1860	Josephine Macarina	779		147	g	Q	55	1-28-54	10		Dr		4	D	
1861	William Maier	771		71	s	Q	35	5-21-48			Dr	DwE	4	D	
1862	David Davies Co.	760	102	105	ls	D	45	4-12-48			Dr	DwE	6	D	
1863	A. R. Johnson	739		57	un	Q	40	6-22-53	10		Dr		6	D	
1864	George Barbee	851	150	153	ls	D	65	4-30-53			Dr		4	D	
1865	Martin Miller	814		38	g	Q	10	7- 2-49			Dr	DwE	4	D,S	
1866	Jones	812		172	s & g	Q					Dr		5	D	
1867	Summers	745		97	g	Q	45	3- -50			Dr		4	S	Well plugged back to 88 feet.

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed: Character of material	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date	Yield: Rate (g.p.m.)	Yield: Drawdown (feet)	Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
	JACKSON TOWNSHIP (continued)														
1868	Ray Bunn	724	104	114	ls	D	30	3- -50			Dr	DwH	4	D	
1869	Elizabeth Harper	802		170	g	Q	30	9- -48	20		Dr	DwE	4	S	
1870	George Grubb	788		60	s & g	Q	55	11-28-49			Dr	DwH	4	D,S	
1871	Dwight Borrer	720		105	g	Q	27	3-17-54	15		Dr		4	D	
1872	John Mordock	749		84	s & g	Q	52	8-31-55		5	Dr		4	D	
1873	Raymond Linsley	744		110	s	Q	35	11-17-55	30		Dr		5	D	Well bailed for 4 hours.
1874	Village of Grove City	853	163	295	ls	D,S	102	7-25-52	200		Dr		10	P	Analysis given in text.
	HAMILTON TOWNSHIP														
1901	T. W. Tolley	710		99	s & g	Q	83	4-10-48			Dr	DwE	4	D	
1902	Alva Daily	715		47	s & g	Q	17	6- -50	5	3	Dr		4	D	Well bailed for 3 hours.
1903	Wendell P. Meteer	718		43	g	Q	18	6-19-48	5	5	Dr	DwE	4	D	Well bailed for 2 hours.
1904	Howard T. Smith	722		56	g	Q	8	6- 6-49	5		Dr	DwH	4	D	
1905	Frank Fisher	741		65	s & g	Q	37	2-21-49	6		Dr	DwE	4	D	
1906	Stouder	741		69	s & g	Q	20	3- 3-48	3	5	Dr	DwE	4	D	
1907	Jones	742		42	g	Q	27	6- -48	3	4	Dr	DwH	4	D	Well bailed for 2 hours.
1908	Jonathan Orr	745		62	s & g	Q	30	12-17-47	5		Dr	DwH	4	D	
1909	William Trott	750		61	g	Q	35	10-20-49	7	5	Dr	DwE	4	D	Well bailed for 3 hours.
1910	C. P. Ankrum	746		50	g	Q	12	8- -49	3		Dr	DwE	4	D	
1911	John Hedrich	745		52	s & g	Q	33	5-12-49			Dr	DwE	4	D	
1912	H. E. Hunter	750		64	s & g	Q					Dr		4	D	
1913	Shaw	750		52	s & g	Q	12	10- -49	6		Dr	DwE	4	D	
1914	R. Erb	750		70	s & g	Q	30	1948			Dr	DwE	6	D	
1915	Wm. McAbee	752		96	g	Q	35	3- 3-52			Dr		4	D	
1916	Cols. Motor Speedway	758		62	g	Q	40	8-23-52	11		Dr		6	D	
1917	John Hubbard	754		51	g	Q	41	4-12-50	10	3	Dr		4	D	Well bailed for 2 hours.
1918	J. Morgan	750		48	s & g	Q	20	1949			Dr	DwE	4	D	
1919	Hartman Farms	740	96	131	s & g	Q	55	7- -37			Dr	TE	8	I	Well #2.
1920	Hartman Farms	730	114	130	s & g	Q	60	6- -37			Dr		8	A	Supply not sufficient for demand.
1921	Debus	730		44	s & g	Q	29	3-24-49	12		Dr	DwE	4	D	
1922	Robert Obert	725		41	g	Q	26	5-12-50	4	3	Dr		4	D	Well bailed for 2 hours.
1923	Hamilton Twp. School	740	101	90	s & g	Q	m	10- 2-50	75	6	Dr	DwE	10	P	(m31.3)
1924	Fishburn	744		97	g	Q	45	8- 7-50	10	10	Dr		4	D	Well bailed for 2 hours.
1925	John Ranike	740		64	g	Q	30	4- -48			Dr		5	D	
1926	Anderson	742		63	g	Q	31	12-23-47	4	4	Dr	DwE	5	D	
1927	Potts	742		70	g	Q	32	3- -48	5	3	Dr	DwE	4	D	Well bailed for 2 hours.
1928	Bill Easterday	741		118	g	Q	34	1954	10		Dr		4	D	
1929	Gilbert Egbert	742		60	s & g	Q	29	4-21-49	7		Dr	DwE	4	D	
1930	C. W. Kilbourne	740		115	s & g	Q	85	4- 5-48	6		Dr	DwE	4	D	
1931	Ed. Derby	730		57	g	Q	31	9-24-48			Dr	DwH	4	S	
1932	Ed. Derby	720		56	g	Q	30	9-14-48			Dr	DwH	4	D	
1933	City of Columbus	712		78	g	Q		4-30-46			Dr		7	A	Test well.
1934	State of Ohio	720		38	g	Q	19	12- 9-46			Dr		6	O	Water-level recorder installed April, 1946 (see text FR-4).
1935	State of Ohio	720		43	g	Q	21	12-13-46			Dr		6	O	(see text FR-5).
1936	State of Ohio	741		45	g	Q	23	12-15-46			Dr		6	O	(see text FR-6).
1937	City of Columbus	715		56	s & g	Q		4- 9-46	290		Dr		12	O	(see text FR-3).
1938	Compton	700		34	g	Q	10	7- 6-48			Dr	SwE	4	D	
1939	T. M. Sheddy	700		70	g	Q	35	10-10-48			Dr	DwH	4	D	
1941	St. Joseph Cemetery	690		86	s & g	Q	10	1-17-51			Dr		5		
1942	St. Joseph Cemetery	715		42	g	Q	15	11- -49	20		Dr		5	P	
1943	Grant Harden	744		51	s & g	Q	36	4-26-54	5		Dr		4	D	
1944	W. Weik	730		60	g	Q	30	10- 6-48			Dr	DwE	4	D	
1945	Frank Peters	735		94	g	Q	38	5- 1-54	9	2	Dr		5	D	
1947	Henry Glassner	742		58	g	Q	29	9- 6-49			Dr	DwH	4	D	
1948	W. E. Anderson & Sons	745		169	s & g	Q	45	8-22-51			Dr		6	I	
1949	United States Government	752		201	g	Q	35	4-28-49	350	24	Dr	TE	12	P	
1950	United States Government	752	196	196	g	Q	33	5-27-42	350	25	Dr	TE	12	P	Analysis given in text.
1951	United States Government	748	208	209	g	Q	41	2-29-42			Dr		6	A	Test well #1.
1952	United States Government	748	210	211	g	Q	52	10-30-52			Dr		12	P	
1953	Jacob Caldwell	675		44	g	Q		12-20-48	10		Dr	DwG	6	S	
1954	Jacob Caldwell	685		50	g	Q	30	12- 5-48	10		Dr	DwH	6	D	Analysis given in text.
1955	MacMillan	710		30	g	Q	20	4- 5-50	4	2	Dr		4	D	Well bailed for 2 hours.
1956	Sam Forshey	720		55	s & g	Q	41	7- 1-49	6		Dr	DwE	4	D	
	MADISON TOWNSHIP														
2001	A. H. Munk	758		36	g	Q	18	1950			Dr	DwH	6	D	
2002	Stokes	757		40	g	Q	19	1-25-52	5	2	Dr		5	D	
2003	John Moillen	733		50	s & g	Q	8	2-11-54			Dr		5	D	
2004	Binns	731		37	s & g	Q	35	4-23-48			Dr	DwH	4	D	
2005	Barrett	762		27	g	Q	14	2- 8-49			Dr	DwH	4	D	
2006	Ralph Miller	756		75	g	Q	25	5-11-50	7	15	Dr		4	D	Well bailed for 2 hours.
2007	Eliha Coleman	735		55	g	Q	10	1-12-48			Dr		5	D	
2008	Dorsey	740		25	g	Q	11	8- 6-48	30	3	Dr	DwE	5	D	
2009	Needles	750		40	s & g	Q	20	5-10-50			Dr		4	D,S	
2010	Ray Roberts	748		55	s & g	Q					Dr		6	D	
2011	Tullie King	785		38	g	Q	14	4-21-49	12		Dr		4	D	
2012	Edward Hempy	790		38	g	Q	18	4-20-49	20	5	Dr		4	D,S	
2013	Central Ohio Paper Co.	784		55	g	Q	12	7- 7-52	6	3	Dr		4	D	
2014	Albert Howes	762		50	g	Q	43	1-10-40	3	3	Dr		4	D	
2015	Columbus & Southern Ohio Electric Co.	740	124	100	s & g	Q	22	7-30-31	1140	59	Dr	TE	26	I	Well nearby, test well #1, encountered shale at 124 feet.
2016	State of Ohio	732		33	s & g	Q	8	10-22-47	10	2	Dr		6	P	
2017	Heath	751		22	g	Q	12	10-22-49	3	3	Dr		6	D,S	Well bailed for 6 hours.
2018	Homer Bachman	756		97	s & g	Q	25	1-28-54	10		Dr		5	D	
2019	Laura Graves	769		84	s & g	Q	20	7- 3-48	5	5	Dr	DwE	4	D	Well bailed for 2 hours.

Table 14. RECORDS OF WELLS IN FRANKLIN COUNTY, OHIO (continued)

