KANSAS GEOLOGICAL SURVEY
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Horizontal Drilling

by

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HORIZONTAL DRILLING

History

The Russians were the first to use horizontal drilling during the 1950's. At that time, horizontal wells were considered technically feasible but not profitable. Since then the USSR has extensively applied horizontal drilling. In the mid 1960's the Chinese reported two horizontal wells. One produced for one week but collapsed because the hole was not cased. The second test was interrupted by the cultural revolution.

From 1970 to the beginning of 1980, horizontal drilling was tried in Canada by Imperial Oil, Ltd., and Texaco Canada, Inc. Results were not too successful, however, the longest horizontal well recorded was drilled to 3,800 feet. Horizontal drilling has progressed rapidly during the past decade in the United States, resulting in hundreds of wells drilled and successfully completed. In the mid 1980's, Unical Netherlands, drilled horizontally from old wells and made some economically successful completions.

A tremendous amount of money has been spent to find the proper drilling procedures, best suited equipment, zones to test, and the overall feasibility of horizontal drilling.

Unfortunately, much of the information has been held confidential. In cases where production figures are available, horizontal drilling appears to be profitable.

Service companies have developed the equipment used in successful horizontal drilling. These companies can and will use their expertise to guide those who are considering the possibility of using horizontal drilling to increase profits from marginal oil and gas zones. Secondary recovery projects are also potential targets for horizontal drilling.

Horizontal Drilling Techniques

There are four different categories of horizontal wells broadly classified on the basis of the rate of angle buildup. Three of these are shown in Figure 1.

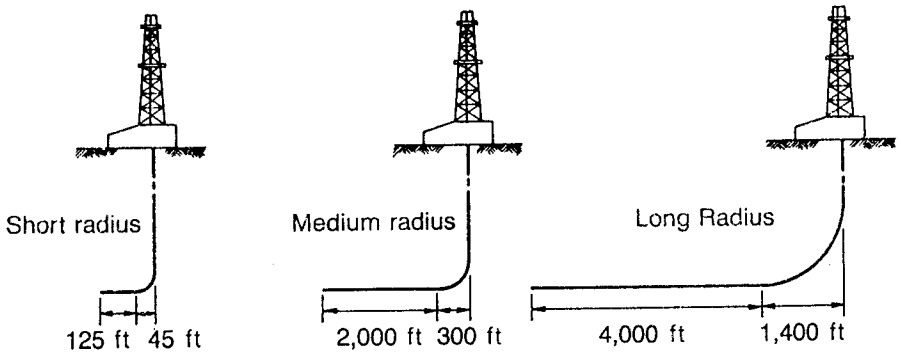


Figure 1-- Examples of different horizontal well types (after Mahoney,1988)

Ultrashort Radius: In this specialized technique (not illustrated in Figure 1), high-pressure water jets and coiled tubing are used to drill two inch diameter holes. Angle buildup rates of 90° per foot are possible. Horizontal drilling is limited to 100 or 200 feet into unconsolidated and weak rock formations. Generally, several holes are bored, all radiating from the same point in a vertical wellbore (Economides,1989).

Short Radius: Wells that drill from the vertical to the horizontal in as little as 47 to 74 lateral feet are classified as short radius wells (Mahoney,1988). Lateral penetrations up to 900 feet are typical (Economides,1989). Drilling operations use specialized equipment that combines hydraulic motors with nonrotating pipe, an interval drive shaft, and a drill bit to develop buildup rates of 1.5° to 3° per feet. Logging is not used in existing wells without horizontal casing.

Short radius methods have tremendous potential for application in older wells and in enhanced oil recovery projects. "Shallow, tight gas sands or coal deposits that produce low volumes of gas but have extended producing lives fit into this category. Live examples where this method might come into play include the shallow Bartlesville reservoirs of southeastern Kansas that lie between 300 and 1,200 feet. Heavy, low viscosity oil regions in Kansas, Missouri, Texas and California also apply (Mahoney,1988 p. 49)."

Medium Radius: Wells in this classification have a radius of curvature from 286 feet to 500 feet and angles of build between

8^{o} to 20^{o} per 100 feet. To date, maximum borehole horizontal penetrations have been around 1,500 feet (Economides,1989).

Medium radius wells are generally employed for formations at or below 1000 feet. Excellent prospects exist in fields that cover large areas, or on large spacing patterns (as the San Juan basin in New Mexico and Texas) and in tight gas sands. Medium radius drilled wells can be horizontally cased.

Long Radius: This system uses standard oil field directional drilling technology. The angle buildup ranges from 3^{o} to 8^{o} per 100 feet. Depending on the reach, it may require the buildup to be performed in two or three sections. Another term frequently used in connection with deviated wells is "extended reach." Extended reach is a relative term and is generally taken to mean a well of over 60^{o} to 70^{o} inclination with a horizontal displacement of over two miles (10,560 ft). Thus, in the case of an extended reach horizontal well, the horizontal section would start after the initial two mile displacement. An extended reach well may not have a truly horizontal section (Economides,1989).

Long radius wells can be drilled using conventional rotary drilling or steerable equipment tools, drill string and techniques. These types of holes can be used on offshore platforms and for reaching under townsites. This process is not likely to be used in existing wells.

Logging is by MWD (measure while drilling). Long radius wells con be horizontally cased. Only medium and long radius wells can be completed and cemented with conventional techniques.

Advantages and Disadvantages of Horizontal Drilling

The primary advantage of horizontal drilling is the production from zones with vertical fractures, zones with variable porosity and permeability through the formation, and zones with variable thickness, which otherwise could never have been found. In addition, by horizontal drilling, an artificial fracture can be induced. Horizontal cores can give much better information of the homogenerty of the reservoir and better reserve estimates. Horizontally drilled wells also can give better results in secondary recovery projects.

In some areas coning is a problem, and the bore hole damage caused by drilling is a problem or pressure draw down. Production of sands with movable fines are also a problem.

Some Observations

When a company starts drilling horizontal wells there will be a learning period. Initial costs will be double that of drilling vertical holes. After several years experience the cost will be only about one third more than the cost of drilling vertical holes. While still more expensive than vertical drilling, horizontally drilled wells may locate three times as many reserves as those detected by vertically drilled wells. Vertical fractures can easily be missed in vertically drilled wells where horizontally drilled wells may intersect many vertical fractures.

Prior to beginning a drilling operation, a thorough investigation of the area to be drilled is essential. Subsurface information of all kinds must be considered including: thicknesses of the formation to be produced, type of drive, pressures to be encountered, drill hole conditions, cementation factors and porosity and permeability derived from core data in the area. Single shot or multiple shot geophysical surveys may also be used. Of course, after the first well is drilled and cored through the target formation, much more information will be available so further investigation may or may not be warranted.

Starting the Prospect

Planning, as to what objectives are to be met and how they can be met,should be conducted for all stages of the drilling operation. First, consider the vertical portion of the hole to be drilled. Surface casing and then intermediate casing need to be set and cemented. Second, the kick off point (KOP), and the radius of curvature needed to reach the target formation must be determined. Third, the optimum amount of horizontal hole to be drilled should be figured. Fourth, the type of completion and down hole equipment needed to finish the well also need to be considered.

Supervision

Rig floor supervision is the most important part of the whole operation. The operators' representative will be required to supervise all stages of operations and should be very knowledgeable of all elements involved in horizontal drilling. Horizontal drilling places exceptional demands, not ordinarily found in conventional drilling, upon supervisory personnel.

Summary

Because horizontal drilling completions have been found to increase production from a wide variety of reservoir types and conditions, and because horizontal drilling techniques have advanced over the last decade, the use of this method is expected to increase rapidly in the near future.

There are guidelines that should be followed when choosing candidates for horizontal drilling. Once chosen, the horizontal well candidate must be classified appropriately--should this be a short, medium or long radius horizontal completion? Next comes the well planning and design phase.

Horizontal drilling necessitates a blend of disciplines and technology and must be combined in a comprehensive unit to obtain practical results. Careful planning and well design are essential. Each horizontal well program will differ to some extent from all others.

Finally, horizontal drilling is a more delicate procedure than most conventional vertical drilling. Therefore, high quality rig supervision is an important consideration when electing to undertake these wells. The best planning and design cannot make up for poor execution.

Possible Horizontal Prospects in Kansas

Horizontal technology has typically been applied in consolidated , naturally fractured carbonates and sandstone formations. Increased production results by exposing more productive lengths of reservoir to the wellbore (Zaleski,1988).

Below are the areas in Kansas that may be considered as good candidates for horizontal drilling:

1) Shallow Bartlesville reservoirs of southeast Kansas that lie between 300 and 1,200 feet.
2) Heavy, low viscosity oil regions (Cherokee County) in eastern Kansas, western Missouri bordering Kansas and northeasten Oklahoma.
3) Severely fractured zones in the Pre-Cambrian subsurface on the Central Kansas uplift.
4) Severely fractured zones at the top of the Arbuckle on the Central Kansas uplift where karst topography exists.
5) The upper Viola surface in south-central Kansas, the fractured area near the pinch-out of the Viola against the Central Kansas Uplift.
6) The northern Nemaha anticline.

7) The highly weathered and fractured mississipian subsurface in central and eastern Kansas.

topography (caves, sinkholes,etc.) are the most rewarding.

8) Vertically fractured carbonate reservoirs in karst topography (caves, sinkholes, stc.) are the most rewarding.

9) Old areas of abandoned production.

10) Areas of enhanced recovery.

11) Gas production from vertical fractures in the upper chalk of the Smokey Hill member of the Niobrara (Cretaceous).

Poor Prospects in Kansas

Horizontal drilling practices should not be used in areas that are prone to lost circulation. The practice of removing recyclable drill cuttings and solids also removes lost circulation material from the mud system which must keep the weight down while drilling. So, horizontal wells should not be drilled in the Hugoton Embayment of the Anadarko basin and other smaller areas of Kansas.

