



WATER-RIGHT DOCKET

Ozark National Scenic Riverways

Docket No: 6

ALLEY SPRING WELL.

Supporting Hydro Data

01-20-1971: letter to nps western service center from geological survey water resources division regarding reports of the wells drill



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Water Resources Division
P.O. Box 340
Rolla, Missouri 65401

January 20, 1971

Mr. Don Barrett
U.S. Department of Interior
National Park Service
Western Service Center
450 Golden Gate Ave., Box 36035
San Francisco, California 94102

Dear Mr. Barrett:

Enclosed are reports of the wells drilled at Round Spring, Alley Spring and Big Spring. Each report consists of:

1. Location map of well with respect to the 50-year flood.
2. Description of the drilling and completion of the well.
3. Insoluble residue log by Missouri Geological Survey.
4. Driller's log.
5. Pump test data and drawdown curves.
6. Water analysis by Missouri Geological Survey.
7. Copy of strip chart from observation well at Round Spring only.

In addition we are furnishing a summary of the data obtained from the ~~seven~~ wells drilled to date and their relationships to the knobs area in the vicinity of Eminence and Two Rivers and to the specific capacity map of the southern part of Missouri taken from Mineral and Water Resources of Missouri.

Time spent on the well drilling activities at the three sites consisting of well location, drilling, pump testing and report writing is summarized below:

Walter Oakes	34 days well location, drilling & pump testing.
Gerald Feder	2 days pump testing.
Leo Emmett	4 days pump testing & data analysis.
E. J. Harvey	6 days, drilling, pump testing & report writing.

It has been a pleasure to work with you on the drilling activities. If you have any questions regarding these reports or the data gathered please do not hesitate to write us.

Sincerely,

A handwritten signature in cursive script, reading "E. J. Harvey". The signature is written in dark ink and is positioned above the typed name.

*E. J. Harvey
Assistant District Chief*

Enclosures

ALLEY SPRING WELL

The Alley Spring well was started September 27, 1970, and the pumping test was completed November 3, 1970. The well started in the Roubidoux Formation which extended to a depth of 145 feet. See attached log of well. Josiah Bridge's geologic map of the Cardareva and Eminence Quadrangles shows the contact between the Roubidoux and Gasconade in the vicinity of the well site at an elevation of about 800 feet. However, the log shows the elevation of the contact at approximately 600 feet, a difference of 200 feet between Bridge's interpretation and present day interpretation of well cuttings. The well was drilled to a total depth of 650 feet and did not reach the Potosi Dolomite. The drilling rate was approximately 30 feet per day and the driller reported that in several parts of the section they were making only 7 feet per bit. The driller's log shows a bad crack at 260 feet, soft section at 315-318 feet and a bad crevice at 340 feet.

From examination of sample cuttings by the Missouri Geological Survey it was determined that the projected casing depth of 300 feet would be satisfactory. A 10-inch hole was drilled to 302 feet where the bridge was set and casing was set at 301 feet. Two hundred pounds of bentonite gel were pumped into the formation ahead of neat cement and the well was pressure grouted with 100 sacks of cement. Good circulation was obtained and cement appeared at the surface. Two hours after completion of grouting the cement was found at 29.35 feet below land surface. Static water level before grouting was 51.80 feet below land surface and after grouting was approximately the same. Twenty-six sacks of neat cement filled the annular space to the surface.

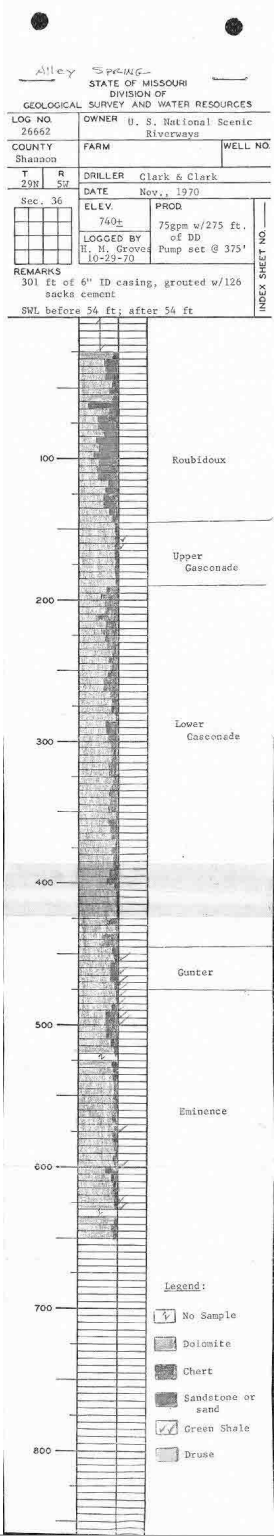
An unused well located 333 feet north of the new well was opened up with a galvanized iron pipe driven through junk thrown into the well. Total depth was 57 feet below land surface and the water level stood about 33.5 feet below land surface. Considering the difference in ground surface elevation between the two wells, the static water levels in the two wells are about the same. During the grouting operation no discernible effect on the water level could be measured in the observation well such as occurred at the Round and Pulltite Spring sites. Measurements were made in the observation well during the maximum capacity and pump tests that followed. No drawdown occurred. In addition, two unused drilled wells 2,200 feet and 3,800 feet from the pumped well were measured periodically. No interference occurred.

