HYDROLOGIC DATA FOR THE SOUTHERN SAND HILLS AREA, NEBRASKA

By M. S. Johnson, J. E. Goeke, and R. A. Engberg

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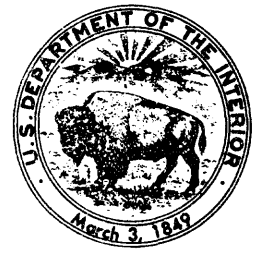

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For additional information
write to:
District Chief
Water Resources Division
U.S. Geological Survey
406 Federal Building
Lincoln, NE 68508

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ABSTRACT

This report presents hydrologic data used in the Southern Sand Hills hydrogeology study, which encompasses an area of approximately 4,330 square miles in west-central Nebraska. These data include summary logs of 64 test holes drilled in or adjacent to the study area. Water-level data for 240 wells are included. These wells were measured in spring and fall of 1982 and spring of 1983. Water-quality samples were collected from 62 irrigation wells. Water-quality data include analyses for 18 routine constituents on samples from all wells and analyses for 8 trace constituents on samples from 25 wells. Rainfall data were collected at 30 sites by local observers from April 1982 to October 1983. Surface-water data for 103 stream sites in the study area are included. Water discharge was measured at these sites as part of seepage surveys conducted from 1978 to 1982 to determine where and how much streams were gaining or losing water.

INTRODUCTION

The Southern Sand Hills hydrogeology study is a cooperative effort of the Twin Platte and Upper Loup Natural Resources Districts (NRD's), the Conservation and Survey Division of the University of Nebraska, and the U.S. Geological Survey. The study area is bounded on the north by the South Fork Dismal River and the Dismal River. This area covers approximately 4,330 square miles and includes all of Arthur, McPherson, and Logan Counties, and parts of Garden, Grant, Hooker, Thomas, Blaine, Custer, Lincoln, and Keith Counties (fig. 1). The results of the study will be published in an interpretive report and will include a ground-water model that may be used to assess the effects of ground-water development scenarios. Some hydrologic data from outside the study area are included in this report, because these data were needed to help define boundary conditions of the ground-water model.

This report includes summary logs of test holes drilled prior to and for the Southern Sand Hills study, water-level data collected in 1982 and 1983, historical and 1982-83 water-quality data for samples collected from wells, precipitation data from a rain-gage network established for the study, and surface-water discharge data from low-flow investigations of streams in or bordering the study area.

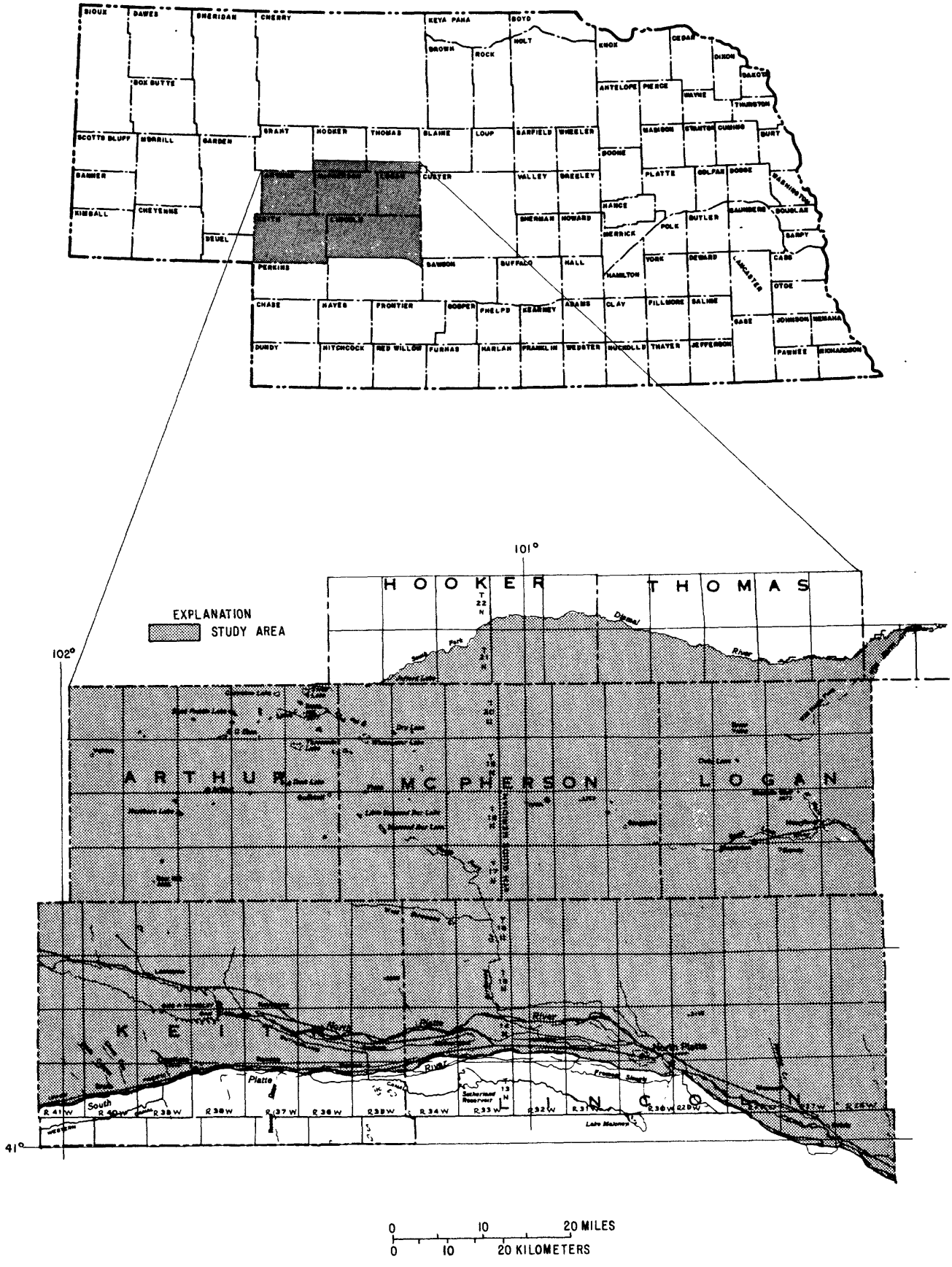

Figure 1.--Location of the study area.

WELL-LOCATION NUMBERING SYSTEM

All well locations in this report have been assigned numbers that designate their location within the land subdivisions surveyed by the U.S. Bureau of Land Management. This system is illustrated on figure 2. The numeral preceding N in the location number indicates the township, the number preceding W indicates the range, and the number preceding the first lower-case letter indicates the section. The lower-case letters denote, respectively, the quarter section, quarter-quarter section, quarter-quarter-quarter section, and quarter-quarter-quarter-quarter section. They are assigned in counter-clockwise direction beginning with the northeast division. The number following the letters is the sequence number. The first well inventoried in the tract represented by the final lower-case letter is assigned a sequence number of 1. If more wells were inventoried in the same tract, they would have sequence numbers of 2, 3, etc. A single inventoried well located in SE1/4 SE1/4 SE1/4 sec. 15, T. 16 N., R. 36 W. (fig. 2), therefore, has a well number of 16N-36W-15DDD1.

In addition to well location number, all test holes herein are assigned a field number. These consist of three parts -- a number, a letter or letters, and another number. The first is a sequential number, the letter or letters identify the program under which the test hole was drilled, and the second number indicates the last two digits of the year in which the test hole was drilled. The letter B indicates a test hole drilled as part of the Conservation and Survey Division and U.S. Geological Survey cooperative program; the letters HP indicate a test hole drilled for the Geological Survey High Plains Regional Aquifer Study; and the letter S indicates a test hole drilled by a contractor specifically for the Southern Sand Hills hydrogeology study.

TEST-HOLE DATA

Summary logs of 64 test holes in or adjacent to the study area are included in Appendix A. Twenty-two were drilled in 1982 for the Southern Sand Hills Study, 26 in 1978-80 for the High Plains Regional Aquifer Study, and 16 earlier as part of a cooperative program of the Conservation and Survey Division and the U.S. Geological Survey. These data are used to determine the configuration of the base of the aquifer and the character of material in the saturated and unsaturated zones.

The distribution of test holes is shown in figure 3. Most test holes drilled for this study were located to provide data for refinement of interpretations based on earlier test-hole data. Samples of drill cuttings were collected at intervals of 5 feet or less and were described on site. Single-point resistance and spontaneous-potential logs were run on some test holes. Summary logs were prepared by using geophysical logs and field sample descriptions. The summary log format is that of the University of Nebraska Conservation and Survey Division. Terminology, geologic units, and material descriptions, therefore, may differ from those standard to the U.S. Geological Survey. Each log lists well location, date drilled, land surface elevation, depth-to-water, if known, and total test-hole depth.

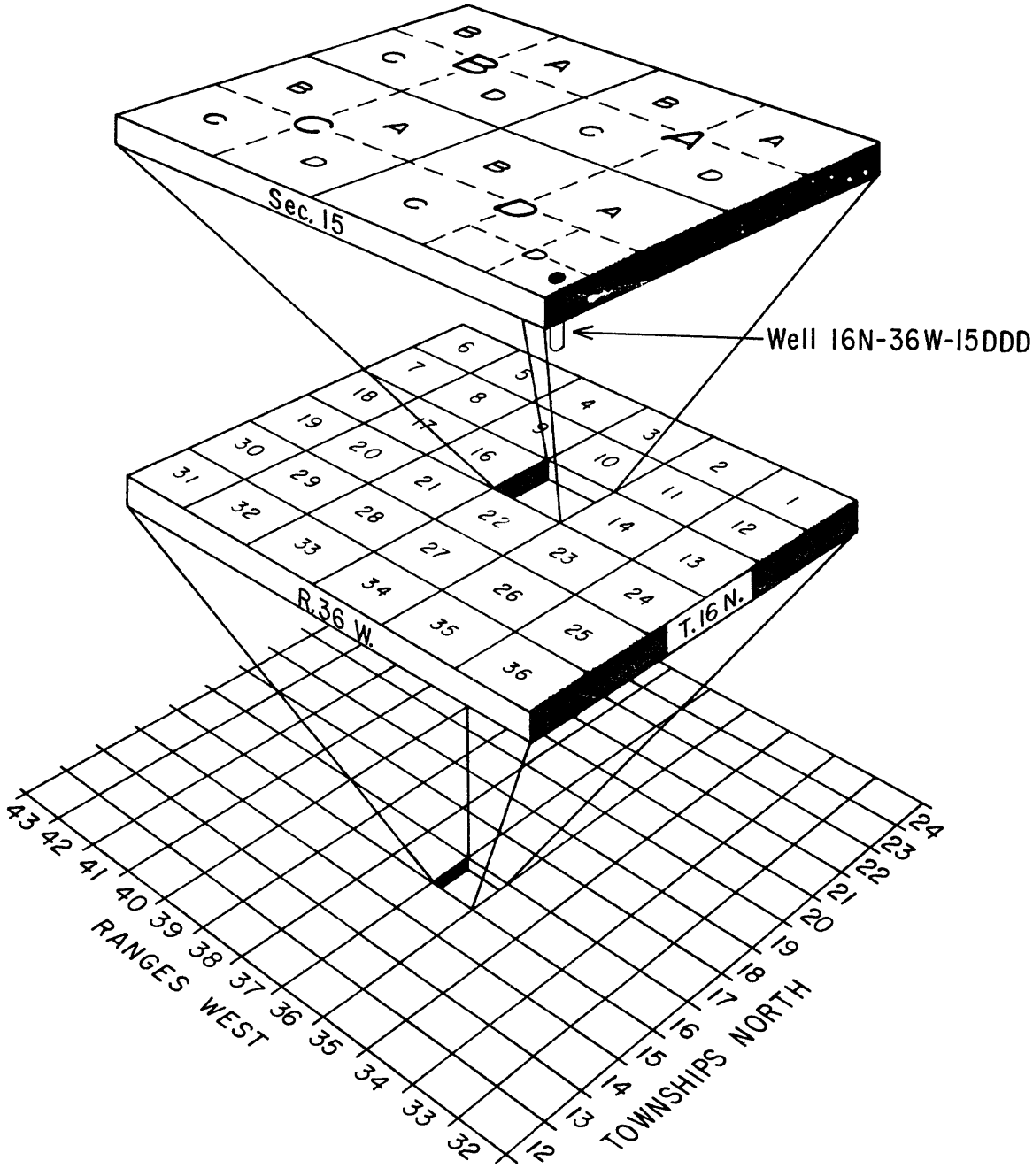

Figure 2.--Well-location numbering system.

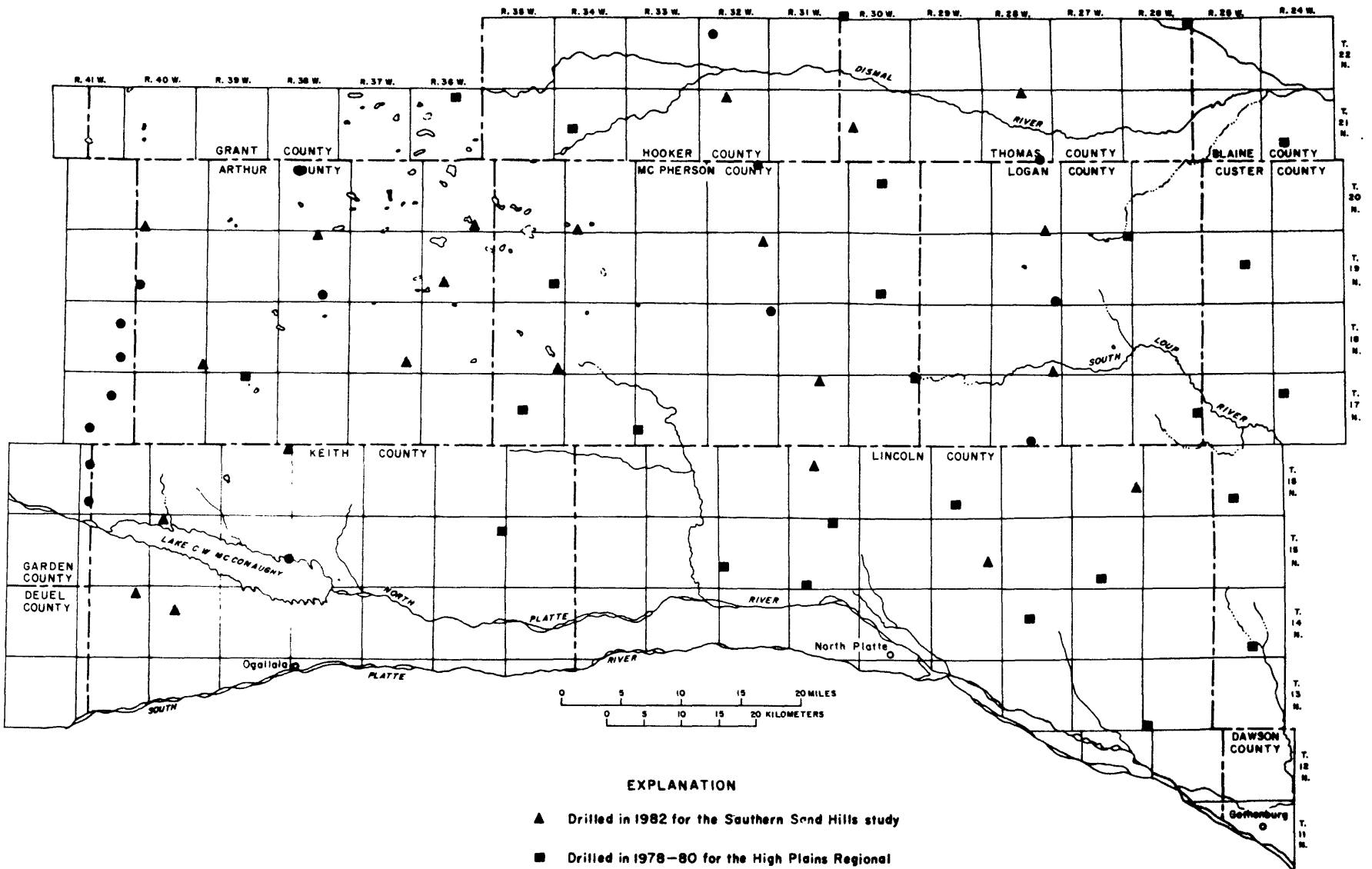

Figure 3.--Location of test holes.

WATER-LEVEL DATA

Water levels have been measured in 240 wells (fig. 4). Most of these are irrigation wells, and include 64 that are part of the regular networks of the Twin Platte and Upper Loup NRD's; the rest were inventoried and measured for the Southern Sand Hills study. Wells specifically inventoried and measured for the study were selected to provide good areal distribution, indicate water-level changes in potential problem areas, and reflect the water-table configuration below various topographic regions. In areas where few irrigation wells were available for measurement, distribution of observation wells is sparse.

Wells selected specifically for the study were inventoried and first measured in the spring of 1982, before the start of the irrigation season. Measurements were repeated in the fall of 1982 at the end of the irrigation season, and again in the spring of 1983. Wells from the NRD's observation-well network, first read in 1976, have been read twice yearly since. Water-level measurements were made with chalked steel tapes. All water levels are reported as depth-to-water, in feet below land-surface datum, and are given in table 1. Also included in table 1 are the names of the well owners and the elevations above sea level of the land surface at the well.

WATER-QUALITY DATA

Water-quality data for samples were collected in 1983 from 62 irrigation wells in the study area. Sampled wells (fig. 5) were chosen to provide uniform distribution across the area and to represent possible water-quality differences associated with various land forms, land use, and water-level conditions. Wells were sampled in stream valleys, adjacent uplands, dune areas of shallow and deep water tables,and tableland areas. In addition, some wells previously sampled in the 1960's and 1970's were resampled for comparative purposes.

All 1983 samples were collected according to established U.S. Geological Survey procedures using USGS sampling equipment. Specific conductance, pH, and water temperature were measured at the time of sample collection. Other determinations were performed by the USGS Central Laboratory in Arvada, Colo. These include calcium, magnesium, sodium, potassium, alkalinity, sulfate, chloride, fluoride, silica, and nitrite plus nitrate as nitrogen. Additionally, hardness, noncarbonate hardness, sodium adsorption ratio, dissolved solids sum, and dissolved solids in tons per acre-foot were computed from the measured determinations.

Water-quality data are presented by county in Appendix B. The appendix includes results of analyses of samples collected from wells in 1983 and the results of analyses of samples collected from the same wells at earlier dates. All data in Appendix B have previously been published in U.S. Geological Survey annual reports for the years in which they were collected but are republished here as a convenience to users who may desire a compilation of the historical water-quality records for the study area.

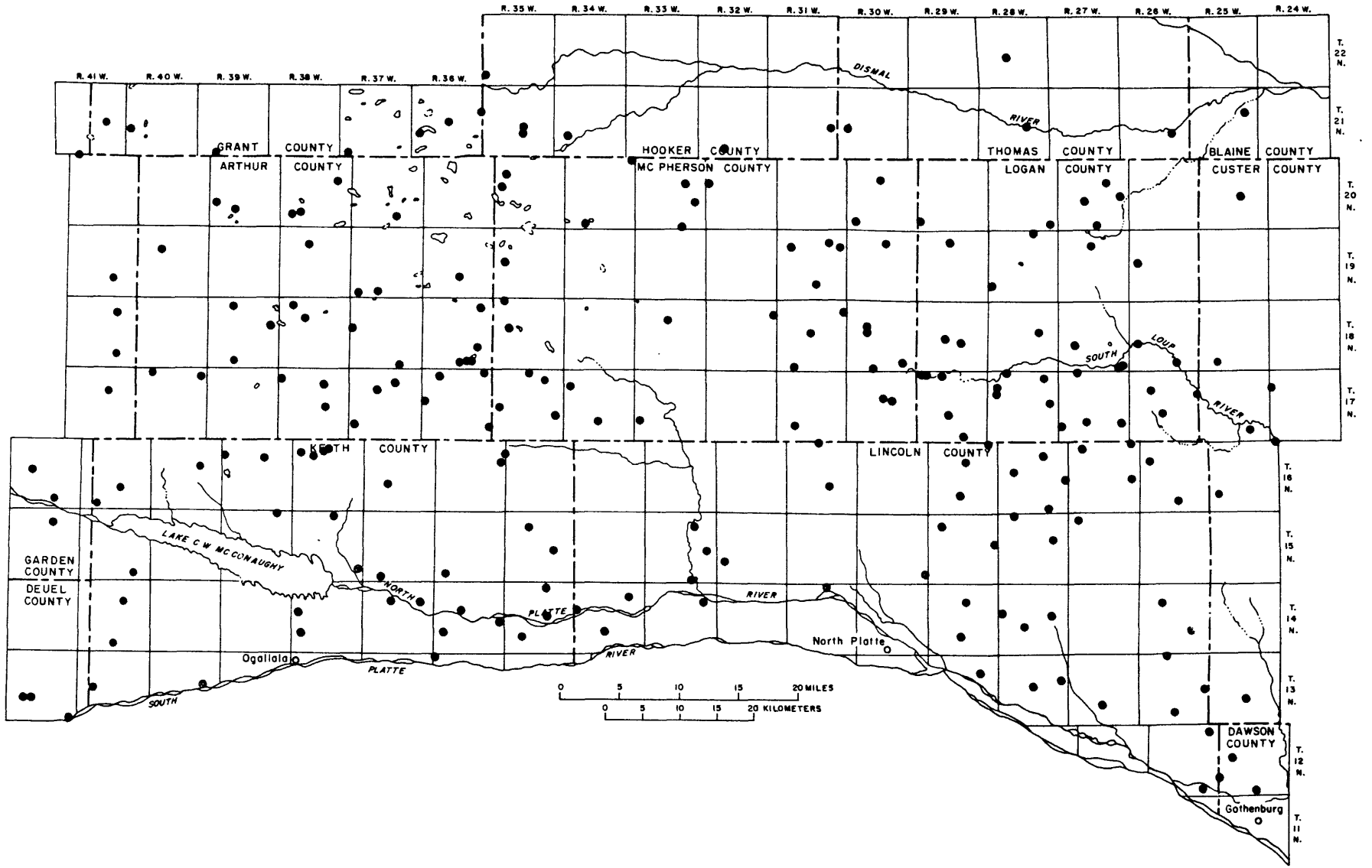

Figure 4.--Location of wells in which water levels were measured, 1982-1983.