Well number	Owner or Name	Elevation at well (feet above sea level)	Depth to bedrock (feet)	Depth of well (feet)	Principal water-bearing bed		Water level		Yield		Type of well	Type of pump	Diameter of well (inches)	Use	Remarks
					Character of material	Geologic horizon	Below land surface (feet)	Date	Rate (g.p.m.)	Drawdown (feet)					
MADISON TOWNSHIP (continued)															
2020	Frank Schrim	769		24	s & g	Q	16	10-24-49	4	1	Dr		4	D,S	
2021	Essmeen	742		52	s & g	Q	32	3- 8-54	30		Dr		5	D	
2022	Columbus & Southern Ohio Electric Co.	741		38	un	Q					Dr			A	Test well.
2023	C. W. Koebel	743		88	s & g	Q	50	1-11-54	4		Dr		4	D	
2024	William Harter	741		90	g	Q	16	6-13-54			Dr		4	D	
2025	Vincent Kisner	748		48	s & g	Q	14	6- -50			Dr		5	D	
2026	Rovert Quick, Sr.	765		110	s & g	Q	45	10-24-48	12		Dr	DwH	5	D	
2027	Victor Vargo	741		51	s & g	Q	35	9-27-48			Dr		4	D	
2028	W. E. Spresser	760		92	s & g	Q					Dr		5	D	
2029	Mauger Construction Co.	755		86	s & g	Q	29	1949			Dr	DwE	6	A	Capacity - 30 gpm.
2030	Meade	732		36	g	Q		12- 1-47	7	5	Dr	DwH	4	D	
2031	John Nagy	731		22	g	Q	7	5- 5-50	4	3	Dr		4	D,S	Well bailed for 2 hours.
2032		729		90	s & g	Q	15	5-17-48	7	12	Dr		4	D,S	Well bailed for 4 hours.
2033	Ralph Miller	735		56	g	Q	15	4-19-49	20	10	Dr		4	D	
2035	Ralph Miller	740		52	s & g	Q		6-28-46	15	5	Dr	DwE	6	D	
2036	Palmer	740		46	s & g	Q	10	7-11-49			Dr		5	D,S	
2037	City Ice & Fuel Co.	741		71	s & g	Q	9	3- 7-49			Dr	DwE	6	I	
2038	Raver	731		75	g	Q	10	7-11-49	20		Dr		4	D	
2039	Dave Seebolt	731		55	s & g	Q		1948	8	5	Dr		4	D	
2040	Talmadge Johnson	742		78	s & g	Q	20	6- 1-49			Dr		5	D	
2041	Thurman Wahlenmaier	748		25	g	Q	8	7- 4-49	20	3	Dr		4	D	
2042	Phyllis Gernovich	762		31	g	Q	6	7- 2-48	5		Dr		4	D	
2043	Frank Schilon	765		50	s & g	Q	14	6- 8-48	3	3	Dr		4	D	
2044	Harold Taylor	765		53	g	Q	8	12- 6-47	10		Dr	DwE	4	D	
2045	Carl Beatty	772		26	g	Q	14	10-18-49	4		Dr		4	D,S	
2046	John Roser	735		47	s	Q	30	6-29-49			Dr	DwH	4	D	
2047	Peter Ponder	735		59	s	Q	52	8-10-48			Dr	DwH	4	D,S	
2048	Harry Smith	733		44	g	Q	33	7-11-47	6		Dr	DwE	4	D,S	
2049	N. G. Archer	732	191	208	sh	D	8	9-26-52			Dr		6	A	Test well.
2050	Walter Miller	730		57	g	Q	10	7-29-48	7	3	Dr	DwH	4	D,S	
2051	Groveport Country Club	732		69	s	Q	20	8- -49	4	3	Dr	DwH	4	P	
2052	Travis	750		29	s & g	Q	23	12- 7-49	4		Dr		4	D	
2053	Melvin Northstine	752		32	g	Q	18	7-10-48	5	3	Dr		4	S	
2054	Dean Garber	740		95	g	Q	20	10-13-47	11	10	Dr	DwE	4	D	
2055	Clyde Herron	752		118	g	Q	9	5-17-49	20	10	Dr		4	D	
2056	Thrush	750		33	g	Q	8	8-18-48	5	5	Dr		4	D	
2059	J. Fred Schmidt	732		62	g	Q	40	7-16-38			Dr	DwE	5	S	
2060	J. Fred Schmidt	730		66	g	Q	40	7-16-38			Dr	DwE	5	S	
2061	Hopewell M. E. Church	725		72	s	Q	1	8-20-48			Dr		4	P	Well flows throughout the year.
2062	Lee S. Roach	738		22	g	Q	14	8-12-50	3	2	Dr	DwE	4	D	Analysis given in text.
2063	A. McCollister	752		39	g	Q					Dr		5	D	
2064	John McCollister	748		40	g	Q					Dr		5	D	