The maximum capacity test was started on November 2nd with the test pump set at 379 feet. The yield was increased in steps from 30 gpm to 70 gpm. The pump was shut down for 5 hours during which time the water level recovered to its original level. The long test was started at 1930 hours on the same day and continued for 1,065 minutes (17 hours). The pumping rate was maintained at approximately 55 gpm. Total drawdown was 215 feet and the specific capacity was 0.25 gpm per foot of drawdown. No attempt was made to interpret a transmissivity from the data. Recovery was measured for 2 hours on completion of the test.

Alley Spring - 9/27/70
Clark & Clark
Lester Sohn, Driller

Driller's Log

Overburden - 0-25'
Lime, white hard - 25-40'
Lime, white hard - 40-55'
Lime, chert, brown, hard - 55-75'
Lime, chert, brown, hard - 75-95'
Sand, white, hard - 95-105'
Lime, chert, white-brown - 105-135'
Lime, chert, white, brown, hard - 135-160'
Lime, chert, white, brown - 160-260' (bad crack)
Lime, chert, iron - 275-300'
Lime, chert, iron, brown - 300-395'
Soft 315-318'; bad crevice @ 340'
Lime, chert, brown - 395-420'
Lime, chert, brown, hard - 420-545'
Lime, chert - 545-650'



Alley Spring Well Step Test
Nov. 2, 1970

Date	Hour	Time minutes	Depth to water (feet)	Yield (gpm)	Remarks
11/2/70	11:15		54.43		
		Pump on @ 1143			
		2	100.00		
		5	106	30	
		10	118.40		
		16	122.30	26	
		28	126.95		
		44	129.25		
		61	130.60		
	12:44	Increased rate to		37.4	
		69	185.8		
		78	158.9		
		82	153.05	27.5	
	13:10	Increased rate to		46	
		92	166.1		
		98	183.25		
		110	190.25	44	
		118	191.15	40	
	13:45	Increased rate to		55	
		125	223.53	55	
		135	234.90	53	
		155	238.10	51	
		164	237.65	51	
	14:40	Increased rate to		79	
	14:41	181	304.77	70	
		185	310.50	75	
		200	320.70	73	
	15:10	210	325.80		
		240	328.95	71	
		260	329.46	71	
		Pump off @ 1600 hours.		Recovery	
		2	242.60		
		10	124.00		
		15	95.00		
		24	75.00		
		39	65.00		
	18:45	165	56.08		
	19:25	205	55.55		