Table 1.--Water-level measurements, spring and fall 1982 and spring 1983, in or adjacent to the study area

[Water-level measurements are in feet below land-surface datum]

WELL NUMBER	OWNER	ELEVATION ABOVE SEA LEVEL, IN FEET	SPRING 1982 MEASUREMENT		FALL 1982 MEASUREMENT		SPRING 1983 MEASUREMENT	
			DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
			ARTHUR COUNTY					
17N 36W 1BACC1	KARG PARTNERSHP	3430.	3-31-82	12.30	--------	-----	-------	-----
17N 36W 5ACCC1	JOE VASA	3485.	3-31-82	22.96	--------	-----	-------	-----
17N 36W18BBDD1	GERALD PACKARD	3480.	3-18-82	14.11	10-13-82	13.69	-------	-----
17N 36W25CDA 1	JIM LAWLER	3435.			10-26-82	26.54	3-18-83	26.13
17N 37W 9CDBA1	GARY STORER	3518.	3-18-82	17.41	10-13-82	18.25	3-15-83	17.67
17N 37W10AAC 1	RUSS GOLDEN	3520.	3-17-82	24.70	10-20-82	24.47	3-18-83	25.07
17N 37W30CADA1	ELDON PETERSON	3499.	3-31-82	20.09	10-13-82	20.58	3-15-83	20.35
17N 38W 6CD 1	DELBERT MCKEAG	3600.	3-13-82	16.39	10-20-82	16.84	3-18-83	17.01
17N 38W10ADB 1	GERALD PACKARD	3565.	3-18-82	33.94	10-13-82	34.49	3-15-83	34.08
17N 38W23BBCC1	GERALD PACKARD	3530.	3-18-82	9.00	10-13-82	9.72	3-15-83	9.25
17N 40W 1DBCC1	DELWIN WILSON	3628.	3-17-82	10.18	10- 6-82	10.75	3-16-83	10.52
17N 40W 5BD 1	WALTER WILSON	3675.	3-18-82	23.14	10-20-82	23.18	3-18-83	23.28
18N 36W 2DADD1	JOE CULLINAN	3468.	3-18-82	8.23	10-14-82	9.26	3-14-83	8.14
18N 36W26A 1	BUCKTAIL RANCH	3507.	3-18-82	42.02	10-26-82	43.05	3-18-83	42.10
18N 36W34AACC1	KARG PARTNERSHP	3512.	4-22-82	78.57	10-14-82	78.53	5-13-83	78.02
18N 36W34BCA 1	KARG PARTNERSHP	3500.	4-22-82	70.56	10-14-82	72.62	5-13-83	70.62
18N 36W35BBDD1	KARG PARTNERSHP	3480.	4-22-82	46.28	10-14-82	47.67	5-13-83	45.99
18N 37W18CBA 1	PEARL CURRY	3578.	3-31-82	7.00	10-13-82	7.72	3-15-83	7.61
18N 37W35CBDA1	JOE VASA	3525.	3-31-82	32.93	--------	-----	5-13-83	33.45
18N 38W 5CBD 1	DONALD WEINER	3680.	3-31-82	54.30	10-18-82	54.74	3-15-83	54.40
18N 38W 9CBDD1	ROBERT LUTE	3625.	3-31-82	10.99	10-18-82	11.30	3-16-83	10.94
18N 39W 4CCA 1	VIRGIL HAWKINS	3665.	3-18-82	9.64	10-20-82	9.25	3-18-83	9.03
18N 39W13BDC 1	WALDO HAYTHORN	3630.	3-17-82	5.35	10-18-82	5.30	3-16-83	5.56
18N 39W33BDBC1	LEE ALLARD	3636.	3-23-82	21.83	10-18-82	22.56	3-16-83	22.23
19N 36W27BB 1	WILBERT SIZER	3545.	3-18-82	17.91	10-25-82	18.19	3-23-83	18.03
19N 37W31ACDD1	GARY HELMER	3600.	3-18-82	13.77	10-14-82	14.37	3-14-83	13.87
19N 37W33BD 1	VIRGIL ENFIELD	3585.	3-18-82	11.39	10-21-82	12.24	3-23-83	11.38
19N 38W 9BDDD1	TED FRYE	3655.	3-17-82	9.71	10-18-82	9.78	3-16-83	9.75
19N 40W 9CC 1	RUBIN CARLHOLM	3718.	3-18-82	6.18	10-21-82	6.90	3-18-83	7.05
20N 37W34AAAB1	ELLINGROD RANCH	3594.	3-30-82	8.02	10-14-82	8.39	3-14-83	7.99
20N 38W14AA 1	NORM KRAMER	3642.	3-18-82	22.55	10-21-82	21.66	3-18-83	21.34
20N 38W29CCC 1	R MCELHINNEY	3680.	3-18-82	28.45	10-21-82	28.85	3-18-83	28.56
20N 38W29DDBB1	R MCELHINNEY	3660.	3-17-82	4.56	10-18-82	5.11	3-16-83	4.98
20N 39W19DCDB1	MEYERS L & C CO	3715.	3-18-82	7.05	10-18-82	7.20	3-16-83	7.20
20N 39W28CABB1	JOHN JENSEN	3700.	3-18-82	7.17	10-21-82	6.94	3-18-83	7.10
			BLAINE COUNTY					
21N 25W14AAC 1	CRAIG THOMPSON	2735.	3-17-82	87.35	--------	-----	5-13-83	86.97
			CUSTER COUNTY					
13N 25W28AACA1	BURTON BECK	2850.	3-25-82	197.88	--------	-----	-------	-----
16N 25W 1AB 1	O DAVENPORT	2675.	5-29-82	19.45	9-30-82	21.82	-------	-----
16N 25W30DB 1	J C DAVENPORT	3000.	5-29-82	264.32	9-30-82	270.42	-------	-----
17N 24W 7CBB 1	BILL VOGLE	2790.	3-11-82	112.68	--------	-----	5- 6-83	112.60
17N 25W35BC 1	BERT FOCHTMAN		5-11-82	20.65	10-26-82	21.49	4-13-83	20.27
18N 25W32BDAD1	SYLVAN MILLS	2819.	3-24-82	81.07	10- 5-82	82.50	5- 6-83	80.89
20N 25W22ACB 1	MARION DOWNING	2808.	3-24-82	66.77	--------	-----	5- 6-83	58.74
			DAWSON COUNTY					
12N 25W17CCC 1	JAMES CARLSON	2712.	5-19-82	120.82	10-13-82	122.59	5-26-83	116.32
12N 25W34CC 1	RAYMOND BLOCK	2612.			10-13-82	40.58	-------	-------
			DEUEL COUNTY					
13N 41W31CD 1	H J BAYLEY	3371.	3-23-82	13.76	10-22-82	13.29	5-10-83	11.22
13N 42W29AAA 1	LAVERNE TRANEL	3607.	3-23-82	140.70	10-22-82	140.61	5-10-83	138.69
13N 42W29BABB1	LAVERNE TRANEL	3550.	3-25-82	98.86	10-21-82	97.10	3-18-83	94.10
13N 42W36CB 1	ROLAND LA GRANGE	3374.	3-23-82	8.30	10-22-82	7.97	5-10-83	4.49
			GARDEN COUNTY					
15N 42W10ABCA1	NE GAME & PARKS	3360.	3-16-82	6.54	10- 6-82	7.74	3-12-83	7.21
16N 42W17DACC1	STEVE COCHRAN	3375.	3-16-82	48.64	10- 6-82	48.39	3-12-83	48.79
16N 42W34AB 1	DELATOR	3303.	3-18-82	12.03	10-21-82	12.52	5-10-83	11.63
17N 41W10DCBD1	HAROLD BURDICK	3670.	3-16-82	37.16	10- 6-82	39.06	3-12-83	37.51
18N 41W11BDB 1	RUSH CREEK L&L CO	3700.	3-17-82	8.65	10- 6-82	9.15	3-12-83	8.78
18N 41W26CCAA1	DAVID LEDDEN	3720.	3-16-82	21.65	10- 6-82	22.37	3-12-83	21.95
19N 41W27ADD 1	H OLSON	3750.	3-17-82	40.30	10- 6-82	40.49	3-12-83	40.52
21N 41W32DDD 1	CECIL COTTON	3780.	3-17-82	6.54	10- 6-82	7.31	3-12-83	6.49
			GRANT COUNTY					
21N 36W22BCAA1	JOHN VINTON	3550.	3-18-82	11.57	10-14-82	12.43	3-14-83	11.39
21N 36W30AACC1	TAYLOR LAWRENCE	3575.	3-30-82	10.93	10-14-82	11.50	3-14-83	10.88
21N 37W31DACD1	ROBERT KRAMER	3640.	3-18-82	7.18	10-18-82	7.60	3-16-83	7.18
21N 39W32DCA 1	JENSEN RANCH	3733.	3-18-82	8.28	10-18-82	6.15	3-16-83	8.63
21N 40W19CDAA1	RAYMOND SUTTON	3780.	3-31-82	13.21	10- 6-82	13.52	3-12-83	13.26
21N 41W23BAD 1	ALFRED SUTTON	3040.	3-31-82	13.60	10- 6-82	10.83	3-12-83	10.15

Table 1.--Water-level measurements, spring and fall 1982 and spring 1983, in or adjacent to the study area--Continued

WELL NUMBER	OWNER	ELEVATION ABOVE SEA LEVEL, IN FEET	SPRING 1982 MEASUREMENT		FALL 1982 MEASUREMENT		SPRING 1983 MEASUREMENT	
			DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
			HOOKER COUNTY					
21N 31W24BDD	D RODEWALD	3210.	3-31-82	114.74	--------	------	5-20-83	114.46
21N 32W33BBD 1	R L STEVENSON	3368.	3-12-82	126.57	11-17-82	127.67	5-13-83	126.62
21N 34W29BDBC1	JACK TUCKER	3440.	3-30-82	7.92	--------	------	5-13-83	7.91
21N 35W18BCB 1	JOHN VINTON	3515.	3-30-82	9.13	--------	------	5-13-83	8.74
21N 35W22DBBD1	TAYLOR LAWRENCE	3475.	3-30-82	5.29	--------	------	5-13-83	5.05
21N 35W27ABCA1	TAYLOR LAWRENCE	3480.	3-30-82	11.25	--------	------	5-13-83	10.84
22N 35W31BAD 1	RUSH CREEK L&L CO	3515.	3-30-82	11.15	--------	------	5-13-83	16.00
			KEITH COUNTY					
13N 35W18DDB 1	EDWARD FLEMING	3114.	3-16-82	41.89	10-18-82	39.64	3-15-83	41.99
13N 36W 6BC 1	CNPP&I DISTRICT	3117.	-------	-----	10-14-82	4.00	-------	-----
13N 36W 8CC 1	U S GEOL SURVEY	3112.	-------	-----	10-18-82	4.53	-------	-----
13N 37W13DD 1	PETE PETERS	3185.	3-16-82	66.87	10-18-82	67.34	3-22-83	66.88
13N 37W18DDB 1	G GEISERT	3260.	3-17-82	90.96	10-18-82	92.62	3-22-83	90.92
13N 39W19DC 1	LEO SCHILZ	3319.	3-17-82	67.14	10-19-82	69.67	3-22-83	66.12
13N 40W14DCA 1	T. J. PLUMMER	3280.	-------	-----	10- 5-82	11.20	3-18-83	9.21
13N 41W20BBDB1	H JOHN SCHUTTE	3571.	4- 1-82	186.09	10-21-82	186.90	3-18-83	185.84
14N 35W 3AC 1	M STAFFORD	3180.	3-16-82	26.78	10-26-82	26.76	3-15-83	27.10
14N 35W15DCAD1	DR S B STAFFORD	3002.	3-16-82	2.89	10- 5-82	3.65	3-11-83	2.67
14N 35W29DBBD1	SNYDER BROS	3060.	3-16-82	29.20	10- 5-82	27.71	3-11-83	29.58
14N 36W16BDBC1	JIM SILLASEN	3055.	3-15-82	6.76	10- 5-82	6.12	3-11-83	6.97
14N 36W24ACAB1	BRYON SADLE	3030.	3-16-82	4.91	10- 5-82	4.85	3-11-83	4.98
14N 36W30ADBB1	TOM NEILSON	3160.	3-16-82	88.26	10- 5-82	87.84	3-11-83	88.64
14N 37W 9CAAD1	EUGENE FELTZ	3100.	3-15-82	24.73	10- 5-82	22.35	3-11-83	24.35
14N 37W11DACD1	JACK BROGAN	3075.	3-15-82	5.70	10- 5-82	5.42	3-11-83	5.73
14N 38W18DBAC1	JOHN NOWAK JR	3440.	4-22-82	215.20	10-20-82	214.44	3-18-83	214.41
14N 38W30AD 1	VANSTEENBURG	3410.	3-17-82	196.09	10-20-82	197.62	3-23-83	196.23
14N 41W10D 1	CHARLES ROBAKER	3598.	4- 1-82	234.16	10-13-82	235.32	3-18-83	234.28
14N 41W33AD 1	LESTER RHOADS	3635.	3-17-82	273.40	10-19-82	275.70	3-23-83	273.96
15N 35W 9BC 1	EUGENE FELTZ	3283.	3-16-82	26.50	10-26-82	27.13	3-15-83	26.14
15N 35W23BCAA1	NE BANK COMM	3220.	3-16-82	28.96	10- 5-82	30.40	3-11-83	30.17
15N 36W31ADAB1	DON CHANDLER	3273.	3-15-82	50.84	10- 5-82	52.12	3-11-83	51.01
15N 37W32DBCD1	E. D. DUNWOODY	3102.	3-15-82	9.14	10- 5-82	11.49	3-11-83	9.22
15N 38W 3DB 1	WHITE TAIL RNCH	3400.	3-17-82	39.46	10-21-82	41.14	3-16-83	40.70
15N 38W25DCCC1	ED GRAHAM	3128.	3-15-82	10.32	10- 5-82	12.45	3-11-83	10.35
15N 39W 2AAC 1	CRAIG HAYTHORNE	3415.	3-17-82	14.80	10-21-82	16.33	3-16-83	14.20
15N 41W35AC 1	CHARLES ROBAKER	3580.	3-17-82	218.11	10-20-82	218.70	3-23-83	217.79
16N 36W12AADD1	ENGINEERED FARMS	3425.	4-22-82	108.80	10-14-82	106.63	3-14-83	102.70
16N 36W12DC 1	ENGINEERED FARMS	3370.	3-16-82	56.00	10-26-82	56.50	3-18-83	56.00
16N 37W21CB 1	FRANCIS GLINN	3430.	3-16-82	22.00	10-21-82	22.33	3-18-83	22.16
16N 38W 3CBDC1	PETERSON RANCH	3500.	3-31-82	15.11	10-13-82	15.51	3-15-83	15.33
16N 38W 7AA 1	CNPP&I DISTRICT	3499.	5- 4-82	11.90	10- 5-82	12.20	5- 2-83	12.00
16N 38W 8AD 1	DUANE LANDIS	3500.	3-17-82	9.18	10-20-82	9.74	3-16-83	9.97
16N 38W 9ABA 1	PETERSON RANCH	3500.	3-31-82	14.28	10-13-82	14.89	3-15-83	14.39
16N 39W 7BD 1	CHARLES BERRY	3560.	3-17-82	55.56	10-20-82	55.19	3-16-83	56.06
16N 39W10DBA 1	CHARLES BERRY	3528.	4- 1-82	18.47				
16N 40W14BDB 1	RANDY LEMMERT	3530.	4- 1-82	19.35	10-13-82	20.50	3-15-83	19.83
16N 41W27BA 1	B LEEPER	3480.	3-17-82	78.78	10-20-82	80.59	3-16-83	78.60
16N 41W32CAAA1	LEONARD BAIRN	3290.	3-16-82	19.77	10- 6-82	15.03	3-12-83	18.28
			LINCOLN COUNTY					
12N 26W 1CCA 1	WM RUBENTHALER	2695.	3-25-82	48.84	10- 4-82	53.31	-------	-----
12N 26W25DAD 1	EMILY OSTERLOH	2633.	3-25-82	38.66	10- 4-82	39.36	-------	-----
12N 26W35DB 1	R D MC WHA	2609.	-------	-----	10-14-82	15.13	-------	-----
12N 28W 8BC 1	OWNER UNKNOWN	2761.	-------	-----	10-14-82	33.58	-------	-----
12N 28W 9BC 1	CNPP&I DISTRICT	2703.	-------	-----	10-14-82	6.25	-------	-----
12N 29W31CCB 1	P HIGHBERGER	3064.	3- 1-82	239.09	9-30-82	242.73	3- 1-83	239.02
13N 26W 4BCAB1	DALE HILD	2839.	3-23-82	103.69	10- 4-82	108.50	3- 8-83	104.97
13N 26W24BAC 1	W BRATTEN	2790.	3-12-82	88.87	10-14-82	91.64	3-14-83	89.49
13N 26W33ABD 1	LYLE GRONEWOLD	2768.	3-23-82	70.14	10- 4-82	72.46	3- 8-83	70.61
13N 27W28DBAA1	BERNARD BROSIUS	2700.	3-25-82	8.44	10- 5-82	9.64	3- 8-83	8.19
13N 28W13BCDA1	RON ROBERTS	2745.	3-25-82	18.75	10- 5-82	19.58	3- 8-83	18.66
13N 28W16DD 1	U S GEOL SURVEY	2719.	-------	-----	10-14-82	5.98	-------	-----
13N 29W11CDA 1	S A NICHOLAS	2753.	3-25-82	6.89	10- 5-82	7.90	3- 1-83	6.34
13N 30W 9CA 1	NEBR HIGHWAY DEPT	2800.	-------	-----	10-15-82	6.44	-------	-----
13N 30W21BB 1	U S GEOL SURVEY	2819.	-------	-----	10-15-82	10.24	-------	-----
13N 33W31AAC 1	QUENTIN HOEFER	3162.	3-16-82	128.23	10-15-82	129.58	3-15-83	127.75
13N 34W18AAC 1	H GRAUERHOLZ	3084.	3-16-82	54.36	10-15-82	54.94	3-15-83	54.30
14N 26W 8DCA 1	LARRY KRACMAN	2865.	3-23-82	90.75	10- 4-82	99.29	3- 8-83	91.70
14N 26W26BBD 1	J RUBENTHALER	2878.	3-12-82	153.10	10-14-82	160.16	3-14-83	148.08
14N 28W14CDD 1	H HAYTHORNE	2843.	3-24-82	27.95	10- 4-82	28.18	3- 1-83	28.07
14N 28W18CACC1	H SUKRAW	2900.	3-24-82	56.69	10- 4-82	57.32	3- 1-83	56.84
14N 28W21CC 1	H SUKRAW	2875.	3-12-82	62.07	10-18-82	66.82	3-14-83	62.28
14N 29W10CCAA1	MARY ANN VINTON	2895.	3-26-82	49.57	10- 5-82	49.75	3- 1-83	49.67
14N 29W28DBDD1	HENRY SCHICK	2835.	3-26-82	36.73	10- 5-82	37.04	3- 1-83	36.78
14N 31W 3BDB 1	WALTER COOMBS	2847.	3-26-82	0.20	10- 5-82	1.45	3- 2-83	0.52
14N 33W11DADA1	CHAS MCCONNELL	2912.	3-26-82	5.32	10- 6-82	4.87	3- 1-83	5.34
14N 34W11ABDD1	JAMES COPELAND	2958.	3-26-82	2.14	10- 6-82	3.87	3- 2-83	2.44
14N 34W18BBDD1	F MCFADDEN	2987.	3-26-82	3.84	--------	-----	-------	-----
14N 34W28ABAB1	DAVID BENSON	3010.	3-26-82	41.37	10- 6-82	39.95	3- 2-83	41.50
15N 27W 6DCAA1	STAN BURNSIDE	2985.	3-24-82	150.28	10- 4-82	150.87	3- 3-83	150.38