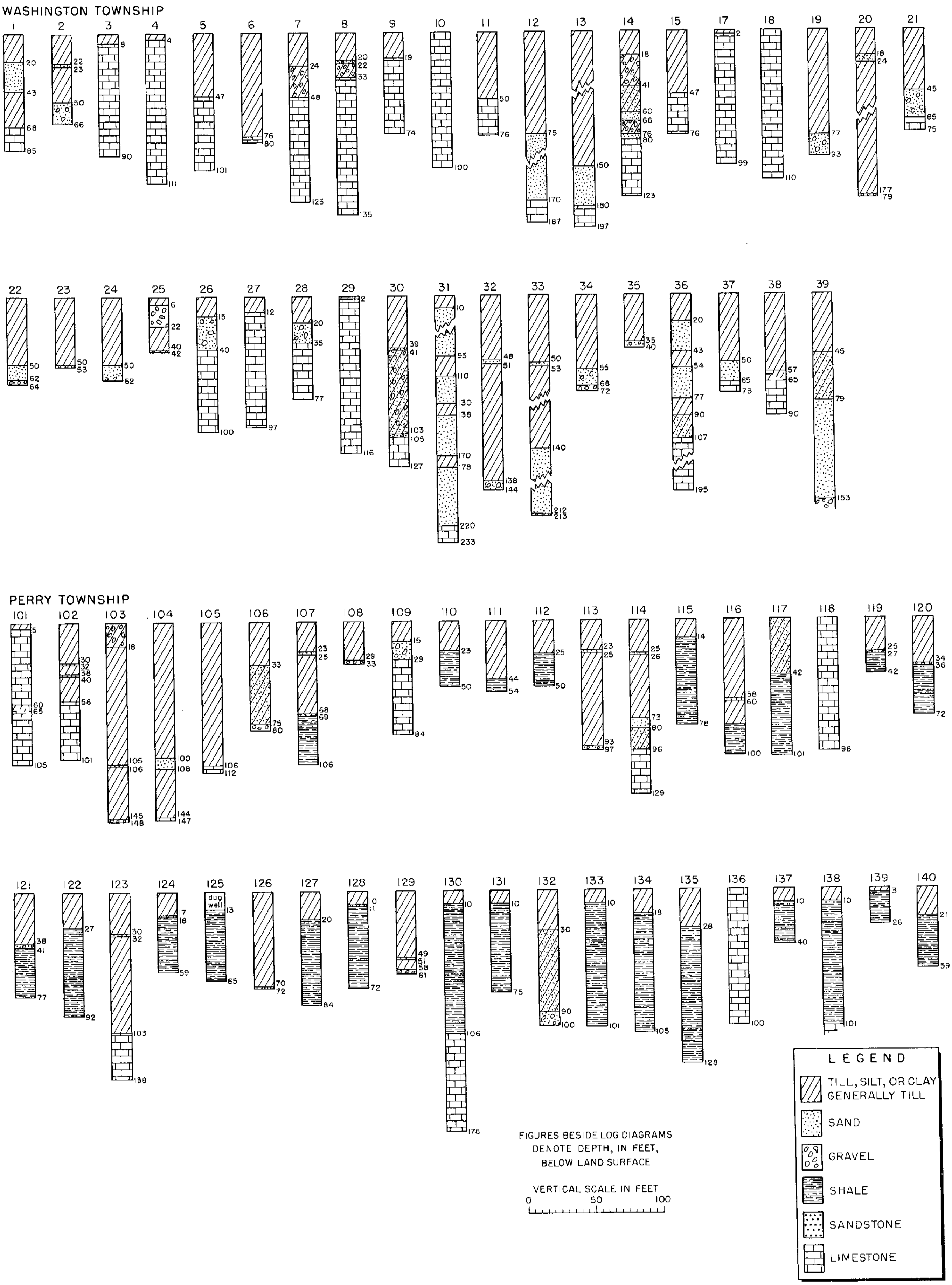


Figure 14-A. Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

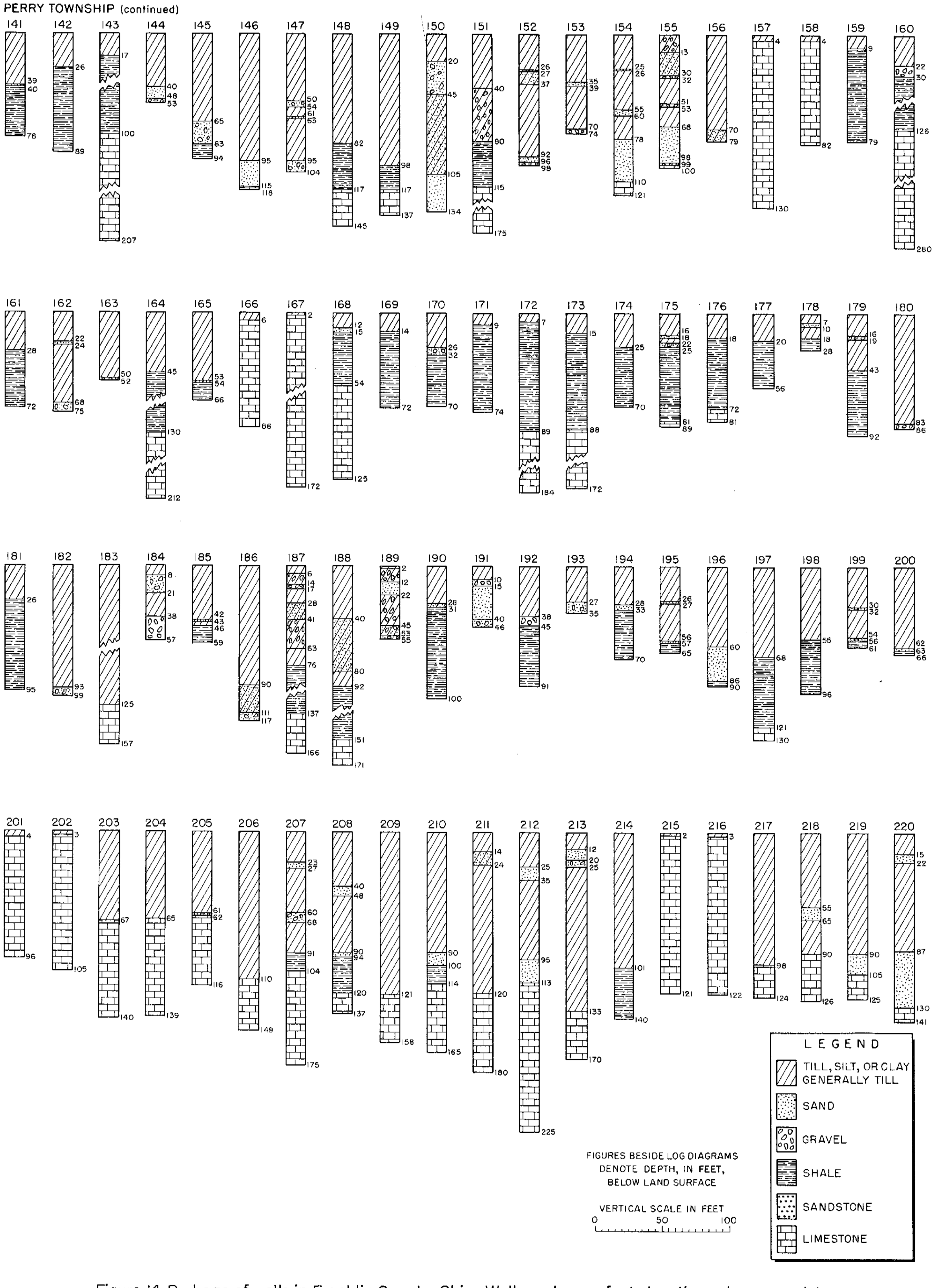


Figure 14-B. Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

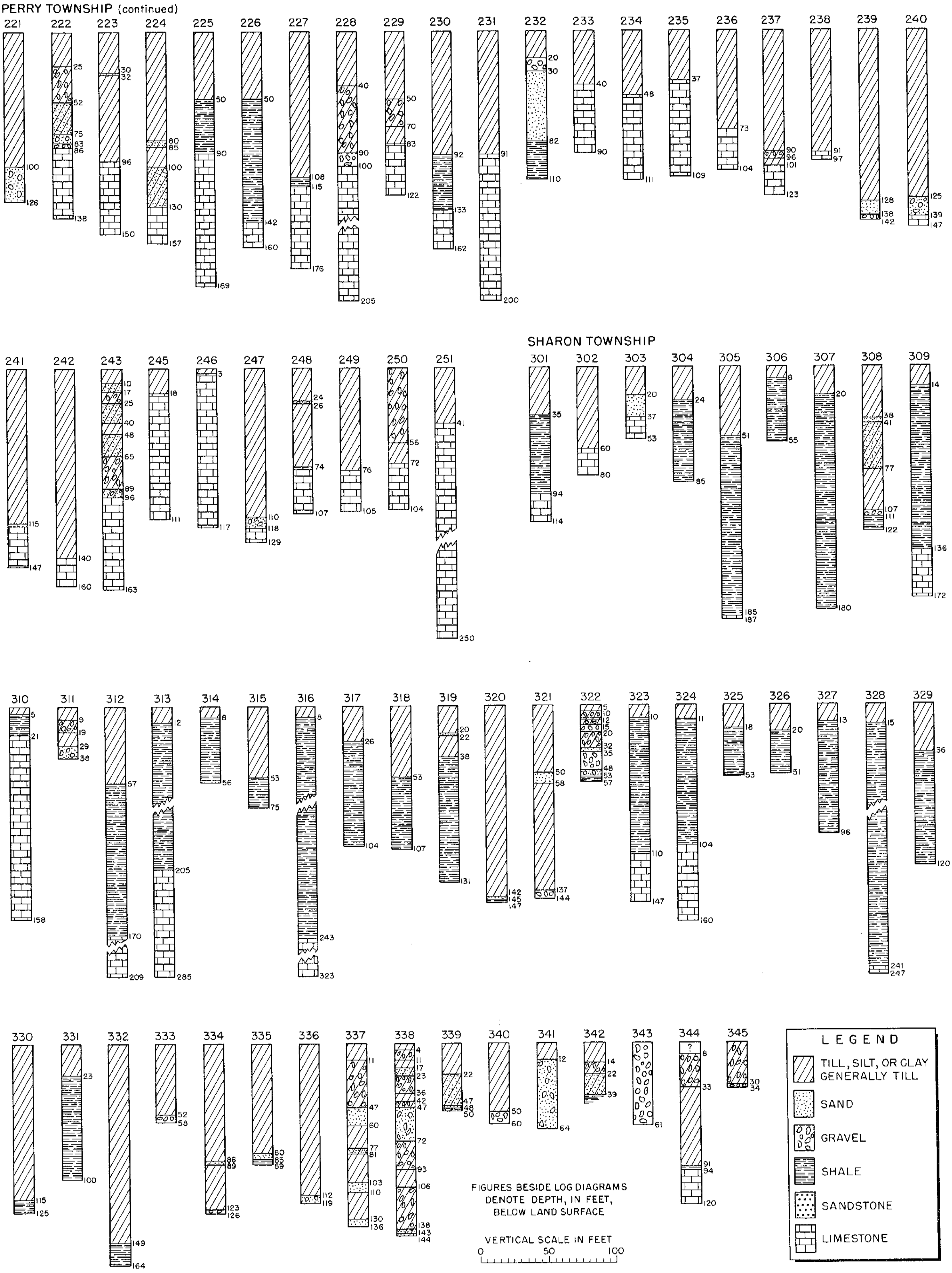


Figure 14-C Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

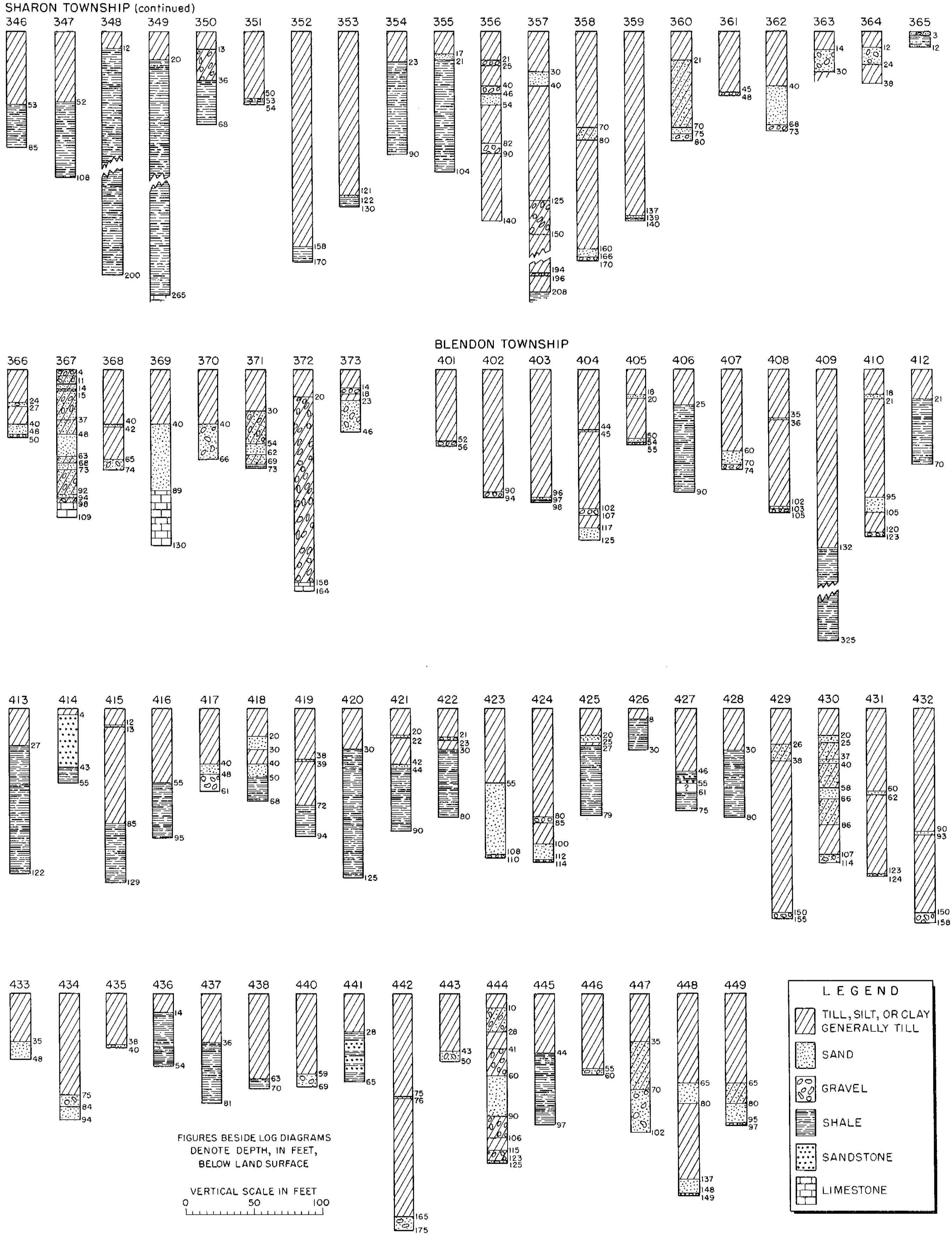


Figure 14-D Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