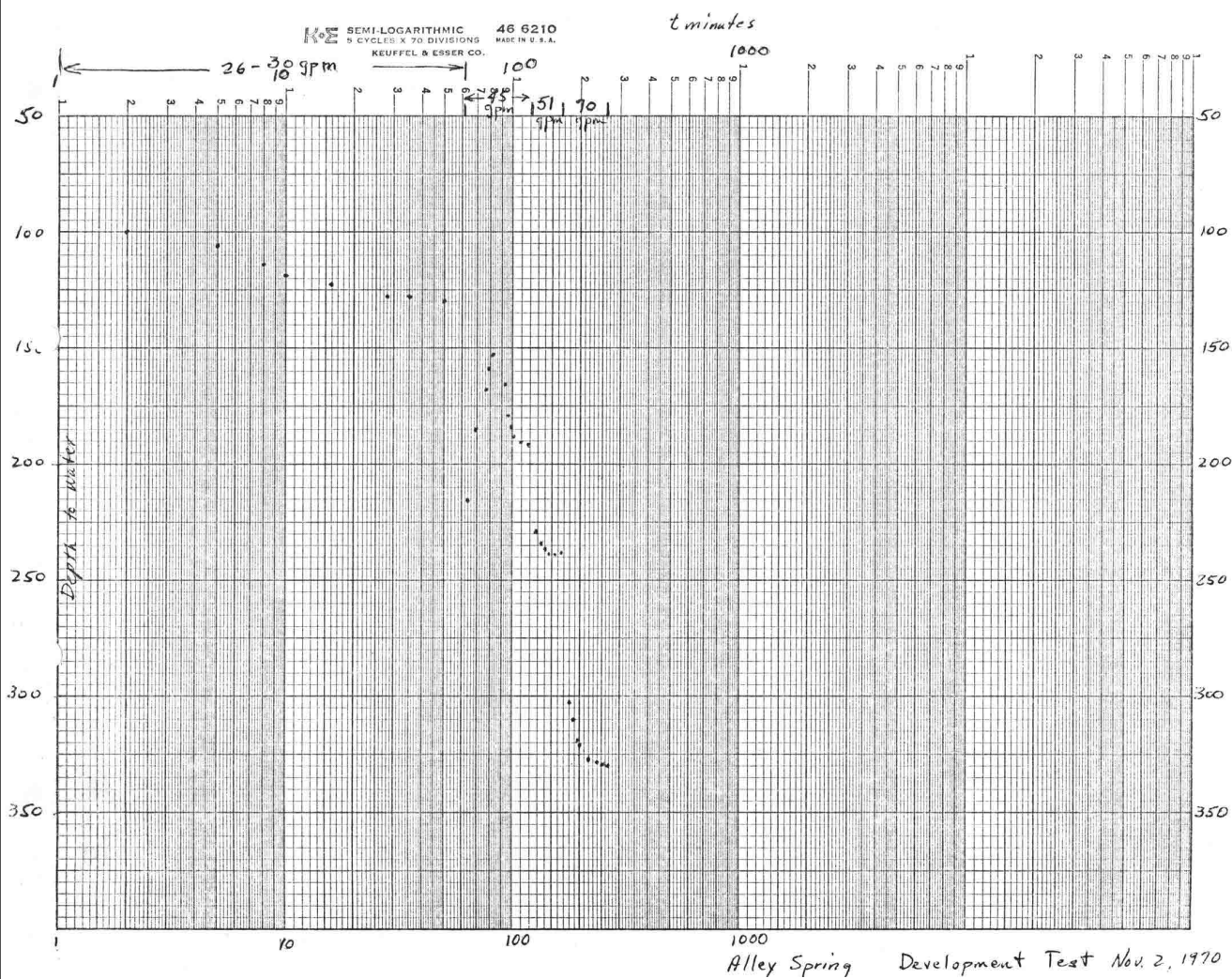
Cond. 225 ~~Amhos~~
@ 15°C.

Alley Spring Well Pump Test
Nov. 2-3, 1970

Date	Hour	Time minutes	Depth to water (feet)	Yield (gpm)	Remarks
11/2/70	19:25		55.55	0	
		Pump on at 1930 hours.			
		2	112.60		
		3	136.30		
		5	200.42		
		7	212.50		
		8	233.95	69	
		10	240.0		
		12	246.45		
		14	251.38		
		16	256.1		Cond. 270 @ 14°C
		20	263.40	61	
		25	266.85		
		30	270.00		
		40	272.15		
		50	271.47		Cond. 340
		60	272.65		
		90	274.28	60	
		120	275.50	60	Cond. 330
		150	275.75	60	
		190	276.50	60	
		210	277.20	60	
11/3/70	0030	240	274.00	59	
		300	273.82	59	
		360	274.90	59	
		420	274.70	59	Cond. 370
		480	275.38	59	Cond. 380
		540	275.72		
		600	275.93		
		660	276.05		
		720	276.70		
		780	275.75		Cond. 385
		840	275.75	59	
		900	275.90		
	11:30	960	276.08		
		1,005	276.02		
		1,050	269.40	58	Cond. 390
		1,065	269.60		
		Pump off @ 1324. Recovery			
	13:27	3	214.28		
		4	200.00		
		7	180		
		8	175		
		11	160		