Kansas Well Schedule
(Form KGS-GW1-4/83)
User's Manual
Modified from USGS "Storage and Retrieval of Well Data"
by C.O. Morgan & J.M. McNellis

Pamela K. Chaffee and Howard G. O'Connor

The proposed format for storage of water-well data and some water-quality data to be used by the Geohydrology Section of the Kansas Geological Survey has been adapted from an older U.S. Geological Survey, Kansas Well Schedule form. Much of the information included and their respective input codes remain the same. Following are listed information included on the present well schedule and their input codes:

STATE (column 1), Kansas and bordering states

Code	State
C	Colorado
K	Kansas
M	Missouri
N	Nebraska
O	Oklahoma

COUNTY (columns 2-3), alphabetic order

Code	County	Code	County	Code	County
01	Allen	21	Dickinson	41	Haskell
02	Anderson	22	Doniphan	42	Hodgeman
03	Atchison	23	Douglas	43	Jackson
04	Barber	24	Edwards	44	Jefferson
05	Barton	25	Elk	45	Jewell
06	Bourbon	26	Ellis	46	Johnson
07	Brown	27	Ellsworth	47	Kearny
08	Butler	28	Finney	48	Kingman
09	Chase	29	Ford	49	Kiowa
10	Chautauqua	30	Franklin	50	Labette
11	Cherokee	31	Geary	51	Lane
12	Cheyenne	32	Gove	52	Leavenworth
13	Clark	33	Graham	53	Lincoln
14	Clay	34	Grant	54	Linn
15	Cloud	35	Gray	55	Logan
16	Coffey	36	Greeley	56	Lyon
17	Comanche	37	Greenwood	57	McPherson
18	Cowley	38	Hamilton	58	Marion
19	Crawford	39	Harper	59	Marshall
20	Decatur	40	Harvey	60	Meade

Code	County	Code	County	Code	County
61	Miami	76	Pratt	91	Sherman
62	Mitchell	77	Rawlins	92	Smith
63	Montgomery	78	Reno	93	Stafford
64	Morris	79	Republic	94	Stanton
65	Morton	80	Rice	95	Stevens
66	Nemaha	81	Riley	96	Sumner
67	Neosho	82	Rooks	97	Thomas
68	Ness	83	Rush	98	Trego
69	Norton	84	Russell	99	Wabaunsee
70	Osage	85	Saline	A0	Wallace
71	Osborne	86	Scott	A1	Washington
72	Ottawa	87	Sedgwick	A2	Wichita
73	Pawnee	88	Seward	A3	Wilson
74	Phillips	89	Shawnee	A4	Woodson
75	Pottawatomie	90	Sheridan	A5	Wyandotte

The symbols ƀ in columns 4, 7, 10, 12, 20, etc. represent blanks to be placed in the computer data file.

TOWNSHIP (columns 5-6), in Kansas all townships are south (S); therefore, only the township number is needed (right-hand justified) and column 7 is left blank. However, if a well is inventoried in another state where townships are north, an "N" may be placed in column 7 instead of a blank.

Examples: 01 or ƀ1 may be used for T.1S
23 is used for T.23S

RANGE (columns 8-9), only the range number is needed. Right-hand justify.

01 or ƀ1 = R.1
23 = R.23

RANGE, EAST OR WEST DESIGNATION (column 11)

E for east ranges = R.1E
W for west ranges = R.23W

SECTION (columns 13-14), only the section number is needed. Right-hand justify.

01 or ƀ1 = Sec. 1
23 = Sec. 23

LOCATION WITHIN A SECTION (columns 15-19), uses the alphabetic system. Left-hand justify. Column 19 is reserved for a well number if there is more than one well at that location. Column 15 designates which 160-acre 1/4 of the section the well is located in; column 16 designates which 40-acre 1/4 of the 160-

acre 1/4; column 17, the 10-acre 1/4 of the 40-acre 1/4; and column 18, the 2-1/2-acre 1/4 of the 10-acre 1/4 (if available).

A = NE 1/4 B = NW 1/4 C = SW 1/4 D = SE 1/4
ABC∅1 = SW 1/4 NW 1/4 NE 1/4 well 1
ABC∅2 = SW 1/4 NW 1/4 NE 1/4 well 2
ABCD1 = SE 1/4 SW 1/4 NW 1/4 NE 1/4 well 1
ABCD2 = SE 1/4 SW 1/4 NW 1/4 NE 1/4 well 2

OWNER OR USER'S NAME (columns 21-39), must be left-hand justified and limited to 19 spaces.

SOURCE OF OWNER INFORMATION (columns 41-42), must be left-hand justified.

W∅ = WWC-5 water well record well (since 1975)
D∅ = Division of Water Resources
H∅ = Kansas Department of Health and Environment
U∅ = U.S. Geological Survey
R∅ = reported from owner or user
L∅ = County Lease map
RD = Rural Directory
RW = reported from owner or user and WWC-5 form
RL = reported from owner or user and lease map
N∅ = neighbor

TYPE OF WELL (columns 44-45), left-hand justified.

DR = Drilled
DU = Dug
DN = Driven
DD = Dug and drilled
SP = Spring
AU = Augered
UN = Unknown

SURFACE ELEVATION in feet above mean sea level (columns 47-52). Column 51 must contain a decimal point.

Examples: 1231.2 = 1231.15 feet above msl
987.2 = 987.25 feet above msl

ELEVATION ACCURACY (column 54), designates to what degree of accuracy the surface elevation has been determined.

1 = Instrument level ±0.1 foot
2 = Instrument level ±1.0 foot
3 = Topographic map 1:24,000 scale (7.5 minute) ±5 feet
4 = Topographic map 1:24,000 scale (7.5 minute) ±2 feet
5 = Topographic map 1:62,500 scale (15 minute) ±10 feet
6 = Topographic map 1:100,000 scale (elevations are in meters--convert to feet) ±2.5 meters or ±8 feet
7 = Altimeter ±5 feet

DATE WELL CONSTRUCTED (columns 56-60), month and year well constructed. Leave blank if unknown or spring.

Month (columns 56-57).

Code	Month	Code	Month
01	January	07	July
02	February	08	August
03	March	09	September
04	April	10	October
05	May	11	November
06	June	12	December

Column 58 must contain a hyphen (a "-" sign).

Year (columns 59-60), is represented by the last two digits of year (e.g., 50 = 1950; 63 = 1963).

DEPTH OF WELL in feet below land surface datum (lsd), (columns 62-67). A decimal point must be placed in column 66. For measured depths, use box in upper right-hand corner (T.D. represents total depth). When a spring, leave blank and indicate spring in accuracy column. M.P. stands for measuring point. Be sure to describe the measuring point in the appropriate space on schedule sheet and provide a sketch for it on back of the sheet.

ACCURACY (column 69), designates to what degree of accuracy the well depth has been determined.

1 = Measured by local, state, or federal water agency with proper equipment and training, to the closest 0.1 foot.
2 = Determined from an electrical, gamma ray, steel tape, or other mechanical log, to nearest foot.
3 = Reported by owner or user, to nearest foot.
4 = Well depth reported by driller, driller's log (WWC-5), or water agency, to closest foot.
5 = Estimated by local, state, or federal water agency to closest foot.
6 = Spring.
7 = Greater than the value entered
8 = Less than the value entered

USE OF WELL (column 71), an alphabetic and numeric code is used:

Code	Use	Code	Use
1	Domestic--includes yard and garden watering	H	Industrial and observation
2	Stock	I	Public supply and observation
3	Irrigation	J	Commercial--includes restaurants, motels, etc.
4	Industrial--includes railroad uses	K	Commercial and observation
5	Public supply--includes schools	L	Irrigation and observation
6	Observation	M	Test and observation
7	None	N	Abandoned
8	Test	O	Public supply, domestic, and stock
9	Domestic and stock	P	None and observation
A	Irrigation and domestic	Q	Abandoned and observation
B	Irrigation, domestic, and stock	R	Pressure relief or drainage well
C	Irrigation and stock	S	Municipal supply
D	Public supply and industrial	T	
E	Domestic and observation	U	Unknown
F	Stock and observation		
G	Domestic, stock, and observation		

WATER LEVEL (columns 73-79). This value represents depth to water in feet. It must be corrected to land surface (use box in upper left-hand corner). Column 77 must contain a decimal point. For water levels above lsd, place a "-" sign in front of the value. Leave blank if unknown.

WATER LEVEL ACCURACY (column 81), designates the degree of accuracy of the water-level measurement.

1 = Measured by local, state, or federal water agency with proper equipment and training, water level less than 100 feet below lsd to nearest 0.01 foot.

2 = Measured by local, state, or federal water agency with proper equipment and training, water level of 100 feet or more below lsd to nearest 0.1 foot.

3 = Reported by owner or user, water level below lsd to nearest foot.

4 = Reported by other than owner or user (i.e., driller, driller's log or water agency); water level below lsd to nearest foot.

5 = Estimated by local, state, or federal water agency, water level below lsd to nearest foot.

6 = Pumping level, to nearest foot.

7 = Water level measured by local, state, or federal water agency, above lsd to nearest 0.1 foot. A "-" sign should precede the water level in columns 73-79. Also used for spring measurements.

8 = Water level measured by local, state, or federal water agency, above lsd to nearest foot. A "-" sign should precede the water level. Also used for spring measurements.

9 = Water level reported above lsd to nearest foot. A "-" sign should precede the water level. Also used for reported spring water levels.

A = Water level estimated by local, state, or federal water agency above lsd to the nearest foot. A "-" sign should precede the water level. Also used for estimated spring water levels.

B = Water level, below lsd, not measured, reported, or estimated. Leave columns 73-79 and 83-90 blank.