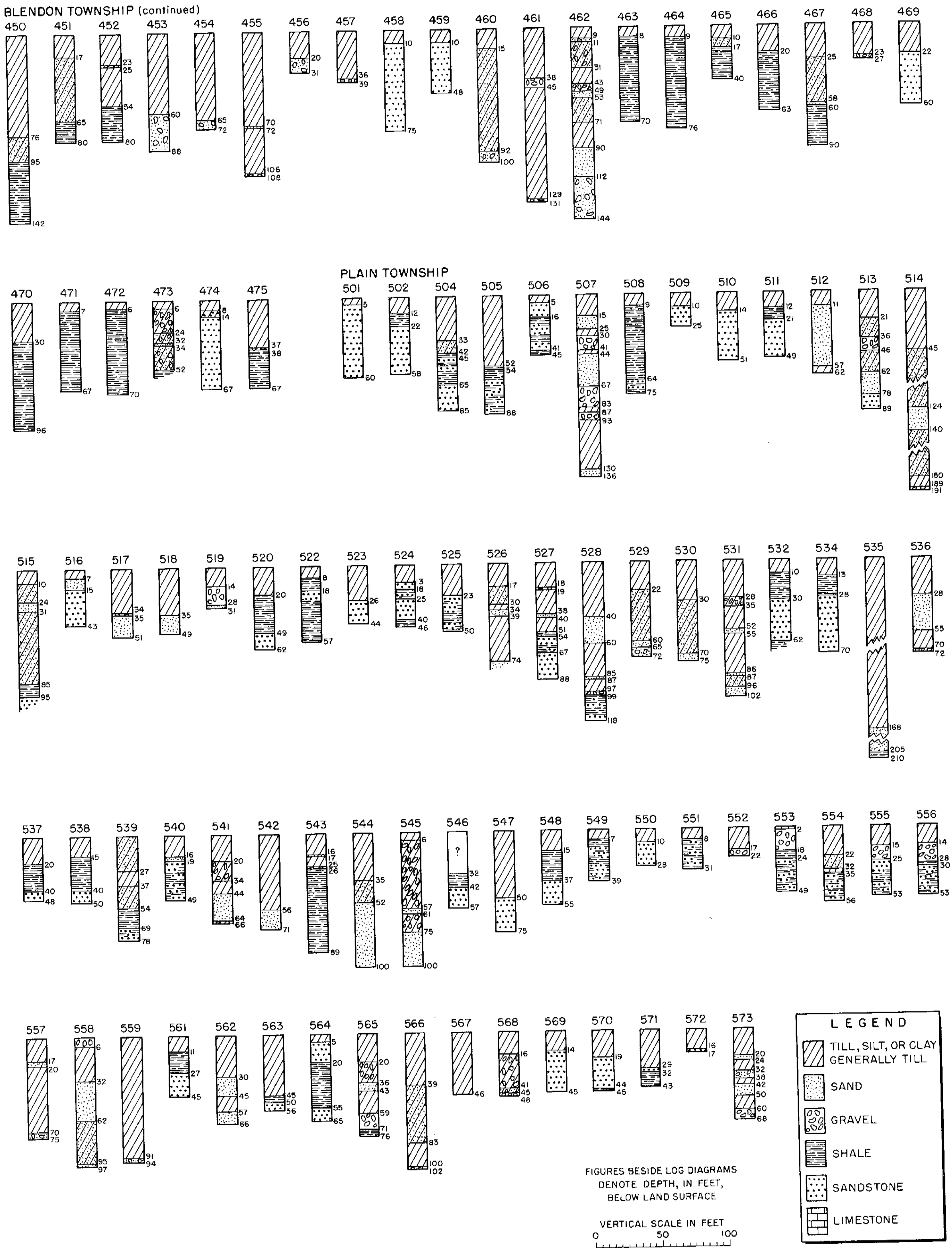


Figure 14-E Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

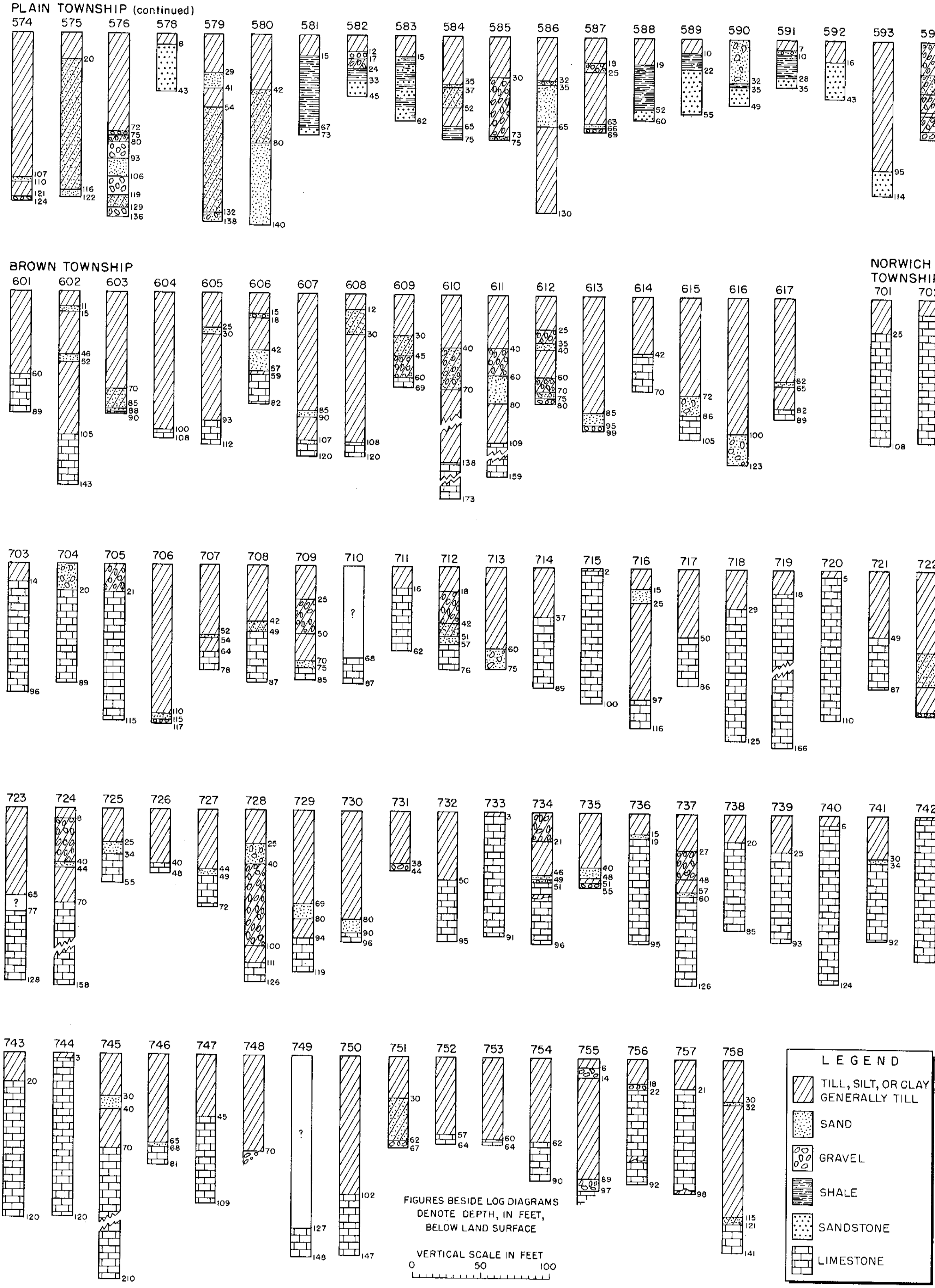


Figure 14-F Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

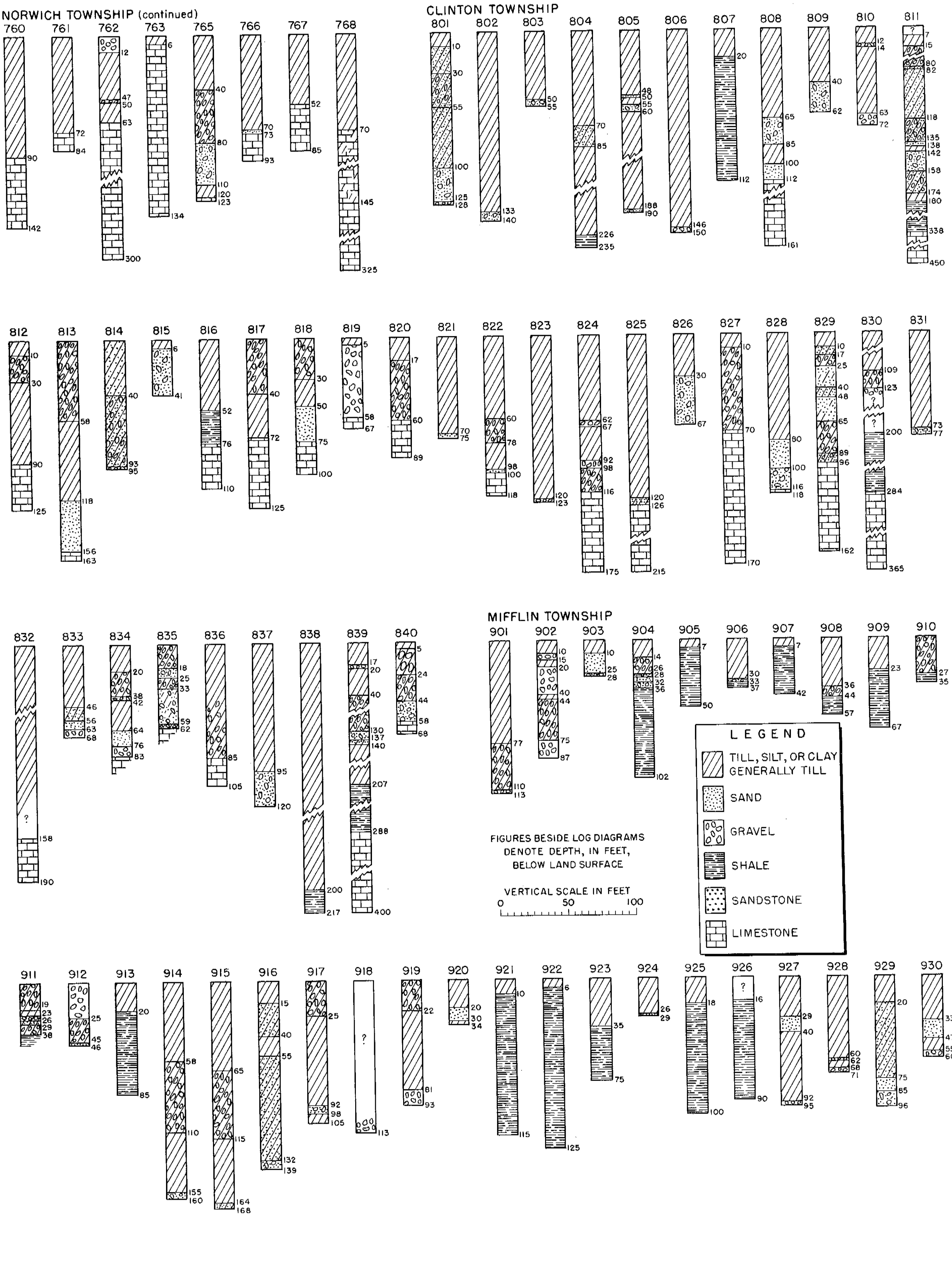


Figure 14-G Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

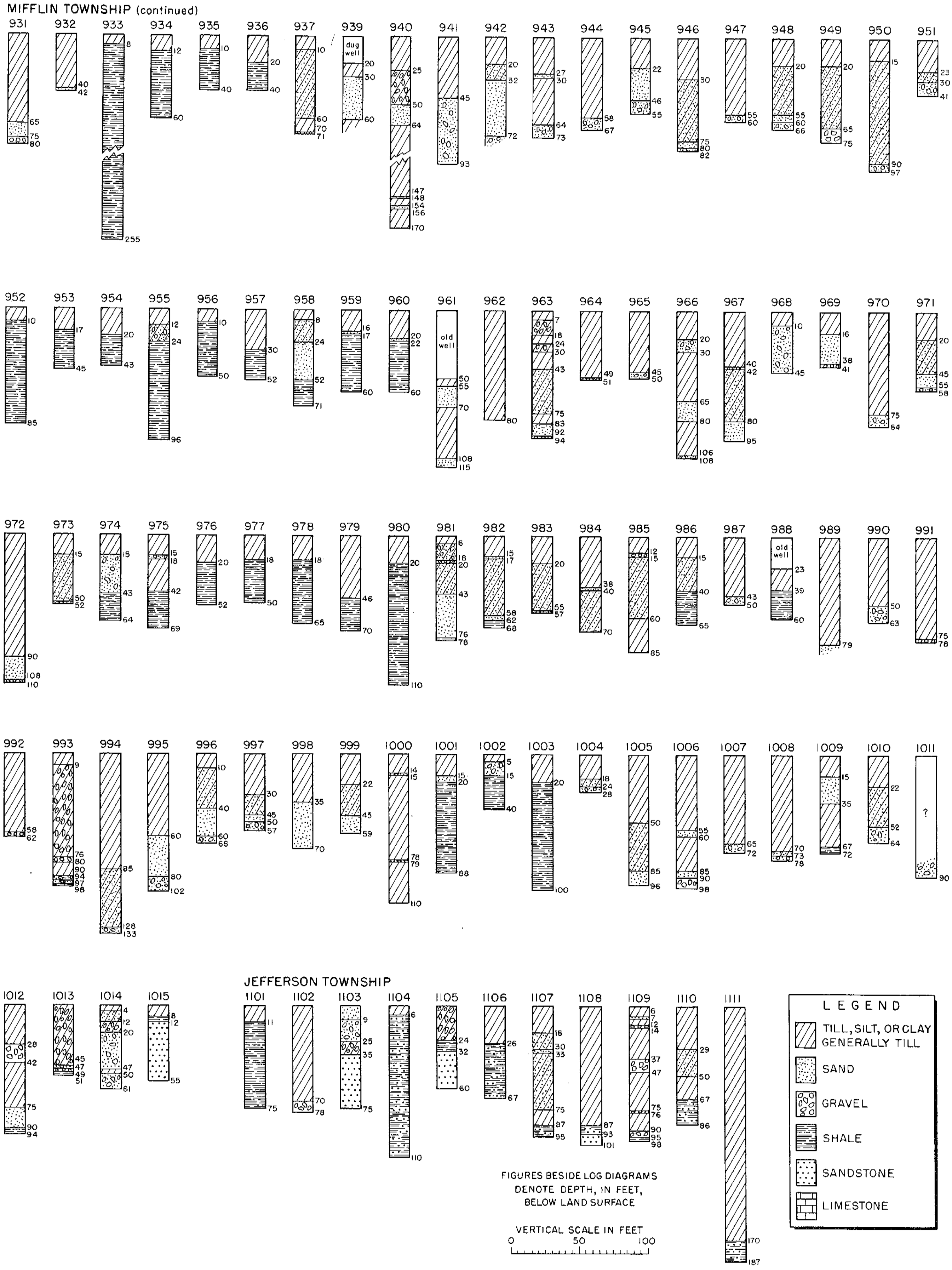


Figure 14-H Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

JEFFERSON TOWNSHIP (continued)