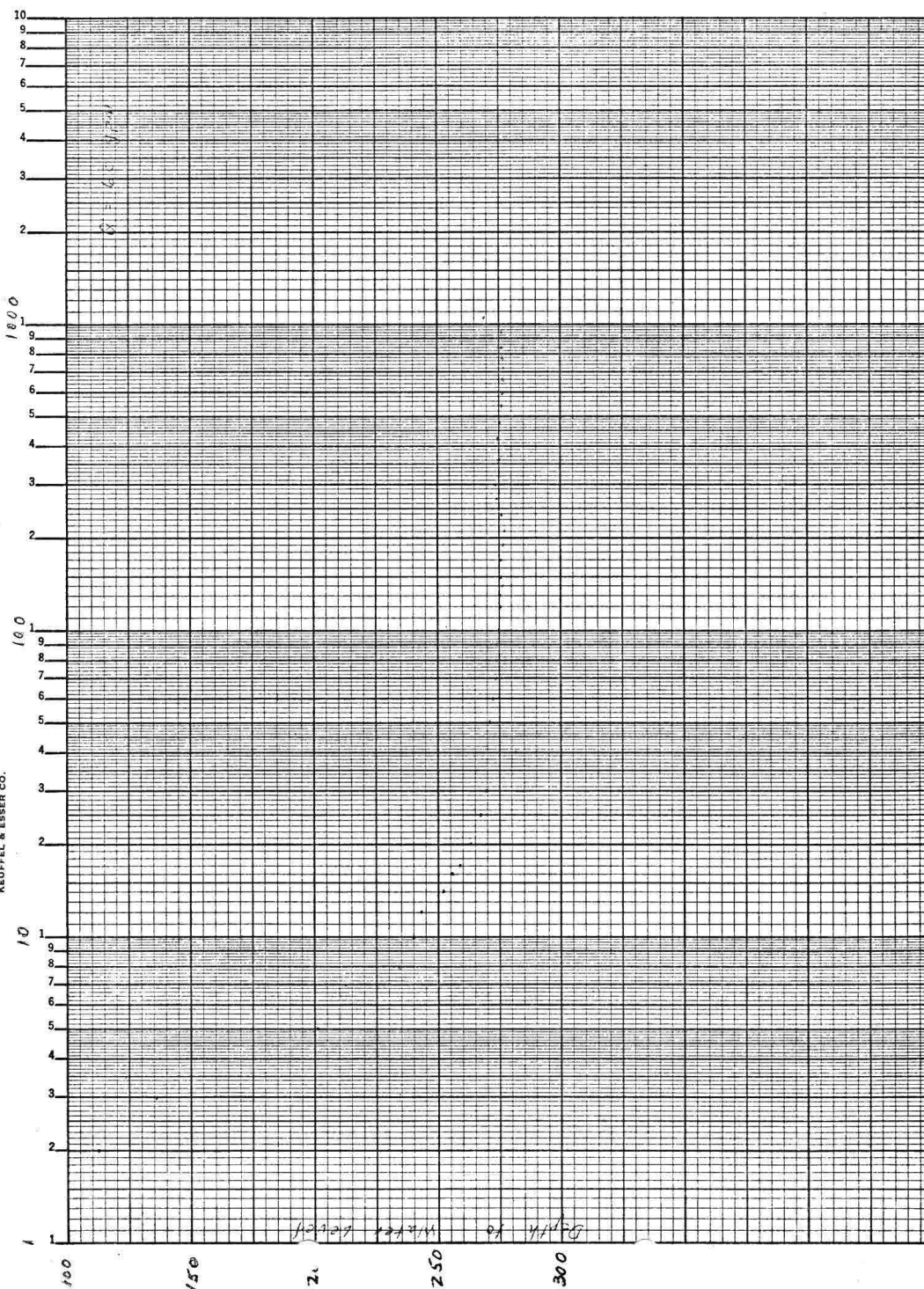
Alley Spring Well Pump Test--continued

Date	Hour	Time minutes	Depth to water (feet)	Yield (gpm)	Remarks
	13:27	14	150		
		19	140		
		33	130		
	14:28	64	124.4		
	15:32	125	121.3		
		End of Pump Test.			



K Σ SEMI-LOGARITHMIC 46 8013
4 CYCLES X 70 DIVISIONS MADE IN U.S.A.
KEUFFEL & ESSER CO.

t_M



Alley Spring Pump Test Nov. 2-3, 1970

MISSOURI GEOLOGICAL SURVEY AND WATER RESOURCES

Box 250

Rolla, Missouri 65401

County: Shannon
 Owner: Alley Spring
 Location: SE 1/4 SE 1/4 NW 1/4
 Analysis No.: 6770
 Collector: W. Oakes, L. E. Emme

Well T.D. 650'