C = Water level, above lsd--including spring, not measured, reported, or estimated. Leave columns 73-79 and 83-90 blank.

Columns 73-79 blank = "dry" if date is entered in columns 83-90.

Examples:

31.52ϕϕ1 = Measured water level 31.52 feet (<100) below lsd

110.30ϕϕ2 or 110.3ϕϕϕ2 = Measured water level 110.34 feet (≥100) below lsd

32.00ϕϕ4 or 32.ϕϕϕϕ4 = Reported water level 32 feet below lsd by WWC-5 water well record

-5.20ϕϕ7 or -5.2ϕϕϕ7 = Measured water level 5.2 feet above lsd

-5.00ϕϕ9 or -5.ϕϕϕϕ9 = Reported water level 5 feet above lsd

-5.00ϕϕA or -5.ϕϕϕϕA = Estimated water level 5 feet above lsd

DATE OF WATER-LEVEL MEASUREMENT (columns 83-90)

Month (columns 83-84), numeric code, right-hand justify. Use same code as for DATE WELL CONSTRUCTED (pg. 4). Column 85 must contain a hyphen.

Day (columns 86-87), numeric code, right-hand justify. Use number of day of the month, numbers 1 through 31. Column 88 must contain a hyphen.

Year (columns 89-90), numeric code, right-hand justify. Use last two digits of year (e.g., 59 = 1959; 82 = 1982).

AQUIFER(S) MATERIAL (columns 92-96), many different combinations have been coded. Additional combinations can be added easily. Right-hand justify a single aquifer material (columns 95-96). Space has been provided for two aquifers contributing to the well. Code the upper aquifer material into columns 92-93, then place a comma "," in column 94, and then the lower aquifer material code in columns 95-96.

Material	Code	Material	Code
Sandstone (Ss)	01	Ls, Sh, Dol	36
Limestone (Ls)	02	Ls, Sh, Gyp	37
Shale (Sh)	03	Ls, Dol, Gyp	38
Dolomite (Dol)	04	Sh, Dol, Gyp	39
Gypsum (Gyp)	05	Sd, Gr, St	40
Coal	06	Sd, Gr, Cl	41
Sand (Sd)	07	Sd, St. Cl	42
Gravel (Gr)	08	Gr, St, Cl	43
Silt (St)	09	Ss and Al	44
Clay (Cl)	10	Ls and Al	45
Alluvium (Al)	11	Sh and Al	46
Igneous (Ig)	12	Dol and Al	47
Metamorphic (Meta)	13	Gyp and Al	48
Not determined	14*	Ss and Sd	49
Ss and Ls	15	Ss and Gr	50
Ss and Sh	16	Ss and St	51
Ss and Dol	17	Ss and Cl	52
Ss and Gyp	18	Ls and Sd	53
Ls and Sh	19	Ls and Gr	54
Ls and Dol	20	Ls and St	55
Ls and Gyp	21	Ls and Cl	56
Sh and Dol	22	Sh and Sd	57
Sh and Gyp	23	Sh and Gr	58
Sd and Gr	24	Sh and St	59
Sd and St	25	Sh and Cl	60
Sd and Cl	26	Dol and Sd	61
Gr and St	27	Dol and Gr	62
Gr and Cl	28	Dol and St	63
St and Cl	29	Dol and Cl	64
Ss, Ls, Sh	30	Gyp and Sd	65
Ss, Ls, Dol	31	Gyp and Gr	66
Ss, Ls, Gyp	32	Gyp and St	67
Ss, Sh, Dol	33	Gyp and Cl	68
Ss, Sh, Gyp	34	Sandy Sh	69
Ss, Dol, Gyp	35	Ash	70

Material	Code	Material	Code
Salt	71	Siltstone (Sts)	82
Black Sh	72	St, Cl, Chalk Gr	83
Colluvium	73	Anhydrite	84
Sandy Sh and Ss	74	Sd & Chalk Gr	85
Red Sh	75	Clayey Chalk Gr	86
Glacial Drift	76	Chert	87
Glac-Fluv Deposits	77	Sts & Calcite concre.	88
Chalk	78	Ls and Chert	89
Chalk Gr	79	Sd, Gr, Ss	90
St and Chalk	80	Sandy Sh and Ls	91
Chalk Gr and St	81	Claystone (Cls)	92

*Leave blank if data is to be added.

AQUIFER(S) UNIT(S) (columns 98-104). Geologic units presently acceptable, formal and informal, and some units not presently acceptable in Kansas are listed and coded. Two lists are presented: 1) a stratigraphic-numeric list on pages 14-21, and 2) an alphabetic-numeric list on pages 22-29. Approximate stratigraphic and alphabetic lists, January 1971; list of abbreviations used, page 13. Right-hand justify a single aquifer unit (columns 102-104). Again, space has been provided for two aquifers. code the upper aquifer unit into columns 98-100, then place a comma "," in column 101, and then the lower aquifer unit code in columns 102-104.

SOURCE OF AQUIFER INFORMATION (columns 106-107), left-hand justify.

- Wϕ = WWC-5 water well record well (since 1975)
- WT = WWC-5 water well record test hole (since 1975)
- WO = water well record (pre-1975)
- Tϕ = Unspecified survey (U.S. or KS.) test hole (rotary or auger)
- TR = Survey test hole (rotary)
- TA = Survey test hole (auger)
- Oϕ = Oil and gas record
- PS = Public supply record--includes city, rural water district, school, driller, USDA
- Mϕ = Measured section
- Kϕ = Driller
- IN = Inference
- Rϕ = Owner or user
- WI = WWC-5 and Inference

DEPTH TO BEDROCK (columns 109-114), corrected to lsd, with decimal point in column 113. Use columns 106-107 "Source of Aquifer Information" to also describe the accuracy of the "Depth to Bedrock" value. Use '0.0' in columns 112-114 if springflow from bedrock.

YIELD (columns 116-119), in gallons per minute (gpm). Right-hand justify. Decimal point not necessary.

Examples: ␣5.5 = 5.5 gpm
101. = 101 gpm
␣101 = 101 gpm
1000 = 1,000 gpm

YIELD ACCURACY (column 121), designates the accuracy of the yield measurement.

1 = Estimated by local, state, or federal water agency using pump test analysis.
2 = Measured by local, state, or federal water agency with proper equipment and training, using measuring devices such as weirs, flow meters, flumes, etc.
3 = Reported by owner or user.
4 = Reported by other than owner or user (i.e., driller, driller's log, or water agency).
5 = Yield estimated by local, state, or federal water agency based on previous experience, historical records, previous measurements, etc. May be significantly in error
6 = Minimum value based on installed pumping equipment.

DIAMETER OF CASING (columns 123-126), in inches, right-hand justify <u>with a decimal point</u> included somewhere in the value, depending on the accuracy of the obtained value.

Examples: ␣␣5. = 5 inch casing
5.75 = 5 3/4 inch casing
␣36. or 36.0 = 36 inch casing
120. = 120 inches or 10 foot diameter dug well

CASING TYPE (column 128), uses an alphabetic code:

Code	Casing Type
A	Aluminum
B	Brick
C	Concrete
D	Iron & Plastic
E	Contact Spring
F	Galvanized steel & Plastic
G	Galvanized steel
H	Fracture spring
I	Iron (oil field)
J	Iron & Galvanized steel
K	Unknown
L	Galvanized Steel, plastic & tile
M	Brick & rock
N	None
O	Oil barrel
P	Plastic (includes PVC, SR, RMP & ABS)
Q	Transite (Asbestos-Cement)
R	Rock
S	Steel
T	Tile
U	Solution Spring
V	Spring, undifferentiated
W	Wood
X	
Y	
Z	

LIFT AND POWER (column 130), an alphabetic and numeric code is used:

Code	Lift & Power
1	Centrifugal-Electric (C,E)
2	Cylinder-Electric (Cy,E)
3	Cylinder-Hand (Cy,H)
4	Cylinder-Wind (Cy,W)
5	Cylinder-Hand & Electric (Cy,H&E)
6	Cylinder-Hand & Wind (Cy,H&W)
7	Cylinder-Electric & Wind (Cy,E&W)
8	Cylinder-Gasoline (Cy,G)
9	Cylinder-Gasoline & Hand (Cy,G&H)
A	Jet-Electric (J,E)
B	Turbine-Electric (T,E)
C	Turbine-Natural Gas (T,NG)
D	Turbine-Liquid Petroleum Gas (T,LPG)
E	Turbine-Diesel (T,D)
F	Turbine-Gasoline (T,G)
G	Turbine-Tractor (T,T)
H	None (N)
I	Bucket-Hand (B,H)
K	Airlift-Electric (AL,E)
L	Airlift-Internal Combustion (AL,IC)
M	Endless Chain-Hand (EC,H)
N	Cylinder-Wind & Gasoline (Cy,W&G)
O	Centrifugal-Natural Gas (C,NG)
P	Centrifugal-Liquid Petroleum Gas (C,LPG)
Q	Submersible-Electric (S,E)
R	Centrifugal-Gasoline or Tractor (C,G/T)
S	Cylinder-Wind and Jet-Electric (Cy,W&J,E)
T	Turbine (T)
U	Unknown (U)
V	Artesian Pressure (Flows)
W	Cylinder-Hand & Jet-Electric (Cy,H&J,E)
X	Artesian Pressure and Submersible-Electric (Flows & S,E)

CHLORIDE CONTENT (columns 132-139), in milligrams per liter. Right-hand justify and column 138 must contain a decimal point: ␣␣␣␣32.5 = 32.5 mg/L Cl^-
␣10146.0 = 10,146. mg/L Cl^-

ACCURACY (column 141). This code designates the source and the accuracy of the chloride concentration:

Code	Accuracy
1	Analysis by Kansas Geological Survey - Geohydrology Section using a field test kit (corrected for error).
2	Analysis by Kansas Geological Survey - Analytical Services Section.
3	Analysis by Kansas Department of Health and Environment
4	Analysis by a state certified private laboratory.
5	Analysis by a research laboratory

SPECIFIC CONDUCTANCE (columns 143-147), in micromhos per centimeter at 25°C. Right-hand justify with a decimal point in column 147. If the specific conductance is greater than or equal to 10,000, a decimal point must be placed in column 148 instead of a blank: ␣478. = 478. µmhos/cm at 25°C
3120. = 3,120. µmhos/cm at 25°C
10690. = 10,690. µmhos/cm at 25°C

ACCURACY, LAB OR FIELD (columns 149-150). This code designates the source and the accuracy of the specific conductance value and whether it was measured in the field, or in a laboratory setting. Place the source and accuracy code in column 149. In column 150, place an 'F' if the specific conductance was measured in the field at the point of sample collection, or an 'L' if it was measured some time later in a laboratory setting.

