

ISWS-74-BUL60(5)

BULLETIN 60-5

STATE OF ILLINOIS

DEPARTMENT OF REGISTRATION AND EDUCATION



*Public Groundwater Supplies*  
*in Brown County*

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ILLINOIS STATE WATER SURVEY

URBANA

1974

# PUBLIC GROUNDWATER SUPPLIES IN BROWN COUNTY

by Dorothy M. Woller

## Introduction

This publication presents all available information on production wells used for public groundwater supplies in Brown County. Bulletin 60, which is divided by county into separate publications, supersedes Bulletin 40 and its Supplements 1 and 2.

The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. Systems and wells described furnish water for drinking or general domestic use in: 1) incorporated municipalities; 2) unincorporated communities where 10 or more separate lots or properties are being served or are intended to be served; 3) state-owned parks and memorials; and 4) state-owned educational, charitable, or penal institutions.

This report includes descriptions for groundwater supplies of 2 municipalities in Brown County. These are preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for municipal use. An explanation of the format used in the descriptions is also given.

**Acknowledgments.** This report was prepared under the general direction of Dr. William C. Ackermann, Chief of the Illinois State Water Survey, and H. F. Smith, Head of the Hydrology Section. The work was done under the direct guidance of William H. Walker, Hydrologist. Special thanks are given to E. W. Sanderson, Assistant Engineer, and J. P. Gibb, Assistant Hydrologist, who checked all of the data and reviewed the manuscript. Mrs. J. L. Ivens and Mrs. P. A. Motherway edited the manuscript, and Susan L. Scherbroeck typed the camera-copy. The chemical analyses, unless otherwise stated, were made by personnel of the Water Survey Chemistry Section under the supervision of Laurel M. Henley. The analyses for the village of Versailles were made by personnel of the Environmental Protection Agency under the supervision of John P. Anderson. Grateful acknowledgment also is given to consulting engineers, well drillers, water superintendents, and municipal officials who have provided valuable information used in this report.

## Geology

The geology of Brown County is described generally in Illinois State Geological Survey Circular 232, *Groundwater Geology in Western Illinois, South Part*. The following brief discussion of geologic conditions in the county summarizes material contained in that publication. For a more detailed definition of the geology in this portion of the state, the reader is referred to the State Geological Survey which is located on the University of Illinois campus, Urbana.

In Brown County sand and gravel deposits suitable for developing municipal or industrial groundwater supplies are present in the Illinois River valley where the fill materials are up to 75 ft thick. Thinner, less continuous sand and

gravel deposits also are present in the La Moine River valley. In the remainder of the county the glacial materials generally are less than 50 ft thick and consist primarily of tight till. These materials are extensively dissected by tributaries of the Illinois River and water-bearing sand and gravel deposits rarely are encountered.

The Keokuk-Burlington limestone of Mississippian age, present beneath the entire county, is the main source of public and private water supplies. Water generally is obtained from wells 300 to 480 ft deep which penetrate from 130 to 200 ft of the limestone. At some places the upper part of the limestone is well creviced and shallower wells (from 200 to 300 ft deep) are possible.

Groundwater possibilities in deeper rock formations are only fair to poor. The Devonian-Silurian dolomite rocks which lie between 700 and 900 ft below land surface are not highly creviced and at some locations contain shows of gas and oil, associated with saline water. Below a depth of about 1000 ft, the St. Peter and other sandstone aquifers are present in the Cambrian-Ordovician rocks. However, these generally contain highly mineralized water that is too salty for most domestic uses (4076.4 mg/l total dissolved minerals and 1310 mg/l chlorides).

### Groundwater Development for Municipal Use

Unconsolidated sand and gravel deposits associated with a narrow bedrock valley tributary to the Illinois River valley are tapped as a source of municipal water supply at Versailles, located in the southeastern part of the county. Two wells ranging in depth from 36 to 45 ft have been constructed in this aquifer. Their reported yields range from 18 to 20 gpm. Production from the Versailles municipal supply in 1972 was about 20,000 gpd. Their iron content ranges from 0.0 to 0.1 mg/l, and the hardness from 397 to 500 mg/l. Water from these wells is chlorinated and fluoridated.

