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*Public Groundwater Supplies
in Calhoun County*

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PUBLIC GROUNDWATER SUPPLIES IN CALHOUN COUNTY

by Dorothy M. Woller

Introduction

This publication presents all available information on production wells used for public groundwater supplies in Calhoun 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 separate descriptions for groundwater supplies of 4 municipalities in Calhoun 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.

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Geology

The geology of Calhoun 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 is taken largely from 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 Calhoun County, thick permeable sand and gravel deposits suitable for high-capacity wells are present in the Mississippi and Illinois River Valleys. The Mississippi Valley deposits reach a maximum thickness of 100 to 125 ft along the river north of Hamburg, and 75 to 100 ft between Hamburg and Batchtown. The Illinois River Valley deposits range in thickness from about 75 to 130 ft. In the Hardin area these deposits consist mainly of sand below a depth of about 30 ft.

The unconsolidated deposits in the upland areas of the county range in thickness from about 20 to 50 ft and are principally wind-blown silt (loess). Locally, the loess is sandy at its base and may be a source for small water supplies obtained from large-diameter bored wells.

Most farm and domestic water supplies in the upland areas of the county are obtained from drilled wells tapping the underlying bedrock units. In the northern quarter of the county these wells are generally finished in the Keokuk-Burlington limestone of Mississippian age. From near Kampsville to 5 or 6 miles south of Hardin, the Devonian and Silurian age limestones are tapped and in the southern quarter of the county (south of the Cap au Gres flexure), the St. Louis limestone of Mississippian age is tapped. In the highly dissected upland portions of the county, limestone springs are also common and have been used as sources for small domestic water supplies.

Lying below the Silurian age rocks in the northern three fourths of the county is the St. Peter sandstone of Ordovician age. In the northern part of the county, water contained in these rocks is highly mineralized. Toward the south particularly along the Mississippi River south of Hardin, moderate quantities of acceptable quality water may be available from this aquifer. South of the flexure, water in the St. Peter sandstone is too highly mineralized for most uses.

Groundwater Development for Municipal Use

Sand and gravel deposits in the unconsolidated materials above bedrock are tapped as the source of municipal water supply at Batchtown, Brussels, Hardin, and Kampsville (see figure 1). At the present time 7 municipal production and standby wells tap these aquifers to depths ranging from 52 to 86.5 ft. These wells reportedly yield from 100 to 250 gpm, depending primarily upon the type of well constructed and the permeability, thickness, and areal extent of the sand and gravel unit tapped by each installation. Estimated production from these wells averaged about 300,000 gpd in 1974. Available chemical analyses indicate that water from the sand and gravel aquifers tapped by these supplies range in iron content from a trace to 4.5 mg/l, and in hardness from 373 to 656 mg/l. Water for Batchtown is filtered, chlorinated, fluoridated, and fed potassium permanganate; Brussel's supply is aerated, settled, chlorinated, filtered, and fluoridated; Hardin's supply is fluoridated and treated with polyphosphate to keep iron in solution; and water for Kampsville is aerated, fluoridated, and chlorinated.

Format

In this publication the descriptions of public groundwater supplies are presented in alphabetical order by place name, as follows: Batchtown, Brussels, Hardin, and Kampsville.

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.*

When available sample study logs by the Illinois State Geological Survey are presented. When these are not available, drillers logs are used as reported. Commonly used drillers terms such as clay, silt, or pebbly clay generally are synonymous with the glacial tills tabulated by the State Geological Survey.

The screen sizes given in this publication are for continuous

slot 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.