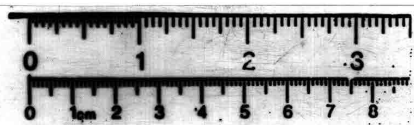
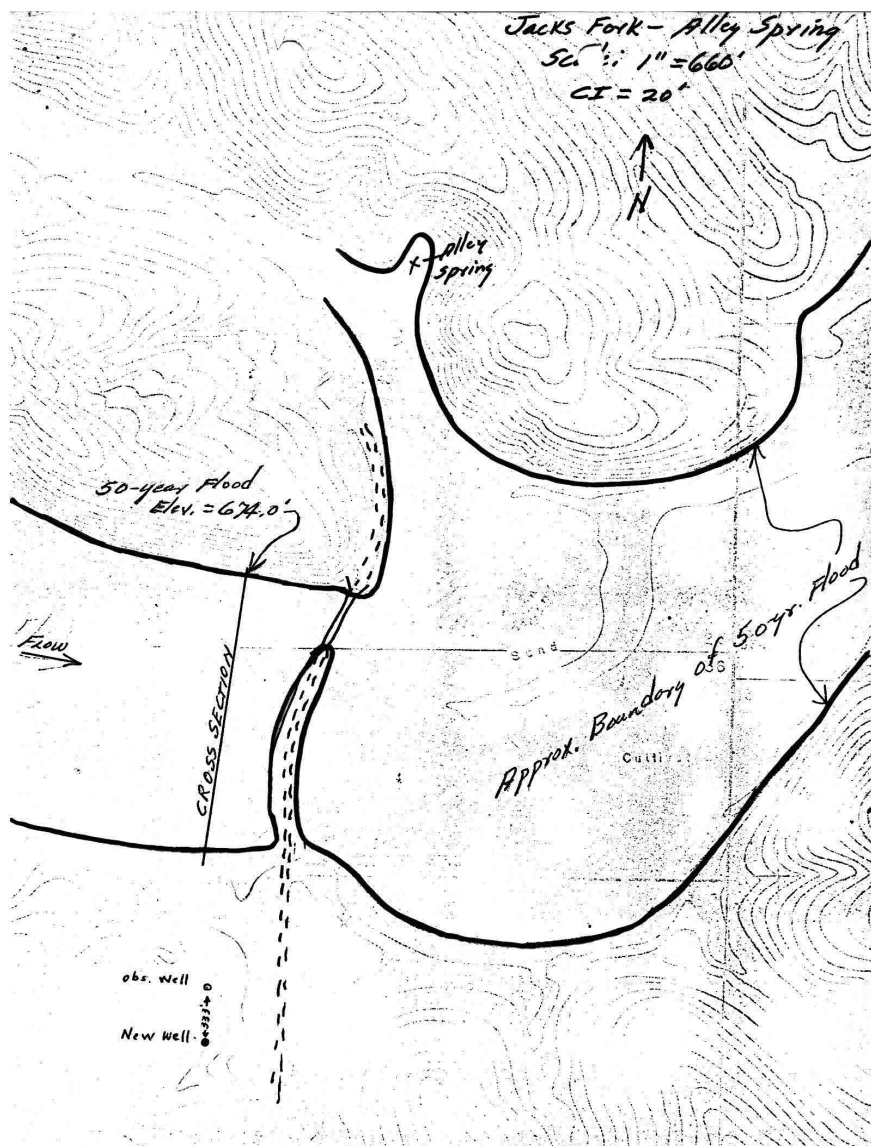
Drilled 10-70, collected at well after
 18 hrs. pumping yield 60 ppm (meas.),
 National Park Service, Van Buren, Mo. S.W.L. 54.4'
 Sec. 36, T29N, R5W Clear, Temp. 14°C

Analyst: M.E. Phillips, E. LoggeDate Analyzed: 12-2-70Date Collected: 11-9-70

CONSTITUENTS	IN PARTS PER MILLION
Turbidity	Light colored susp. matter
Odor	None
pH	7.0
Alkalinity (CaCO ₃)	230.5
Phenolphthalein	6.0
Methyl Orange	224.5
Carbonate (CO ₃)	3.6
Bicarbonate (HCO ₃)	273.9
Silica (SiO ₂)	11.3
Aluminum (Al)	0.0
Calcium (Ca)	54.5
Magnesium (Mg)	19.8
Sodium (Na)	1.5
Potassium (K)	0.7
Total Manganese (Mn)	0.014
Total Iron (Fe)	0.21
Sulfate (SO ₄)	3.8
Chloride (Cl)	2.2
Nitrate (NO ₃)	0.4
Fluoride (F)	0.8
Total Dissolved Solids	235.0
Total Hardness	217.6
Carbonate Hardness	217.6
Non-carbonate Hardness	

Remarks:

Copies To:



Other Supporting Information

Form Approved
OMB No. 158-R0116

U.S. ENVIRONMENTAL PROTECTION AGENCY
WATER PROGRAM OPERATIONS (WH-450)
WASHINGTON, D.C. 20460

INVENTORY OF PUBLIC WATER SUPPLIES
(See instructions on the reverse)

KEY IDENTIFICATION NUMBER

NAME OF WATER UTILITY
15 USMPS OZARK NATL SCENIC RIVERWAY 46

ADDRESS
47 PO BOX 448 76

CITY
77 YAN BUREN 101

COUNTY
102 SHANNON 126

STATE
127 MO 128 ZIP 129 63965 133 PHONE AREA CODE 134 314 136 TELEPHONE NUMBER 137 3234236 143

UTILITY OWNER (Check one) (144)

☐ MUNICIPALITY, DISTRICT, ETC. 1 ☐ INVESTOR 2 ☒ FEDERAL 3 ☐ STATE 4 ☐ OTHER (Specify in remarks) 5