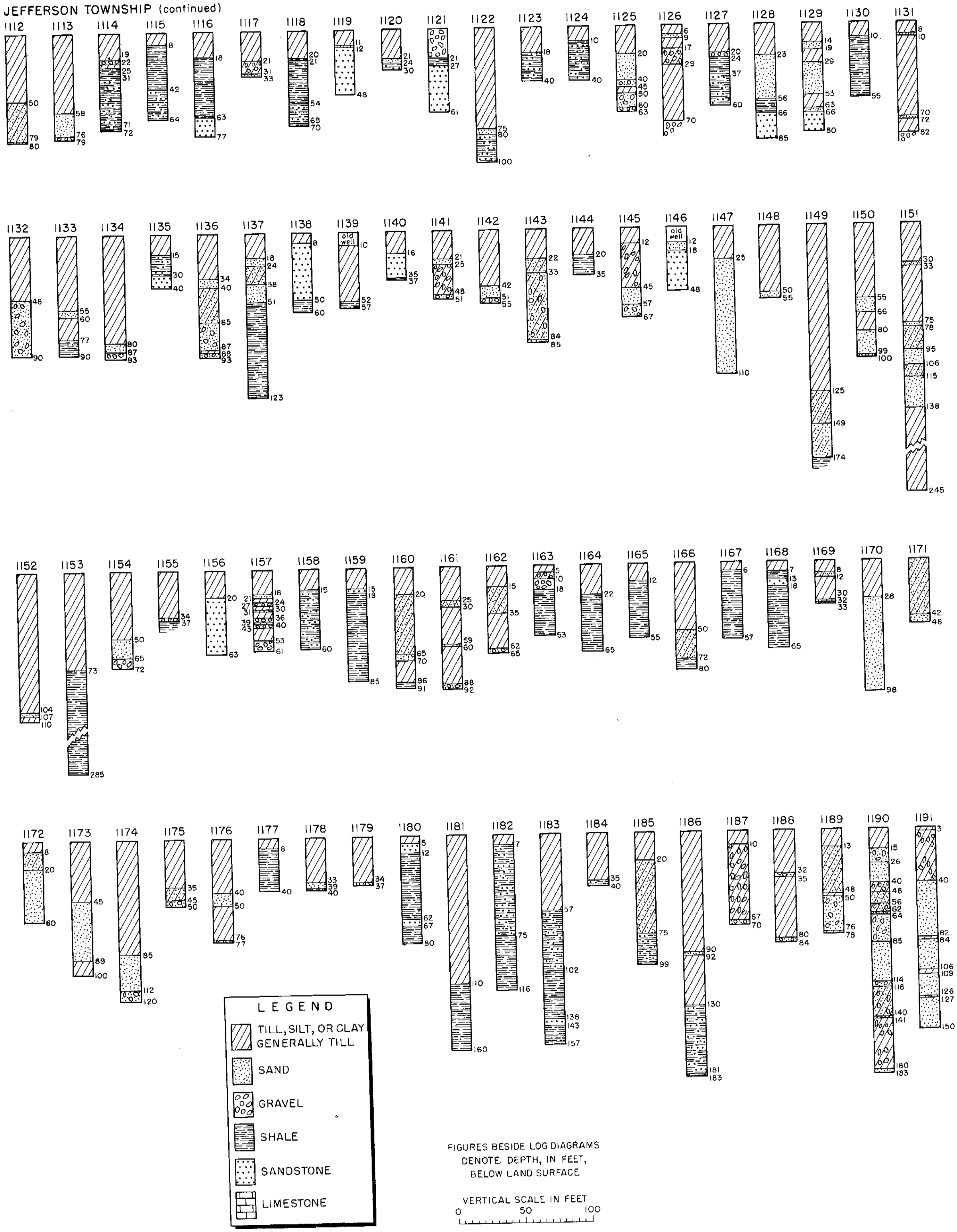


Figure 14-1 Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

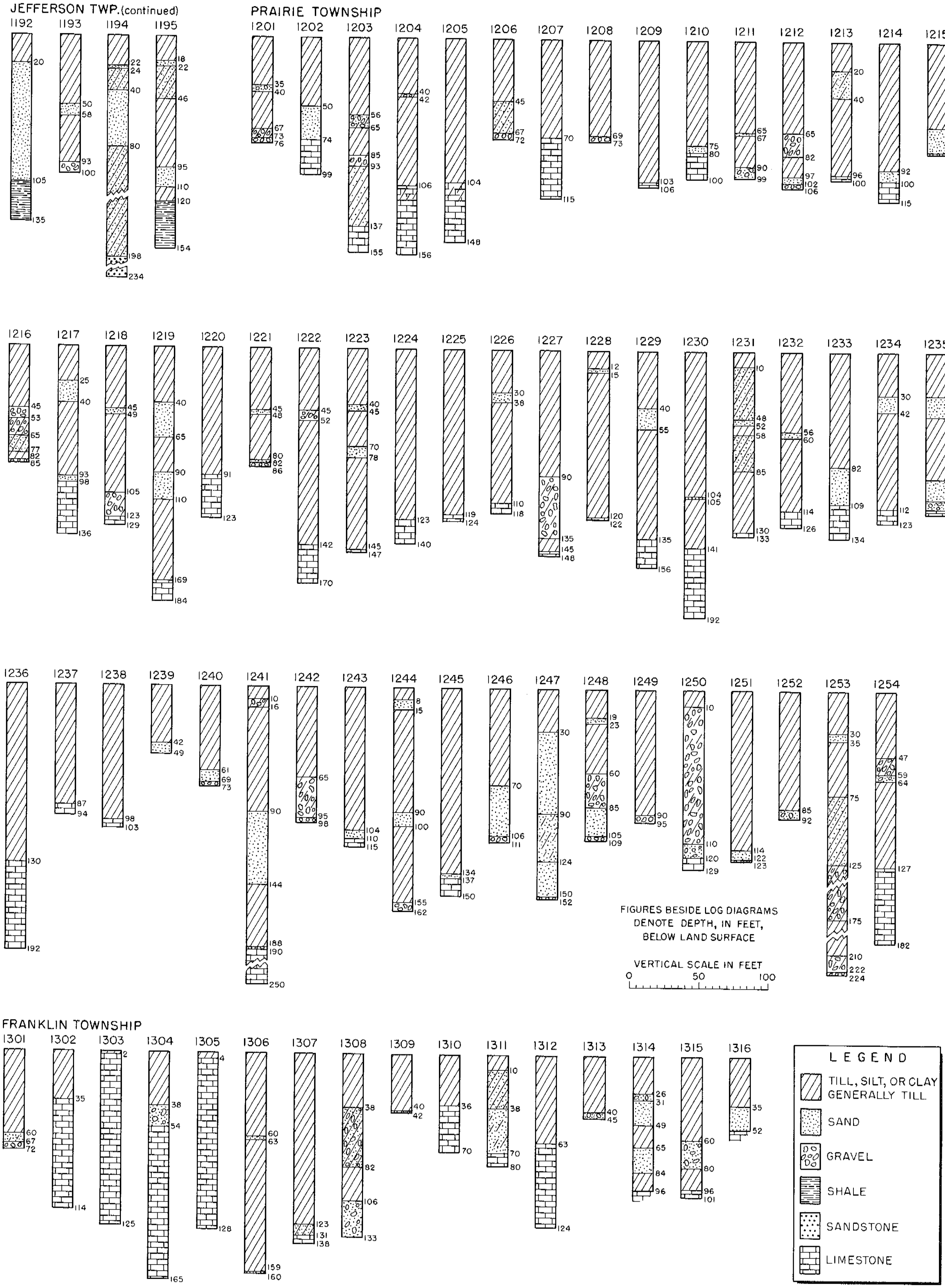


Figure 14-J Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

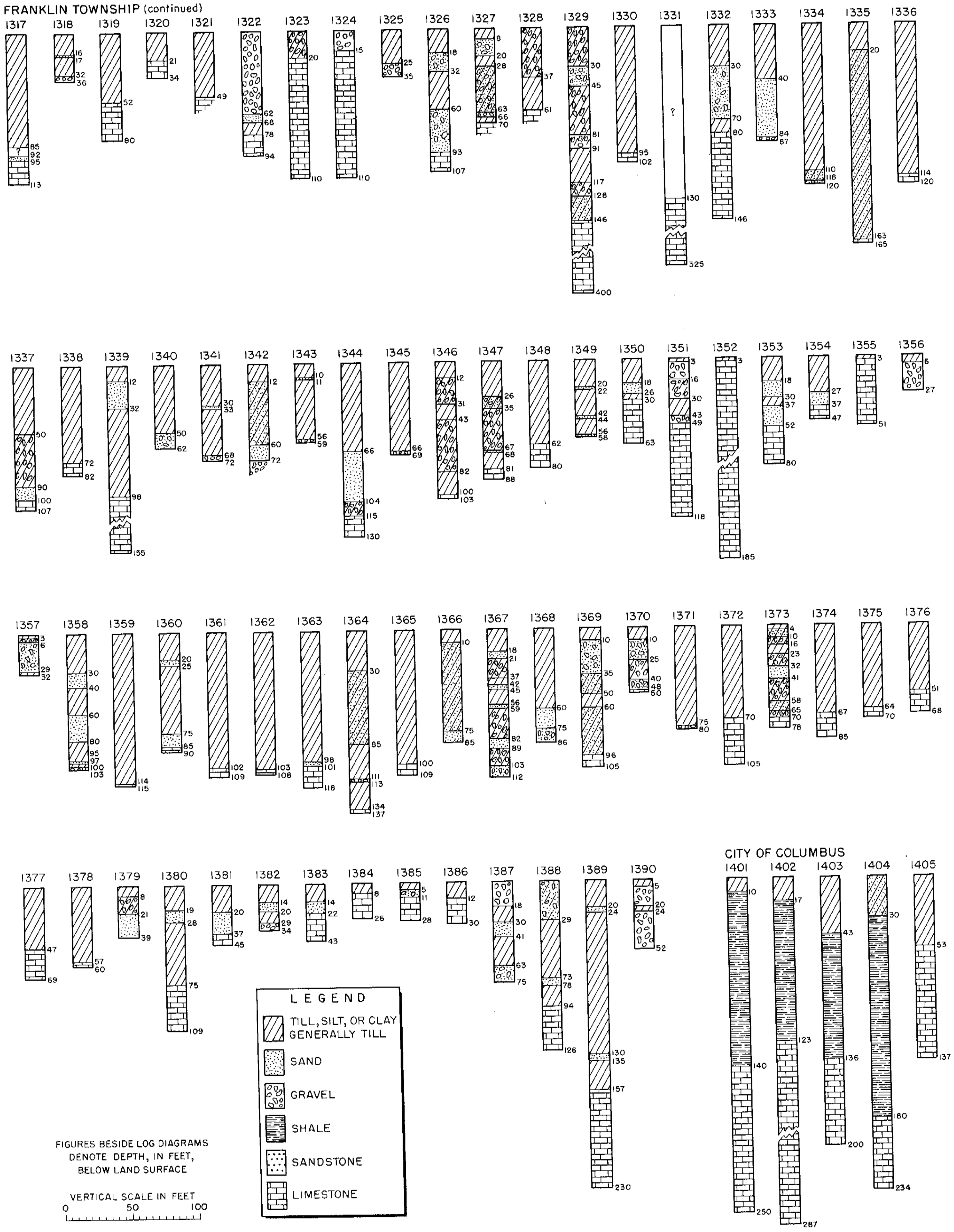


Figure 14-K Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