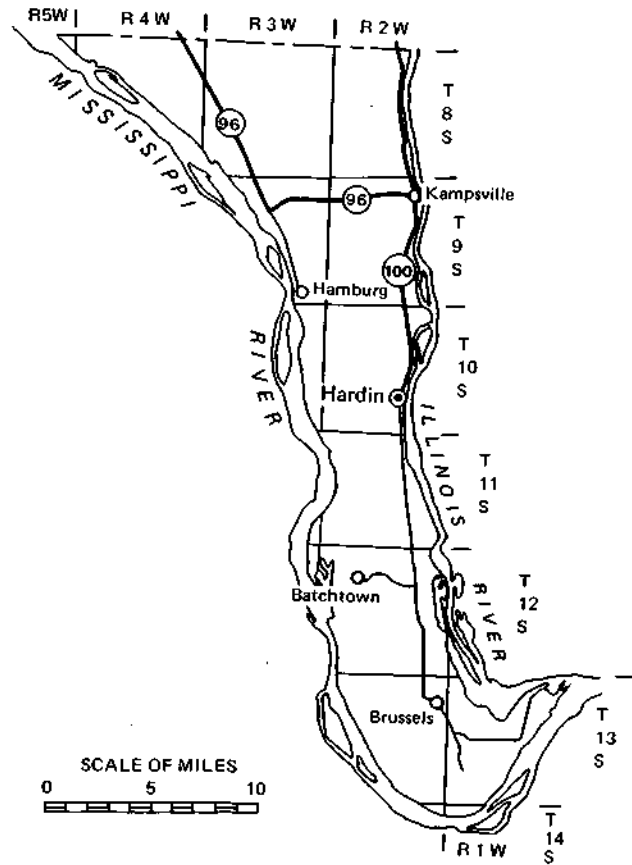


Figure 1. Location of public groundwater supply systems in Calhoun County

Abbreviations Used

ft.....	foot (feet)
gpd.....	gallons per day
gpm.....	gallons per minute
hp.....	horsepower
hr.....	hour(s)
ID.....	inside diameter
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
rpm.....	revolutions per minute
T.....	township
TDH.....	total dynamic head

BATCHTOWN

The village of Batchtown (217) installed a public water supply in 1972. Two wells are in use. In 1974 there were 104 services, all metered; the average daily pumpage was 15,146 gpd. The water is filtered, chlorinated, fluoridated, and fed potassium permanganate.

WELL NO. 1, finished in sand and gravel, was completed in March 1966 to a depth of 86.5 ft by the Calhoun Drilling Co., Batchtown. This well, originally developed as a test hole, was completed as a permanent well in October 1973. The well is located in the treatment plant building about 2.8 miles east of the village, approximately 1500 ft N and 2000 ft W of the SE corner of Section 11, T12S, R2W. The land surface elevation at the well is approximately 455 ft.

A drillers log of Well No. 1 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Black soil	50	50
Coarse clean gravel	5	55
Coarse gravel, much cleaner	23	78
Very clean gravel	8.5	86.5

An 8-in. diameter hole was drilled to a depth of 86.5 ft. The well is cased with 8-in. pipe from 3 ft above land surface to a depth of 23 ft and 6-in. pipe from 1.5 ft above land surface to a depth of 86.5 ft. The casing is slotted from 76.5 to 86.5 ft. The annulus between the two casings is cement grouted from 0 to 20 ft.

A production test was conducted on April 4, 1966, by representatives of the driller, the State Water Survey, and Wm. H. Klingner & Associates, Engineers. After 6.5 hr of pumping at a rate of 190 gpm, the drawdown was 1.6 ft from a nonpumping water level of 32.0 ft below land surface. Ten min after pumping was stopped, the water level had recovered to 32.1 ft. On the basis of the production test data, it was estimated that this well should yield 200 gpm (288,000 gpd) on a long-term basis.

The pumping equipment presently installed is a 14-stage Layne vertical turbine pump (Model No. 74640) set at 50 ft, rated at 35 gpm at about 430 ft TDH, and powered by a 7 1/2-hp 3500 rpm U.S. electric motor (Model No. S. L. 8823G270).

A partial analysis of a sample (Lab. No. 168626) collected during the initial production test, after pumping for 6.5

hr at 190 gpm, showed the water to have a hardness of 388 mg/l, total dissolved minerals of 434 mg/l, and an iron content of 3.2 mg/l.

WELL NO. 2, finished in sand and gravel, was completed in August 1971 to a depth of 86 ft by the Calhoun Drilling Co., Batchtown. The well is located in the treatment plant building 10 ft east of Well No. 1, approximately 1500 ft N and 1990 ft W of the SE corner of Section 11, T12S, R2W. The land surface elevation at the well is approximately 455 ft.