Table 1.--Water-level measurements, spring and fall 1982 and spring 1983, in or adjacent to the study area--Continued

WELL NUMBER	OWNER	ELEVATION ABOVE SEA LEVEL, IN FEET	SPRING 1982 MEASUREMENT DATE	SPRING 1982 MEASUREMENT WATER LEVEL	FALL 1982 MEASUREMENT DATE	FALL 1982 MEASUREMENT WATER LEVEL	SPRING 1983 MEASUREMENT DATE	SPRING 1983 MEASUREMENT WATER LEVEL
			LINCOLN COUNTY					
15N 28W 5BDB 1	DEAN NIEDAN	2970.	3-25-82	89.32	10- 5-82	89.50	3- 2-83	89.25
15N 28W14ACC 1	BUEFORD BAILEY	2940.	3-24-82	103.19	10- 4-82	103.53	3- 3-83	103.26
15N 29W 8BCA 1	DEAN NIEDAN	2980.	3-24-82	73.93	10- 5-82	72.41	3- 3-83	72.12
15N 29W13DD 1	L STEWART	2975.	3-10-82	101.43	10-15-82	101.90	3-14-83	101.64
15N 30W36ACCA1	W C OVERHOLT	2962.	3-24-82	78.30	10- 5-82	78.66	3- 2-83	78.46
15N 32W30ABD 1	DENNIS SHIMMIN	3030.	3-15-82	107.40	10-18-82	108.22	3-15-83	105.97
15N 33W11BBDD1	JIM FLEECS	3050.	3-26-82	88.18	10- 8-82	88.64	3- 2-83	88.09
15N 33W24B 1	MARGARET UDSEN	3067.	3-26-82	116.98	10- 8-82	118.67	3- 2-83	116.76
15N 33W35CBCC1	FRED HOATSON	2923.	3-26-82	7.53	10- 6-82	8.85	3- 2-83	7.60
16N 26W 7DDBB1	MARGARET UDSEN	2980.	3-23-82	186.28	--------	------	3- 3-83	188.59
16N 26W34BBD 1	P WEINMAN	2915.	3-12-82	146.46	10-14-82	148.57	3-14-83	147.34
16N 27W 1BBD 1	D SMITH	2990.	3-12-82	185.20	10-14-82	186.25	3-14-83	185.24
16N 27W 5CBD 1	GEORGE KRAMER	2995.	3-23-82	155.65	10- 4-82	156.89	3- 3-83	155.99
16N 27W24B 1	ED STRASBURG	2920.	3-23-82	122.25	--------	------	3- 3-83	118.37
16N 28W10A 1	KENNETH BROSIUS	3038.	3-23-82	169.46	10- 5-82	170.52	3- 3-83	169.72
16N 28W17C 1	JOE KRAMER	3002.	3-24-82	120.52	10- 5-82	121.30	3- 3-83	120.66
16N 28W24ACAB1	HAROLD JOHNSON	2985.	3-24-82	141.76	10- 5-82	142.42	3- 3-83	141.88
16N 28W35CCA 1	WM BROSIUS	2975.	3-12-82	126.28	10-14-82	126.15	3-14-83	128.42
16N 29W 1BB 1	HOMER EMPFIELD	3020.	3-12-82	116.20	10-14-82	118.26	3-14-83	117.62
16N 29W10CCA 1	D HEISS	3050.	3-12-82	113.38	10-14-82	114.74	3-14-83	114.30
16N 29W28DBDD1	R T MARLAND	3000.	3-24-82	88.14	10- 5-82	88.53	3- 3-83	88.10
16N 31W 4AB 1	U S GEOL SURVEY	3025.	-------	------	10-25-82	69.43	5-13-83	69.39
16N 31W22CDA 1	J STEFFUS	3080.	3-23-82	68.41	10-25-82	68.69	3-14-83	68.84
			LOGAN COUNTY					
17N 26W 8DDBB1	HENRY TUNNEL	3085.	3-11-82	289.40	--------	-----	5- 6-83	296.06
17N 26W13AAC 1	RON MORRISON	2756.	3-24-82	12.73	10- 5-82	13.87	5- 6-83	12.21
17N 26W21DAC 1	JOHN I HALSTEDT	2964.	3-24-82	191.72	10- 5-82	192.45	5- 6-83	191.58
17N 27W 5BA 1	U S GEOL SURVEY		-------	-------	10-26-82	12.48	-------	------
17N 27W25BDCD1	LOUIS HALSTEDT	3025.	3-25-82	218.66	11-15-82	219.08	5- 6-83	218.22
17N 27W28BB 1	JOHN NEWBORN		5-11-82	187.32	10-26-82	189.27	4-13-83	188.74
17N 27W30CCAA1	VERNON BROSIUS	2995.	3-22-82	139.07	--------	------	5- 6-83	139.10
17N 28W 2DABC1	W SALISBURY	2905.	3-23-82	25.32	11-15-82	25.88	5- 6-83	24.86
17N 28W 5ABD 1	VANCE WHITEHILL	2931.	3-25-82	11.38	10- 6-82	12.08	5- 5-83	10.80
17N 28W 7ACDD1	HARRY FREY	2938.	3-15-82	7.51	--------	------	5- 5-83	7.09
17N 28W13CACC1	RAYMOND RANDORF	3020.	3-23-82	158.13	10- 5-82	159.12	5- 6-83	158.13
17N 28W18ABAA1	HARRY FREY	2960.	3-25-82	23.80	10- 6-82	24.64	5- 5-83	23.50
17N 29W 4BDCC1	PARKER BROTHERS	2982.	3-25-82	14.49	11- 5-82	14.79	5- 5-83	13.97
17N 29W 6ACAA1	MYRON BLAKEWELL	3012.	3-25-82	21.82	--------	------	5- 5-83	21.55
17N 29W 6BCAA1	TED KLUG	3020.	3-25-82	28.14	--------	------	5- 5-83	27.82
17N 29W21DBC 1	DARRELL W HEISS	3060.	3-25-82	106.79	10- 6-82	107.38	5- 5-83	106.45
17N 29W34DDBB1	TOM JOHNSON	3054.	3-25-82	118.82	10- 6-82	119.62	5- 5-83	118.66
18N 26W19DCAA1	MILLDALE RANCH	2810.	3-24-82	8.70	10- 5-82	9.54	5- 6-83	7.97
18N 26W35BCCB1	DENNIS BEATLY	2788.	3-24-82	16.80	10- 5-82	17.86	5- 6-83	16.37
18N 27W20CDDC1	RICHARD WELLS	2875.	3-24-82	6.19	10- 5-82	7.35	5- 6-83	5.71
18N 27W36CADA1	DANNY WITTHUHN	2842.	3-16-82	28.73	--------	-----	-------	-----
18N 27W36CCA 1	LEE COEN	2834.	3-24-82	20.47	10- 5-82	21.43	5- 6-83	19.77
18N 28W14CDB 1	DIAMOND BAR	2918.	3-23-82	2.74	10- 6-82	3.52	5- 6-83	2.09
18N 29W21BDBA1	LARIAT BOYS RCH	3020.	3-25-82	29.92	--------	-----	5- 5-83	30.73
18N 29W22DBA 1	LARIET BOYS RCH	3000.	3-25-82	33.79	10- 6-82	34.19	5- 5-83	33.40
19N 26W18DDC 1	PETE KIEWIT JR	2930.	3-22-82	88.13	10- 6-82	92.00	4-27-83	89.94
19N 27W 9DAB 1	VICTOR KARG	2935.	3-22-82	60.76	10- 6-82	61.62	4-28-83	59.67
19N 28W 3AACD1	JAMES STURTZ	2975.	3-23-82	35.34	11-15-82	34.58	4-28-83	33.90
19N 28W30CDB 1	CLARENCE LANKA	3027.	3-23-82	35.30	--------	-----	5- 9-83	35.90
19N 29W 9ABD 1	BUD MCGOODEN	3044.	3-23-82	47.30	10- 7-82	47.52	4-28-83	47.65
20N 27W14BBC 1	KENNETH ROGERS	2872.	3-22-82	44.44	11-15-82	44.90	4-27-83	44.30
20N 27W21CAC 1	VICTOR KARG	2940.	3-22-82	81.05	10- 6-82	82.95	4-27-83	80.91
20N 27W24BDB 1	KENNETH ROGERS	2860.	3-22-82	17.55	11-15-82	21.65	4-27-83	19.53
20N 27W34CACC1	VICTOR KARG	2940.	3-22-82	57.40	10- 6-82	60.07	4-28-83	57.16
20N 28W36CAC 1	VICTOR KARG	2945.	3-22-82	36.37	10- 6-82	37.20	4-28-83	35.56
20N 29W31BCAA1	GEORGE PFEIFFER	3068.	3-26-82	47.31	10- 7-82	47.45	4-28-83	47.55
			MC PHERSON COUNTY					
17N 30W15BCB 1	CARL RUNDBACK	3137.	3-31-82	114.74	10- 6-82	115.70	4-28-83	114.80
17N 30W15DABA1	HAROLD PETERSON	3120.	3-23-82	109.01	--------	------	-------	------
17N 31W29DBC 1	D. M. MANN	3132.	3-30-82	71.75	10- 6-82	72.25	4-28-83	72.52
17N 33W30ACBB1	REX RICHARDSON	3210.	3-31-82	60.85	10- 8-82	60.66	3-18-83	60.06
17N 34W 7ACAA1	RON ALFS	3400.	3-31-82	110.57	10- 8-82	111.67	3-18-83	110.69
17N 34W27BCBB1	C & G MORGAN	3275.	3-15-82	51.10	10-26-82	52.10	3-15-83	51.30
17N 35W 2DC 1	TIEHEN FARMS	3440.	3-15-82	98.36	10-26-82	99.90	3-15-83	97.84
17N 35W 3BBDC1	TOM TIEHEN	3480.	3-31-82	105.55	10- 8-82	106.52	3-18-83	104.83
17N 35W19ABAD1	CARL RUNDBACK	3408.	3-31-82	27.27	10- 8-82	22.27	3-18-83	21.48
17N 35W24CDAA1	FRED SEIFERT	3335.	3-31-82	50.26	--------	------	-------	-----
18N 30W17ACAA1	JIM DOYLE	3195.	3-31-82	140.46	10- 7-82	140.94	5- 5-83	139.48
18N 30W17DCA 1	JOHN NEAL	3220.	3-23-82	149.40	--------	------	4-28-83	144.64
18N 30W33CCA 1	DAVE HORA	3157.	3-23-82	117.39	11- 5-82	121.01	4-27-83	120.85
18N 30W35ACA 1	LEONARD CORRELL	3074.	3-31-82	47.27	10- 6-82	47.92	4-27-83	47.97
18N 31W12ABA 1	L TRUMBLE	3260.	3-31-82	186.81	10- 7-82	187.17	5- 5-83	187.38
18N 31W16DD 1	U S GEOL SURVEY	3225.	-------	------	10-25-82	110.37	4-27-83	110.47
18N 31W32CAD 1	TED CORRELL	3210.	3-30-82	106.63	10- 6-82	106.91	5- 5-83	106.96
18N 32W12ACA 1	DON HATCH	3265.	3-30-82	88.24	10-25-82	88.72	4-27-83	88.82

Table 1.--Water-level measurements, spring and fall 1982 and spring 1983, in or adjacent to the study area--Continued

WELL NUMBER	OWNER	ELEVATION ABOVE SEA LEVEL, IN FEET	SPRING 1982 MEASUREMENT		FALL 1982 MEASUREMENT		SPRING 1983 MEASUREMENT	
			DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
			MC PHERSON COUNTY					
18N 33W 9DACC1	MARY MCNUTT	3290.	3-30-82	15.71	10-26-82	17.52	3-23-83	16.20
18N 35W 5BB 1	ORVILLE THOMPSON	3445.	3-18-82	14.95	10-26-82	15.75	3-23-83	15.24
18N 35W17BDAD1	EDWARD PUEPPKA	3460.	3-31-82	46.89	10- 8-82	38.03	3-18-83	36.70
19N 30W10BACC1	MARVIN MUNSON	3115.	3-31-82	56.26	10- 7-82	57.62	4-29-83	57.57
19N 31W 8CBA 1	RON DOBBINS	3280.	3-30-82	108.47	--------	-----	-------	-----
19N 31W11BAD 1	SANDHILLS AG LB	3210.	-------	-----	--------	-----	4-28-83	90.44
19N 31W12CAB 1	SANDHILLS AG LB	3180.	3-23-82	81.69	10- 7-82	82.28	4-28-83	82.01
19N 31W27CAC 1	SS&T FARMS	3280.	3-30-82	131.22	10- 7-82	132.75	5- 4-83	132.47
19N 35W17CCA 1	STORER CATTLE	3475.	3-15-82	11.88	10- 8-82	11.65	3-18-83	10.78
20N 30W 9DDB 1	VERNARD KNOLL	3136.	3-26-82	92.13	10- 7-82	88.88	4-28-83	88.79
20N 30W31ACA 1	VERNON JAMISON	3155.	3-12-82	67.47	10- 7-82	67.78	4-28-83	67.69
20N 32W18BBDA1	PIONEER FEED YD	3385.	3-30-82	90.14	10- 8-82	91.09	3-18-83	90.52
20N 33W14BBD 1	HERSCHEL MOORE	3390.	3-30-82	55.94	10-25-82	56.69	3-23-83	57.14
20N 33W24CCBA1	PIONEER FEED YD	3425.	3-30-82	83.80	10- 8-82	85.63	3-18-83	84.07
20N 33W34DDDB1	PIONEER FEED YD	3400.	3-30-82	30.66	10- 8-82	31.14	3-18-83	30.76
20N 34W 1A 1	M T LAWRENCE	3430.	3-22-82	27.70	10-23-82	28.22	3-23-83	28.10
20N 34W32DA 1	CLAYTON HUFFMAN	3420.	3-22-82	5.53	10-25-82	5.70	3-23-83	5.07
20N 35W 8ACCC1	MAX ROTHWELL	3500.	3-30-82	7.02	10-25-82	7.52	3-23-83	6.63
20N 35W18ADCD1	MAX ROTHWELL	3495.	3-30-82	9.11	10- 8-82	9.69	3-18-83	9.73
			THOMAS COUNTY					
21N 26W23DC 1	WAYNE COLLIER	2755.	3-22-82	43.76	--------	-----	5-19-83	43.67
21N 28W23BD 1	U S GEOL SURVEY	2810.	5-11-82	13.44	11-24-82	13.47	5-12-83	13.07
21N 30W20CBBA1	RODEWALD RANCH	3180.	3-31-82	107.76	-------	-----	5-20-83	107.66
22N 28W21ACD 1	BERNARD EWOLDT	2935.	3-19-82	74.98	11-15-82	75.09	5-20-83	75.08

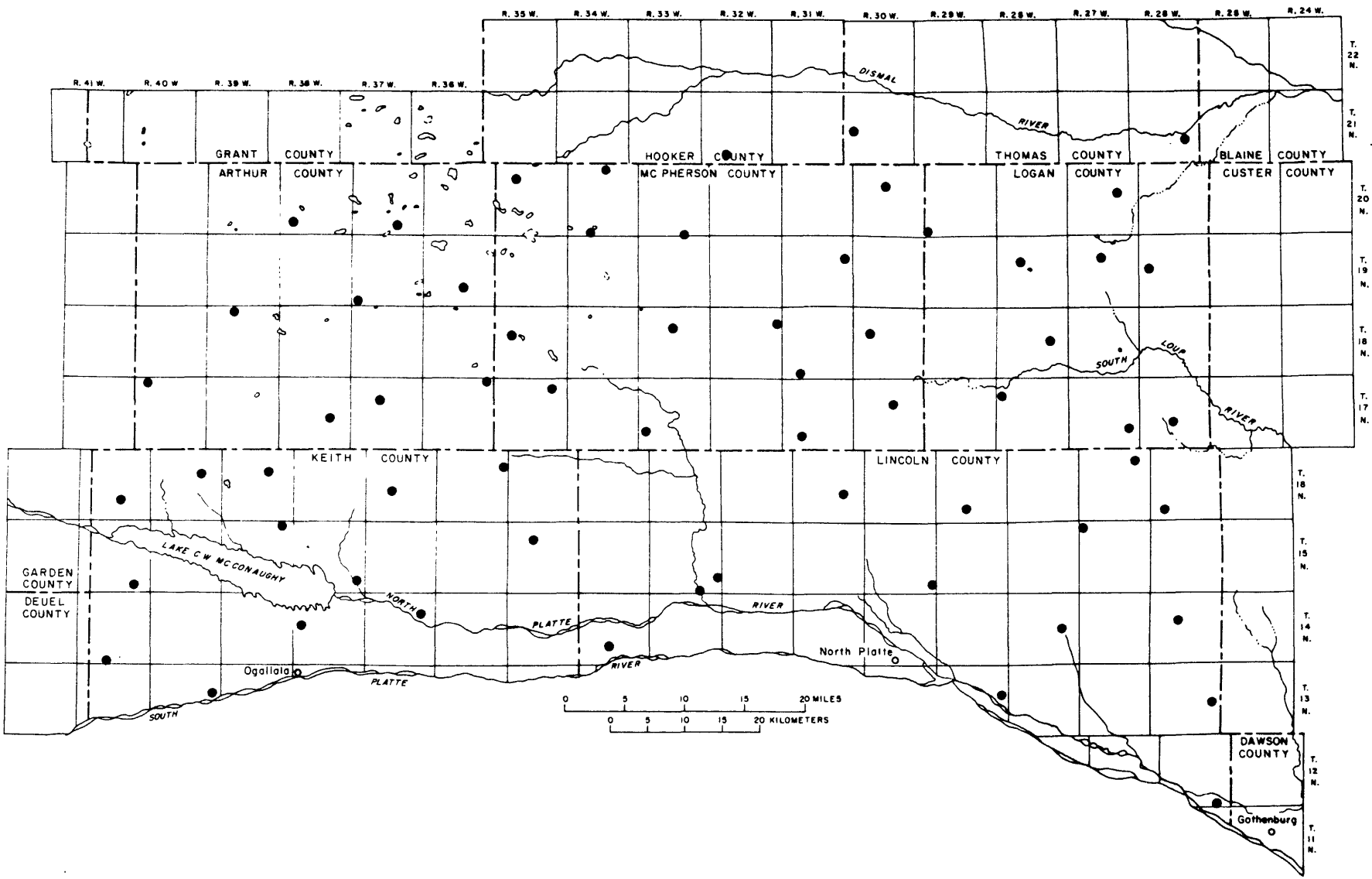

Figure 5.--Location of wells from which water-quality samples have been collected.

CLIMATIC DATA

Daily rainfall amounts were recorded by local observers at 30 sites within the project area from April 1982 to October 1983, except during the winter months. Rain gages were distributed to the observers in April 1982 at locations shown in figure 6 to supplement existing climatic stations. Data are shown in table 2 as monthly totals.

Rainfall data are needed to estimate consumptive use and irrigation requirements of crops and to estimate recharge to the aquifer. In addition to the data in table 2, climatic data for 16 stations in or near the study area are available from the National Oceanic and Atmospheric Administration.

STREAM-DISCHARGE DATA FROM LOW-FLOW INVESTIGATIONS

Water discharges measured during low-flow periods at 103 stream sites are listed in table 3. Measurements were made in September and October 1978 on the South Loup and Dismal Rivers and their tributaries; in November 1981 on Birdwood Creek and other tributaries to the Platte and North Platte Rivers; and in October 1982 on the South Platte and Platte Rivers. The data were collected to determine the point of origin of perennial streams originating in the project area, and to determine where and how much streams were gaining or losing water. These data were previously published in U.S. Geological Survey annual reports for the water years in which the measurements were made. They are republished here as a convenience to users of this report and the subsequent interpretive report. The location of measurement sites shown in figure 7 was dependent both on configuration of the drainage basin and accessibility.