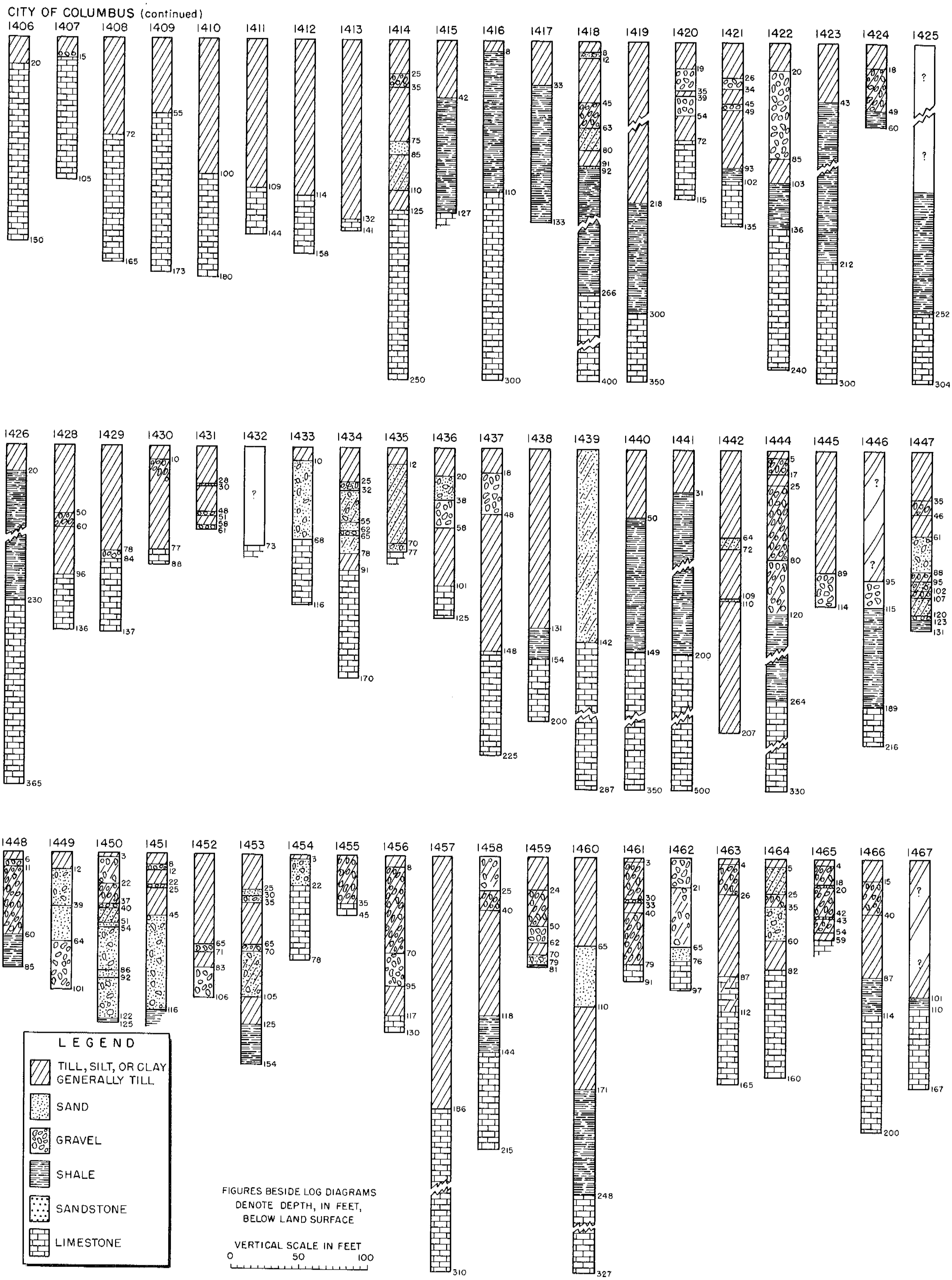


Figure 14-L Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

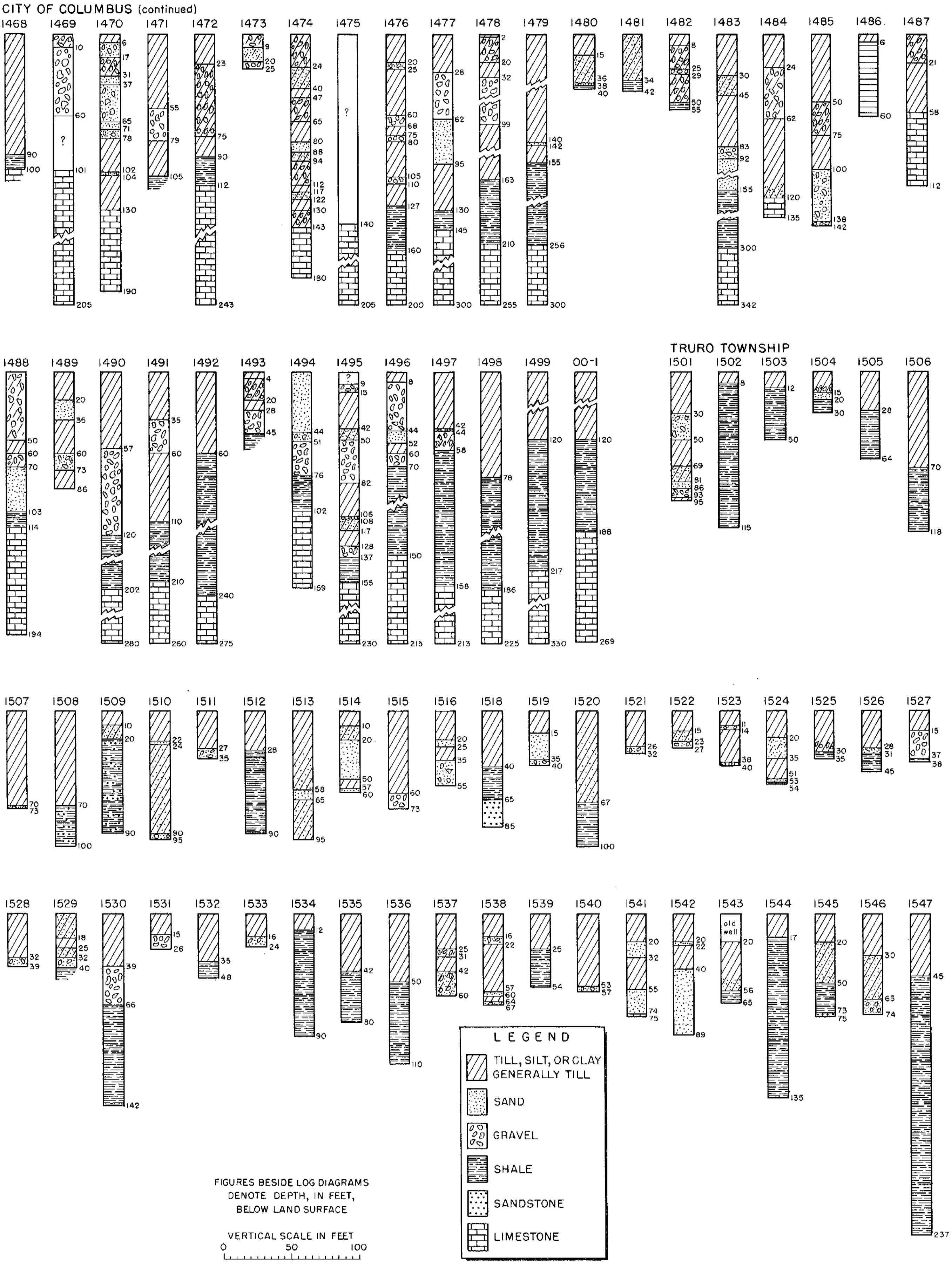


Figure 14-M Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

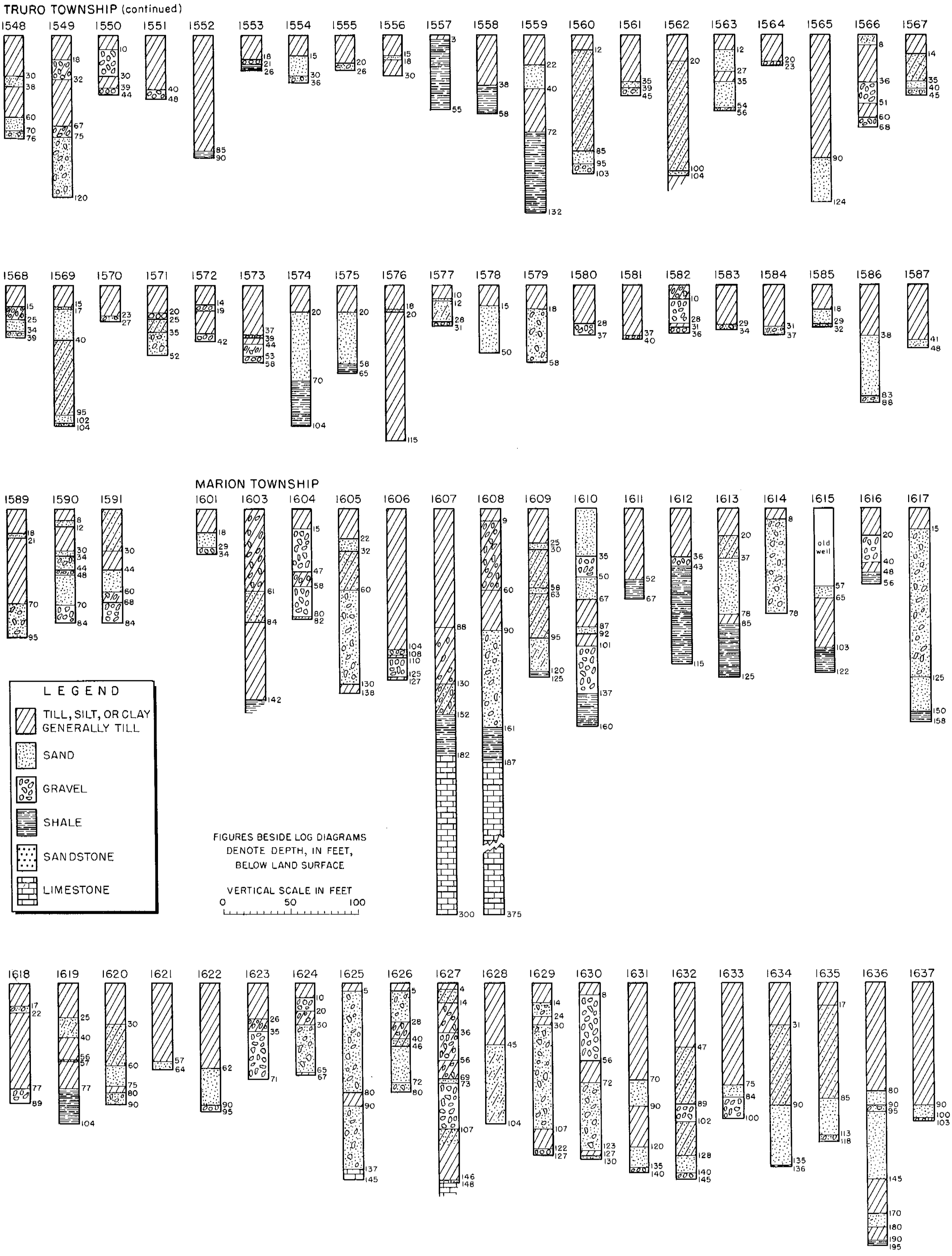


Figure 14-N Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