Consolidated bedrock aquifers, principally the Keokuk-Burlington limestone, are tapped as a source of both private and municipal supplies through the entire county. The Keokuk-Burlington limestone is tapped as a source of water by the village of Mound Station, located in the west central

part of the county, utilizing one production well. This well is 483 ft deep and yields 33 gpm. Production from this supply in 1971 was about 10,000 gpd. The iron content ranges from 0.0 to 0.2 mg/l, and the hardness from 26 to 40 mg/l. Water from this supply is aerated and chlorinated. Fluoridation is not required because of natural fluoride content.

### Format

In this publication the descriptions of public groundwater supplies are presented in alphabetical order by place name as follows: Mound Station and Versailles.

The U. S. Census of population for 1970 is given at the beginning of each description.

The number of services and quantity of water distributed at each supply are given where available for the earliest and the latest reported values.

Individual production wells for each supply are described in the order of their construction. The description for each well includes the *aquifer tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses.*

The screen sizes given in this publication are for continuous slot type screens. Slot sizes given indicate the width of the slot openings in thousandths of an inch. For example, a 20 slot screen has slot openings 0.020 in. wide and a 100 slot screen has slots 0.100 in. wide.

### Abbreviations Used

ft.....	foot (feet)
gpd.....	gallons per day
gpm.....	gallons per minute
hp.....	horsepower
hr.....	hour(s)
in.....	inch(es)
Lab.....	laboratory
me/l.....	milliequivalents per liter
mg/l.....	milligrams per liter
min.....	minute(s)
No.(s).....	number(s)
pc/l.....	picocuries per liter
R.....	range
T.....	township
TDH.....	total dynamic head
Tr.....	trace

## MOUND STATION

The village of Mound Station [P. O., Timewell] (203) installed a public water supply in 1966. One well is in use. In 1966 there were 64 services, all metered; the average daily pumpage was 9000 gpd. In 1971 there were 73 services, all metered; the average and maximum daily pumpages were 10,000 and 15,000 gpd, respectively. The water is aerated and chlorinated. The natural fluoride concentration in the water is adequate to satisfy state requirements for this ingredient.

WELL NO. 1, finished in limestone, was completed in October 1964 to a depth of 483 ft by Gene Groves, Plymouth. The well is located about 75 ft N of the firehouse in the village park, approximately 1000 ft N of the SE corner of Section 4, T1S, R4W. The land surface elevation at the well is approximately 751 ft.

A drillers log of Well No. 1 follows:

Formation	Thickness (ft)	Depth (ft)
Clay, yellow to blue	53	53
Shale, gray	7	60
Sandstone	4	64
Shale, dark gray	61	125
Shale, very dark	13	138
Slate, black	4	142
Shale, light gray	13	155
Sandstone	4	159
Lime, brown and gray	31	190
Shale, gray, some streaks lime	84	274
Limestone, white, cherty, dolomitic	208	482
Blue shale	1	483

An 8-in. diameter hole was drilled to a depth of 60 ft and finished 6 in. in diameter from 60 to 483 ft. The well is equipped with a 6-in. pitless adapter from land surface to a depth of 5 ft, and cased with 6-in. steel pipe to a depth of 275 ft. The annulus between the 8-in. bore hole and 6-in. casing is sealed with cement grout from 0 to 60 ft.

A production test was conducted on December 29, 1964, by representatives of the driller, the State Water Survey, and Wm. H. Klingner & Associates, Engineers. After 5.5 hr of pumping at a rate of 33 gpm, the drawdown was 93.00 ft from a nonpumping water level of 188.25 ft below land surface. Six min after pumping was stopped, the water level had recovered to 192.00 ft. On the basis of the production test data, it was estimated that this well might produce as much as 25 gpm (36,000 gpd) on a long-term basis.