A drillers log of Well No. 2 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Black soil and yellow clay	20	20
Black river bottom mud	30	50
Coarse sand and gravel (clean)	36	86

A 16-in. diameter hole was drilled to a depth of 20 ft and finished 8 in. in diameter from 20 to 86 ft. The well is cased with 8-in. wrought iron pipe from 3 ft above land surface to a depth of 76 ft followed by 10 ft of 7.6-in. No. 40 slot Johnson stainless steel screen. The annulus between the bore hole and casing is filled with cement grout from 0 to 20 ft.

The pumping equipment presently installed is a 14-stage Fairbanks-Morse vertical turbine pump (Model No. 6977) set at 55 ft, rated at 35 gpm at about 430 ft TDH, and powered by a 7 1/2-hp 3500 rpm U.S. electric motor (Model No. F-2963-00-271).

The following mineral analysis (Lab. No. 196976) is for a water sample from the well collected September 17, 1974, after 10 min of pumping.

WELL NO. 2, LABORATORY NO. 196976

	<i>mg/l</i>	<i>me/l</i>		<i>mg/l</i>	<i>me/l</i>
Iron (total)	Fe	3.8	Silica	SiO ₂	26.0
Manganese	Mn	0.27	Fluoride	F	0.2
Ammonium	NH ₄	0.0	Boron	B	0.1
Sodium	Na	7.3	Nitrate	NO ₃	1.3
Potassium	K	1.1	Chloride	Cl	7
Calcium	Ca	97.6	Sulfate	SO ₄	62.7
Magnesium	Mg	36.6	Alkalinity (as CaCO ₃)		332
Strontium	Sr	0.10	Hardness (as CaCO ₃)		394
Barium	Ba	< 0.1	Total dissolved minerals		439
Copper	Cu	0.00	Turbidity		21
Cadmium	Cd	0.00	Color		0
Chromium	Cr	0.00	Odor		0
Lead	Pb	< 0.05	Temp. (reported)		57.5F
Lithium	Li	0.01			
Nickel	Ni	< 0.05			
Zinc	Zn	0.00			

BRUSSELS

The village of Brussels (191) installed a public water supply in 1963. One well is in use. In 1965 there were 76 services, all metered; the average daily pumpage was 8000 gpd. In 1973 there were 96 services, all metered; the average and maximum daily pumpages were 20,000 and 25,000 gpd,

respectively. The water is aerated, settled, chlorinated, filtered, and fluoridated.

WELL NO. 1, finished in sand and gravel, was completed in November 1963 to a depth of 78 ft by the Calhoun Drilling Co., Batchtown. The well is located about 0.8 mile east

of the village in the northeast corner of the treatment plant, approximately 1250 ft S and 2000 ft W of the NE corner of Section 7, T6N, R1W. The land surface elevation at the well is approximately 440 ft.

A drillers log of Well No. 1 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Loam, gray clay	20	20
Gray muck	10	30
Black muck with sand	18	48
Dirty sand	2	50
Clean coarse sand and gravel	28	78

An 8-in. diameter hole was drilled to a depth of 78 ft. The well is cased with 8-in. steel pipe from 1 ft below the pumphouse floor to a depth of 68 ft followed by 10 ft of 8-in. No. 40 slot Cook Silicon bronze screen. A 2-ft length of 12-in. diameter steel pipe is attached to the top of the 8-in. well casing by a reducer.

A production test using one observation well was conducted on December 10, 1963, by representatives of the driller, the State Water Survey, and Wm. H. Klingner & Associates, Engineers. After 4.1 hr of pumping at a rate of 150 gpm, the drawdown was 2.41 ft from a nonpumping water level of 21.50 ft below land surface. Thirty-five min after pumping was stopped, the water level had recovered to 21.65 ft. On the basis of the production test data, it was estimated that this well should yield 225 gpm (324,000 gpd) on a long-term basis.

On February 3, 1965, the nonpumping water level was reported to be 33 ft.