Code	Accuracy
1	Analysis by Kansas Geological Survey - Geohydrology Section using a portable conductivity meter (corrected for temperature).
2	Analysis by Kansas Geological Survey - Analytical Services Section
3	Analysis by Kansas Department of Health and Environment
4	Analysis by a state certified private laboratory
5	Analysis by a research laboratory

SAMPLE COLLECTION DATE (columns 152-159), date sample collected for the preceeding chloride (columns 132-139) and/or specific conductance value(s) (columns 143-147).

Month (columns 152-153), numeric code, right-hand justify. Use same code used for Date Well Constructed (Pg. 4). Column 154 must have a hyphen.

Day (column 155-156), numeric code, right-hand justify. Use number of day of the month, numbers 1 through 31. Column 157 must contain a hyphen.

Year (columns 158-159), numeric code, right-hand justify. Use last two digits of year (e.g., 59 = 1959; 83 = 1983).

OTHER CHEM(ICAL) QUALITY DATA AVAILABLE (column 161), numeric code (and alphabetic code if necessary) to designate other sources of chemical quality data for the same well or spring:

Code	Data Source(s)
1	Kansas Geological Survey
2	Kansas Department of Health and Environment
3	State certified private laboratory
4	Research laboratory
5	U.S. Geological Survey

REMARKS (columns 163-173), space designated for an individual's (or project's) own particular use.

Some space for additional water-level information, chemical data and respective accuracies, and remarks are provided on the schedule sheet. This information will be entered into the computer on the following line starting in column 73 and ending (as necessary) in column 173.

Space is provided on the back of the schedule sheet for sketching water well construction and/or geology, location of the well (or spring) within the proper township and range (scale of sketch is approximately 1:24,000), aerial views of the well in relation to buildings, roads, pump, pressure tank, etc., and a side view of the well in relation to any nearby objects (buildings, pump, pressure tank, etc.) or physical features. Be sure to show the measuring point in the close-up aerial and side view sketches of the well. Also include in sketches the source of collected sample(s).

List of abbreviations used in Aquifer(s) Unit(s)

Name	Abbrev.	Name	Abbrev.
BASAL	BS	PENNSYLVANIAN	PENN
BED	B	PITTSBURG	PITTS
BRANCH	BR	PLEISTOCENE	PLEIST
BURROAK	BURR	PERIDOTITE	PERIDOT
CAMBRIAN	CAM	QUARRY	QUAR
CONGLOMERATE	CONG	QUATERNARY	QUAT
CHALK	CHK	QUERY	$
CHEYENNE	CHYN	RECENT	REC
CITY	CY	SAND	SD
CLAY	CL	SANDSTONE	SS
CREEK	CRK	SERIES	SER
CRETACEOUS	CRET	SHALE	SH
DAKOTA	DAK	SILTSTONE	STS
DEPOSITS	DEP	SILURIAN	SIL
DEVONIAN	DEV	SPRINGS	SP
DOLOMITE	DOL	STAGE	ST
FALLS	FALS	STATION	STAT
FLORENCE	FLOR	SUBGROUP	SGP
FLUVIAL	FLUV	SUBSERIES	SSER
FORMATION	FM	SUBSTAGE	SST
GLACIALFLUVIAL	GLAC-FLUV	SYLVAN	SYL
GYPSUM	GYP	SYSTEM	SYS
GRAVEL	GRAV	TERRACE	TER
GROUP	GP	TERTIARY	TERT
HERINGTON	HERING	TRIASSIC	TRI
ILLINOISAN	ILL	UPPER	U
ISLAND	IS	WALTER	WALT
JEFFERSON	JEFF	YARMOUTHIAN	YARMOUTH
JURASSIC	JUR		
JURASSIC-TRIASSIC	JUTR		
KANSAN	KAN		
KIMMSWICK	KIMM		
LIMESTONE	LS		
LOWER	L		
MEDICINE	MED		
MEMBER	ME		
MIDDLE	M		
MISSISSIPPIAN	MISS		
NEBRASKAN	NEBRAS		
OGALLALA	OGAL		
ORDOVICIAN	ORD		

STRATIGRAPHIC - NUMERIC LIST

UNIT	CODE	UNIT	CODE
CENOZOIC ROCKS	001	KANSAN ST	033
NEOGENE SYS	002	SAPPA FM	034
QUATERNARY SYS	003	PEARLETTE ASH B	035
PLEISTOCENE SER	004	NORTONVILLE CLAY	404
U PLEISTOCENE SSER	005	GRAND ISLAND FM	036
OUTWASH DEP	385	KANSAS TILL	037
COLLUVIUM	598	CEDAR BLUFF TILL	164
RECENT ST	006	NICKERSON TILL	158
HOLOCENE	131	ATCHISON FM	038
ALLUVIUM	588	AFTONIAN ST	039
AEOLIAN-FLUV DEP	007	AFTON SOIL	040
AEOLIAN DEP	008	NEBRASKAN ST	041
FLUVIAL DEP	009	BLANCO FM	042
WISCONSINAL ST	010	FULLERTON FM	043
NEWMAN TERRACE DEP	587	HOLDREGE FM	044
MANKATOAN SST	011	NEBRASKA TILL	045
BIGNELL FM	012	IOWA POINT TILL	162
CARYAN SST	013	NEBRASKAN GLAC-FLUV DEP	434
TERRACE DEP	014	DAVID CITY FM	046
BRADYAN SST	015	YARMOUTH-NEBRAS ST	047
BRADY SOIL	016	MEADE GP	048
PEORIA FM	017	CROOKED CREEK FM	049
TAZEWELLIAN SST	018	ATWATER ME	050
IOWAN SST	019	STUMP ARROYO ME	051
GLACIAL DRIFT	020	BALLARD FM	052
SANGAMONIAN ST	021	MISSLER ME	079
SANGAMON SOIL	022	ANGELL ME	053
ILLINOISAN ST	023	QUAT OR TERT SYS	054
LOVELAND FM	024	PLIO-PLEIST SER	055
CRETE FM	025	UPLAND CHERT GRAV	056
BUCK CREEK TER DEP	160	TERTIARY SYS	057
REC-ILL ST	026	PLIOCENE SER	058
SANBORN GP	027	GILMAN CANYON	339
VANHEM FM	028	REXROAD FM	059
KINGSDOWN FM	029	[illegible] ME	120
L PLEISTOCENE SSER	030	OGALLALA FM	060
YARMOUTHIAN ST	031	KIMBALL ME	061
McPHERSON	469	ASH HOLLOW ME	062
YARMOUTH SOIL	032	VALENTINE ME	063
KAN GLAC-FLUV DEP	155	DELMORE FM	064

UNIT	CODE	UNIT	CODE
LAVERNE FM	065	L($) CRET SER	100
CALVERT ASH B	066	COCKRUM SS	101
DELLVALE ASH B	067	DAKOTA FM	102
FORT WALLACE ASH B	068	JANSSEN CLAY ME	103
RAWLINS ASH B	069	TERRA COTTA CL ME	104
REAGER ASH B	070	OMADI FM	105
REAMSVILLE ASH B	071	CRUISE SS ME	106
NEOGENE-CRET SYS	590	HUNTSMAN SH ME	107
OGALLALA-DAKOTA	436	GURLEY SS ME	108
OGALLALA-CHEYENNE	444	COMANCHEAN SER	109
OGAL-DAK-CHYN	446	L$ CRET-L CRET SER	591
OGAL-DAK-CHYN-JUTR	454	L CRETACEOUS SER	110
OGAL-CHYN-JUTR	468	KIOWA SH	111
MESOZOIC ROCKS	072	CHAMPION SHELL B	112
CRETACEOUS SYS	073	CHEYENNE SS	113
GULFIAN SER	074	JURASSIC SYS	114
U CRETACEOUS SER	075	U JURASSIC SER	115
MONTANA GP	076	MORRISON FM	116
PIERRE SH	077	JUR-TRI SYS	592
BEECHER IS SH ME	078	TRIASSIC SYS	117
SALT GRASS SH ME	080	U TRIASSIC SER	118
LAKE CREEK SH ME	081	DOCKUM GP	119
WESKAN SH ME	082	PALEOZOIC ROCKS	121
SHARON SP SH ME	083	PERMIAN SYS	122
COLORADO GP	084	GUADALUPIAN SER	123
NIOBRARA CHALK	085	U PERMIAN SERIES	124
SMOKY HILL CH ME	086	QUARTERMASTER GP	125
FORT HAYS LS ME	087	TALOGA FM	126
CARLILE SH	088	BIG BASIN FM	127
CODELL SS ME	089	DAY CREEK DOL	128
BLUE HILL SH ME	090	WHITEHORSE FM	129
FAIRPORT CHALK ME	091	KIGER SH ME	130
GREENHORN LS	092	RELAY CREEK DOL ME	132
BRIDGE CREEK LS ME	093	MARLOW SS ME	133
PFEIFER SH ME	094	L PERMIAN SER	134
FENCEPOST LS B	095	LEONARDIAN SER	135
JETMORE CHALK ME	096	CIMARRONIAN ST	136
HARTLAND SH ME	097	NIPPEWALLA GP	137
LINCOLN LS ME	098	DOG CREEK FM	138
GRANEROS SH	099	BLAINE GYP	139