RETAIL POPULATION SERVED
145 2000 153 NUMBER SERVICES 154 25 160 NUMBER METERS 161 1 167

NUMBER OF WHOLESALE CUSTOMERS
168 0 170

PREDOMINANT CHARACTERISTIC(S) OF YOUR SERVICE AREA

COMMUNITY	COMPANY TOWN	RECREATION AREA	MOBILE HOME PARK	INSTITUTION	SCHOOL OR COLLEGE	MOTEL	RESTAURANT	SERVICE STATION	CAMPGROUND	PICNIC AREA	LODGE	MARINA	SKI RESORT	BATHING AREA	VISITOR CENTER	HIGHWAY SAFETY REST AREA	AIRPORT	OTHER (Specify in remarks)
	X							X	X		X							

171 189

CAPACITIES

PRODUCTION, NORMAL OPERATION (Gal/Day)
190 75000 199 EMERGENCY POWER ONLY (Gal/Day)
200 0 209

DISTRIBUTION STORAGE, GRAVITY FLOW (Gallons)
210 75000 219

PRODUCTION

AVERAGE DAY (Gal/Day)
220 30000 229 MAXIMUM DAY (Gal/Day)
230 40000 239

DATE FORM COMPLETED
240 YB MO 243

NO.	SOURCE	NAME	INTAKE LOCATION			MARK (One only)	TREATMENT												LAB CONTROL				
			DEG	MIN	SEC		SURFACE	GROUND	PURCHASED	AERATION	PRECHLORINATION	COAGULATION	SEDIMENTATION	FILTRATION	CORROSION CONTROL	SOFTENING	TASTE AND ODOR CONTROL	IRON REMOVAL	AMMONIATION	FLUORIDE ADJUSTMENT	DISINFECTION	CHEMICAL	BACTERIAL
01	R	WELL	37	08	25	X														X	X	X	
02	R		91	26	42																		
03	R																						
04	R																						

REMARKS (Up to 50 characters) (763 - 832)

* INCLUDES AVERAGE DAILY SUMMER VISITATION

ALLEY SPRING

INSTRUCTIONS

1. **IDENTIFICATION NUMBER** – This is a 14 digit code number that geographically identifies the location of the utility. It will be filled in by EPA personnel.
2. **NAME OF WATER UTILITY** – This is the complete, official name of the utility.
3. **ADDRESS** – This is the mailing address of the utility (*this may be but does not necessarily have to be the physical location of the treatment plant*).
4. **CITY, COUNTY, STATE** – This is the city, county and state of the mailing address of the utility.
5. **ZIP CODE** – This is the zip code of the mailing address of the utility.
6. **IS THE UTILITY OWNED BY A MUNICIPALITY, DISTRICT, INVESTOR OWNER, STATE OR OTHER** (*specify in remarks*) – Place an **X** in the box that describes the type of ownership of the utility.
7. **RETAIL POPULATION SERVED-NUMBER SERVICES, METERS** – Fill in these boxes with the most current information available. Do Not include the population served by water utilities that purchase water from you wholesale.
8. **NUMBER OF WHOLESALE CUSTOMERS** – In cases where water is sold to wholesale customers (*customers who buy water from you for resale*) fill in the boxes with the number of this type of customer.
9. **WHAT IS THE CHARACTERISTIC(S) OF YOUR SERVICE AREA?** – Place an **X** in the boxes necessary to describe the predominant characteristic(s) of your service area.
10. **CAPACITIES** – Fill in these boxes with the most current information available. Report all storage that does not have to be pumped into the system, whether it is elevated or ground storage.
11. **PRODUCTION** – Fill in these boxes with the most current information available.
12. **DATE FORM COMPLETED** – Fill in the numeric designation of the month (*01 - 12*) and the last two digits of the year when the form was completed.
13. **REMARKS** – Additional information can be provided (*maximum of 50 Alpha and/or Numeric characters*).
14. **SOURCE AND TREATMENT** – Write in the spaces below Name the name of the river, lake, other utility, well field, or other source from which the supply of water is taken. Circle "R" for regular source or "A" for auxiliary source. If more than one source is used, use separate lines for each source. If more than four sources are used, then list on a second form starting with 05. Place an **X** in the block(s) for the types of treatment rendered the raw water. Mark each source separately.
15. **INTAKE LOCATION** – Latitude and Longitude of intake.
16. **LABORATORY CONTROL** – Place an **X** in the box for the type of types of laboratory analyses made at the treatment facility. Leave these blocks blank if no laboratory analyses are performed.

SUMMARY

We are including a summary of the drilling to date in the tabulation below. The wells are listed in the order of decreasing specific capacities.