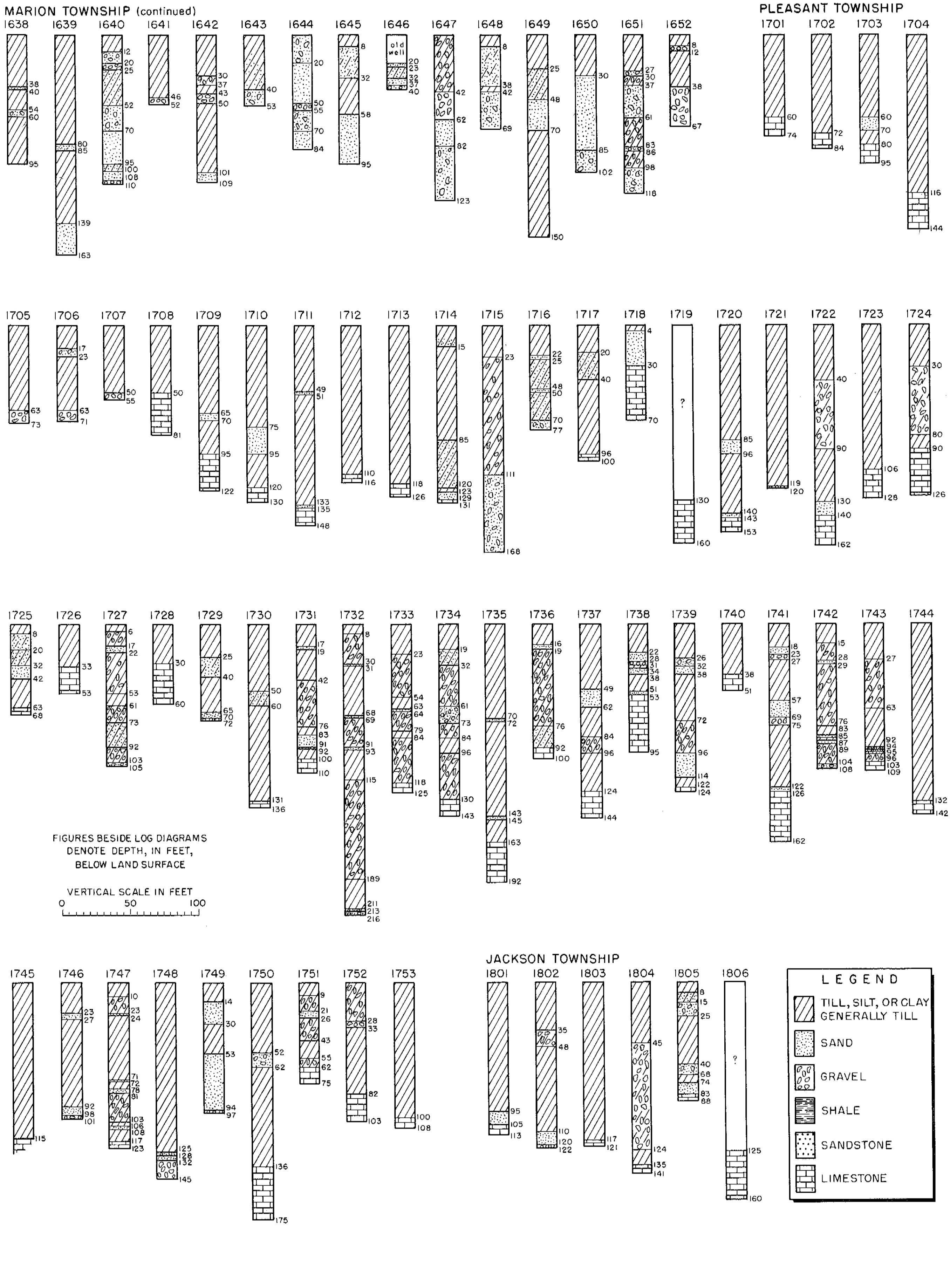


Figure 14-O Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

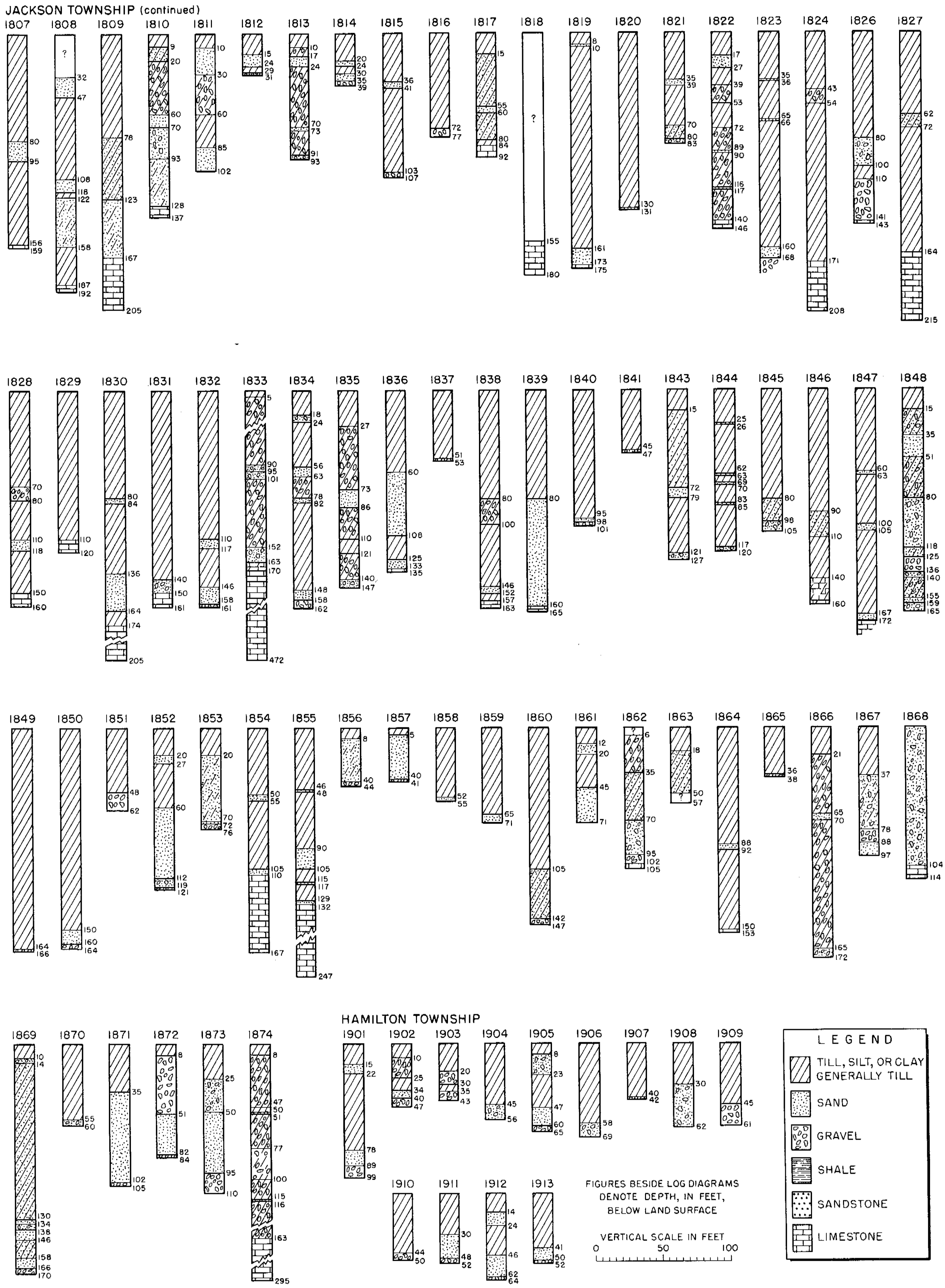


Figure 14-P Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.

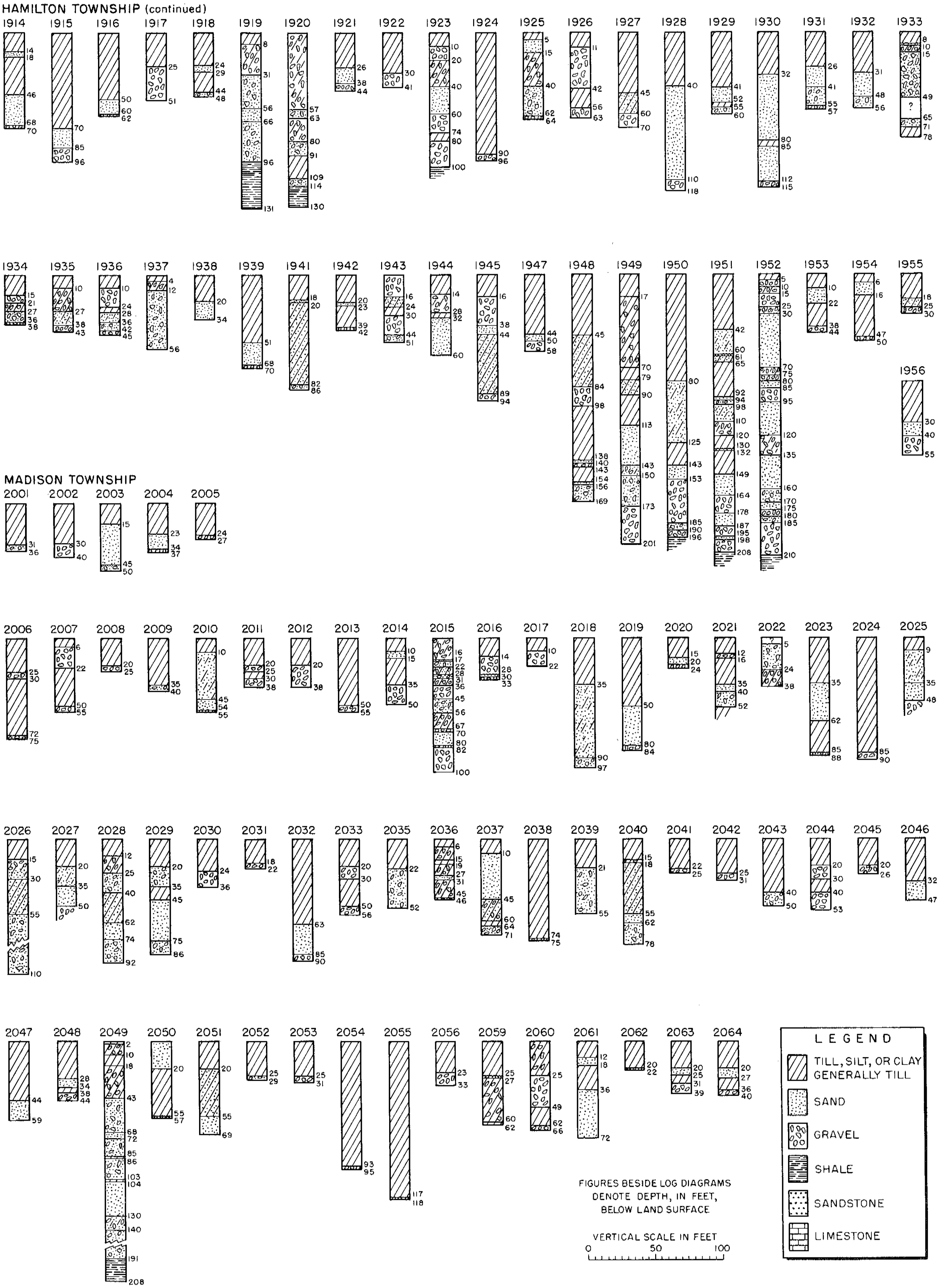
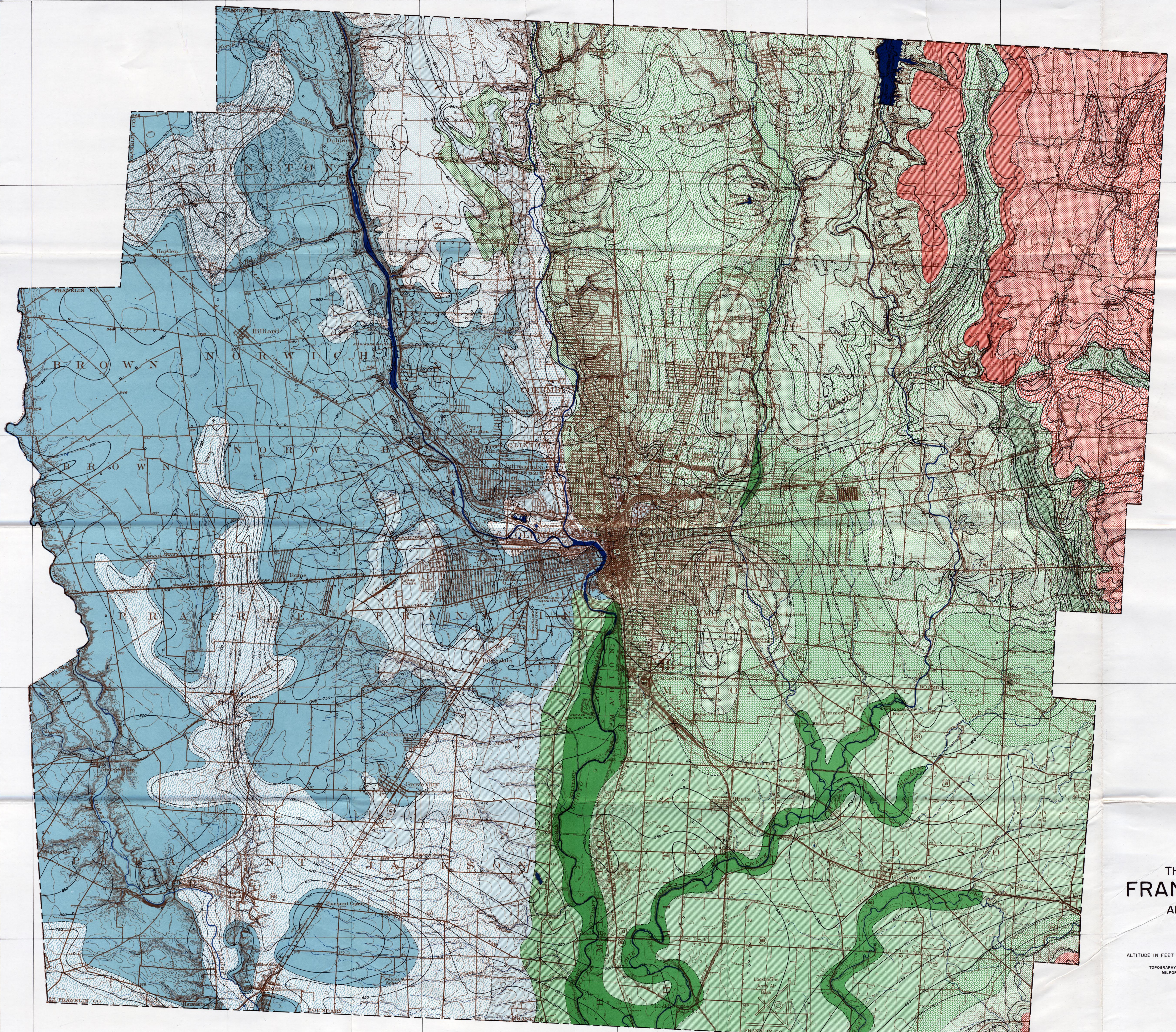