STRATIGRAPHIC - NUMERIC LIST (continued)

UNIT	CODE	UNIT	CODE
HASKEW GYP ME	140	MATFIELD SH	185
SHIMER GYP ME	141	BLUE SPRINGS SH ME	186
NESCATUNGA GYP ME	142	KINNEY LS ME	187
MED LODGE GYP ME	143	WYMORE SH ME	188
FLOWERPOT SH	144	WREFORD LS	189
CEDAR HILLS SS	145	SCHROYER LS ME	190
SALT PLAIN STS	146	HAVENSVILLE SH ME	191
CRISFIELD SS B	147	THREEMILE LS ME	192
HARPER STS	148	COUNCIL GROVE GP	193
KINGMAN STS ME	149	SPEISER SH	194
CHIKASKIA STS ME	150	FUNSTON LS	195
SUMNER GP	151	BLUE RAPIDS SH	196
STONE CORRAL FM	152	CROUSE LS	197
NINNESCAH SH	153	EASLY CREEK SH	198
RUNNYMEDE STS ME	154	BADER LS	199
WELLINGTON FM	156	MIDDLEBURG LS ME	200
MILAN DOL ME	157	HOWSER SH ME	201
HUTCHINSON SALT ME	159	EISS LS ME	202
CARLTON LS ME	161	STEARNS SH	203
HOLLENBERG LS ME	163	BEATTIE LS	204
WOLFCAMPIAN SER	165	MORRILL LS ME	205
GEARYAN ST	166	FLORENA SH ME	206
CHASE GP	167	COTTONWOOD LS ME	207
NOLANS LS	168	ESKRIDGE SH	208
HERINGTON LS ME	169	GRENOLA LS	209
PADDOCK SH ME	170	NEVA LS ME	210
KRIDER LS ME	171	SALEM POINT SH ME	211
ODELL SH	172	BURR LS ME	212
WINFIELD LS	173	LEGION SH ME	213
CRESSWELL LS ME	174	SALLYARDS LS ME	214
GRANT SH ME	175	ROCA SH	215
STOVALL LS ME	176	RED EAGLE LS	216
DOYLE SH	177	HOWE LS ME	217
GAGE SH ME	178	BENNETT SH ME	218
TOWANDA LS ME	179	GLENROCK LS ME	219
HOLMESVILLE SH ME	180	JOHNSON SH	220
BARNESTON LS	181	FORAKER LS	221
FORT RILEY LS ME	182	LONG CREEK LS ME	222
OKETA SH ME	183	HUGHES CREEK SH ME	223
FLORENCE LS ME	184	AMERICUS LS ME	224

STRATIGRAPHIC - **NUMERIC LIST (continued)**

UNIT	CODE	UNIT	CODE
ADMIRE GP	225	WAMEGO SH ME	264
JANESVILLE SH	226	PIERSON POINT SH	265
HAMLIN SH ME	227	TARKIO LS ME	266
OAKS SH ME	228	NEMAHA SGP	267
HOUCHEN CR LS ME	229	WILLARD SH	268
STINE SH ME	230	EMPORIA LS	269
FIVE POINT LS ME	231	ELMONT LS ME	270
WEST BRANCH SH ME	232	HARVEYVILLE SH ME	271
FALLS CITY LS	233	READING LS ME	272
ONAGA SH	234	AUBURN SH	273
HAWXBY SH ME	235	BERN LS	274
ASPINWALL LS ME	236	WAKARUSA LS ME	275
TOWLE SH ME	237	SOLDIER CR SH ME	276
INDIAN CAVE SS B	238	BURLINGAME LS ME	277
L PERM-U PENN SER	593	SACFOX SGP	278
PENNSYLVANIAN SYS	239	SCRANTON SH	279
VIRGILIAN SER	240	SILVER LAKE SH ME	280
U PENN SER	241	RULO LS ME	281
VIRGILIAN ST	242	CEDAR VALE SH ME	282
WABAUNSEE GP	243	ELMO COAL	283
RICHARDSON SGP	244	HAPPY HOLLOW LS ME	284
WOOD SIDING FM	245	WHITECLOUD SH ME	285
BROWNVILLE LS ME	246	HOWARD LS	286
PONY CREEK SH ME	247	UTOPIA LS ME	287
GRAYHORSE LS ME	248	WINZELER SH ME	288
PLUMB SH ME	249	CHURCH LS ME	289
NEBRAS CITY LS ME	250	AARDE SH ME	290
CANEYVILLE LS	251	NODAWAY COAL	291
ROOT SH	252	BACHELOR CR LS ME	292
FRENCH CREEK SH ME	253	SEVERY SH	293
JIM CREEK LS ME	254	SHAWNEE GP	294
FRIEDRICH SH ME	255	TOPEKA LS	295
STOTLER LS	256	COAL CREEK LS ME	296
GRANDHAVEN LS ME	257	HOLT SH ME	297
DRY SH ME	258	DU BOIS LS ME	298
DOVER LS ME	259	TURNER CREEK SH ME	299
PILLSBURY SH	260	SHELDON LS ME	300
LANGDON SH	261	JONES POINT SH ME	301
ZEANDALE LS	262	CURZON LS ME	302
MAPLE HILL LS ME	263	IOWA POINT SH ME	303

STRATIGRAPHIC - NUMERIC LIST (continued)

UNIT	CODE	UNIT	CODE
HARTFORD LS ME	304	WESTPHALIA LS ME	345
CALHOUN SH	305	TONGANOXIE SS ME	346
DEER CREEK LS	306	U SIBLEY COAL	347
ERVINE CREEK LS ME	307	U SIBLEY COAL	348
LARSH-BURR SH ME	308	PEDEE GP	349
ROCK BLUFF LS ME	309	IATAN LS ME	350
OSKALOOSA SH ME	310	WESTON SH ME	351
OSAWKIE LS ME	311	MISSOURIAN ST	352
TECUMSEH SH	312	LANSING GP	353
LECOMPTON LS	313	STANTON LS	354
AVOCA LS ME	314	SOUTH BEND LS ME	355
KING HILL SH ME	315	ROCK LAKE SH ME	356
BEIL LS ME	316	STONER LS ME	357
QUEEN HILL SH ME	317	EUDORA SH ME	358
BIG SPRINGS LS ME	318	CAPTAIN CR LS ME	359
DONIPHAN SH ME	319	VILAS SH	360
SPRING BR LS ME	320	PLATTSBURG LS	361
ELGIN SS	321	SPRING HILL LS ME	362
KANWAKA SH	322	HICKORY CR SH ME	363
STULL SH ME	323	MERRIAM LS ME	364
CLAY CREEK LS ME	324	KANSAS CITY GP	365
JACKSON PARK SH ME	325	ZARAH SGP	366
OREAD LS	326	BONNER SPRINGS SH	367
KEREFORD LS ME	327	WYANDOTTE LS	368
HEUMADER SH ME	328	FARLEY LS ME	369
PLATTSMOUTH LS ME	329	ISLAND CREEK SH ME	370
HEEBNER SH ME	330	ARGENTINE LS ME	371
LEAVENWORTH LS ME	331	QUINDARO SH ME	372
SNYDERVILLE SH ME	332	FRISBIE LS ME	373
TORONTO LS ME	333	LANE SH	374
DOUGLAS GP	334	LANE-BONNER SP SH	375
LAWRENCE FM	335	LANE-VILAS SH	376
WATHENA SH ME	336	LINN SGP	377
AMAZONIA LS ME	337	IOLA LS	378
WILLIAMSBURG COAL	338	RAYTOWN LS ME	379
IRELAND SS ME	340	MUNCIE CREEK SH ME	380
ROBBINS SH ME	341	PAOLA LS ME	381
HASKELL LS ME	342	CHANUTE SH	382
STRANGER FM	343	COTTAGE GRO SS ME	383
VINLAND SH ME	344	THAYER COAL	384

STRATIGRAPHIC - NUMERIC LIST (continued)

UNIT	CODE	UNIT	CODE
NOXIE SS ME	386	MEMORIAL SH	427
DRUM LS	387	HOLDENVILLE SH	428
CORBIN CITY LS ME	388	LENAPAH LS	429
DEWEY LS ME	389	IDENBRO LS ME	430
CEMENT CITY LS ME	390	PERRY FARM SH ME	431
CHERRYVALE SH	391	NORFLEET LS ME	432
QUIVIRA SH ME	392	NOWATA SH	433
WESTERVILLE LS ME	393	WALT JOHNSON SS ME	435
WEA SH ME	394	ALTAMONT LS	437
BLOCK LS ME	395	WORLAND LS ME	438
FONTANA SH ME	396	LAKE NEOSHO SH ME	439
WEA-QUIVERA SH ME	397	AMORET LS ME	440
BRONSON SGP	398	TINA LS	441
DENNIS LS	399	BANDERA SH	442
WINTERSET LS ME	400	MULBERRY COAL	443
STARK SH ME	401	BANDERA QUAR SS ME	445
CANVILLE LS ME	402	PAWNEE LS	447
GALESBURG SH	403	LABERDIE LS ME	448
DODDS CREEK SS ME	405	MINE CREEK SH ME	449
SWOPE LS	406	MYRICK STAT LS ME	450
BETHANY FALLS LS ME	407	ANNA SH ME	451
HUSHPUCKNEY SH ME	408	LABETTE SH	452
MIDDLE CREEK LS ME	409	WARRENSBURG SS	453
LADORE SH	410	ENGLEVALE SS ME	455
HERTHA LS	411	FORT SCOTT LS	456
SNIABAR LS ME	412	HIGGINSVILLE LS ME	457
MOUND CITY SH ME	413	LITTLE OSAGE SH ME	458
CRITZER LS ME	414	HOUX LS B	459
COFFEYVILLE FM	415	SUMMIT COAL	460
PLEASANTON GP	416	BLACKJACK CR LS ME	461
TACKET FM	417	CHEROKEE GP	462
KNOBTOWN SS ME	418	CABANISS FM	463
CHECKERBOARD LS	419	EXCELLO SH	464
SEMINOLE FM	420	MULKY COAL	465
SOUTH MOUND SH ME	421	BREEZY HILL LS ME	466
HEPLER SS ME	422	IRON POST COAL	467
DESMOINESIAN SER	423	STICE COAL	470
M PENN SER	424	WHEELER COAL($)	471
DESMOINESIAN ST	425	BEVIER COAL	472
MARMATON GP	426	UNMAPPED REGOLITH	473