Water discharges shown in table 3 are direct measurements made with a current meter. When a stream had more than one channel, the total discharge of all channels is listed. Measurement sites are listed in downstream order for the various time periods, starting with measurements made in September 1978, including locations where no flow was observed.

Streamflow data from continuous and partial-record gaging stations in the project area are published annually in U.S. Geological Survey Water Resources Data for Nebraska reports. Some of the low-flow data in table 3 are from continuous-record gaging stations, and these measurements are indicated by the word "gage" immediately following the stream location. Other related surface-water data are published annually in the Nebraska Department of Water Resources hydrographic reports.

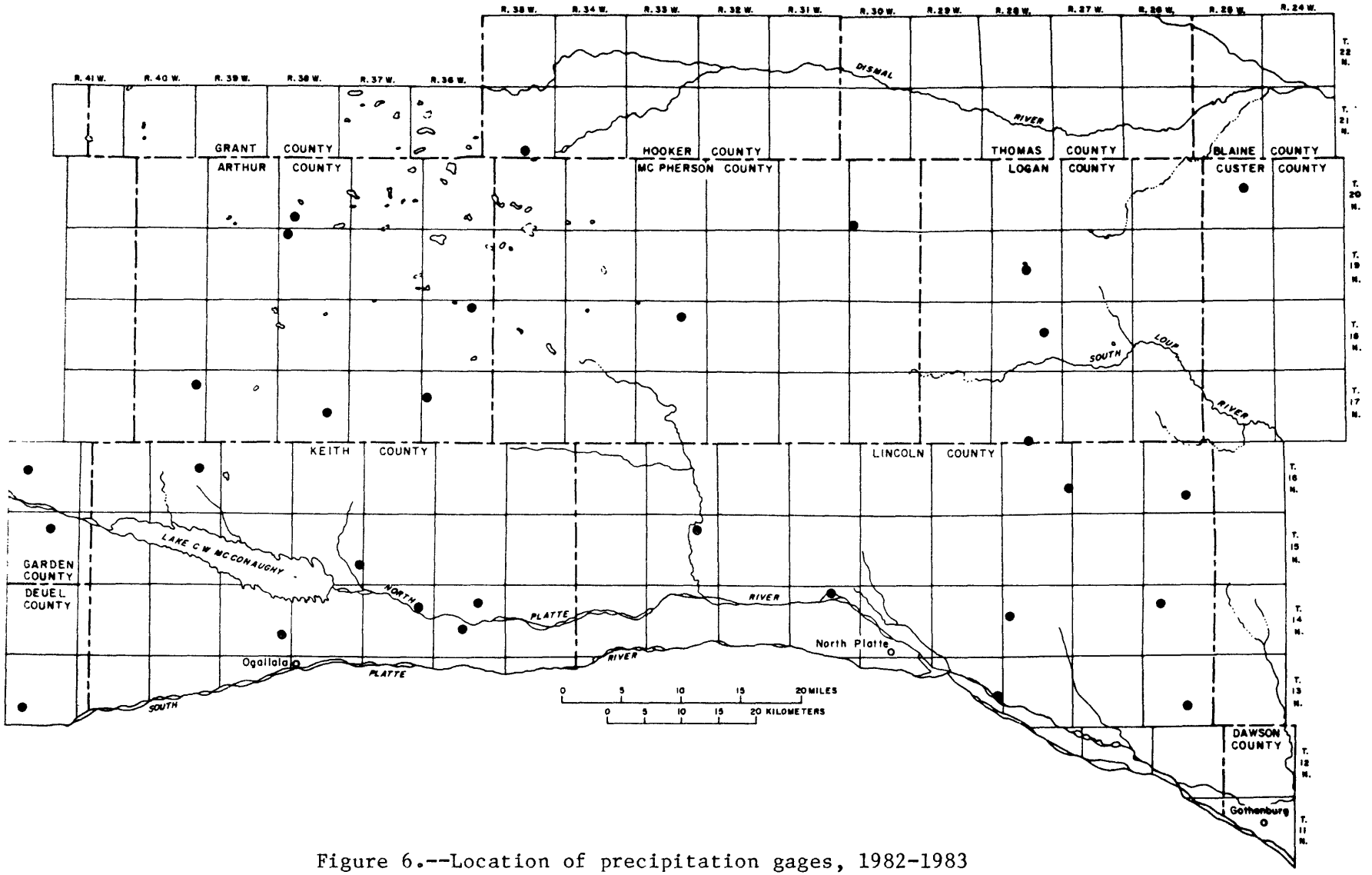

Figure 6.--Location of precipitation gages, 1982-1983

Table 2.--Monthly precipitation totals, in inches, at selected sites in the study area

County	Location	Observer	1982 Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	1983 Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
Arthur	17N36W18	Packard	--	3.62	--	1.64	--	2.24	0.93	--	--	--	2.47	2.99	3.77	0.97	0.40	--
Arthur	17N38W22	Packard	--	--	--	1.50	--	1.97	.50	--	--	--	2.60	3.50	4.14	.46	.55	--
Arthur	17N40W12	Wilson	0.92	2.42	--	2.17	--	--	--	--	--	--	--	--	--	--	--	--
Arthur	18N36W2	Cullinan	--	--	3.32	3.03	1.38	2.87	.91	--	1.60	2.11	3.89	3.52	3.55	2.34	.98	0.91
Arthur	19N38W6	McElhinney	1.16	4.16	2.69	3.20	.99	1.53	--	a1.00	1.86	1.94	5.01	3.41	4.14	1.05	.46	.70
Arthur	20N38W29	McConnell	--	--	--	--	--	--	--	--	--	--	--	--	2.40	2.05	--	--
Custer	20N25W15	Downing	--	5.45	2.42	1.24	3.57	.23	4.23	--	a1.50	--	8.45	7.95	--	2.95	--	1.51
Deuel	13N42W29	Tranel	--	4.32	8.75	3.30	2.34	1.24	.34	1.37	2.23	2.74	2.23	b1.94	1.87	2.71	0.00	.99
Garden	15N42W10	Shimmin	.50	3.80	5.99	2.17	1.15	1.23	.31	1.68	2.76	1.65	2.54	4.42	1.66	1.06	1.18	.92
Garden	16N42W17	Cochran	.36	2.24	6.85	2.02	b1.04	.93	a.30	1.45	--	a.44	3.04	4.55	2.68	.80	.27	1.25
Hooker	21N35W34	Smith	--	3.48	1.85	1.25	1.70	1.92	0.00	--	--	--	--	--	--	--	--	--
Keith	14N36W10	Sillasen	--	3.75	5.37	2.16	.79	1.42	.77	--	--	3.23	.67	2.00	--	b.51	.41	--
Keith	14N36W21	Snyder	1.50	2.97	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Keith	14N37W11	Brogan	--	4.79	6.33	2.51	.65	1.47	--	--	--	--	3.02	4.07	3.29	.45	.32	--
Keith	14N39W25	Bekius	--	4.69	4.99	2.37	1.06	2.22	.53	--	1.56	3.91	3.07	3.31	--	.92	.43	--
Keith	15N38W25	Graham	1.01	3.58	3.30	2.94	1.02	2.05	1.15	--	1.03	--	--	--	--	--	--	--
Keith	16N40W14	Lemmert	.60	1.69	2.67	2.63	--	1.72	--	--	--	--	--	--	--	--	--	--
Lincoln	13N26W27	Soderman	--	4.87	2.69	1.96	1.45	1.04	2.53	1.09	2.34	1.09	4.90	3.97	2.93	2.06	.56	.79
Lincoln	13N29W24	Nicholas	--	--	3.30	1.51	1.22	3.27	--	--	--	--	--	--	--	--	--	--
Lincoln	14N26W8	Kracman	--	--	2.50	1.49	2.13	1.07	1.41	1.20	3.80	4.30	4.52	6.74	--	.80	1.20	.60
Lincoln	14N28W18	Sukraw	--	--	2.82	2.13	1.45	--	--	--	1.90	1.30	3.04	3.98	3.13	1.12	.27	.91
Lincoln	14N31W3	Coombs	--	6.97	2.57	--	--	--	--	--	--	--	--	--	--	--	--	--
Lincoln	15N33W11	Fleecs	--	5.70	4.71	1.19	1.04	1.32	1.69	1.16	2.29	--	4.17	3.58	4.09	1.40	.21	1.05
Lincoln	16N26W27	Weinman	1.50	4.37	2.02	1.45	2.45	.90	2.66	a2.80	a 2.70	a1.45	6.05	6.00	3.45	1.75	.95	--
Lincoln	16N29W24	Johnson	--	6.81	--	--	--	--	--	--	--	5.15	5.69	1.65	--	--	--	--
Logan	17N28W34	Kramer	--	5.57	2.10	1.14	1.75	.85	2.40	1.75	2.10	1.60	3.65	3.70	3.00	1.60	1.10	.80
Logan	18N28W14	Jones	--	6.06	3.30	1.85	3.42	1.01	2.45	--	--	1.95	1.37	3.53	3.00	1.70	--	--
Logan	19N28W21	Lanka	--	5.10	1.40	.91	3.25	.70	3.58	--	--	--	--	b1.37	b3.65	1.65	--	--
McPherson	18N33W10	Daigger	2.10	6.00	2.21	.45	3.01	1.20	--	--	1.50	.75	4.65	2.72	5.45	--	--	--
McPherson	20N30W31	Jamison	2.07	6.50	.60	.10	1.60	--	--	--	--	--	--	--	--	--	--	--

a Does not include reported snow amounts.
b Partial record for month.

Table 3.--Water discharge measurements during periods of low flow at selected sites in the study area

Location	Discharge, in cubic feet per second
	Sept. 19-21, 1978
South Loup River 4 mi west of Stapleton in SW¼NW¼ sec. 5, T.17 N., R.28 W.	0
South Loup River 3 mi west of Stapleton in SE¼SE¼ sec. 32, T.18 N., R.28 W.	.01
South Loup River at Stapleton in SW¼NW¼ sec. 35, T.18 N., R.28 W.	2.4
South Loup River 1 mi north of Stapleton in NE¼NE¼ sec. 35, T.18 N., R.28 W.	2.9
South Loup River near Gandy in SE¼NW¼ sec. 32, T.18 N., R.27 W.	2.8
South Loup River 3 mi northeast of Gandy in NW¼SE¼ sec. 35, T.18 N., R.27 W.	2.2
South Loup River 5 mi northeast of Gandy in SW¼SE¼ sec. 24, T.18 N., R.27 W.	3.2
South Loup River 6 mi northeast of Gandy in SW¼SW¼ sec. 19, T.18 N., R.26 W.	9.0
South Loup River 8 mi northwest of Arnold in NE¼NE¼ sec. 28, T.18 N., R.26 W.	8.9
South Loup River 5 mi northwest of Arnold in SE¼NE¼ sec. 2, T.17 N., R.26 W.	9.6
South Loup River 2 mi northwest of Arnold in NE¼NE¼ sec. 19, T.17 N., R.25 W.	11
South Loup River at Arnold in NW¼SW¼ sec. 27, T.17 N., R.25 W.	20
Sand Creek near Arnold in NE¼NW¼ sec. 34, T.17 N., R.25 W.	.26
South Loup River 3 mi east of Arnold in SE¼SE¼ sec. 25, T.17 N., R.25 W.	35
	Oct. 2-6, 1978
North Fork Dismal River 9 mi northeast of Lena in NE¼NE¼ sec. 12, T.21 N., R.36 W.	0
North Fork Dismal River 10 mi northeast of Lena in NW¼NE¼ sec. 6, T.21 N., R.35 W.	trace
North Fork Dismal River 18 mi north of Flats in SW¼SW¼ sec. 35, T.22 N., R.35 W.	1.6
North Fork Dismal River 16 mi southwest of Mullen in SE¼NE¼ sec. 21, T.22 N., R.34 W.	20
North Fork Dismal River 13 mi southwest of Mullen in NE¼NE¼ sec. 26, T.22 N., R.33 W.	41
North Fork Dismal River 13 mi south of Mullen in NE¼NE¼ sec. 29, T.22 N., R.32 W.	53
South Fork Dismal River 13 mi north of Flats in NW¼SW¼ sec. 29, T.21 N., R.34 W.	0
South Fork Dismal River 14 mi northeast of Flats in SW¼NE¼ sec. 28, T.21 N., R.34 W.	trace
South Fork Dismal River 13 mi south of Mullen in SE¼NE¼ sec. 29, T.22 N., R.32 W.	29
Dismal River 13 mi south of Mullen in SW¼NW¼ sec. 28, T.22 N., R.32 W.	74
Dismal River 15 mi southeast of Mullen in NE¼SE¼ sec. 30, T.22 N., R.31 W.	103
Dismal River 14 mi south of Seneca in SW¼SW¼ sec. 29, T.22 N., R.30 W.	118
Dismal River 12 mi southwest of Thedford in SE¼NW¼ sec. 10, T.21 N., R.29 W.	143
Dismal River 13 mi south of Thedford in NE¼SE¼ sec. 17, T.21 N., R.28 W.	161
Dismal River 14 mi south of Thedford in SE¼NW¼ sec. 23, T.21 N., R.28 W.	188
Dismal River 10 mi southwest of Halsey in NE¼SE¼ sec. 20, T.21 N., R.26 W.	248
Dismal River 9 mi south of Halsey in NW¼SW¼ sec. 23, T.21 N., R.26 W.	228
Dismal River 9 mi south of Halsey in SW¼NW¼ sec. 24, T.21 N., R.26 W.	272
Dismal River 6 mi west of Dunning in SW¼NW¼ sec. 9, T.21 N., R.25 W.	283
Dismal River 5 mi west of Dunning in NE¼SW¼ sec. 3, T.21 N., R.25 W.	303
	Nov. 4-5, 1981
Clear Creek 4 mi north of Lake McConaughy in NE¼NW¼ sec. 21, T.16 N., R.41 W.	2.5
Clear Creek 2 mi northwest of Lake McConaughy in SE¼SE¼ sec. 29, T.16 N., R.41 W.	7.8
Otter Creek 3 mi north of Lake McConaughy in SW¼SW¼ sec. 20, T.16 N., R.40 W.	16
Otter Creek at north edge of Lake McConaughy in NW¼SE¼ sec. 5, T.15 N., R.40 W.	20
Goldfish Creek at north edge of Lake McConaughy in NE¼NW¼ sec. 10, T.15 N., R.40 W.	4.3
West Lonergan Creek 2 mi north of Lake McConaughy in NW¼SE¼ sec. 36, T.16 N., R.40 W.	.08
West Lonergan Creek 2 mi north of Lake McConaughy in NW¼NW¼ sec. 6, T.15 N., R.39 W.	.33
West Lonergan Creek 1 mi north of Lake McConaughy in NW¼SE¼ sec. 7, T.15 N., R.39 W.	.10
East Lonergan Creek 1 mi north of Lake McConaughy in NE¼SW¼ sec. 8, T.15 N., R.39 W.	5.3
West Fork Whitetail Creek 7 mi N.W. of Keystone in NE¼SW¼ sec. 2, T.15 N., R.38 W.	4.2
East Fork Whitetail Creek 7 mi N.W. of Keystone in NW¼SE¼ sec. 2, T.15 N., R.38 W.	14
Whitetail Creek 5 mi northwest of Keystone in NE¼NE¼ sec. 15, T.15 N., R.38 W.	24
Whitetail Creek 3 mi northwest of Keystone in SW¼NE¼ sec. 26, T.15 N., R.38 W.	26
Whitetail Creek 1 mi west of Keystone in SE¼SE¼ sec. 36, T.15 N., R.28 W.	28
Coon Creek 2 mi east of Keystone in SE¼SE¼ sec. 34, T.15 N., R.37 W.	.26
Skunk Creek 5 mi east of Keystone in SE¼NW¼ sec. 6, T.14 N., R.36 W.	1.8
Skunk Creek 5 mi east of Keystone in SE¼SW¼ sec. 6, T.14 N., R.36 W.	2.1
Sand Creek 6 mi southeast of Keystone in SW¼NW¼ sec. 9, T.14 N., R.36 W.	2.4
Cedar Creek 4 mi north of Paxton in SW¼SW¼ sec. 8, T.14 N., R.35 W.	.05
Cedar Creek 4 mi north of Paxton in NE¼SW¼ sec. 17, T.14 N., R.35 W.	1.3

Table 3.--Water discharge measurements during periods of low flow at selected sites in the study area--Continued

Location	Discharge, in cubic feet per second
	Nov. 4-5, 1981
North Fork Birdwood Creek 15 mi S.W. of Tryon in NW¼NE¼ sec. 11, T.17 N., R.34 W.------	21
North Fork Birdwood Creek 14 mi N. of Sutherland in SW¼SE¼ sec. 10, T.16 N., R.33 W.---	72
West Birdwood Creek 19 mi north of Paxton in NE¼NE¼ sec. 31, T.17 N., R.35 W.----------	0
West Birdwood Creek 18 mi north of Paxton in SW¼NW¼ sec. 6, T.16 N., R.35 W.----------	.01
West Birdwood Creek 18 mi north of Paxton in SE¼NE¼ sec. 3, T.16 N., R.35 W.----------	17
West Birdwood Creek 14 mi north of Sutherland in NW¼NW¼ sec. 13, T.16 N., R.34 W.------	41
Birdwood Creek 12 mi northeast of Sutherland in SW¼SW¼ sec. 23, T.16 N., R.33 W.-------	135
Birdwood Creek 10 mi northeast of Sutherland in SW¼NE¼ sec. 2, T.15 N., R.33 W.--------	127
Birdwood Creek 8 mi northeast of Sutherland in SE¼NW¼ sec. 10, T.15 N., R.33 W.--------	145
Birdwood Creek 7 mi northeast of Sutherland in NE¼NE¼ sec. 22, T.15 N., R.33 W.--------	141
Birdwood Creek 5 mi northeast of Sutherland in NE¼SE¼ sec. 27, T.15 N., R.33 W.--------	140
Birdwood Creek 4 mi northeast of Sutherland in NE¼SW¼ sec. 2, T.14 N., R.33 W.---------	148
White Horse Creek trib. 5 mi N.W. of North Platte in NW¼SE¼ sec. 35, T.15 N., R.31 W.--	0
White Horse Creek trib. 2 mi north of North Platte in SE¼SE¼ sec. 7, T.14 N., R.30 W.--	5.3
White Horse Creek trib. 1 mi north of North Platte in SE¼NE¼ sec. 21, T.14 N., R.30 W.-	15
White Horse Creek 7 mi north of North Platte in NE¼SW¼ sec. 19, T.15 N., R.30 W.-------	.36
White Horse Creek 5 mi north of North Platte in NE¼SE¼ sec. 31, T.15 N., R.30 W.-------	5.3
White Horse Creek 1 mi north of North Platte in SE¼SE¼ sec. 16, T.14 N., R.30 W.-------	trace
White Horse Creek 1 mi northeast of North Platte in NE¼NW¼ sec. 26, T.14 N., R.30 W.---	20
White Horse Creek 3 mi east of North Platte in SW¼NW¼ sec. 5, T.13 N., R.29 W.---------	24
Pawnee Creek 3 mi east of Maxwell in NW¼NW¼ sec. 19, T.13 N., R.27 W.----------	8.6
Pawnee Creek 5 mi southeast of Maxwell in SW¼SW¼ sec. 28, T.13 N., R.27 W.----------	8.2
Pawnee Creek 1 mi northwest of Brady in NE¼SW¼ sec. 3, T.12 N., R.27 W.----------	10
	Oct. 4-7, 1982
South Platte River at Big Springs in SW¼NW¼ sec. 31, T.13 N., R.41 W.----------	121
South Platte River 5 mi southwest of Brule in SE¼NW¼ sec. 25, T.13 N., R.41 W.---------	119
South Platte River at Brule in SW¼NW¼ sec. 23, T.13 N., R.40 W.----------	116
South Platte River 4 mi east of Brule in SE¼NW¼ sec. 17, T.13 N., R.39 W.----------	117
South Platte River at Ogallala in NE¼NE¼ sec. 7, T.13 N., R.38 W.----------	159
South Platte River 3 mi east of Ogallala in SE¼NE¼ sec. 3, T.13 N., R.38 W.----------	154
South Platte River at Roscoe in NE¼SE¼ sec. 5, T.13 N., R.37 W.----------	139
South Platte River 4 mi east of Roscoe in NW¼SE¼ sec. 1, T.13 N., R.37 W.----------	156
South Platte River Supply Canal 6 mi SW of Paxton in SW¼NW¼ sec. 9, T.13 N., R.36 W.---	137
South Platte River at Paxton in SE¼NW¼ sec. 8, T.13 N., R.35 W.----------	10
South Platte River 2 mi east of Paxton in SW¼SE¼ sec. 3, T.13 N., R.35 W.----------	10
South Platte River 4 mi east of Paxton in SW¼SW¼ sec. 6, T.13 N., R.34 W.----------	12
South Platte River 4 mi west of Sutherland in SW¼NW¼ sec. 34, T.14 N., R.34 W.----------	12
South Platte River at Sutherland in SW¼NE¼ sec. 32, T.14 N., R.33 W.----------	68
South Platte River 2 mi southeast of Sutherland in SE¼SE¼ sec. 27, T.14 N., R.33 W.-----	100
South Platte River at Hershey in NW¼NW¼ sec. 33, T.14 N., R.32 W.----------	96
South Platte River 5 mi southeast of Hershey in NE¼NE¼ sec. 31, T.14 N., R.31 W.-------	105
South Platte River 3 mi west of North Platte in SW¼SW¼ sec. 35, T.14 N., R.31 W.-------	128
South Platte River at North Platte (gage) in NE¼NE¼ sec. 8, T.13 N., R.30 W.----------	131
South Platte River 2 mi southeast of North Platte in NE¼SE¼ sec. 11, T.13 N., R.30 W.--	760
North Platte River at North Platte (gage) in NW¼SE¼ sec.28, T.14 N., R.30 W.----------	405
Platte River below Tri-County Supply Canal div. in SE¼NW¼ sec. 8, T.13 N., R.29 W.-----	225
Platte River 6 mi southeast of North Platte in SW¼SW¼ sec. 10, T.13 N., R.29 W.--------	239
Platte River at Maxwell in SW¼SW¼ sec. 27, T.13 N., R.28 W.----------	243
Platte River at Brady (gage), two channels, in sec. 11 and 23, T.12 N., R.27 W.--------	282
Platte River 5 mi southeast of Brady in SW¼NE¼ sec. 33, T.12 N., R.26 W.----------	278