Site	Formation penetrated	T.D.	Casing depth	Open Hole Dia.	Length	Yield	DD	Sp. Cap.
Big Spring	Potosi 190-520	520	370	8	150	230	20	11
Pulltite Spring	Potosi 240-310	308	205	6	103	118	26	4.5
Round Spring	Potosi 180-400	400	200	8	200	120	43	2.8
Austin House	Potosi 225-250	250	200	8	50	6	11	.55 *
Owls Bend	Potosi 75±303	303	202	6	101	50	112	.45
Alley Spring	Eminence 475-650	650	300	8	350	55	214	.26
Two Rivers	Potosi 160-350	350	100	8	250	11	110	.10

Some significance may become apparent from a comparison of the results in the tabulation, the graphs of the wells drilled, and the map showing their locations with respect to the igneous knobs in the area around Eminence. The wells at Big Spring, Pulltite Spring, Round Spring, Owls Bend and Two Rivers penetrated a substantial part of the Potosi section. The Austin House well penetrated a small part of the section. Big Spring well is located farthest from the center of the igneous knobs and had the highest specific capacity (11 gpm per foot of drawdown). Pulltite Spring well is a little closer in and has a good specific capacity (4.5 gpm per foot of drawdown). Austin House well, although it penetrated only a few feet of the Potosi, had a specific capacity that was much lower than those at Pulltite and Round Springs, but was higher than those obtained at Owls Bend and Two Rivers. Owls Bend well near the eastern flank of the knobs area had a rather low specific capacity for the thickness of Potosi penetrated but not as low as that of the Two Rivers well which probably penetrated most of the Potosi section. The Two Rivers well is essentially surrounded by igneous knobs. The well at Alley Spring did not penetrate the Potosi and for this reason is not included in the comparison.

* Rounding of numbers I had done in the past accounts for some small differences in the two tables and the figures shown on the map.

The comparison suggests that circulation of water in the Potosi is slower and retarded in the knobs area perhaps because of lack of fracture and bedding plane openings through which water might travel. Mineralization along fractures may have sealed openings to retard flow. Whatever the cause, lower yields might be expected in the knobs area and higher yields outside the knobs. Of course exceptions to this probably will be found as additional sites are developed.

Projected yields for various pumping levels					
SWL (feet)	PWL (feet)	DD (feet)	Yield (gpm)	Sp. Cap. (gpm/ft)	
BIG SPRING					
53	78	25	280	11	
	100	47	515		
	150	97	1,007		
	370	317	3,500		Bottom of casing
PULLTITE SPRING					
32	58	26	118	4.5	
	100	68	306	4.5	
	150	118	530	4.5	
	200	168	760	4.5	Bottom of casing
ROUND SPRING					
80	123	43	120	2.8	
	150	70	196	2.8	
	175	95	266	2.8	
	200	120	336		Bottom of casing
AUSTIN HOUSE					
57	102	45	23	.51	
	150	93	47		
	200	143	73		Bottom of casing
OWLS BEND					
45	155	110	50	.45	
	200	155	70		Bottom of casing
ALLEY SPRING					
55	270	215	58	.27	
	300	245	66		Bottom of casing
TWO RIVERS					
92	210	118	11	.09	This pumping level is 110 ft. below bottom of casing.



conade Dolomite at an average depth of 500 to 600 feet. The wells that produce from this section are ideal for clubs, schools, small towns, and industries.