The pumping equipment presently installed is a Fairbanks-Morse turbine pump set at 50 ft, rated at 100 gpm at about 40 ft TDH, and powered by a 3-hp Fairbanks-Morse electric motor.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B111276) is for a water sample from the well collected May 1, 1974, after 30 min of pumping at 100 gpm.

WELL NO. 1, LABORATORY NO. B111276

		<i>mg/l</i>	<i>me/l</i>		<i>mg/l</i>	<i>me/l</i>
Iron	Fe	4.40		Silica	SiO ₂	28
Manganese	Mn	0.20		Fluoride	F	0.3
Ammonium	NH ₄	0.2	0.01	Boron	B	0.1
Sodium	Na	7	0.30	Nitrate	NO ₃	0.0
Potassium	K	0.8	0.02	Chloride	Cl	3
Calcium	Ca	87	4.34	Sulfate	SO ₄	21
Magnesium	Mg	38	3.13	Alkalinity(asCaCO ₃)		384
Arsenic	As	0.00				
Barium	Ba	0.2		Hardness (as CaCO ₃)		373
Copper	Cu	0.00				
Cadmium	Cd	0.00		Total dissolved		
Chromium	Cr	0.00		minerals		419
Lead	Pb	0.00				
Mercury	Hg	0.0000		pH(asrec'd)		7.6
Nickel	Ni	0.0		Radioactivity		
Selenium	Se	0.00		Alpha <i>pc/l</i>		0.0
Silver	Ag	0.00		ideviation		0.0
Cyanide	CN	0.00		Beta <i>pc/l</i>		2.6
Zinc	Zn	0.0		ideviation		2.4

HARDIN

The village of Hardin (1035) installed a public water supply in 1926. Two wells are in use. In 1952 there were 230 services, 50 percent metered; the average daily pumpage was 15,000 gpd. In 1975 there were 435 services, of which 16 are metered; the average and maximum daily pumpages were 215,000 and 300,000 gpd, respectively. The water is fluoridated and treated with polyphosphate to keep iron in solution.

WELL NO. 1, finished in sand and gravel, was completed in November 1934 to a depth of 70 ft by E. C. Kuhse, Grafton. The well is located in the fire station on Main St. west of Water St., approximately 2450 ft S and 390 ft W of the NE corner of Section 27, T10S, R2W. The land surface elevation at the well is approximately 460 ft.

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

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
PLEISTOCENE SYSTEM		
Soil, clay, and silt	35	35
Gravel	5	40
Sand	5	45
Sand, silt, and gravel	10	55

<i>Strata (continued)</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Sand	12.5	67.5
DEVONIAN OR SILURIAN SYSTEM		
Rock	2.5	70

An 8.5-in. diameter hole was drilled to a depth of 70 ft. The well is cased with 8.2-in. ID standard pipe from land surface to a depth of 55 ft followed by 15 ft of 7.5-in. No. 20 slot Cook Everdur screen.

On December 7, 1934, the well reportedly produced 205 gpm for 3 hr with a drawdown of 4 ft from a nonpumping water level of 24 ft below the top of the well.

A production test was conducted by the State Water Survey on April 21, 1972, after the well had been acidized. After 2 hr of pumping at a rate of 250 gpm, the final drawdown was 7.1 ft from a nonpumping water level of 32.0 ft below land surface. Ten min after pumping was stopped, full recovery was observed. During the test, Well No. 2 was pumping continuously.

The pumping equipment presently installed consists of a 15-hp U.S. Hollowshaft electric motor, an 8-in., 7-stage Layne vertical turbine pump set at 45 ft, rated at 200 gpm at about

203 ft TDH, and has 45 ft of 5.5-in. column pipe. A 5-ft section of 4-in. suction pipe is attached to the pump intake.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B112524) of a sample collected May 15, 1974, after pumping for 35 min at 250 gpm, showed the water to have a hardness of 462 mg/l, total dissolved minerals of 605 mg/l, an iron content of 0.35 mg/l, and a manganese content of 1.55 mg/l.

WELL NO. 2, finished in sand and gravel, was completed in January 1954 to a depth of 64 ft by the Calhoun Drilling Co., Batchtown. The well is located about 75 ft south and 10 ft west of Well No. 1, approximately 2525 ft S and 400 ft W of the NE corner of Section 27, T10S, R2W. The land surface elevation at the well is approximately 460 ft.