Figure 14-Q Logs of wells in Franklin County, Ohio. Well numbers refer to locations shown on plate 2.



EXPLANATION

AREAS IN WHICH THE PRINCIPAL SOURCES OF GROUND WATER ARE THE GLACIAL DEPOSITS

Best ground-water areas in Franklin County. Wells yield 1,000 gallons a minute or more from permeable sand and gravel deposits adjacent to the major perennial streams. Large sustained yields recharged by stream infiltration.

Regionally extensive permeable sand and gravel deposits not traversed by major streams. Yields of as much as 500 gallons a minute or more may be developed, although a test drilling program should be conducted to locate the coarser materials.

Shallow sand and gravel deposits traversed by a major stream. Yields of as much as 300 gallons a minute should be available from induced stream infiltration.

Interbedded sand and gravel deposits underlying thick till. Yields of as much as 200 gallons a minute may be obtained after extensive test drilling. Greater yields may be available during short periods of intermittent pumping. Yields of 350 gallons a minute have been reported.

Lenses of sand and gravel deposits interbedded in clayey till which overlies the shale bedrock. Yields of as much as 25 gallons a minute, sufficient for small industries, farm, and domestic supplies.

Irregular lenses of sand and gravel thinly scattered in thin to thick layers of glacial till which overlies impermeable Mississippian or Devonian shale. Yields of 5 to 10 gallons a minute, sufficient for farm and domestic use are available.

Thin glacial drift overlying impervious shale. Yields of as much as 5 gallons a minute from lenses of sand and gravel scattered irregularly throughout glacial drift. Yields of less than 2 gallons a minute may be expected where permeable materials are not encountered. Home owners commonly rely on dug wells and cisterns to supplement their supplies.

AREAS IN WHICH THE PRINCIPAL SOURCES OF GROUND WATER ARE THE DEVONIAN AND SILURIAN LIMESTONE AND DOLOMITE

Ground water obtained from Devonian and Silurian limestone and dolomite. Yields of as much as 175 gallons a minute may be expected from Devonian limestone. Cumulative yields up to 400 gallons a minute, may be obtained at greater depth, however, the degree of hardness, dissolved solids and sulphates increases. Hydrogen sulphide may or may not be present at depth.

Ground water obtained from permeable sand and gravel traversed by major streams. Depending upon the exact location, yields of as much as 250 gallons a minute or more may be expected. Cumulative yields of as much as 400 gallons a minute may be expected from wells developed in both sand and gravel deposits and the underlying limestone.

Permeable sand and gravel deposits not in contact with a perennial stream. Wells yield up to 25 gallons a minute. Wells which do not encounter permeable sand and gravel deposits may be drilled to the underlying limestone to obtain a ground-water supply.

Thin lenses of sand and gravel sparsely interbedded in thick deposits of clayey till in buried valleys. Yields from 5 to 10 gallons a minute sufficient for farm and domestic supplies are available. Data are insufficient to map accurate depth and extent of water-bearing materials. Larger yields are obtained from the underlying limestone.

Thin to relatively thick clayey till deposits overlying Devonian shale. Local lenses of sand and gravel near the weathered shale may yield as much as 5 gallons a minute. If sand and gravel lenses are not present, average yields of less than 2 gallons a minute are obtained. Home owners often rely on dug wells and cisterns. Beneath the shale is Devonian limestone from which larger yields are obtained; the water usually contains hydrogen sulphide.

AREAS IN WHICH THE PRINCIPAL SOURCES OF GROUND WATER ARE THE MISSISSIPPIAN SANDSTONE FORMATIONS

Ground water obtained from Berea sandstone. Potential yields of as much as 25 gallons a minute may be developed. Yields of 40 to 70 gallons a minute may be developed if wells are pumped intermittently.

Ground water obtained from Lower Cuyahoga sandstone and shale. Yields average 15 gallons a minute, although yields of 30 gallons a minute have been reported.

Thin to thick deposits of sand and gravel interbedded in glacial till. Wells yield 5 to 10 gallons a minute. In these areas, wells which do not encounter sand and gravel must be drilled to the underlying sandstone to obtain water.

OTHER AREAS

Fine-grained sand and silt at various depths in deeply buried valleys. Material generally contains water but it cannot be recovered except with difficulty. Wells are usually developed in scattered sand and gravel lenses above or below this material, or in the underlying bedrock.

LOCATION OF BEDROCK DATA

o
Wells from which bedrock data were obtained

△ ⚒
Exposure or quarry in consolidated rock

——500——
Contour on the bedrock surface

MAP ILLUSTRATING

THE GROUND-WATER RESOURCES OF FRANKLIN COUNTY, OHIO AND THE APPROXIMATE CONTOURS ON THE BEDROCK SURFACE

BY JAMES J. SCHMIDT

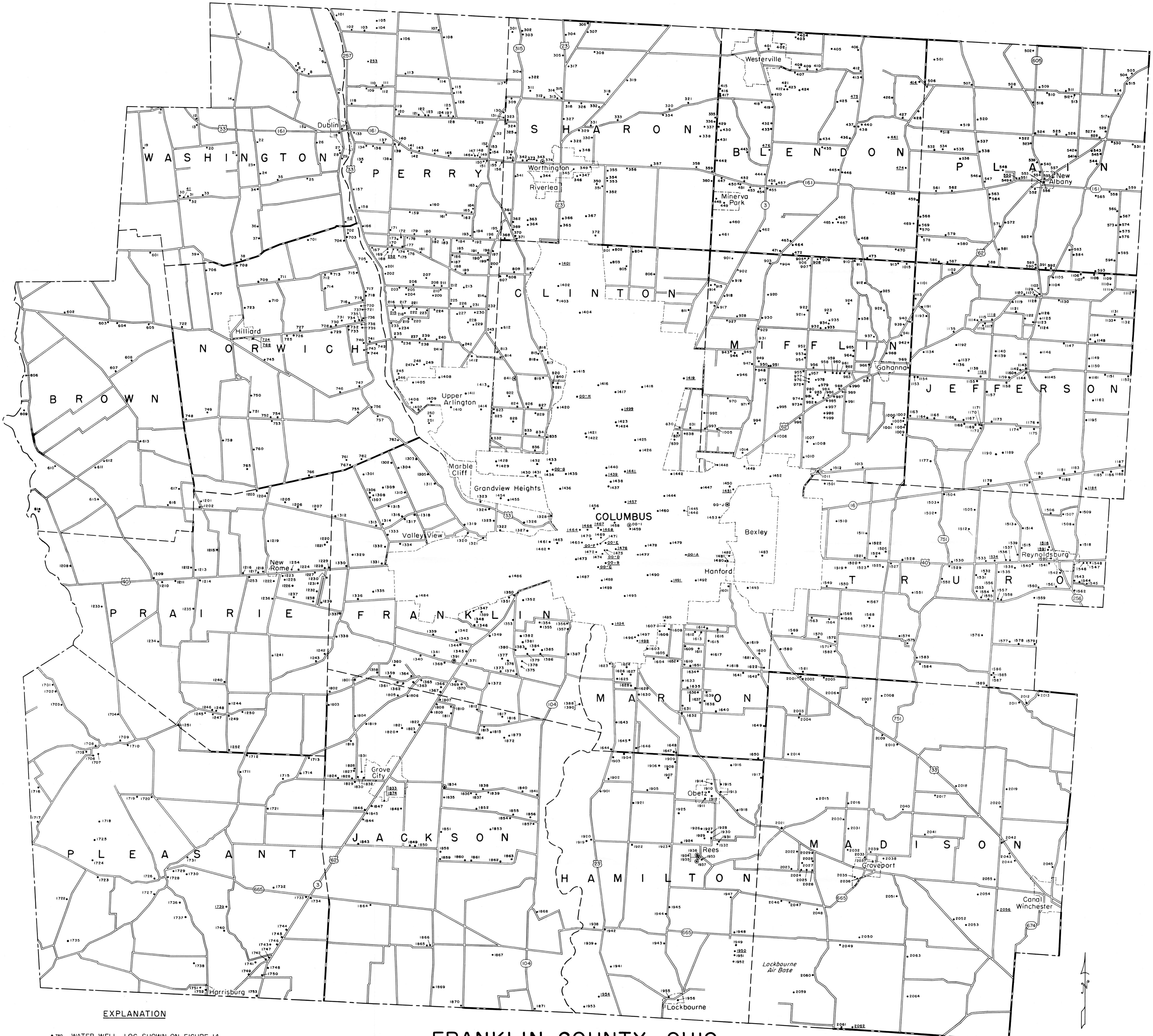
ALTITUDE IN FEET ABOVE SEA LEVEL

BEDROCK CONTOUR INTERVAL 50 FEET

TOPOGRAPHY FROM THE U.S. GEOLOGICAL SURVEY TOPOGRAPHIC MAPS OF THE DUBLIN, EAST COLUMBUS, LONDON, MILFORD CENTER, WEST COLUMBUS, AND WESTERVILLE QUADRANGLES. CONTOUR INTERVAL 10 FEET.

SCALE IN MILES
0 1 2 3 4

PUBLISHED BY
STATE OF OHIO
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
1958
BULLETIN 30 PLATE I



EXPLANATION

- • 780 WATER WELL, LOG SHOWN ON FIGURE 14
- ⊙ 841 OBSERVATION WELL

NUMBER REFERS TO WELL DATA SHOWN IN TABLE 14

NUMBER UNDERLINED REFERS TO CHEMICAL ANALYSES SHOWN IN TABLES 5 AND 6

- 40 U. S. HIGHWAY
- 665 STATE HIGHWAY

FRANKLIN COUNTY, OHIO

MAP SHOWING LOCATIONS OF WELLS DESCRIBED IN TABLE 14 AND FIGURE 14

SCALE IN MILES 0 1 2 3 4

BULLETIN 30 PLATE 2

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1958