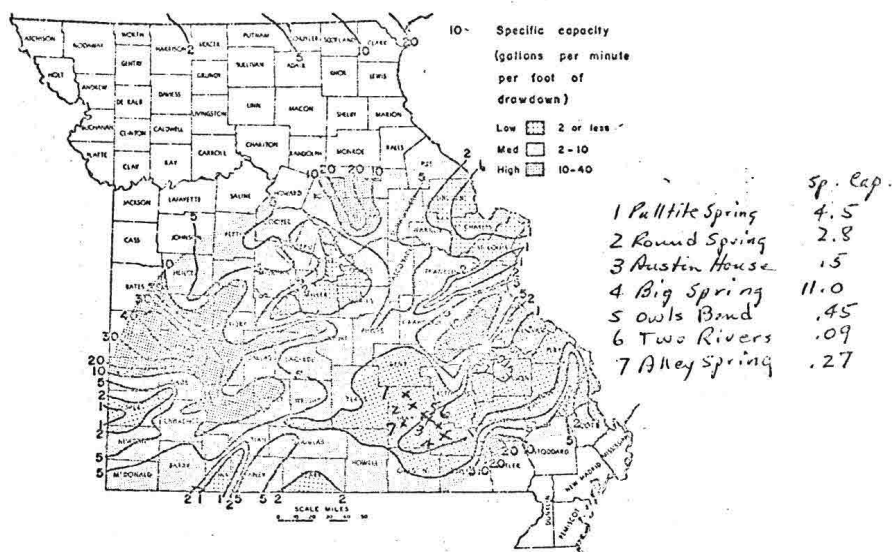


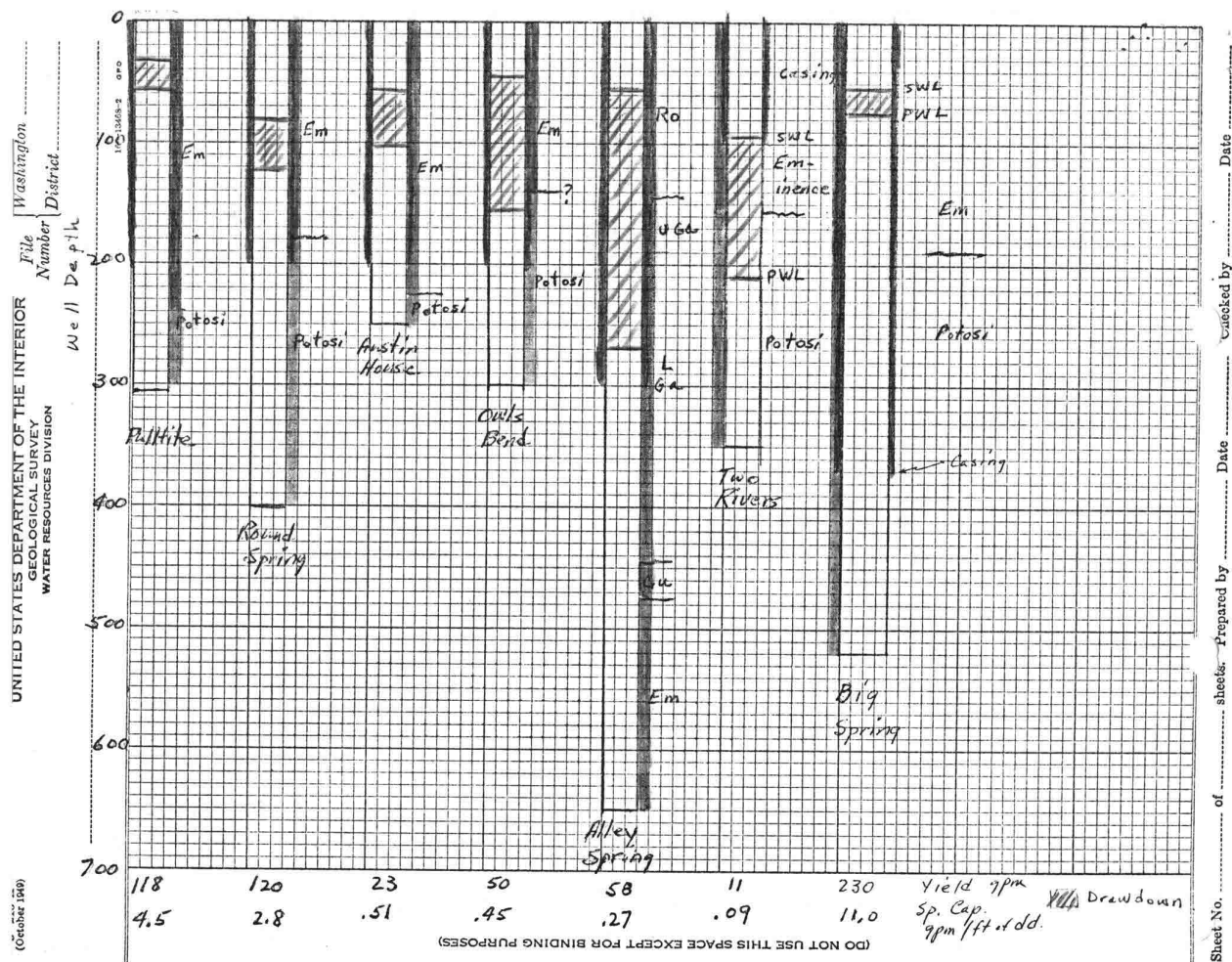
FIGURE 66.—Specific capacities of typical wells in the Ozarks.

Throughout the area numerous municipal and industrial wells yield 500 to 1,000 gallons per minute. These wells vary in depth. Wells that produce 200 to 500 gallons per minute average 1,000 to 1,500 feet in depth. Wells at Springfield in Greene County, for example, average 1,400 to 1,700 feet in depth and produce 500 to 1,000 gallons per minute. Wells at Rolla in Phelps County and Sullivan in Franklin County are 1,000 to 1,200 feet in depth and produce 400 to 600 gallons per minute.

Throughout the area requirements of 15 to 25 gallons per minute can normally be met by drilling to a depth of 300 to 350 feet through the Roubidoux Formation. This is usually an ideal depth for farm wells. Private wells for farms and dwellings in the central Ozarks average 300 feet in depth, whereas in the southwest part of the State the average depth to the Roubidoux is 800 feet.

Descriptions of aquifers

Lamotte Sandstone.—The Lamotte Sandstone is geologically the oldest aquifer in the State and is the basal unit of the Cambrian Sys-



Docket Information

Number of Documents in Docket 21

Documents Dated from 9/27/1970 to 1/20/1971

Docket Compiled: 6/7/2011