STRATIGRAPHIC - NUMERIC LIST (continued)

UNIT	CODE
VERDIGRIS LS ME	474
ARDMORE LS ME	475
CROWEBURG COAL	476
BROKEN ARROW COAL	477
UNNAMED	478
FLEMING COAL	479
UNNAMED	480
MINERAL COAL	481
UNNAMED	482
SCAMMON COAL	483
CHELSEA SS ME	484
PILOT COAL	485
TIAWAH LS	486
TEBO COAL	487
UNNAMED	488
WIER PITTS COAL	489
KREBS FM	490
SEVILLE LS ME	491
KNIFETON COAL	492
UNNAMED	493
BLUEJACKET SS ME	494
DRYWOOD COAL	495
UNNAMED	496
COLUMBUS COAL	497
ROWE COAL	498
UNNAMED	499
NEUTRAL COAL	500
UNNAMED	501
LITTLE CABIN SS ME	502
WARNER SS ME	503
RIVERTON COAL	504
UNNAMED	505
ATOKAN SER	506
ATOKAN (BENDIAN) ST	507
ATOKAN ST	508
CHAT	509
UNNAMED	510
MORROWAN SER	511
L PENN SER	512
MORROWAN ST	513

UNIT	CODE
KEARNY FM	514
PENN BS CON	515
PENN-MISS SYS	594
MISSISSIPPIAN SYS	516
CHESTERAN SER	517
U MISS SER	518
CHESTERAN ST	519
UNNAMED	520
MERAMECIAN SER	521
MERAMECIAN ST	522
STE. GENEVIEVE LS	523
ST. LOUIS LS	524
SPERGEN LS	525
SALEM LS	526
WARSAW LS	527
COWLEY FM	528
L MISS SER	529
OSAGIAN SER	530
OSAGIAN ST	531
KEOKUCK LS	532
BURLINGTON LS	533
REEDS SPRING LS	534
ST. JOE LS	535
KINDERHOOKIAN SER	536
KINDERHOOKIAN ST	537
GILMORE CITY LS	538
SEDALIA DOL	539
NORTHVIEW SH	540
CHOUTEAU LS	541
COMPTON LS	542
BOICE SH	543
DEV OR MISS SYS	544
CHATTANOOGA SH	545
MISS-DEV SYS	595
DEVONIAN SYS	546
M DEVONIAN SER	547
DEV-SIL SYS	596
L SIL-M DEV SER	548
SILURIAN SYS	549
L SILURIAN SER	550

STRATIGRAPHIC NUMERIC LIST (continued)

UNIT	CODE
HUNTON GRP	551
UNNAMED	552
UNNAMED	553
CHIMNEYHILL DOL	554
ORDOVIDIAN SYS	555
U ORDOVICIAN SER	556
MAQUOKETA (SYL) SH	557
M ORDOVICIAN SER	558
VIOLA (KIMM) LS	559
SIMPSON GP	560
PLATTEVILLE FM	561
ST. PETER SS	562
UNNAMED	563
L ORDOVICIAN SER	564
ARBUCKLE GP	565
COTTER DOL	566
JEFFERSON CITY DOL	567
COTTER-JEFF C DOL	568
ROUBIDOUX FM	569
GASCONADE DOL	570
VAN BUREN FM	571
GUNTER SS ME	572
ORD-CAM SYS	597
L ORD-U CAM SER	573
EMINENCE DOL	574
CAMBRIAN SYS	575
U CAMBRIAN SER	576
BONNETERRE DOL	577
HONEY CREEK LS	578
LAMOTTE (REAGAN) SS	579
LAMOTTE SS	580
REAGAN SS	581
PENN-CAM SYS	582
GRANITE WASH	583
PRECAMBRIAN ROCKS	584
PRECAMBRIAN SYS	585
UNDIFFERENTIATED	586
NEWMAN TERRACE DEP	587
ALLUVIUM	588
HILLS POND PERIODO	589

UNIT	CODE
NEOGENE-CRET SYS	590
L$CRET-LCRET SER	591
JUR-TRI SYS	592
L PERM U PENN SER	593
PENN-MISS SYS	594
MISS-DEV SYS	595
DEV-SIL SYS	596
ORD-CAM SYS	597
COLLUVIUM	598
BLANK	599
NOT DETERMINED	600

ALPHABETIC - NUMERIC LIST

UNIT	CODE
AARDE SH ME	290
ADMIRE GP	225
AEOLIAN DEP	008
AEOLIAN-FLUV DEP	007
AFTON SOIL	040
AFTONIAN ST	039
ALLUVIUM	588
AMAZONIA LS ME	337
AMERICUS LS ME	224
AMORET LS ME	440
ANGELL ME	053
ANNA SH ME	451
ARBUCKLE GP	565
ARDMORE LS ME	475
ARGENTINE LS ME	371
ASH HOLLOW ME	062
ASPINWALL LS ME	236
ATCHISON FM	038
ATOKAN SER	506
ATOKAN ST	508
ATOKAN (BENDIAN) ST	507
ATWATER ME	050
AUBURN SH	273
AVOCA LS ME	314
BACHELOR CR LS ME	292
BADER LS	199
BALLARD FM	052
BANDERA QUAR SS ME	445
BANDERA SH	442
BARNESTON LS	181
BEATTIE LS	204
BEECHER IS SH ME	078
BEIL LS ME	316
BENNETT SH ME	218
BERN LS	274
BETHANY FALLS LS ME	407
BEVIER COAL	472
BIG BASIN FM	127
BIGNELL FM	012
BIG SPRINGS LS ME	318
BLACKJACK CR LS ME	461
BLAINE GYP	139
BLANCO FM	042
BLANK	599
BLOCK LS ME	395
BLUE HILL SH ME	090
BLUEJACKET SS ME	494
BLUE RAPIDS SH	196
BLUE SPRINGS SH ME	186
BOICE SH	543
BONNER SPRINGS SH	367
BONNETERRE DOL	577
BRADY SOIL	016
BRADYAN SST	015
BREEZY HILL LS ME	466
BRIDGE CREEK LS ME	093
BROKEN ARROW COAL	477
BRONSON SGP	398
BROWNVILLE LS ME	246
BUCK CREEK TERR	160
BURLINGAME LS ME	277
BURLINGTON LS	533
BURR LS ME	212
CABANISS FM	463
CALHOUN SH	305
CALVERT ASH B	066
CAMBRIAN SYS	575
CANEYVILLE LS	271
CANVILLE LS ME	402
CAPTAIN CR LS ME	359
CARLILE SH	088
CARLTON LS ME	161
CARYAN SST	013
CEDAR HILLS SS	145
CEDAR BLUFFS TILL	164
CEDAR VALE SH ME	282
CEMENT CITY LS ME	390
CENOZOIC ROCKS	001
CHAMPION SHELL B	112
CHANUTE SH	382

ALPHABETIC - NUMERIC LIST (continued)

UNIT	CODE	UNIT	CODE
CHASE GP	167	CRUISE SS ME	106
CHAT	509	CURZON LS ME	302
CHATTANOOGA SH	545	DAKOTA FM	102
CHECKERBOARD LS	419	DAVID CITY FM	046
CHELSEA SS ME	484	DAY CREEK DOL	128
CHEROKEE GP	462	DEER CREEK LS	306
CHERRYVALE SH	391	DELLVALE ASH B	067
CHESTERAN SER	517	DELMORE FM	064
CHESTERAN ST	519	DENNIS LS	399
CHEYENNE SS	113	DESMOINESIAN SER	423
CHIMNEYHILL DOL	554	DESMOINESIAN ST	425
CHIKASKIA STS ME	150	DEVONIAN SYS	546
CHOUTEAU LS	541	DEV OR MISS SYS	544
CHURCH LS ME	289	DEV-SIL SYS	596
CIMARRONIAN ST	136	DEWEY LS ME	389
CLAY CREEK LS ME	324	DOCKUM GP	119
COAL CREEK LS ME	296	DODDS CREEK SS ME	405
COCKRUM SS	101	DOG CREEK FM	138
CODELL SS ME	089	DONIPHAN SH ME	319
COFFEYVILLE FM	415	DOUGLAS GP	334
COLLUVIUM	598	DOVER LS ME	259
COLORADO GP	084	DOYLE SH	177
COLUMBUS COAL	497	DRUM LS	387
COMANCHEAN SER	109	DRY SH ME	258
COMPTON LS	542	DRYWOOD COAL	495
CORBIN CITY LS ME	388	DU BOIS LS ME	298
COTTAGE GRO SS ME	383	EASLY CREEK SH	198
COTTER DOL	566	EISS LS ME	202
COTTER-JEFF C DOL	568	ELGIN SS	321
COTTONWOOD LS ME	207	ELMO COAL	283
COUNCIL GROVE GP	193	ELMONT LS ME	270
COWLEY FM	528	EMINENCE DOL	574
CRESSWELL LS ME	174	EMPORIA LS	269
CRETACEOUS SYS	073	ENGLEVALE SS ME	455
CRETE FM	025	ERVINE CREEK LS ME	307
CRISFIELD SS B	147	ESKRIDGE SH	208
CRITZER LS ME	414	EUDORA SH ME	358
CROOKED CREEK FM	049	EXCELLO SH	464
CROUSE LS	197	FAIRPORT CHALK ME	091
CROWEBURG COAL	476	FALLS CITY LS	233