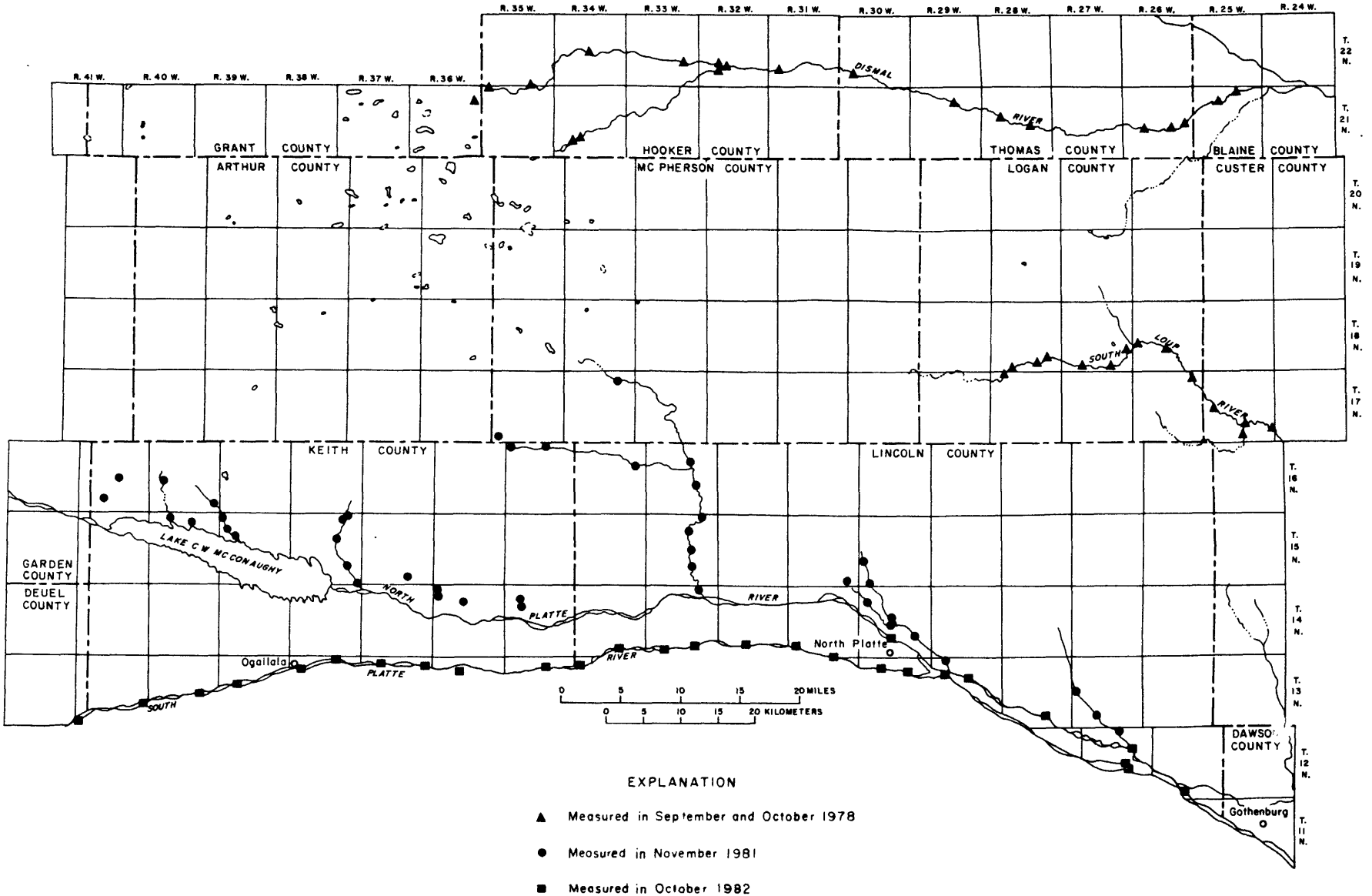

Figure 7.--Location of water-discharge measurement sites for low-flow investigations, 1978, 1981, and 1982.

APPENDIX A. Logs of test holes in or adjacent to the study area

Test Hole 34-HP-78

Location: T. 22N., R. 26W., 1AACA
Date Drilled: 10-17-78
Ground altitude: 2735 feet (Halsey 15 minute quadrangle)
Depth to water: 35 feet
Total depth: 725 feet

Material Description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, slightly silty	0	62
Sand, very fine, very coarse, trace fine gravel	62	75
Sand, very fine to medium, moderately silty	75	78
Sand to sand and gravel, very fine sand to fine gravel, much fine to coarse sand	78	84
Silt, slightly to moderately sandy, very fine to fine sand, slightly to moderately clayey	84	120
Tertiary System, Ogallala Group:		
Sand, very fine to medium, trace coarse to very coarse, very slightly silty	120	145
Sand, very fine to medium, moderately silty	145	149
Sand, very fine to medium, trace coarse to very coarse	149	190
Sand, very fine to medium, slightly to moderately silty	190	199
Sand, very fine to medium, slightly silty	199	210
Silt, slightly sandy, very fine to fine	210	224
Sand, fine to medium, trace coarse	224	231
Silt, slightly to moderately clayey, slightly sandy, very fine to fine	231	270
Sand to sandstone, very fine to medium, trace coarse, slightly silty, especially at 279 to 182 feet	270	286
Sandstone, very fine to medium, slightly to very silty	286	304
Sand to sandstone, very fine to medium, slightly silty	304	315
Sandstone, very fine to medium, slightly to moderately silty	315	330
Sand to sandstone, very fine to coarse, slightly silty	330	355
Silt, moderately clayey, pale olive	355	357
Sand to sandstone, very fine to coarse, trace very coarse sand and fine gravel, slightly silty	357	387
Silt to siltstone, moderately clayey, trace fine sand, pale olive to pale yellow	387	397
Silt to siltstone, moderately clayey, lime cemented, slightly fine, pale yellow to white	397	406
Silt to siltstone, slightly limey, moderately to very clayey, chert lenses, olive	406	421
Sandstone, very fine to medium brown	421	425
Silt to siltstone, with thin sandstone seams, slightly to moderately clayey, olive to pale olive	425	440
Sand, very fine to medium, thin sandstone and silt seams, pale yellow to pale olive	440	465
Sandstone, very fine to medium, moderately silty and limey to lime cemented, pale olive to white	465	479

Sand, very fine to medium, slightly silty, olive to pale olive	479	484
Sandstone, very fine to medium, moderately silty, limey and lime cemented, pale yellow	484	488
Sand, very fine to very coarse, much medium, trace of fine gravel	488	503
Siltstone, slightly to moderately sandy, slightly to very clayey, pale olive brown to white	503	527
Sand, very fine to very coarse, much medium to coarse, trace fine gravel, rare white siltstone seams	527	556
Sand and gravel, very fine to very coarse sand to fine gravel, much coarse to very coarse sand	556	567
Sand, very fine to medium, moderately to very silty, with siltstone seams, pale yellow	567	594
Sand, very fine to medium, silt seams 602 to 603 feet	594	611
Sandstone, very fine to fine, trace medium, very silty with siltstone, brown and pale olive	611	640
Tertiary System, Arikaree Group:		
Sand, very fine to medium, moderately silty and limey, very pale brown to white	640	643
Sandstone, very fine to fine, moderately silty, pale olive to brown	643	660
Siltstone, in part slightly limey, trace black sandstone and pink grains, brown	660	704
Tertiary System, White River Group, Brule Formation:		
Siltstone, pale brown	704	725

Test Hole 35-HP-78

Location: T. 23N., R. 30W., 31DADD
Date drilled: 10-23-78
Ground altitude: 3105 feet (Shimmins Lake 15 minute quadrangle)
Depth to water 70 feet
Total depth: 850 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, moderately to very silty, gray to brown	0	45
Clay, moderately silty, gray to brown	45	65
Silt, slightly to moderately clayey, moderately sandy, very to fine to medium, yellow to brown	65	101
Clay, silty, slightly to moderately sandy, very fine to fine, gray to green	101	121
Sand, very fine to medium, slightly silty and clayey, gray	121	135
Silt, clayey, moderately sandy, very fine, greenish to gray	135	140
Sand, fine to coarse, trace clay seams, greenish gray to gray	140	165
Silt, very clayey, trace interbedded sand, very fine to medium, olive gray	165	195
Sand, fine to coarse, trace silt and clay seams, olive gray	195	206
Sand and gravel, fine sand to medium gravel	206	215
Tertiary System, Ogallala Group:		
Sandstone, fine sand, slightly to moderately silty, brown	215	240
Silt, clayey, slightly to moderately sandy, very fine to fine, brown	240	265
Sandstone, very fine to fine, slightly silty, rootlets, brown	265	280
Silt, clayey, in part sandy, very fine, brown to pale olive	280	315
Sandstone, very fine, clayey and silty, rootlets, pale olive	315	330
Sand, very fine to fine, rootlets, brown	330	369
Sand, very fine to fine, moderately to very clayey and silty, rootlets, pale olive	369	385
Silt, very clayey, pale olive	385	395
Sand, very fine to fine, moderately silty, slightly clayey rootlets, brown	395	410
Sand, fine to medium, rootlets, with interbedded yellow to white to green clay seams	410	440
Sand to sandstone, fine to medium, trace coarse, in part silty, rootlets, olive to olive green	440	515
Silt, very clayey and sandy, fine sand, pale olive	515	525
Clay, silty, slightly sandy, fine, very limey, light gray to white	525	540
Sand to sandstone, very fine to medium, in part moderately clayey and silty, trace rootlets, trace lime, pale olive to olive	540	610
Sandstone, very fine to medium, moderately silty and clayey, pale olive	610	630

Sand to sandstone, very fine to medium, pale olive	630	640
Silt, moderately to very clayey, slightly to moderately sandy, very fine to fine, pale yellow to green gray	640	670
Sand, very fine to medium, slightly clayey, green gray	670	680
Silt, moderately to very clayey, trace iron stain, yellow brown	680	700
Sand to sandstone, very fine to fine, moderately silty, moderately to very clayey, trace rootlets, pale yellow to brown	700	720
Tertiary System, Arikaree Group:		
Sandstone, very fine to medium, moderately silty, moderately to very clayey, brown	720	800
Silt to siltstone, slightly sandy, very fine sand, trace green clay, yellow brown	800	850

Test hole 36-HP-78

Location: T. 24N., R 31W., 24ACD
Date drilled: 10-30-78
Ground altitude: 3100 feet (Seneca 15 minute quadrangle)
Depth to water: 130 feet
Total depth: 695 feet

Material description	Depth in feet	
	From	To
Quaternary System, Undifferentiated:		
Sand, fine to coarse, brown	0	11
Clay, slightly to moderately silty, pale olive	11	30
Sand, very fine to fine, moderately to very silty, slightly to moderately clayey	30	70
Silt, moderately to very clayey, moderately sandy, very fine to fine	70	91
Sandstone, fine to coarse, moderately clayey, moderately silty, limey, pale olive	91	95
Sand, fine to coarse, olive	95	124
Sand and gravel, fine sand to fine gravel	124	128
Tertiary System, Ogallala Group:		
Silt, very sandy, very fine to medium, yellow to brown	128	136
Sand to sandstone, very fine to medium, moderately to very silty, yellow brown	136	170
Sandstone with sand and silt seams, very fine to medium, rootlets, pale olive, in part reddish brown	170	310
Sandstone, very fine to medium, moderately to very silty, slightly to moderately clayey, rootlets, light gray to pale olive	310	372
Sandstone to sand, very fine to medium, slightly to moderately silty, rootlets, olive	372	426
Claystone, slightly sandy, very fine to fine, very silty, pale yellow	426	440
Sandstone, fine to medium, moderately silty, olive	440	452
Claystone, slightly to moderately sandy, fine to medium, moderately to very silty, pale yellow	452	469
Sand to sandstone, fine to medium, trace coarse, slightly to moderately silty	469	480
Claystone, pale yellow	480	482
Sand to sandstone, fine to medium, rootlets, pale olive	482	507
Interbedded sand, sandstone, and silt, very fine to medium sand, slightly to moderately clayey, pale olive to pale yellow	507	543
Sandstone, very fine to medium, very silty, moderately clayey, rootlets, pale olive to pale yellow	543	597
Silt, sandy, moderately to very clayey, very limey, very pale yellow to white	597	608
Claystone with interbedded siltstone and silty, clayey sandstone, very fine sand, slightly to very limey, pale olive to pale yellow	608	650
Siltstone with sandstone seams, moderately clayey, moderately limey, gray brown to reddish brown	650	691
Claystone, limey, white	691	694

Siltstone and claystone, sandy, very fine to fine, in part limey, brown to reddish brown with white streaks	694	725
Tertiary System, White River Group, Brule Formation:		
Claystone and siltstone, in part limey, brown to pinkish gray with white streaks	725	770

Test Hole 37-HP-78

Location: T. 17N., R 30W., 1AAAA
Date drilled: 11-14-78
Ground altitude: 3035 feet (Stapleton NW 7.5 minute quadrangle)
Depth to water: 50 feet
Total depth: 710 feet

Material Description	Depth in feet	
	From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, moderately silty, brown	0	50
Sand, very fine to medium, slightly to moderately silty, brown to pale yellow	50	90
Silt and sand, interbedded sand, silt is slightly sandy and moderately clayey, pale yellow, sand is very fine to medium, moderately silty, rare rootlets and sandstone fragments	90	212
Sand and gravel, very fine to very coarse sand to medium gravel, much coarse to very coarse sand, silt to siltstone lenses at 231, 270, 391, 305, 323, and 340 feet	212	358
Tertiary System, Ogallala Group:		
Silt, very clayey, red brown	358	363
Sand, very fine to medium with interbedded silt and siltstone seams, pale brown	363	439
Siltstone with interbedded sand seams, sand is very fine to medium, silt is in part limey with lime cement, pale brown to pale yellow to white	439	448
Sand to sandstone, very fine to medium, trace siltstone, pale brown to pale olive	448	466
Sandstone to sand, very fine to medium, slightly to moderately silty with siltstone, trace rootlets, pale brown to pale olive	466	497
Sand to sandstone, very fine to medium, trace rootlets, trace siltstone, pale brown to pale olive	497	536
Sandstone to sand, very fine to medium, moderately to very silty, thin limey lenses and siltstone lenses, pale brown to pale olive	536	570
Siltstone with interbedded sands and sandstones, very fine to coarse, much fine to medium, in part lime cemented, pale brown	570	630
Sandstone, very fine to fine, brown	630	638
Tertiary System, White River Group, Brule Formation:		
Siltstone, slightly sandy, very fine to medium, traces of lime and lime cement, light red brown	638	710

Test Hole 38-HP-79

Location: T. 20N., R. 30W., 9ADD
Date drilled: 3-13 & 14-79.
Ground altitude: 3140 feet (Tryon 15 minute quadrangle)
Total depth: 740 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very to fine to coarse, interbedded silt and clay seams trace iron stain, brownish gray to pale olive	0	52
Silt, moderately to very clayey, moderately sandy, very fine to fine, pale olive	52	63
Sand, very fine to medium, with interbedded clay and silt seams, brown to pale olive	63	92
Silt, moderately to very clayey, slightly sandy, slightly to very limey, pale olive to white	92	138
Sand, very fine to fine, moderately silty, pale olive	138	150
Silt, moderately to very clayey, interbedded sand seams, very fine to medium sand, pale olive	150	206
Sand, very fine to medium, slightly silty, light olive gray	206	229
Sand and gravel, fine sand to fine gravel	229	245
Teriary System, Ogallala Group:		
Sand to sandstone, very fine to medium, slightly silty, rootlets, pale olive	245	274
Sand, very fine to medium, trace coarse, rootlets, pale olive to gray	274	346
Silt, very clayey, pale yellow	346	360
Sand to sandstone, very fine to fine, moderately silty, trace rootlets, pale olive	360	386
Sandstone, very fine to medium, moderately to very silty, very limey, in part very clayey, light gray	386	414
Silt, moderately sandy, very fine to medium, pale gray to pale olive	414	434
Sand to sandstone, very fine to medium, moderately silty, limey, pale olive	434	442
Sandstone, very fine to medium, moderately to very silty, pale olive	442	482
Sand to sandstone, very fine to fine, pale olive	482	497
Sandstone to sand, very fine to medium, slightly to moderately silty,slightly to moderately clayey, olive to pale olive	497	546
Sand, very fine to coarse, rootlets, in part very limey, pale olive to pale yellow	546	578
Sandstone to sand, very fine to medium, trace coarse sand to fine gravel, limey 595 to 614 feet, moderately silty, pale olive to pale brown	578	614
Claystone, slightly sandy, very fine to medium, limey, pale yellow to pale olive to green	614	658
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, moderately sandy, very fine, moderately clayey, olive to pale olive	658	699
Siltstone, brown with olive to trace reddish brown	699	740

Test hole 39B-HP-79

Location: T. 19N., R. 30W., 33ACA
Date drilled: 3-15 & 16-79
Ground altitude: 3180 feet (Tryon 15 minute quadrangle)
Depth to water:
Total depth: 870 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, gray brown	0	16
Silt, moderately to very clayey, trace iron stain, in part sandy, pale olive	16	74
Sand, very fine to medium, silty, gray brown	74	78
Silt, very clayey, moderately to very sandy, very fine to medium, yellow brown	78	98
Sand, very fine to medium, trace coarse, slightly to moderately silty, light olive gray	98	124
Silt, moderately clayey with interbedded sand seams, very fine to fine, in part very limey, pale brown to pale yellow brown	124	147
Sand, very fine to medium, trace coarse, light brownish gray	147	161
Silt, moderately clayey, moderately sandy, very fine, light brownish gray	161	168
Sand, very fine to fine, moderately silty, light brownish gray to pale olive	168	180
Silt, moderately clayey, pale olive	180	185
Sand, very fine to fine, slightly to moderately silty	185	214
Silt, moderately to very clayey, moderately sandy, very fine to fine, light gray	214	220
Sand, very fine to fine, trace medium, moderately silty, brown	220	238
Silt, moderately to very clayey, moderately sandy, very fine to medium, light to brownish gray	238	252
Sand and gravel, fine to very coarse sand and fine to medium gravel, silt seam 280 to 282 feet	252	300
Tertiary System, Ogallala Group:		
Sandstone to sand, very fine to fine, very silty, moderately clayey, light olive gray	300	339
Sand to sandstone, very fine to medium, slightly to moderately silty, light brownish gray	339	351
Sandstone, very fine to medium, very silty, lime cemented, rootlets, pale brown	351	357
Sand to sandstone, very fine to medium, trace coarse, slightly to moderately silty, in part limey, rootlets, light brownish gray	357	410
Sandstone, very fine to medium, moderately to very silty, moderately to very clayey, in part very limey, rootlets, light gray	410	483
Silt, very sandy, very fine to medium, with sandstone and sand seams, slightly limey, pale olive	483	552