A drillers log of Well No. 2 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Top soil, not classified	38	38
Bluish gravel	4	42
Bluish to reddish gravel	1	43
Bluish to reddish gravel, coarse, clean	1	44
Coarse reddish gravel	1	45
Changing to reddish gray finer gravel	1	46
Gray red finer gravel	2	48
Coarse sand and fine gravel	5	53
Finer sand	10	63
Bedrock	1	64

A 10-in. diameter hole was drilled to a depth of 5 ft and finished 8 in. in diameter from 5 to 64 ft. The well is cased with 10-in. outer pipe from the top of the pump pedestal for a depth of 5 ft and 8-in. black pipe from 4 in. above the top of the pump pedestal to a depth of 49 ft followed by 15 ft of 8-in. No. 30 slot Cook Silicon bronze screen. The annulus

between the casings is sealed with lead.

A production test was conducted on January 13, 1954, by representatives of the driller, the village, the State Water Survey, and Flagg and Corlew, Consulting Engineers. After 3.9 hr of pumping at an average rate of 150 gpm, the drawdown was 1.28 ft from a nonpumping water level of 20.22 ft below land surface. During this test, Well No. 1 was pumping intermittently.

The pumping equipment presently installed is an 8-in., 10-stage Fairbanks-Morse turbine pump (Serial No. AS221) set at 50 ft, rated at 150 gpm at about 198 ft TDH, and powered by a 10-hp 1750 rpm Fairbanks-Morse electric motor.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B0024545) is for a water sample from the well collected June 19, 1972, after 24 hr of pumping at 125 gpm.

WELL NO. 2, LABORATORY NO. B0024545						
		<i>mg/l</i>	<i>me/l</i>		<i>mg/l</i>	<i>me/l</i>
Iron	Fe	0.1	0.00	Silica	SiO ₂	21.6
Manganese	Mn	0.64	0.02	Fluoride	F	0.3
Ammonium	NH ₄	0.0		Boron	B	0.38
Sodium	Na	21.8	0.95	Nitrate	NO ₃	8.4
Potassium	K	3	0.08	Chloride	Cl	32
Calcium	Ca	102	5.09	Sulfate	SO ₄	65
Magnesium	Mg	45.2	3.72	Alkalinity(asCaCO ₃)		344
				Hardness (as CaCO ₃)		444
Barium	Ba	0.0		Total dissolved minerals		524
Copper	Cu	0.01		pH (asrec'd)		7.2
Cadmium	Cd	0.00		Radioactivity		
Chromium	Cr	0.0		Alpha pc/l		0.7
Lead	Pb	0.00		±deviation		1.6
Mercury	Hg	< 0.0005		Beta pc/l		2.2
Nickel	Ni	0.0		±deviation		1.6
Silver	Ag	0.0				
Zinc	Zn	0.13				

KAMPSVILLE

The village of Kampsville (439) installed a public water supply in 1956. One well (No. 2) is in use and another well (No. 1) is available for emergency use. In 1959 there were approximately 100 services. In 1975 there were 220 services, 11 percent metered; the average and maximum daily pumpages were 38,000 and 70,000 gpd, respectively. The water is aerated, fluoridated, and chlorinated.

A test well was drilled to a depth of 58 ft in April 1956 by the Calhoun Drilling Co., Batchtown, prior to the installation of a public water supply for the village. It was located on the west side of Route 100 about 50 ft W of the center line of the pavement and about 0.9 mile south of the village. Upon completion, the test well reportedly produced 100 gpm for 9 hr with a drawdown of 23.53 ft from a non-pumping water level of 18.92 ft below the top of the casing. Twenty min after pumping was stopped, the water level had recovered to 20.05 ft.

WELL NO. 1, finished in sand and gravel, was completed

in July 1956 to a depth of 60 ft by the Calhoun Drilling Co., Batchtown. This well is seldom used because it pumps sand. The well is located on the west side of Route 100 about 0.9 mile south of the village, approximately 2400 ft N and 1700 ft E of the SW corner of Section 11, T9S, R2W. The land surface elevation at the well is approximately 440 ft.