ALPHABETIC - NUMERIC LIST (continued)

UNIT	CODE	UNIT	CODE
FARLEY LS ME	369	HAPPY HOLLOW LS ME	284
FENCEPOST LS B	095	HARPER STS	148
FIVE POINT LS ME	231	HARTFORD LS ME	304
FLEMING COAL	479	HARTLAND SH ME	097
FLORENA SH ME	206	HARVEYVILLE SH ME	271
FLORENCE LS ME	184	HASKELL LS ME	342
FLOWERPOT SH	144	HASKEW GPY ME	140
FLUVIAL DEP	009	HAVENSVILLE SH ME	191
FONTANA SH ME	396	HAWXBY SH ME	235
FORAKER LS	221	HEEBNER SH ME	330
FORT HAYS LS ME	087	HEPLER SS ME	422
FORT RILEY LS ME	182	HERINGTON LS ME	169
FORT SCOTT LS	456	HERTHA LS	411
FORT WALLACE ASH B	068	HEUMADER SH ME	328
FRENCY CREEK SH ME	253	HICKORY CR SH ME	363
FRIEDRICH SH ME	255	HIGGINSVILLE LS ME	457
FRISBIE LS ME	373	HILLS POND PERIDOT	589
FULLERTON FM	043	HOLDENVILLE SH	428
FUNSTON LS	195	HOLDREGE FM	044
GAGE SH ME	178	HOLLENBERG LS ME	163
GALESBURG SH	403	HOLMESVILLE SH ME	180
GASCONADE DOL	570	HOLOCENE	131
GEARYAN ST	166	HOLT SH ME	297
GILMAN CANYON	339	HONEY CREEK LS	578
GILMORE CITY LS	538	HOOSER SH ME	201
GLACIAL DRIFT	020	HOUCHEN CR LS ME	229
GLENROCK LS ME	219	HOUX LS B	459
GRANDHAVEN LS ME	257	HOWARD LS	286
GRAND ISLAND FM	036	HOWE LS ME	217
GRANEROS SH	099	HUGHES CREEK SH ME	223
GRANITE WASH	583	HUNTON GRP	551
GRANT SH ME	175	HUNTSMAN SH ME	107
GRAYHORSE LS ME	248	HUSHPUCKNEY SH ME	408
GREENHORN LS	092	HUTCHINSON SALT ME	159
GRENOLA LS	209	IATAN LS ME	350
GUADALUPIAN SER	123	IDENBRO LS ME	430
GULFIAN SER	074	ILLINOISAN ST	023
GUNTER SS ME	572	INDIAN CAVE SS B	238
GURLEY SS ME	108	IOLA LS	378
HAMLIN SH ME	227	IOWAN SST	019

ALPHABETIC - NUMERIC LIST (continued)

UNIT	CODE
IOWA POINT SH ME	303
IOWA POINT TILL	162
IRELAND SS ME	340
IRON POST COAL	467
ISLAND CREEK SH ME	370
JACKSON PARK SH ME	325
JANESVILLE SH	226
JANSSEN CLAY ME	103
JEFFERSON CITY DOL	567
JETMORE CHALK ME	096
JIM CREEK LS ME	254
JOHNSON SH	220
JONES POINT SH ME	301
JURASSIC SYS	114
JUR-TRI SYS	592
KANSAN ST	033
KANSAS CITY GP	365
KANSAN GLAC-FLUV DEP	155
KANSAS TILL	037
KANWAKA SH	322
KEARNY FM	514
KEOKUCK LS	532
KEREFORD LS ME	327
KIGER SH ME	130
KIMBALL ME	061
KINDERHOOKIAN SER	536
KINDERHOOKIAN ST	537
KING HILL SH ME	315
KINGMAN STS ME	149
KINGSDOWN FM	029
KINNEY LS ME	187
KIOWA SH	111
KNIFETON COAL	492
KNOBTOWN SS ME	418
KREBS FM	490
KRIDER LS ME	171
LABERDIE LS ME	448
LABETTE SH	452
LADORE SH	410
LAKE CREEK SH ME	081
LAKE NEOSHO SH ME	439
LAMOTTE SS	580
LAMOTTE (REAGAN) SS	579
LANE SH	374
LANE-BONNER SP SH	375
LANE-VILAS SH	376
LANGDON SH	261
LANSING GP	353
LARSH-BURR SH ME	308
LAVERNE FM	065
LAWRENCE FM	335
LEAVENWORTH LS ME	331
LECOMPTON LS	313
LEGION SH ME	213
LENAPAH LS	429
LEONARDIAN SER	135
LINCOLN LS ME	098
LINN SGP	377
LITTLE CABIN SS ME	502
LITTLE OSAGE SH ME	458
LONG CREEK LS ME	222
LOVELAND FM	024
L CRETACEOUS SER	110
L($) CRET SER	100
L($) CRET-L CRET SER	591
L MISS SER	529
L ORDOVICIAN SER	564
L ORD-U CAM SER	573
L PENN SER	512
L PERMIAN SER	134
L PERM-U PENN SER	593
L PLEISTOCENE SSER	030
L SIBLEY COAL	348
L SIL-M DEV SER	548
L SILURIAN SER	550
MANKATOAN SST	011
MAPLE HILL LS ME	263
MAQUOKETA (SYL) SH	557
MARLOW SS ME	133
MARMATON GP	426

ALPHABETIC - NUMERIC LIST (continued)

UNIT	CODE	UNIT	CODE
MATFIELD SH	185	NEVA LS ME	210
McPHERSON	469	NEWMAN TERRACE DEP	587
MEADE GP	048	NICKERSON TILL	158
MED LODGE GYP ME	143	NINNESCAH SH	153
MEMORIAL SH	427	NIOBRARA CHALK	085
MERAMECIAN SER	521	NIPPEWALLA GP	137
MERAMECIAN ST	522	NODAWAY COAL	291
MERRIAM LS ME	364	NOLANS LS	168
MESOZOIC ROCKS	072	NORFLEET LS ME	432
MIDDLEBURG LS ME	200	NORTHVIEW SH	540
MIDDLE CREEK LS ME	409	NORTONVILLE CLAY	404
M DEVONIAN SER	547	NOT DETERMINED	600
M ORDOVICIAN SER	558	NOWATA SH	433
M PENN SER	424	NOXIE SS ME	386
MILAN DOL ME	157	OAKS SH ME	228
MINE CREEK SH ME	449	ODELL SH	172
MINERAL COAL	481	OGALLALA FM	060
MISSISSIPPIAN SYS	516	OGALLALA-DAKOTA	436
MISS-DEV SYS	595	OGALLALA-CHEYENNE	444
MISSLER ME	079	OGAL-DAK-CHYN	446
MISSOURIAN ST	352	OGAL-DAK-CHYN-JUTR	454
MONTANA GP	076	OGAL-CHYN-JUTR	468
MORRILL LS ME	205	OKETA SH ME	183
MORRISON FM	116	OMADI FM	105
MORROWAN SER	511	ONAGA SH	234
MORROWAN ST	513	ORD-CAM SYS	597
MOUND CITY SH ME	413	ORDOVICIAN SYS	555
MULBERRY COAL	443	OREAD LS	326
MULKY COAL	465	OUTWASH DEP	385
MUNCIE CREEK SH ME	380	OSAGIAN SER	530
MYRICK STAT LS ME	450	OSAGIAN ST	531
NEBRAS CITY LS ME	250	OSKALOOSA SH ME	310
NEBRASKAN ST	041	OZAWKIE LS ME	311
NEBRASKA TILL	045	PADDOCK SH ME	170
NEB GLAC-FLUV DEP	434	PALEOZOIC ROCKS	121
NEMAHA SGP	267	PAOLA LS ME	381
NEOGENE-CRET SYS	590	PAWNEE LS	447
NEOGENE SYS	002	PEARLETTE ASH B	035
NESCATUNGA GYP ME	142	PEDEE GP	349
NEUTRAL COAL	500	PENN BS CON	515

ALPHABETIC - NUMERIC LIST (continued)

UNIT	CODE
PENN-CAM SYS	582
PENNSYLVANIAN SYS	239
PENN-MISS SYS	594
PEORIA FM	017
PERMIAN SYS	122
PERRY FARM SH ME	431
PFEIFER SH ME	094
PIERRE SH	077
PIERSON POINT SH	265
PILLSBURY SH	260
PILOT COAL	485
PLATTEVILLE FM	561
PLATTSBURG LS	361
PLATTSMOUTH LS ME	329
PLEASANTON GP	416
PLEISTOCENE SER	004
PLIOCENE SER	058
PLIO-PLEIST SER	055
PLUMB SH ME	249
PONY CREEK SH ME	247
PRECAMBRIAN ROCKS	584
PRECAMBRIAN SYS	585
QUARTERMASTER GP	125
QUATERNARY SYS	003
QUAT OR TERT SYS	054
QUEEN HILL SH ME	317
QUINDARO SH ME	372
QUIVIRA SH ME	392
RAWLINS ASH B	069
RAYTOWN LS ME	379
READING LS ME	272
REAGAN SS	581
REAGER ASH B	070
REAMSVILLE ASH B	071
RECENT SI	006
REC-ILL ST	026
RED EAGLE LS	216
REEDS SPRING LS	534
RELAY CREEK DOL ME	132
REXROAD FM	059