Sand to sandstone, very fine to medium, trace coarse sand to fine gravel, in part silty and slightly limey, pale yellow to pale olive	552	638
Clay to claystone, moderately silty, in part limey, pale yellow	638	666
Sand to sandstone, very fine to medium, trace coarse to very coarse, light gray brown	666	682
Silt to siltstone, moderately to very clayey, moderately sandy, rootlets, pale olive	682	702
Sand to sandstone, very fine to fine, pale olive	702	706
Silt to siltstone, moderately to very clayey, moderately sandy, very fine to fine, pale yellow to pale olive	706	744
Sand to sandstone, very fine to fine, pale olive	744	747
Silt to siltstone, moderately to very clayey, pale olive	747	762
Sand to sandstone, very fine to fine, slightly to moderately silty, pale olive	762	769
Silt to siltstone, moderately to very clayey with claystone, pale olive	769	773
Sand to sandstone, very fine to fine, moderately silty, pale olive	773	778
Clay to claystone, moderately to very silty, moderately sandy, very fine to fine, pale olive	778	783
Sand to sandstone, very fine to fine, slightly to moderately silty, pale olive	783	790
Clay to claystone, moderately to very silty, pale olive to brown	790	808
Sand to sandstone, very fine to fine, very silty, brown	808	810
Silt to siltstone, very clayey, pale olive to pale yellow	810	822
Sand to sandstone, very fine to medium, moderately to very silty, moderately clayey, pale olive to pale yellow	822	826
Claystone to siltstone, in part limey, olive to brown	826	844
Tertiary System, White River Group, Brule Formation:		
Siltstone, trace claystone, in part limey, brown to dark brown	844	870

Test Hole 40B-HP-79

Location: T. 19N., R. 35W., 25CBC
Date drilled: 4-3-79
Ground altitude: 3410 feet (Flats 15 minute quadrangle)
Depth to water:
Total depth: 825 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, slightly silty, dark brown	0	10
Silt, very sandy, very fine to fine, pale olive	10	15
Sand, very fine to coarse, slightly to moderately silty, pale olive	15	40
Interbedded silt and sand, very fine to medium with trace coarse to very coarse, pale olive to pale brown	40	68
Sand, very fine to medium, with interbedded silt and clay seams, gray to pale olive	68	148
Silt, clayey, very sandy, green to gray	148	150
Sand, very fine to very coarse, much fine to medium, slightly to moderately silty with green to gray siltstone seams	150	242
Silt, clayey, moderately sandy, gray to green	242	245
Sand, very fine to very coarse, moderately silty	245	250
Sand and gravel, medium sand to fine gravel, trace clay seams	250	263
Tertiary System, Ogallala Group:		
Silt to siltstone, clayey with sand seams, pale olive to green gray	263	302
Sandstone, very fine to medium, occasional clayey silt seams, rootlets, brown	302	365
Sand, very fine to fine, rootlets, brown	365	392
Silt, clayey, limey, white	392	405
Sand to sandstone, very fine to medium, slightly silty, rootlets, brown	405	420
Sandstone to sand, very fine to medium, in part lime cemented, brown to white	420	490
Sand and sandstone, very fine to coarse, much fine to medium, silt seams, in part limey, gray to green to white	490	525
Sand, very fine to medium, trace coarse to very coarse, with sandstone, silt and clay seams, brown to green gray to white	525	565
Sand to sandstone, very fine to coarse, trace very coarse, with limey clay seams, pale brown	565	583
Siltstone with sand and limey sandstone seams, pale yellow to olive to yellow	583	616
Sand, very fine to medium, trace coarse to very coarse, in part limey, brown to pale yellow	616	650
Siltstone, moderately sandy, very fine to medium, trace coarse to very coarse coarse, limey, pale yellow to white	650	682
Sand, very fine to medium, with pale yellow siltstone seams	682	702
Siltstone, clayey, moderately sandy, very fine to medium, pale yellow to olive	702	725
Sand, very fine to very coarse, with pale yellow and pink siltstone seams	725	776

Siltstone, pale brown	776	782
Sand, very fine to very coarse, with some light brown silt and siltstone	782	804
Tertiary System, White River Group, Brule Formation:		
Siltstone, light brown	804	825

Test hole 41-HP-79

Location: T. 21N., R. 36W., 3DDD
Date drilled: 4-10, 16, 17, 23, 25-79
Ground altitude: 3538 feet (Carr Lake 15 minute quadrangle)
Depth to water:
Total depth: 1070 feet

Material description	Depth in feet	
	From	To
Quaternary System, Undifferentiated:		
Silt, clayey, organic, dark brown	0	15
Sand, very fine to medium, moderately to very silty, light brownish gray	15	61
Silt, moderately to very clayey, interbedded sands, very fine to medium, greenish gray	61	189
Sand, very fine to fine, moderately to very silty, light olive to gray	189	220
Silt, moderately clayey, moderately sandy, very fine to fine sand, light olive to gray to pale olive	220	226
Sand and gravel, fine sand to fine gravel, pale green	226	275
Silt, very sandy, very fine to very coarse sand, green to gray	275	278
Sand, very fine to medium, moderately silty	278	296
Sand and gravel, very fine sand to fine gravel, greenish	296	336
Tertiary System, Ogallala Group:		
Sandstone, very fine to fine, olive gray	336	356
Sand and gravel, very fine sand to fine gravel	356	368
Sandstone and sand, interbedded, very fine to fine, rootlets, brown to olive	368	416
Sand, very fine to medium, trace sandstone, rootlets, olive	416	443
Sandstone, fine to medium, lime cemented, slightly to moderately silty, rootlets, olive to white	443	507
Sandstone, very fine to fine, very silty, in part very limey, rootlets, pale olive	507	538
Sand to sandstone, very fine to medium, in part limey, rootle pale olive	538	659
Sandstone, very fine to medium, moderately to very silty, with pale yellow claystone, limey zones, pale olive	659	747
Sandstone, very silty to siltstone, very sandy, very fine to fine sand, in part limey, pale yellow to pale olive	747	863
Sandstone, slightly to moderately silty, very fine to medium sand, pale olive	863	886
Sandstone, very fine to medium, moderately silty and limey, pale olive	886	947
Sandstone to siltstone, very fine, very silty, olive to pale olive	947	972
Tertiary System, White River Group, Brule Formation:		
Siltstone, brown with yellow to gray green claystone	972	1070

Test hole 47-HP-79

Location: T. 24N., R. 35W., 30 ADAA
Date drilled: 5-30-79
Ground Altitude: 3510 feet (Hire 15 minute quadrangle)
Depth to water:
Total depth: 905 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, trace coarse, slightly very silty, slightly to moderately clayey, brown	0	90
Silt, moderately to very clayey, slightly sandy, very fine, dark olive gray to black	90	94
Sand, very fine to fine, moderately silty, moderately clayey, olive gray to dark olive gray	94	116
Clay, moderately sandy, very fine, greenish gray	116	121
Sand, very fine to fine, moderately silty, moderately clayey, greenish olive gray	121	129
Clay, moderately to very silty, moderately to very sandy, olive gray to greenish gray	129	149
Sand, very fine to fine, very silty, very clayey, olive gray	149	178
Silt, moderately clayey, very sandy, very fine, trace sandstone, olive	178	190
Sand, very fine to fine, very silty, moderately clayey, olive	190	198
Silt, very sandy, very fine to fine, moderately clayey, olive gray	198	209
Sand, very fine to fine, trace sandstone, very silty, moderately clayey, olive gray	209	232
Silt, very clayey, moderately sandy, very fine, trace rootlets, pale olive	232	239
Sand, very fine to medium, moderately silty, slightly clayey, brown	239	246
Silt, moderately clayey, very sandy, brown	246	252
Sand, very fine to medium moderately silty, moderately clayey, brown	252	258
Silt to siltstone, lime cemented, slightly sandy, very fine, pale brown to white	258	285
Tertiary System, Ogallala Group:	285	306
Interbedded silt, very clayey and sand, very fine to medium, brown to light olive gray	306	344
	344	360
Sand, very fine to medium, slightly to moderately silty, rootlets, light brownish gray	360	429
Silt, moderately sandy, very fine to medium, slightly clayey, light olive gray	429	447
Sand to sandstone, very fine to medium, slightly to very silty, slightly clayey, rootlets, in part limey, olive	447	496
Silt, very sandy, very fine to medium, moderately clayey, rootlets, olive	496	502

Sand to sandstone, very fine to medium, moderately silty, moderately clayey, rootlets, olive	502	513
Silt, very sandy, very fine to fine, moderately clayey,	513	520
Sandstone to sand, very fine to medium, moderately silty, in part very clayey, olive to pale olive	520	543
Silt, very clayey, moderately sandy, very fine to medium, pale olive to pale brown	543	556
Sand, very fine to medium, trace coarse, moderately silty, moderately clayey, olive to olive gray	556	584
Clay to claystone, moderately sandy, very fine to fine, pale yellow	584	587
Sand to sandstone, very fine to coarse, trace very coarse sand to fine gravel, moderately silty, moderately clayey, trace rootlets, in part lime cemented, pale olive to pale brown	587	660
Silt, slightly to moderately clayey, very sandy, very fine to fine, pale olive	660	666
Sandstone, very fine to fine, slightly to moderately silty, moderately clayey, lime cemented, light gray	666	696
Interbedded sand, very fine to medium, and clay to claystone, very limey, brown to pale olive	696	714
Sand, very fine to medium, slightly to moderately silty, brown	714	729
Clay to claystone, moderately sandy, very fine to fine, pale yellow	729	740
Sand, fine to coarse, moderately silty, pale yellow to olive gray	740	749
Clay, slightly silty, pale yellow	749	751
Sand, fine to coarse, trace very coarse sand to fine gravel, moderately to very clayey, pale yellow to grayish brown	751	785
Tertiary System, White River Group, Brule Formation:		
Limestone, very clayey, moderately sandy, very fine to fine, pale brown	785	805
Silt to siltstone, slightly to moderately clayey, with claystone seams, brown to yellow brown	805	905

Test Hole 60-HP-79

Location: T. 15N., R. 31W., 3AAA
Date drilled: 11-1-79
Ground altitude: 3004 feet (North Platte 2 SE 7.5 minute quadrangle)
Depth to water:
Total depth: 500 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, trace coarse to very coarse and trace fine gravel, slightly clayey, trace iron stain, moderately to very silty, gray brown to brown	0	34
Silt, moderately to very clayey, pale yellow to pale olive	34	45
Sand and gravel, very fine sand to fine gravel, trace medium gravel, thin clay seams, brown to pale yellow	45	70
Interbedded sand, very fine to very coarse, and silt, light yellow brown	70	88
Sand and gravel, very fine to very coarse sand, fine to medium gravel, trace coarse gravel and cobbles	88	102
Silt to siltstone, slightly sandy, clayey, very pale brown to red brown	102	114
Sand and gravel, very fine to very coarse sand and fine to medium gravel	114	125
Silt, slightly to very sandy, very fine to medium, very pale brown and yellow brown	125	141
Sand and gravel, very fine to very coarse sand and fine to medium gravel	141	150
Tertiary System, Ogallala Group:		
Sandstone, very fine to fine, very silty, rootlets, pale yellow to brown	150	164
Sand, fine to coarse, slightly to moderately silty, rootlets, brown	164	183
Sandstone, very fine to coarse, trace silt seams, moderately to very silty, rootlets, pale yellow brown	183	197
Sandstone, very fine to medium, moderately clayey and silty, lime cemented, white	197	204
Sand to sandstone, very fine to medium, moderately to very silty, rootlets, trace pale yellow and white limey clay seams, brown	204	263
Sand to sandstone, very fine to medium, trace coarse, slightly to moderately silty, rootlets, brown	263	314
Silt, moderately to very clayey, slightly to moderately sandy, very fine to fine, limey, pale yellow	314	324
Silt, slightly clayey, moderately sandy, lime cemented, pale yellow white	324	340
Silt, moderately sandy, white limey clay seams, light olive gray	340	350
Sand, very fine to very coarse, trace fine gravel, slightly to moderately silty	350	359
Silt, very sandy, very fine to medium, in part limey and clayey, pale yellow	359	374

Sand to sandstone, very fine to medium, yellow to white silty seams, brown	374	420
Sandstone, lime cemented, hard, very pale brown to white	420	440
Silt, pale yellow to pale olive with siltstone seams	440	468
Siltstone, pale brown with white clay streaks	468	484
Tertiary System, White River Group, Brule Formation:		
Siltstone with white clay streaks, trace pink siltstone, pale brown to red brown	484	500

Test Hole 61-HP-79

Location: T. 15N., R. 31W., 32DCC
Date drilled: 11-2-79
Ground altitude: 3870 feet (Hershey East 7.5 minute quadrangle)
Depth to water: 10 feet
Total depth: 300 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, slightly silty, gray brown	0	17
Sand and gravel, very fine to very coarse sand and fine to coarse gravel	17	24
Sand, very fine to fine, slightly silty, gray brown	24	31
Tertiary System, Ogallala Group:		
Sandstone, very fine to fine, moderately limey, very pale brown	31	38
Silt, moderately to very sandy, limey, pale yellow to white	38	48
Sandstone to sand, very fine to fine, moderately silty, limey, pale yellow to white	48	56
Sandstone, very fine to medium, moderately to very silty, slightly limey, pale yellow	56	62
Sandstone, very fine to medium, lime cemented, rootlets, pale brown to red brown	62	67
Sandstone, very fine to medium, moderately to very silty, rootlets, red brown	67	70
Sandstone to sand, very fine to medium, rootlets, brown	70	96
Silt, moderately limey, moderately sandy, very pale brown	96	100
Sandstone to sand, very fine to medium, in part limey and lime cemented, brown	100	112
Silt, very sandy, very fine to medium, limey, very pale brown	112	118
Sandstone, very fine to medium, moderately silty, rootlets, in part limey, brown	118	138
Silt, very sandy, very fine to medium, slightly clayey, and limey, pale brown	138	144
Sandstone to sand, very fine to medium, in part limey and silty, brown to pale brown	144	198
Silt, very sandy, very fine to fine, slightly limey, pale brown	198	205
Sandstone to sand, very fine to medium, slightly to moderately silty, rootlets, pale brown	205	222
Silt, very sandy, very fine to medium, very pale brown	222	234
Sandstone to sand, very fine to medium, slightly silty, pale brown	234	250
Sand and gravel, very fine to very coarse sand to fine gravel, trace silt and sandstone	250	268
Tertiary System, White River Group, Brule Formation:		
Limestone, with clay seams, hard, white	268	273
Siltstone to silt, very pale brown to reddish brown	273	300

Test Hole 62-HP-79

Location: T. 16N., R 29W., 28CCC
Date drilled: 11-6-79
Ground altitude: 3010 feet (Stapleton SW 7.5 minute quadrangle)
Depth to water:
Total depth: 780 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, slightly silty, slightly clayey, yellow	0	43
Silt, slightly to very sandy, very fine to fine, slightly to moderately clayey, olive yellow	43	60
Sand, very fine to medium, slightly silty, pale olive	60	99
Silt, very sandy, very fine to fine, pale brown	99	102
Sand, very fine to medium, pale olive	102	106
Silt, very sandy, very fine to medium, pale brown	106	108
Sand, very fine to medium, pale olive	108	122
Interbedded sand, very fine to medium, and moderately to very silty sand with trace iron stain, pale olive	122	167
Sand and gravel, fine to very coarse sand and fine to medium gravel	167	186
Sand, very fine to medium, moderately to very silty, yellow	186	205
Sand and gravel, fine to very coarse sand and fine to coarse gravel	205	220
Silt, very sandy, very fine to fine, yellow brown	220	233
Sand and gravel, very fine to very coarse sand and fine to medium gravel	233	238
Silt, moderately to very clayey, slightly sandy, light yellow brown	238	275
Sand, very fine to coarse, slightly silty, very pale brown	275	280
Tertiary system, Ogallala Group:		
Sandstone, very fine to medium, slightly to very silty, slightly to very limey, white	280	295
Sand, fine to medium, trace coarse, pale yellow	295	318
Silt, slightly sandy, very fine to medium, yellow	318	322
Sand, fine to medium, pale yellow	322	342
Sandstone, very fine to medium, moderately to very silty with thin silt seams, rootlets, in part clayey and limey, pale yellow	342	374
Sandstone, very fine to medium, slightly silty, rootlets, limey to silty seams, pale yellow	374	450
Sandstone, fine to medium, occasional lime cement, slightly to moderately silty, rootlets, pale yellow	450	480
Sand to sandstone, fine to medium, slightly silty, trace lime, pale yellow	480	505
Sandstone, fine to medium, silty zones, pale yellow	505	542
Sand, fine to medium, slightly silty, rootlets, pale yellow	542	586
Sand, fine to medium, slightly silty, pale yellow	586	606
Sand, fine to medium, slightly to moderately silty, pale yellow	606	616

Sand, fine to medium, slightly silty, moderately limey, pale yellow	616	623
Silt, moderately sandy, very fine to medium, slightly clayey, pale yellow	623	632
Sand to sandstone, very fine to medium, moderately to very limey, moderately to very silty, white	632	643
Sand, very fine to medium, very silty, pale yellow	643	650
Sand, very fine to medium, slightly to moderately silty, pale yellow	650	658
Sand, very fine to medium, moderately to very silty, pale yellow	658	674
Sand, very fine to medium, slightly silty, pale yellow	674	698
Silt, very sandy, very fine to medium, pale yellow	698	703
Sand, fine to very coarse, much medium, trace gravel, slightly silty	703	738
Silt, very sandy, very fine to medium, pale yellow	738	742
Sand, fine to medium, trace coarse, rootlets, pale yellow brown	742	772
Silt, very sandy, slightly to moderately clayey, pale yellow brown	772	774
Sand, very fine to medium, brown	774	776
Tertiary System, White River Group, Brule Formation:		
Siltstone to silt, brown	776	780

Test Hole 63-HP-79

Location: T. 14N., R. 28W., 16BDD
Date drilled: 11-8-79
Ground altitude: 2937 feet (Maxwell NE 7.5 minute quadrangle)
Depth to water:
Total depth: 600 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, slightly silty, yellow brown	0	25
Sand, very fine to fine, very silty, slightly clayey, light olive brown	25	52
Sand, fine to medium, slightly to moderately silty, olive yellow to yellow	52	104
Silt, very clayey, brownish gray	104	127
Sand, very fine to very coarse, trace fine gravel, light yellow brown	127	133
Silt, very sandy, very fine to medium, yellow brown	133	136
Sand and gravel, fine to very coarse sand and fine gravel	136	167
Sand, fine to medium, slightly to very silty, brownish yellow	167	207
Sand, fine to very coarse, trace fine gravel	207	218
Silt, very sandy, brownish yellow	218	220
Tertiary System, Ogallala Group:		
Sand, very fine to very coarse, with fine gravel, rootlets, in part limey, slightly silty, pale olive	220	284
Sandstone, fine to medium, moderately to very silty, pale yellow	284	288
Sand, fine to medium, in part lime cemented, olive to yellow	288	329
Sand, very fine to medium, slightly to moderately silty, limey, rootlets, pale yellow	329	372
Sandstone, fine to medium, olive	372	383
Sandstone, very fine to medium, moderately silty, limey zones, rootlets, pale yellow	383	412
Sandstone, very fine to medium, slightly silty, moderately limey, pale yellow	412	440
Interbedded silt and sand, very fine to medium, limey, olive yellow to pale yellow	440	457
Sandstone, fine to medium, slightly silty, rootlets, in part moderately limey, pale olive	457	499
Siltstone, clayey, slightly sandy, yellow	499	507
Sand and gravel, fine to very coarse sand, trace fine gravel	507	559
Siltstone, very clayey, moderately sandy, brown	559	566
Sand, fine to medium, moderately to very silty, light yellow brown	566	588
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, yellow to brown	588	600

Test Hole 64-HP-79

Location: T. 15N., R. 27W., 33BAB
Date drilled: 11-13-79
Ground altitude: 2925 feet (Brady NW 7.5 minute quadrangle)
Depth to water:
Total depth: 700 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, moderately to very sandy, very fine to fine, brown to pale brown	0	62
Sand, very fine to fine, slightly to moderately silty, pale yellow	62	89
Silt, slightly clayey, slightly sandy, pale olive	89	97
Sand, very fine to medium, moderately to very silty, pale olive to pale yellow	97	112
Silt, moderately sandy, moderately clayey, pale yellow	112	122
Sand and gravel, very fine to very coarse sand, fine to medium gravel, rare brown yellow silt seams	122	216
Silt, moderately clayey, slightly sandy, light reddish brown	216	240
Sand, very fine to very coarse, very silty, light reddish brown	240	245
Silt, moderately clayey, slightly sandy, moderately to very limey, very pale brown to reddish brown	245	291
Tertiary System, Ogallala Group:		
Sand to sandstone, very fine to medium, moderately silty, rootlets, moderately limey, pale brown	291	328
Silt, moderately sandy, very fine to fine, very pale brown	328	333
Sand, very fine to coarse, slightly silty, pale olive to pale olive	333	363
Silt, slightly clayey, slightly sandy, pale yellow	363	380
Sandstone to sand, very fine to medium, rootlets, pale brown	380	390
Silt, slightly clayey, slightly sandy, moderately to very limey, very pale brown to white	390	404
Sand to sandstone, very fine to medium, moderately silty, pale brown	404	421
Silt, slightly to very sandy, very fine to fine, moderately to very limey, very pale brown to white	421	474
Sand, very fine to medium, moderately silty, pale yellow to pale olive silt	474	485
Siltstone to silt, pale yellow to pale olive	485	488
Sand, very fine to very coarse, with trace fine gravel, occasional thin silt seams, silt, pale yellow to olive	488	674
Tertiary System, White River Group, Brule Formation:		
Siltstone, pale olive brown to reddish brown	674	700