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

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
PLEISTOCENE SERIES		
Till, bluish muck, silt	50	50
Broken, cherty rock, and gravel	8	58

An 8-in. diameter hole was drilled to a depth of 60 ft. The well is cased with 8-in. standard pipe from 1.5 ft above the pumphouse floor to a depth of 45 ft followed by 15 ft of 8-in. Cook Everdur screen. The screened section consists of 9 ft of No. 30 slot followed by 6 ft of No. 80 slot.

A production test using one observation well was conducted on July 11, 1956, by representatives of the driller, the village, the State Water Survey, and Wm. H. Klingner & Associates, Engineers. After 9 hr of pumping at a rate of 100 gpm, the drawdown was 16.25 ft from a nonpumping water level of 18.83 ft below the pump base. Thirty-five min after pumping was stopped, the water level had recovered to 19.89 ft.

In June 1963, the earth around the well caved in due to excessive sand pumping and the caved in area was filled with soil.

The pumping equipment presently installed consists of a 3-hp 1760 rpm Fairbanks-Morse electric motor, a 6-in., 4-stage Fairbanks-Morse turbine pump (Serial No. A-284 702) rated at 100 gpm at about 56 ft TDH, and has 45 ft of 4-in. column pipe.

A mineral analysis of a sample (Lab. No. 150648) collected September 17, 1959, after pumping for 1.5 hr at 90 gpm, showed the water to have a hardness of 402 mg/l, total dissolved minerals of 430 mg/l, and an iron content of 1.9 mg/l.

WELL NO. 2, finished in sand and gravel, was completed in 1963 to a depth of 52 ft by the Calhoun Drilling Co., Batchtown. The well is located 30 ft north of Well No. 1, approximately 2430 ft N and 1700 ft E of the SW corner of Section 11, T9S, R2W. The land surface elevation at the well is approximately 440 ft.

A 26-in. diameter hole was drilled to a depth of 52 ft. The well is cased with 8-in. steel pipe from 2.5 ft above the pumphouse floor to a depth of 37 ft followed by 15 ft of

8-in. No. 25 slot Cook Silicon bronze screen. The annulus between the bore hole and casing-screen assembly is filled with bentonite from 0 to 25 ft and with gravel from 25 to 52 ft.

On August 23, 1963, the well reportedly produced 106 gpm with a drawdown of 14 ft from a nonpumping water level of 18 ft below land surface.

The pumping equipment presently installed is a Fairbanks-Morse turbine pump set at 40 ft, rated at 100 gpm at about 56 ft TDH, and powered by a 3-hp 1750 rpm U.S. Holloshaft electric motor.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B111444) is for a water sample from the well collected May 6, 1974, after 30 min of pumping.

WELL NO. 2, LABORATORY NO. B111444

		mg/l	me/l		mg/l	me/l
Iron	Fe	3.83		Silica	SiO ₂	22
Manganese	Mn	0.46		Fluoride	F	0.2 0.01
Ammonium	NH ₄	0.7	0.04	Boron	B	0.1
Sodium	Na	20	0.87	Nitrate	NO ₃	0.0 0.00
Potassium	K	1.3	0.03	Chloride	Cl	18 0.51
Calcium	Ca	114	5.69	Sulfate	SO ₄	52 1.08
Magnesium	Mg	49	4.03	Alkalinity (as CaCO ₃)		470 9.40
Arsenic	As	0.00		Hardness (asCaCO ₃)		486 9.72
Barium	Ba	0.2		Total dissolved minerals		535
Copper	Cu	0.03		pH (asrec'd)		7.4
Cadmium	Cd	0.00		Radioactivity		
Chromium	Cr	0.00		Alpha	pc/l	0.8
Lead	Pb	0.00		±deviation		2.4
Mercury	Hg	0.0000		Beta	pc/l	2.5
Nickel	Ni	0.0		±deviation		2.5
Selenium	Se	0.00				
Silver	Ag	0.00				
Cyanide	CN	0.00				
Zinc	Zn	0.0				