UNIT	CODE
RICHARDSON SGP	244
RIVERTON COAL	504
ROBBINS SH ME	341
ROCA SH	215
ROCK BLUFF LS ME	309
ROCK LAKE SH ME	356
ROOT SH	252
ROUBIDOUX FM	569
ROWE COAL	498
RULO LS ME	281
RUNNY MEDE STS ME	154
SACFOX SGP	278
SALEM LS	526
SALEMPOINT SH ME	211
SALLYARDS LS ME	214
SALT GRASS SH ME	080
SALT PLAIN STS	146
SANBORN GP	027
SANGAMONIAN ST	021
SANGAMON SOIL	022
SAPPA FM	034
SCAMMON COAL	483
SCHROYER LS ME	190
SCRANTON SH	279
SEDALIA DOL	539
SEMINOLE FM	420
SEVERY SH	293
SEVILLE LS ME	491
SHARON SP SH ME	083
SHAWNEE GP	294
SHELDON LS ME	300
SHIMER GYP ME	141
SILURIAN SYS	549
SILVER LAKE SH ME	280
SIMPSON GP	560
SMOKY HILL CH ME	086
SNIABAR LS ME	412
SNYDERVILLE SH ME	332
SOLDIER CR SH ME	276
SOUTH BEND LS ME	355

ALPHABETIC - NUMERIC LIST (continued)

UNIT	CODE
SOUTH MOUND SH ME	421
SPEISER SH	194
SPERGEN LS	525
SPRING BR LS ME	320
SPRING HILL LS ME	362
STANTON LS	354
STARK SH ME	401
STEARNS SH	203
STE. GENEVIEVE LS	523
ST. JOE LS	535
ST. LOUIS LS	524
ST. PETER SS	562
STICE COAL	470
STINE SH ME	230
STONE CORRAL FM	152
STONER LS ME	357
STOTLER LS	256
STOVALL LS ME	176
STRANGER FM	343
STULL SH ME	323
STUMP ARROYO ME	051
SUMMIT COAL	460
SUMNER GP	151
SWOPE LS	406
TACKET FM	417
TALOGA FM	126
TARKIO LS ME	266
TAZEWELLIAN SST	018
TEBO COAL	487
TECUMSEH SH	312
TERRACE DEP	014
TERRA COTTA CL ME	104
TERTIARY SYS	057
THAYER COAL	384
THREEMILE LS ME	192
TIAWAH LS	486
TINA LS	441
TONGANOXIE SS ME	346
TOPEKA LS	295
TORONTO LS ME	333

UNIT	CODE
TOWANDA LS ME	179
TOWLE SH ME	237
TRIASSIC SYS	117
TURNER CREEK SH ME	299
UNDIFFERENTIATED	586
UNMAPPED REGOLITH	473
UNNAMED	478
UNNAMED	480
UNNAMED	482
UNNAMED	488
UNNAMED	493
UNNAMED	496
UNNAMED	499
UNNAMED	501
UNNAMED	505
UNNAMED	510
UNNAMED	520
UNNAMED	552
UNNAMED	553
UNNAMED	563
UPLAND CHERT GRAV	056
U CAMBRIAN SER	576
U CRETACEOUS SER	075
U JERASSIC SER	115
U MISS SER	518
U ORDOVICIAN SER	556
U PENN SER	247
U PERMIAN SERIES	124
U PLEISTOCENE SSER	005
U SIBLEY COAL	347
U TRIASSIC SER	118
UTOPIA LS ME	287
VALENTINE ME	063
VAN BUREN FM	571
VANHEM FM	028
VERDIGRIS LS ME	474
VILAS SH	360
VINLAND SH ME	344
VIOLA (KIMM) LS	559
VIRGILIAN SER	240

ALPHABETIC - NUMERIC LIST (continued)

UNIT	CODE
VIRGILIAN ST	242
WABAUNSEE GP	243
WAKARUSA LS ME	275
WALT JOHNSON SS ME	435
WAMEGO SH ME	264
WARNER SS ME	503
WARRENSBURG SS	453
WARSAW LS	527
WATHENA SH ME	336
WEA SH ME	394
WEA-QUIVIRA SH ME	397
WELLINGTON FM	156
WESKAN SH ME	082
WEST BRANCH SH ME	232
WESTERVILLE LS ME	393
WESTON SH ME	351
WESTPHALIA LS ME	345
WHEELER COAL($)	471
WHITECLOUD SH ME	285
WHITEHORSE FM	129
WIER PITTS COAL	489
WILLARD SH	268
WILLIAMSBURG COAL	338
WINFIELD LS	173
WINTERSET LS ME	400
WINZELER SH ME	288
WISCONSINAN ST	010
WOLFCAMPIAN SET	165
WOOD SIDING FM	245
WORLAND LS ME	438
WREFORD LS	189
WYANDOTTE LS	368
WYMORE SH ME	188
X I ME	120
YARMOUTH-NEBRAS ST	047
YARMOUTHIAN ST	031
YARMOUTH SOIL	032
ZARAH SGP	366
ZEANDALE LS	262

Tape Held (ft) Tape Wet (ft)		
Depth to water below M.P. (ft) M.P. above/below lsd (ft)		
Depth to water below lsd (ft)		

Kansas Well Schedule

T.D. Tape Held (ft) Length of Weight (ft)	
T.D. below M.P. (ft) M.P. above/below lsd (ft)	
T.D. of Well below lsd (ft)	

Record by_____ Date:_____ Project:_____ State:_____ (1) County Code: _____ (2 3 4) DWR Permit Number: _____

Well Location: (5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20) T R E-W Sec 160 40 10 2½ No.

Owner or User: (21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40)

Source of Owner Info.:_____ (41 42 43) (W) (D) (H) (U) (R) WWC-5, DWR, KDHE, USGS, Owner or User

Type of Well: _____ (44 45 46) (DR) (DU) (DN) (DD) (SP) Drilled, Dug, Driven, Dug & Drilled, Spring

Surface Elevation above msl (ft): (47 48 49 50 51 52 53)

Elevation Accuracy: (54 55)

Driller: _____ name _____ address

Date Constructed: (56 57 58 59 60 61) mon year

Depth of Well below lsd (ft): (62 63 64 65 66 67 68)

Accuracy: (69 70)

Use of Well: _____ (71 72)

Water Level _____ above/below lsd (73 74 75 76 77 78 79 80)

Accuracy: (81 82)

Date Measured: (83 84 85 86 87 88 89 90 91) mon day year

Description of M.P.:_____ above/below lsd.

Aquifer(s) Material: _____ (92 93 94 95 96 97)

Aquifer(s) Unit(s): _____ (98 99 100 101 102 103 104 105)

Source of Aquifer Info.: _____ (106 107 108)

Depth to Bedrock: lsd (109 110 111 112 113 114 115)

Yield: (gpm) (116 117 118 119 120)

Accuracy: (121 122)

Diameter of casing (inches):_____ (123 124 125 126 127)

Casing Type: _____ (128 129)

Lift & Power: _____ (130 131)

Chloride Content: (mg/L) (132 133 134 135 136 137 138 139 140)

Accuracy: (141 142)

Specific Conductance: (μmhos/cm at 25°C) (143 144 145 146 147 148)

Accuracy, Lab or Field: (149 150 151)

Sample Collection Date: (152 153 154 155 156 157 158 159 160) mon day year

Other Chem. Quality Data Available: (161 162)

Remarks: (163 164 165 166 167 168 169 170 171 172 173)

For additional Water Level Information, Chemical Data, and Remarks use second line:

(73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91)
Water Level Acc. Date Measured

(132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151)
Chloride Content Acc. Specific Conductance Acc. L or F

(152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173)
Sample Collection Date | Other Chem Data | Remarks

Owner or User:_____ name _____ address

Topography of well site: Draw, Flood Plain, Lowland, Rolling, Slope, Terrace, Upland _____

Ownership Category: County, Federal Gov't., City, Corp. or Co., Private, State Agency, Water District_____

Method Drilled: Air, Bored, Cable, Dug, Driven, Hyd. Rotary, Jetted, Rev. Rotary, Trenching, Spring_____

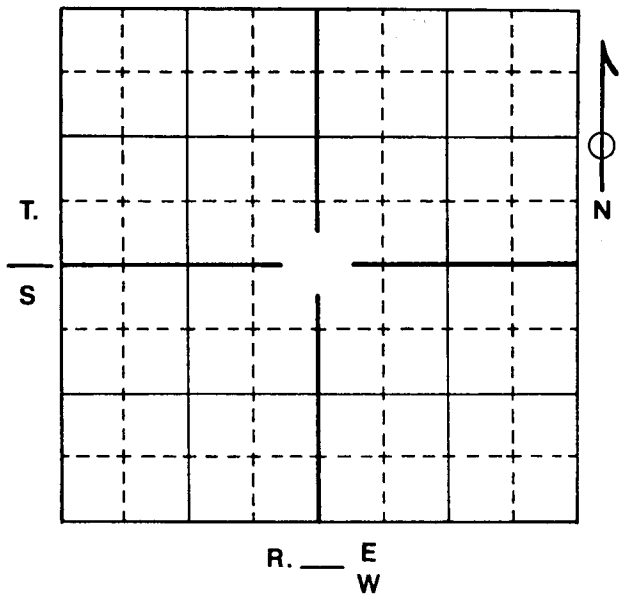
Sample Number:_____ Water Temperature:_____ °F / °C Time Pumped:_____min. Source of Sample:_____ Location of Sample Source (sketch on back)

Water Quality Description:_____ Source:_____

Pumpage & Other Data Available:_____ Specific Capacity:_____ (gpm/ft dd)

Quadrangle:_____ Well Number:_____

Form KGS-GW1-4 83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