Test Hole 65-HP-79

Location: T. 13N., R. 26W., 31CDA
Date drilled: 11-14-79
Ground altitude: 2740 feet (Brady 7.5 minute quadrangle)
Depth to water:
Total depth: 480 feet

Material description	Depth to feet From	To
Quaternary System, Undifferentiated:		
Silt, moderately to very sandy, very fine to fine, moderately to very clayey, brown to pale brown	0	65
Silt, very clayey, green gray	65	78
Silt, very clayey, very dark brown	78	92
Sand and gravel, coarse to very coarse sand and fine to medium gravel	92	106
Tertiary System, Ogallala Group:		
Silt to siltstone, interbedded sandstone and limey zones, greenish gray	106	148
Sand to sandstone, very fine to medium, moderately silty, greenish gray	148	166
Sandstone to sand, very fine to fine, silty to limey zones greenish gray	166	183
Sand to sandstone, very fine to medium, trace coarse to very coarse sand and fine gravel, rootlets, light yellow brown	183	205
Sandstone, very fine to medium, moderately to very silty, in part lime cemented, pale brown	205	242
Silt, slightly sandy, very limey, very pale brown	242	250
Sand, very fine to medium, limey white clay streaks, pale brown	250	255
Sandstone to sand, very fine to medium, moderately limey, pale brown	255	260
Sand, very fine to very coarse, trace fine gravel, moderately silty	260	272
Limestone, moderately sandy and clayey, white to pale olive	272	280
Sandstone to sand, very fine to medium, moderately silty, in part lime cemented, pale brown to white	280	310
Silt, slightly to moderately sandy, very pale brown	310	332
Sand, very fine to medium, pale brown	332	339
Silt, moderately sandy, very fine to medium, pale yellow	339	345
Sand, very fine to medium, trace coarse to very coarse, slightly to moderately silty	345	360
Silt, very sandy, very fine to medium, pale yellow	360	390
Sand to sandstone, very fine to medium, moderately silty, pale brown to pale yellow	390	408
Siltstone, slightly to moderately sandy, very fine to medium, pale yellow to pale olive	408	419
Sandstone, very fine to medium, moderately clayey, very silty, lime cemented, white	419	444
Tertiary System, White River Group, Brule Formation:		
Siltstone, brown to pale olive	444	480

Test Hole 66-HP-79

Location: T. 14N., R. 25W., 27CBC
Date drilled: 11-15-79
Ground altitude: 2850 feet (Odencranze Table North 7.5 minute quadrangle)
Depth to water:
Total depth: 700 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, moderately clayey, slightly sandy, dark brown to yellow brown	0	26
Silt, slightly to moderately clayey, iron stains, pale olive	26	104
Silt, moderately clayey, light yellow brown	104	140
Silt, slightly to moderately clayey, limey clay seams, occasional limey concretions, light gray to pale brown to white	140	226
Sand and gravel, very fine to very coarse sand and fine to medium gravel, much coarse to very coarse sand	226	253
Silt, moderately clayey, pale brown	253	255
Sand and gravel, very fine to very coarse sand and fine to medium gravel, much very coarse sand to fine gravel, trace coarse gravel, slightly silty	255	283
Silt, slightly clayey, slightly sandy, pale yellow with white, limey clay streaks	283	300
Tertiary System, Ogallala Group:		
Sand, very fine to very coarse, trace fine gravel, moderately silty, pale brown	300	310
Sandstone, very fine to medium, lime cemented with white limey clay	310	317
Silt, slightly to moderately clayey, trace sandstone, in part lime cemented, trace rootlets, light yellow brown to brown	317	330
Sandstone, very fine to fine, moderately silty, limey clay seams, brown to pale brown	330	351
Sand, very fine to coarse, much very fine to fine, moderately silty, light yellow brown	351	370
Interbedded sandstone, very fine to medium, and silt, clayey and limey, very pale brown to white	370	394
Sand, very fine to very coarse, much fine to medium, trace fine gravel, slightly to moderately silty	394	411
Silt, slightly clayey, moderately sandy, very fine to very coarse, light olive gray	411	414
Sand, very fine to very coarse, much very fine to medium, rare fine gravel, slightly to moderately silty	414	422
Sandstone, very fine to medium, moderately to very silty, pale brown to brown	422	434
Sand, very fine to fine, moderately silty, trace sandstone, brown	434	441
Sandstone, very fine to fine, slightly to moderately silty, limey, pale brown to white	441	450
Silt, moderately sandy, limey, very pale brown to white	450	456

Sand, very fine to medium, moderately silty, slightly to moderately limey, pale brown	456	466
Silt, moderately sandy, lime cemented sandstone and limey clay seams, very pale brown to white	466	481
Sandstone to sand, very fine to medium, slightly to very silty, occasional limey silt to clay seams, very pale brown to brown	481	548
Silt, very sandy, very fine to medium, slightly to moderately clayey, slightly to moderately limey, pale yellow	548	556
Sand, very fine to coarse, moderately silty, pale yellow	556	560
Silt, slightly to moderately clayey, pale yellow	560	562
Sand, very fine to coarse, moderately silty, pale yellow	562	565
Silt, very sandy, very fine to medium, pale yellow	565	571
Silt, very sandy, very fine to fine, moderately limey with lime cemented sandstone seams, pale to very pale brown	571	622
Sandstone, very to fine, moderately silty, pale yellow	622	635
Sand, very fine to very coarse, trace fine gravel, much fine to medium, moderately silty	635	644
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, brown to very pale brown	644	660
Siltstone to silt, trace pink, trace olive claystone, pale brown	660	700

Test Hole 67-HP-79

Location: T. 16N., R. 25W., 29AAA
Date drilled: 11-16-79
Ground altitude: 2850 feet (Arnold SW 7.5 minute quadrangle)
Depth to water:
Total depth: 700 feet

Material Description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, slightly to moderately clayey, slightly to moderately sandy, very fine to fine, dark brown to pale brown	0	47
Silt, slightly clayey, moderately to very sandy zones, very fine to fine, pale olive to pale yellow to pale brown	47	100
Sand, very fine to medium, moderately silty	100	111
Silt, slightly to moderately clayey, slightly to very sandy, pale yellow to pale brown with white, limey clay streaks	111	158
Sand, very fine to very coarse, much fine to medium, moderately silty	158	166
Sand and gravel, very fine to very coarse sand and fine to medium gravel, much coarse to very coarse sand	166	192
Silt, moderately clayey, pale yellow	192	195
Sand and gravel, very fine to very coarse sand and fine to medium gravel, much very coarse sand, trace coarse gravel to cobbles	195	232
Silt, very sandy, very fine to coarse, yellow brown	232	237
Sand, very fine to very coarse, trace fine gravel, moderately silty	237	240
Silt, slightly sandy, pale yellow to very pale brown	240	252
Sandstone, very fine to medium, moderately silty, rootlets, pale brown	252	260
Silt, slightly clayey, thin limey sandstone and limey clay seams, light reddish brown to light gray to pale yellow	260	288
Sand and gravel, very fine to very coarse sand and fine gravel, much coarse to very coarse, slightly to moderately silty	288	300
Tertiary System, Ogallala Group:		
Sandstone, very fine, slightly to very silty, in part lime cemented, rootlets, gray brown to pale brown to pale yellow	300	393
Sand, very fine to medium, moderately silty, slightly limey, pale brown to light reddish brown	393	404
Silt, slightly to moderately sandy with sandstone lenses, very fine to medium, in part limey, gray brown to very sandy brown to pale yellow to brown	404	437
Siltstone, moderately clayey with white clay streaks, pale yellow	437	444
Silt, slightly to moderately clayey, slightly sandy, moderately to very limey, pale yellow to white	444	465
Sandstone, very fine to fine, trace medium to very coarse, moderately to very silty, pale yellow to white	465	480
Silt to siltstone, moderately sandy, pale yellow	480	484
Sandstone, with limey, clayey silt seams, light yellow brown to pale olive	484	495

Silt, moderately to very sandy, very fine to medium with sandstone seams, pale yellow	495	520
Sandstone, very fine to medium, moderately silty, pale yellow to olive	520	534
Silt, moderately sandy, pale yellow to pale brown	534	538
Sand to sandstone, very fine to medium, moderately silty, light yellow brown	538	555
Silt, slightly sandy, very fine to medium, slightly clayey, slightly limey, pale yellow	555	560
Sandstone, very fine to fine, limey clay seams, pale yellow	560	580
Silt to siltstone, slightly sandy, moderately limey, white clay seams, pale yellow to light brown gray	580	610
Sand to sandstone, very fine to fine, moderately to very silty, with light reddish brown siltstone seams, pale brown to brown	610	668
Silt to siltstone, brown and pale yellow	668	688
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, pale brown to reddish brown	688	700

Test Hole 68-HP-79

Location: T. 17N., R. 26W., 24ABA
Date drilled: 11-17-79
Ground altitude: 2910 feet (Logan 7.5 minute quadrangle)
Depth to water:
Total depth: 740 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, slightly to very silty, dark gray brown to pale yellow	0	25
Silt, slightly sandy, very fine to fine, pale olive	25	28
Sand, very fine to fine, moderately silty, iron stains, pale olive	28	34
Silt, slightly clayey, moderately sandy, very fine to fine, iron staining, pale olive	34	39
Sand, very fine to fine, moderately silty, pale olive	39	44
Silt, slightly to moderately clayey, slightly sandy, pale olive	44	55
Sand, very fine to medium, moderately silty	55	72
Silt, slightly clayey, slightly sandy with iron staining, pale olive	72	75
Sand, very fine to medium, moderately silty	75	86
Silt, very sandy, very fine to medium, pale yellow	86	90
Sand, very fine to medium, moderately to very silty with pale yellow silt seams	90	112
Silt, moderately sandy, pale yellow to pale brown	112	118
Sand, very fine to medium, slightly to very silty, pale yellow	118	144
Silt, slightly to moderately sandy, pale yellow	144	156
Sand, very fine to medium, slightly to moderately silty, pale yellow	156	172
Sand and gravel, medium to very coarse sand and fine to medium gravel, much medium to coarse sand, trace coarse gravel	172	192
Silt, slightly sandy, slightly clayey, pale olive	192	200
Sand and gravel, very fine to very coarse sand and fine to medium gravel, trace coarse gravel	200	246
Silt, moderately sandy, slightly clayey, light yellow to pale olive	246	266
Sand and gravel, very fine to very coarse sand and fine to medium gravel, much coarse to very coarse sand	266	276
Tertiary System, Ogallala Group:		
Silt, moderately clayey, limey with lime cemented sandstone seams, pale yellow to white	276	302
Sandstone, very fine to medium, moderately silty, slightly to moderately limey, pale olive to very pale brown	302	312
Sand, very fine to medium, slightly silty, slightly limey, rootlets, pale olive	312	322
Silt, very sandy, very fine to medium, moderately to very limey, very pale yellow	322	336

Sandstone to sand, very fine to fine, slightly silty, slightly limey, light yellow brown	336	366
Silt, very sandy, very fine to fine, in part limey, pale yellow to pale olive	366	378
Sandstone, very fine to fine, slightly silty, slightly limey, white clayey streaks, light yellow brown	378	395
Silt, moderately sandy, white clayey streaks, pale yellow	395	400
Sand, very fine to medium, with olive sandstone seams	400	414
Silt, slightly to moderately clayey, slightly sandy, pale yellow	414	423
Sandstone, very fine to fine, moderately silty, moderately limey, very pale brown	423	439
Silt, moderately sandy, moderately to very limey, trace rootlets, pale yellow	439	446
Sand, very fine to fine, moderately to very silty, moderately to very limey, pale yellow	446	454
Silt, moderately sandy, moderately limey, pale yellow	454	456
Sand, very fine to medium, moderately silty, moderately to very limey, pale yellow	456	472
Silt, moderately sandy, slightly clayey, moderately to very limey, pale yellow to pale olive	472	476
Sand, very fine to medium, moderately silty, moderately limey, pale olive	476	482
Silt, slightly to moderately clayey, slightly limey, trace siltstone seams, olive yellow	482	503
Clay to claystone, pale olive to pale yellow	503	511
Silt, moderately clayey, pale olive to reddish yellow	511	515
Sand, very fine to very coarse, much medium to coarse, moderately silty, light reddish brown to pale yellow	515	524
Silt, moderately to very sandy, trace rootlets, reddish brown to pale yellow	524	544
Sand, very fine to medium, moderately to very silty, pale yellow	544	565
Silt, moderately sandy, moderately to very limey, pale yellow	565	580
Sandstone, very fine to medium, moderately limey, moderately silty, pale yellow to reddish brown	580	600
Sand, very fine to medium, moderately silty with yellow brown siltstone seams	600	615
Silt, moderately sandy with interbedded lime cemented sandstone, very pale brown to light olive gray to pale yellow	615	640
Sandstone, very fine to medium, moderately silty, moderately to very limey, pale yellow	640	660
Silt, slightly to very sandy, with sandstone seams, very fine to fine, slightly to moderately limey, slightly clayey, pale yellow	660	720
Tertiary System, White River Group, Brule Formation:		
Siltstone to silt, moderately clayey, brown to red brown	720	740

Test Hole 73-HP-80

Location: T. 24N., R. 25W., 7ACC
Date drilled: 4-10-80
Ground altitude: 2700 feet (Purdum 15 minute quadrangle)
Depth to water:
Total depth: 720 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Top soil, silty, sandy, dark brown	0	8
Sand and gravel, medium sand and fine to medium gravel	8	16
Silt, moderately sandy, slightly clayey, light brownish gray	16	22
Sand and gravel, fine to very coarse sand and fine to medium gravel, brown	22	54
Tertiary System, Ogallala Group:		
Silt, moderately sandy, slightly clayey, light brownish gray	54	64
Sand, very fine to fine, trace medium to coarse, moderately silty	64	67
Silt, very sandy, very fine to fine, light brown	67	71
Sand to sandstone, very fine to fine, slightly to moderately silty, brown to reddish brown	71	98
Silt, moderately clayey, light gray	98	102
Sand to sandstone, fine to medium, trace coarse to very coarse and fine gravel, slightly to moderately silty, rootlets, light gray	102	142
Silt, moderately to very clayey, light gray	142	146
Sand, very fine to fine, moderately silty, light brown	146	150
Silt, with interbedded sandstone seams, rootlets, light brown	150	168
Sand, very fine to medium, slightly to moderately silty, light brown	168	174
Silt, moderately clayey, lime cemented, light gray	174	180
Sand to sandstone, very fine to medium, slightly to moderately silty, light brown	180	198
Sandstone to sand, very fine to medium, slightly to moderately silty, light brown	198	245
Sand to sandstone, very fine to medium, slightly to moderately silty, rootlets, light brown	245	303
Silt, moderately sandy, light gray brown	303	306
Sand to sandstone, very fine to medium, slightly silty, light brown	306	326
Silt, moderately clayey, limey, very pale brown	326	330
Sandstone to sand, very fine to medium, moderately silty, slightly clayey, in part lime cemented, light brown	330	352
Silt, moderately to very sandy, slightly clayey, slightly limey, light brown	352	370
Sand to sandstone, very fine to medium, slightly to moderately silty, slightly to very limey, very pale brown	370	399
Sandstone to sand, very fine to medium, rare coarse to very coarse, slightly to moderately silty, in part limey, slightly clayey, light brown to brown	399	493
Sand, fine to coarse, slightly silty, brown	493	519
Silt, very sandy, very fine to fine, slightly to moderately clayey, pale brown	519	542
Sand, fine to medium, trace coarse, slightly clayey, brown	542	564

Silt, slightly to moderately clayey, slightly to moderately sandy, light gray	564	575
Sand, fine to coarse, slightly to moderately silty, light gray	575	590
Silt, very sandy, very fine to medium, slightly clayey, light gray	590	619
Sand and gravel, very fine to very coarse sand and fine to medium gravel, rare silt seam, brown	619	686
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, moderately to very clayey, reddish brown	686	720

Test Hole 74-HP-80

Location: T. 23N., R. 23W., 15BCB
Date drilled: 4-15-80
Ground altitude: 2560 feet (Brewster NW 7.5 minute quadrangle)
Depth to water:
Total depth: 760 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand and gravel, fine to very coarse sand and fine to medium gravel, slightly to moderately silty, brown	0	26
Sand to sandstone, fine to coarse sand, trace very coarse sand and fine gravel, slightly silty, rootlets, brown	26	100
Tertiary System, Ogallala Group:		
Sand to sandstone, very fine to medium, moderately to very silty, slightly to moderately clayey, gray brown to brown	100	122
Silt, moderately clayey, light gray brown	122	138
Sand to sandstone, very fine to medium, slightly silty, brown to light brown	138	155
brown		
Sandstone, very fine to medium, slightly clayey, slightly to moderately silty, olive to brown	155	177
Sand to sandstone, very fine to medium, slightly silty, brown	177	189
Sandstone, very fine to medium, trace coarse, moderately silty, slightly clayey, light brown	189	213
Sand to sandstone, very fine to medium, slightly silty, light greenish brown to brown	213	250
Sandstone, very fine to medium, moderately silty, slightly clayey, greenish brown to brown	250	263
Sand to sandstone, very fine to medium, slightly silty, greenish brown to brown	263	278
Silt, slightly clayey, moderately sandy, pale brown	278	281
Sand to sandstone, very fine to medium, slightly silty, brown	281	292
Silt, moderately sandy, very fine to medium, slightly to moderately clayey, very pale brown to brown	292	316
Sandstone to sand, very fine to medium, slightly silty, pale brown to brown	316	333
Silt, moderately sandy, very fine to fine, slightly to moderately clayey, brown	333	343
Sandstone, very fine to medium, slightly to moderately silty, brown	343	352
Sand to sandstone, very fine to medium, brown	352	363
Sandstone, very fine to medium, slightly silty, brown	363	394
Sandstone, very fine to medium, moderately to very silty, brown	394	440
Sand, very fine to medium, trace coarse, brown to reddish brown	440	444
Sandstone, very fine to medium, moderately to very silty, clayey, brown to reddish brown	444	470
Sand, very fine to medium, brown to reddish brown	470	473
Silt, moderately to very sandy, very fine to medium, slightly clayey, brown	473	476
Sand and gravel, fine sand to fine gravel, trace medium gravel	476	484
Silt, moderately to very clayey, slightly limey, pale brown	484	507

Sand and gravel, very fine to very coarse sand and fine to medium gravel	507	531
Sand, fine to coarse, trace very coarse sand and fine gravel, slightly silty with silt seams	531	572
Sandstone, very fine to medium, slightly to moderately silty, trace siltstone seams, reddish brown	572	689
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, moderately to very clayey, reddish brown	689	760

Test Hole 75-HP-80

Location: T. 21N., R. 24W., 28AAA
Date drilled: 4-16-80
Ground altitude: 2763 feet (Dunning 15 minute quadrangle)
Depth to water
Total depth: 720 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, slightly to moderately sandy, slightly clayey, brown	0	51
Sand, very fine to medium, brown	51	55
Silt, slightly clayey, slightly to moderately sandy, brown	55	94
Sand, very fine to coarse, slightly to moderately silty, slightly clayey	94	122
Silt, moderately to very clayey, slightly sandy, brown	122	127
Sand, very fine to medium, trace coarse, brown	127	131
Clay, slightly sandy, gray brown to reddish brown	131	177
Sand and gravel, fine sand to medium gravel	177	216
Silt, slightly clayey, moderately sandy, gray brown	216	226
Clay, slightly sandy, brownish gray	226	244
Sand and gravel, fine sand to fine gravel	244	256
Silt, moderately clayey, slightly sandy, gray brown	256	270
Tertiary System, Ogallala Group:		
Sand, fine to medium, trace sandstone, moderately silty, brown	270	294
Clay, slightly sandy, brown	294	296
Sand and gravel, fine sand to fine gravel	296	307
Sand to sandstone, fine to medium, trace coarse to very coarse, slightly silty, moderately limey, rootlets, pale brown to white	307	373
Silt, slightly to moderately clayey, in part sandy, very fine to medium, light greenish brown	373	444
Sand, very fine to medium, slightly to moderately silty and limey, pale brown	444	454
Silt, slightly sandy, slightly clayey, lime cemented	454	458
Sand, very fine to medium, moderately silty, greenish brown	458	463
Silt, moderately sandy, moderately limey, pale brown to brown	463	470
Sand, very fine to medium, slightly to moderately silty, brown	470	476
Silt, slightly to moderately clayey, slightly to moderately sandy, slightly limey, light brown	476	486
Sand, very fine to medium, trace coarse to very coarse sand and fine gravel, slightly to moderately silty, light brown	486	498
Silt with interbedded sand seams, fine to very coarse sand, in part slightly to very clayey, brown	498	518
Sand, very fine to very coarse, with fine gravel, slightly limey	518	528
Silt, very clayey, light brownish gray	528	531
Sand and gravel, fine to very coarse sand and fine gravel, trace medium gravel, in part silty	531	592
Silt, slightly sandy, slightly clayey, light gray	592	612