The pumping equipment presently installed is a Red Jacket submersible pump set at 389 ft, rated at 25 gpm at about 400 ft TDH or 32 gpm at about 375 ft TDH (actual observed rate is 33 to 35 gpm), and powered by a 5-hp electric motor. The well is equipped with 385 ft of airline.

The following mineral analysis (Lab. No. 186659) is for a water sample from the well collected September 17, 1971, after approximately 30 min of pumping at 38 gpm.

WELL NO. 1, LABORATORY NO. 186659

		mg/l	me/l			mg/l	me/l
Iron	Fe	0.00		Silica	SiO <sub>2</sub>	7.0	
Manganese	Mn	0.00		Boron	B	0.5	
Ammonium	NH <sub>4</sub>	0.5	0.03	Fluoride	F	2.6	
Sodium	Na	368.1	16.01	Nitrate	NO <sub>3</sub>	0.4	0.01
Potassium	K	2.3	0.06	Chloride	Cl	315	8.88
Calcium	Ca	6.0	0.30	Sulfate	SO <sub>4</sub>	17.5	0.36
Magnesium	Mg	2.4	0.22	Alkalinity (as CaCO <sub>3</sub> )		348	6.96
Strontium	Sr	0.19					
				Hardness (as CaCO <sub>3</sub> )		26	0.52
Copper	Cu	0.03					
Cadmium	Cd	0.00		Total dissolved			
Chromium	Cr	0.00		minerals		930	
Lead	Pb	<0.05		Turbidity	Tr		
Lithium	Li	0.09		Color	0		
Nickel	Ni	<0.05		Odor	0		
Zinc	Zn	0.02					
Barium	Ba	<0.1					

## VERSAILLES

The village of Versailles (429) installed a public water supply in 1954. Two wells are in use. In 1955 there were 170 services, all metered; the average and maximum daily pumpages were 6700 and 11,000 gpd, respectively. In 1972 there were 205 services, all metered; the average and maximum daily pumpages were 20,000 and 75,000 gpd, respectively. The water is chlorinated and fluoridated.

WELL NO. 1, finished in sand and gravel, was completed in July 1953 to a depth of 45 ft by George Chadwick, Rushville. The well is located about 0.5 mile northeast of the village, approximately 1005 ft W and 1390 ft S of the NE corner of Section 17, T2S, R2W. The land surface ele-

vation at the well is 530.4 ft.

A correlated drillers log of Well No. 1 furnished by the State Geological Survey follows:

Formation	Thickness (ft)	Depth (ft)
<b>PLEISTOCENE SERIES</b>		
Soil, sandy	6	6
Gravel, clay	4	10
Sand and clay	14	24
Sand and gravel, coarse, some water	7	31
Fine sand, some gravel, water	9	40
Coarse gravel, water	5	45

A 10-in. diameter hole was drilled to a depth of 17 ft and finished 8 in. in diameter from 17 to 45 ft. The well

is cased with 10-in. drive pipe from within the pump foundation to a depth of 17 ft and an 8-in. steel pipe from 1 ft above the pumphouse floor to a depth of 40 ft followed by 5 ft of 8-in. No. 90 slot Johnson Everdur silicon red brass screen.

A production test using two observation wells was conducted on July 13-14, 1953, by representatives of the driller, the village, the State Water Survey, and Wm. H. Klingner & Associates, Engineers. After 18.5 hr of pumping at a rate of 18.2 gpm, the drawdown was 17.21 ft from a non-pumping water level of 6.05 ft below land surface. Twenty-five min after pumping was stopped, the water level had recovered to 6.19 ft. Prior to this test, Well No. 2 had been pumping for a period of 4 hr at a rate of 20 gpm and continued pumping at the same rate for the first 10 hr of this test.

On September 24, 1956, with pumps in both wells operating, the drawdown in Well No. 1 was 24.1 ft from a nonpumping water level of 16.3 ft below the pump base.

The pumping equipment presently installed is a Red Jacket submersible pump set at 30 ft, and powered by a 3-hp Emerson electric motor.

A mineral analysis of a sample made by the Environmental Protection Agency (Lab. No. B105406) collected December 26, 1972, after pumping for 2 hr at 25 gpm, showed the water to have a hardness of 525 mg/l, total dissolved minerals of 616 mg/l, and an iron content of 0.10 mg/l.

WELL NO. 2, finished in sand and gravel, was completed in July 1953 to a depth of 36 ft by George Chadwick, Rushville. The well is located 246 ft SE of Well No. 1, approximately 760 ft W and 1420 ft S of the NE corner of Section 17, T2S, R2W. The land surface elevation at the well is 528.2 ft.

A drillers log of Well No. 2 follows:

Formation	Thickness (ft)	Depth (ft)
Sandy soil	5	5
Sand, gravel, and clay	5	10
Muddy sand	10	20
Sand and gravel, water	15	35
Fine sand and water	5	40
Blue clay	20	60
(plugged back to 36 ft)		

A 10-in. diameter hole was drilled to a depth of 18 ft and finished 8 in. in diameter from 18 to 36 ft. The well is cased with 10-in. drive pipe from within the pump foundation to a depth of 18 ft and an 8-in. pipe from 1 ft above the pumphouse floor to a depth of 26 ft followed by 10 ft of 8-in. No. 60 slot Johnson Everdur wire-wound screen.

A production test using two observation wells was conducted on July 13-14, 1953, by representatives of the driller, the village, the State Water Survey, and Wm. H. Klingner & Associates, Engineers. After 13.5 hr of pumping at a rate of 20 gpm, the drawdown was 8.64 ft from a non-pumping water level of 4.67 ft below land surface. Twenty-five min after pumping was stopped, the water level had recovered to 4.93 ft. Four hr after pumping began, Well No. 1 started pumping at a rate of 18.2 gpm and remained on for the duration of the test.

On September 24, 1956, with pumps in both wells operating, the drawdown in Well No. 2 was 11.6 ft from a non-pumping water level of 14.3 ft below the pump base.

The pumping equipment presently installed is a Red Jacket submersible pump set at 40 ft, rated at 25 gpm, and powered by a 3-hp Emerson electric motor.

The following mineral analysis made by the Environmental Protection Agency (Lab. No. B105405) is for a sample collected December 26, 1972, after 2 hr of pumping at 25 gpm.

**WELL NO. 2, LABORATORY NO. B105405**

		mg/l	me/l	mg/l	me/l
Iron	Fe	0.24	0.01	Silica	SiO <sub>2</sub> 16
Manganese	Mn	0.04	0.00	Fluoride	F 0.2
Ammonium	NH <sub>4</sub>	0		Boron	B 0.1
Sodium	Na	10	0.44	Nitrate	NO <sub>3</sub> 8.4
Potassium	K	1.4	0.04	Chloride	Cl 20
Calcium	Ca	120	5.99	Sulfate	SO <sub>4</sub> 88
Magnesium	Mg	52	4.27	Alkalinity (as CaCO <sub>3</sub> )	390
Arsenic	As	0.00		Hardness (as CaCO <sub>3</sub> )	513
Barium	Ba	0.1		Total dissolved minerals	549
Copper	Cu	0.03		pH (as rec'd)	7.1
Cadmium	Cd	0.00		Radioactivity	
Chromium	Cr	0.00		Alpha pc/l	2.0
Lead	Pb	0.00		± deviation	2.2
Mercury	Hg	0.00	0.0	Beta pc/l	9.2
Nickel	Ni	0.0		± deviation	2.6
Selenium	Se	0.00			
Silver	Ag	0.00			
Zinc	Zn	0.0			