Sand, very fine to coarse, slightly to moderately silty	612	628
Silt, slightly to moderately clayey, slightly to moderately sandy, light olive gray to light gray	628	692
Silt and siltstone, clayey, reddish brown	692	720

Test Hole 76-HP-80

Location: T. 19N., R. 25W., 15DCC
Date drilled: 4-17-80
Ground altitude: 2800 feet (Linscott 15 minute quadrangle)
Depth to water:
Total depth: 700 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, moderately sandy, slightly clayey, gray brown	0	11
Silt, moderately to very clayey, gray	11	17
Silt, moderately to very sandy, slightly clayey, gray	17	31
Silt, slightly to moderately sandy, slightly to moderately clayey, brownish gray	31	136
Claystone, pale green	136	144
Sand and gravel, fine sand to fine gravel, trace coarse gravel	144	200
Tertiary system, Ogallala Group:		
Sand to sandstone, fine to very coarse, trace fine gravel moderately silty, trace rootlets, gray brown	200	230
Sand, very fine to very coarse, trace fine gravel, slightly silty, rootlets, gray brown	230	250
Silt, moderately to very sandy, slightly clayey, gray	250	260
Sand to sand and gravel, fine to very coarse, with fine gravel, slightly silty, trace rootlets, gray green	260	303
Clay, limey, pale brown	303	306
Sand, very fine to very coarse, trace fine gravel, slightly silty, gray brown	306	321
Silt, moderately to very clayey, slightly to moderately sandy, gray	321	327
Sandstone, very fine to medium, slightly silty, gray	327	342
Clay, moderately limey, gray	342	356
Sand, very fine to medium, slightly silty, slightly limey, gray brown	356	368
Silt, moderately sandy, moderately limey with lime cement, pale brown	368	371
Sand, very fine to medium, slightly silty, slightly limey, brown	371	376
Silt, moderately sandy, lime cemented, pale brown	376	378
Sand, very fine to medium, slightly silty, brown	378	385
Silt, slightly to moderately sandy, very fine to medium, slightly limey, pale brown to brown	385	396
Sand to sandstone, very fine to medium, moderately silty, lime cemented, pale brown	396	406
Silt, slightly to very sandy, very fine to fine, in part limey and lime cemented, reddish gray brown	406	428
Sand to sandstone, very fine to medium, slightly silty, trace rootlets, gray brown	428	478
Silt, slightly clayey, gray green	478	482
Sand to sand and gravel, very fine to very coarse sand, trace fine to medium gravel, slightly silty	482	516

Interbedded sand and gravel and silt, fine sand to fine gravel, silt, limey, slightly clayey, pale brown	516	534
Sand to sand and gravel, fine sand to fine gravel, much coarse sand	534	546
Silt, moderately sandy, very fine to medium, moderately limey, gray	546	554
Sand to sandstone, fine to coarse, slightly limey, gray brown	554	562
Silt, slightly to moderately clayey, slightly to moderately sandy, limey, pale gray brown	562	574
Sand, very fine to medium, trace coarse, moderately silty, gray brown	574	579
Silt, moderately to very clayey, slightly to very sandy, fine to coarse, trace very coarse sand to fine gravel, moderately limey, gray brown	579	598
Sand, fine to coarse, trace very coarse, slightly to moderately silty	598	605
Silt, moderately clayey, slightly sandy, moderately limey gray brown	605	608
Sand, very fine to coarse, trace very coarse sand and fine gravel, moderately silty, moderately limey, gray brown	608	614
Silt to siltstone, slightly to moderately sandy, slightly to moderately clayey, brown	614	616
Sand to sand and gravel, fine to very coarse sand, trace fine gravel, slightly to moderately silty, pale brown	616	638
Silt, moderately clayey, slightly sandy, moderately to very limey, pale grayish brown	638	672
Tertiary System, Arikaree Group:		
Sand, very fine to fine, with trace silty sandstone, brownish gray, slightly pinkish	672	700

Test Hole 77-HP-80

Location: T. 17N., R. 24W., 7CAC
Date drilled 4-18-80
Ground altitude: 2795 feet (Arnold 7.5 minute quadrangle)
Depth to water:
Total depth: 740 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, slightly to moderately clayey, brown	0	86
Sand, very fine to medium	86	90
Silt, moderately to very clayey, brown	90	98
Sand, very fine to medium, moderately silty, gray brown	98	117
Silt, slightly to moderately clayey, slightly sandy, gray brown	117	123
Sand, very fine to coarse, trace very coarse sand and fine gravel, slightly to moderately silty	123	133
Silt, moderately to very clayey, moderately sandy, brown to reddish brown	133	136
Sand and gravel, fine to very coarse sand and fine to medium gravel, trace coarse gravel, much coarse to very coarse sand	136	173
Silt, moderately to very clayey, gray brown	173	181
Sand and gravel, fine sand to medium gravel, trace coarse gravel	181	243
Silt, moderately to very clayey, slightly sandy, brown	243	260
Tertiary System, Ogallala Group:		
Sand to sandstone, very fine to medium, limey, rootlets, pale brown to brown	260	274
Silt, moderately clayey, slightly sandy, slightly limey, pale brown to brown	274	279
Sand to sandstone, very fine to medium, trace coarse, slightly to moderately silty, slightly limey, brown	279	288
Sandstone, very fine to medium, moderately silty, slightly limey, pale brown	288	310
Sand to sandstone, very fine to medium, slightly silty, rootlets, slightly limey, light gray	310	346
Sandstone, very fine to medium, moderately silty, lime cemented, light gray	346	356
Sand to sandstone, fine to coarse, moderately silty, slightly limey, gray brown	356	380
Silt, slightly to moderately clayey, slightly sandy, very limey, light gray	380	384
Sand to sandstone, very fine to medium, slightly to moderately silty, slightly to moderately limey, light gray	384	393
Silt, moderately to very clayey, slightly limey, light gray	393	402
Sand to sandstone, very fine to coarse, slightly to very limey, light gray	402	448
Siltstone, slightly sandy, light gray brown	448	450
Sand, very fine to medium, slightly to moderately silty, rootlets, gray	450	454

Sandstone, very fine to medium, moderately to very silty, rootlets, light gray	454	476
Sand to sandstone, very fine to medium, slightly to moderately silty, rootlets, light gray	476	491
Siltstone, slightly clayey, slightly limey, gray	491	494
Sandstone to sand, very fine to medium, trace coarse, very limey, lime cemented, rootlets, grayish brown	494	560
Silt to siltstone, slightly to moderately sandy, moderately limey, pale brown	560	573
Silt, moderately to very sandy, very limey, pale brown	573	586
Silt to siltstone, moderately to very sandy, very fine to medium, trace coarse, pale brown	586	653
Sand to sandstone, fine to coarse, slightly clayey, pale brown	653	674
Tertiary System, Arikaree Group:		
Sandstone, very fine to medium, moderately to very silty, pale brown	674	682
Sandstone to sand, very fine to medium, moderately silty, moderately limey, pale brown	682	690
Sandstone, very fine to medium, moderately to very silty, lime cemented, pale brown	690	694
Sandstone, very fine to fine, slightly to moderately silty, very limey, pale brown	694	710
Siltstone to silt, reddish brown	710	740

Test Hole 89-HP-80

Location: T. 24N., R. 34W., 21CCC
Date drilled: 9-16-80
Ground altitude: 3400 feet (Hire 15 minute quadrangle)
Depth to water:
Total depth: 1000 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, trace medium, slightly to very silty, gray brown	0	62
Clay, slightly to moderately silty, light grayish brown	62	66
Sand, very fine, moderately silty, trace rootlets, grayish brown	66	87
Clay, moderately to very sandy, moderately silty, grayish brown	87	94
Sand, very fine to fine, moderately silty, slightly clayey, olive	94	102
Clay, grayish olive	102	105
Sand, very fine to fine, grayish brown	105	108
Sand, very fine to fine, moderately to very silty, gray	108	112
Sand, very fine to fine, gray	112	116
Sand, very fine to fine, moderately to very silty, grayish brown	116	120
Sand, very fine to fine, gray	120	127
Silt, slightly to moderately clayey, slightly to moderately sandy, very fine to fine, grayish brown	127	130
Sand, very fine to fine, slightly to very silty, gray	130	163
Silt, moderately to very clayey, slightly sandy, very fine to fine, gray	163	167
Sand, very fine to fine, slightly to moderately silty, gray	167	214
Silt, slightly clayey, very dark grayish brown	214	220
Sand and gravel, fine sand to fine gravel, trace medium gravel	220	234
Silt, moderately clayey, greenish gray	234	237
Sand and gravel, fine sand to fine gravel, much very coarse sand, gray	237	281
Tertiary System, Ogallala Group:		
Silt, moderately clayey, gray	281	297
Sand, very fine to fine, moderately silty, grayish brown	297	303
Silt, moderately clayey, slightly to moderately sandy, very fine to fine, grayish brown to brown	303	328
Sand to sandstone, very fine to medium, slightly silty, grayish brown	328	403
Sandstone to sand, very fine to fine, moderately to very silty, trace rootlets, slightly to moderately clayey, grayish brown to olive	403	483
Sand to sandstone, very fine to fine, trace medium, slightly silty, rootlets, gray brown	483	504
Silt, moderately sandy, very fine to fine, gray to brown	504	507
Sand to sandstone, very fine to fine, slightly to moderately silty, interbedded silt seams, rootlets, gray brown	507	549
Clay, gray	549	551
Sand, very fine to very coarse, trace fine gravel, in part sandstone, slightly to moderately silty, trace rootlets, gray brown	551	612

Silt, moderately clayey, moderately sandy, very fine to fine, gray brown	612	614
Sand to sandstone, very fine to fine, slightly silty, rootlets, gray brown	614	627
Silt, moderately clayey, gray brown	627	629
Sand to sandstone, very fine to fine, slightly silty, rootlets, grayish brown	629	654
Sand, very fine to medium, slightly silty, rootlets, grayish brown	654	674
Sandstone, very fine to fine, moderately to very silty, slightly to moderately clayey, in part limey, gray brown to gray	674	688
Sand, very fine to fine, slightly to moderately silty, in part limey, gray brown	688	706
Silt to siltstone, moderately to very clayey, moderately to very limey, light gray	706	775
Silt to siltstone, moderately clayey, slightly sandy, pale yellow to gray	775	798
Sand to sandstone, very fine to fine, moderately silty, with siltstone seams, light gray to grayish brown	798	875
Silt to siltstone, moderately to very sandy, very fine to fine sand, pinkish brown	875	886
Sand to sandstone, very fine to fine, trace medium to coarse sand, moderately to very silty with siltstone seams, dark to light grayish brown	886	940
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, moderately to very sandy, very fine to fine sand, pinkish gray	940	1000

Test Hole 90-HP-80

Location: T. 15N., R. 32W., 30BCC
Date drilled: 9-18-80
Ground altitude: 2995 feet (Hershey West 7.5 minute quadrangle)
Depth to water:
Total depth: 360 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, moderately to very silty, grayish brown	0	19
Sand and gravel, fine sand to fine gravel, trace medium to coarse gravel	19	67
Clay, slightly silty, reddish brown	67	77
Sand, very fine to fine, very silty, moderately clayey, in part limey, pale brown to yellow brown	77	92
Sand, very fine to medium, trace coarse to very coarse, trace fine gravel, rootlets, moderately to very limey, gray brown	92	104
Tertiary System, Ogallala Group:		
Sand, very fine to very coarse, trace fine gravel, trace volcanic ash, grayish brown	104	121
Sand to sandstone, very fine to fine, moderately silty, trace volcanic ash and rootlets, pale to dark brown	121	134
Sand, very fine to medium, trace coarse to very coarse, rootlets, trace sandstone, brown	134	180
Sandstone to sand, very fine to fine, trace medium, slightly to very limey, in part lime cemented, slightly to moderately silty, gray brown	180	210
Sandstone, very fine to medium, moderately to very silty, slightly limey, trace sandstone, gray brown	210	224
Sand, very fine to medium, trace coarse to very coarse, trace fine gravel, in part lime cemented, rootlets, grayish brown	224	256
Sand to sandstone, very fine to medium, trace coarse to very coarse, moderately to very silty, very limey, pale brown	256	268
Sand and gravel, very fine to very coarse sand and fine gravel, trace medium gravel, clay seam 284 to 285 feet	268	301
Sandstone, very fine to fine, trace medium, moderately silty, very limey, lime cemented, light gray	301	322
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, moderately clayey, brownish gray to reddish brown	322	360

Test Hole 91-HP-80

Location: T. 17N., R. 33W., 30CBC
Date drilled: 9-14-80
Ground altitude: 3210 feet (Tin Camp Ranch 7.5 minute quadrangle)
Depth to water:
Total depth: 580 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, very silty, slightly to moderately clayey, grayish brown	0	40
Sand, very fine to fine, trace medium, gray	40	107
Sand, very fine to medium, trace coarse to very coarse, with interbedded blue gray, silty clay seams, gray	107	144
Sand and gravel, fine sand to medium gravel, trace very coarse gravel, much very coarse sand to fine gravel	144	162
Tertiary System, Ogallala Group:		
Silt, moderately clayey, moderately sandy, brown	162	178
Sand, very fine to fine, trace medium, slightly silty, grayish brown	178	187
Silt, slightly to moderately clayey, grayish brown	187	189
Sand, very fine to very coarse, trace fine gravel, sandstone seams, grayish brown	189	225
Silt, very sandy, with interbedded silty sand and sandstone, rootlets, yellow brown	225	246
Sand to sandstone, very fine to medium, rootlets, slightly silty, grayish brown	246	274
Silt, moderately to very clayey, limey, ashy, gray	274	277
Sand, very fine to fine, trace medium to coarse, in part ashy, brown	277	310
Sand to sandstone, very fine to fine with interbedded silt, limey, pale grayish brown	310	348
Sand, very fine to medium, trace coarse to very coarse, slightly silty	348	357
Sandstone, very fine to medium, trace coarse, moderately silty with interbedded silt seams, trace rootlets, gray brown	357	376
Sand, very fine to coarse, trace very coarse sand and fine gravel, slightly silty, trace rootlets, grayish brown	376	400
Clay, olive	400	402
Sand, very fine to coarse, trace very coarse, in part slightly silty, grayish brown	402	505
Sand, very fine to fine, slightly silty, grayish brown	505	535
Silt, moderately to very sandy, slightly clayey, moderately to very limey, pale brown	535	556
Tertiary System, White River Group, Brule Formation:		
Siltstone, clayey, reddish brown	556	580

Test Hole 92-HP-80

Location: T. 17N., R. 35W., 21ABB
Date drilled: 9-20-80
Ground altitude: 3379 feet (Big Bald Hill Ne 7.5 minute quadrangle)
Depth to water:
Total depth: 660 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Top soil, silt, very sandy, slightly clayey, dark brown	0	2
Sand, very fine to fine, very silty, slightly clayey, dark brown	2	5
Silt, very sandy, very fine to fine, slightly clayey, grayish brown	5	15
Sand, very fine to medium, trace coarse, in part slightly to moderately silty, greenish gray	15	80
Sand, very fine to fine, moderately silty, slightly clayey, greenish gray	80	102
Silt, very sandy, slightly clayey, gray	102	123
Sand, very fine to fine, with interbedded silt, slightly clayey, gray	123	158
Sand, very fine to fine, moderately to very silty, slightly clayey, gray	158	184
Sand and gravel, very fine sand to fine gravel, trace medium to coarse gravel, much coarse to very coarse sand	184	207
Sand to sandstone, very fine to fine, very silty, rootlets, grayish brown	207	221
Sand and gravel, very fine sand to fine gravel, trace medium gravel, much coarse to very coarse sand	221	243
Tertiary System, Ogallala Group:		
Silt, very sandy, very fine to fine, trace medium, greenish gray	243	256
Sand to sandstone, very fine to fine, trace medium, clayey, silt seams, greenish gray to gray	256	282
Silt, moderately clayey, slightly to moderately sandy, very fine to fine, gray	282	286
Sand to sandstone, very fine to fine, trace medium, slightly silty, interbedded sandy silt lenses, slightly clayey, gray	286	308
Silt, slightly to moderately clayey, moderately to very sandy, gray	308	310
Sand to sandstone, very fine to coarse, slightly silty, grayish brown	310	383
Silt to siltstone, sandy, trace volcanic ash, grayish brown	383	390
Volcanic ash, gray	390	395
Silt, moderately clayey, moderately to very sandy, very fine to fine, grayish brown	395	412
Sand, very fine to medium, trace coarse to very coarse, rootlets, slightly silty, grayish brown	412	424
Silt, slightly to moderately clayey, moderately sandy, very fine to fine, grayish brown	424	426

Sand, very fine to medium, trace coarse to very coarse, trace sandstone, trace rootlets, grayish brown	426	480
Silt to siltstone with interbedded sand, silt is sandy, very fine to fine, olive	480	502
Sand, very fine to medium, slightly silty, grayish brown	502	510
Silt to siltstone, moderately sandy, very fine to medium, slightly clayey, olive	510	520
Sand, very fine to medium, trace coarse to very coarse, slightly to moderately silty, grayish brown	520	529
Sand, very fine to coarse, trace very coarse, grayish brown	529	566
Sand to sandstone, very fine to medium, moderately silty, interbedded siltstone seams, grayish brown	566	595
Sand to sandstone, very fine to medium, slightly to moderately silty, lime cemented, grayish brown	595	624
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, clayey, in part limey, reddish brown	624	660

Test Hole 93-HP-80

Location: T. 15N., R. 36W., 12ADC
Date drilled: 9-22-80
Ground altitude: 3320 feet (Big Bald Hill 7.5 minute quadrangle)
Depth to water:
Total depth: 420 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, moderately sandy, very fine to medium, trace iron stain, dark gray brown to pale yellow	0	20
Sand, very fine to medium, slightly silty, slightly limey, pale yellow	20	32
Silt, moderately to very sandy, very fine to fine, trace medium to coarse, slightly clayey, greenish gray	32	102
Sand, very fine to fine, slightly to very silty, greenish gray	102	138
Silt, moderately sandy, very fine to medium, trace coarse	138	146
Sand, very fine to very coarse, trace fine to medium gravel, much coarse to very coarse sand	146	156
Silt, very sandy, very fine to coarse, light olive gray	156	160
Sand and gravel, very fine to very coarse sand and fine to medium gravel, much very coarse sand, slightly silty	160	168
Silt, moderately to very sandy, very fine to fine, olive gray	168	174
Sand, very fine to very coarse, much coarse to very coarse, moderately silty, olive gray	174	188
Sand and gravel, very fine to very coarse sand and fine to medium gravel, trace coarse gravel, much coarse to very coarse sand	188	211
Clay, very silty, slightly sandy, light yellow brown	211	230
Sand and gravel, very fine to very coarse sand and fine to medium gravel, trace coarse gravel, much very coarse sand to fine gravel, slightly silty	230	252
Silt, moderately clayey, light reddish brown	252	254
Sand, very fine to medium	254	258
Silt, moderately to very sandy, very fine to medium, reddish brown	258	268
Tertiary System, Ogallala Group:		
Sandstone, very fine to medium, trace rootlets, trace silt and clay layers, light reddish brown	268	273
Silt, very sandy with sandstone, slightly limey, pale yellow	273	278
Sandstone, very fine to fine, slightly to moderately silty, pale yellow	278	286
Sand, very fine to medium, slightly to moderately silty, pale yellow	286	304
Sandstone, very fine to fine, moderately to very silty, limey to lime cemented, trace rootlets, very pale brown	304	318
Sand, very fine to medium, slightly silty, pale brown	318	325
Silt, slightly to very sandy, slightly clayey, pale yellow	325	352

Tertiary System, Arikaree Group:		
Sandstone, very fine to fine, moderately to very silty, with siltstone seams, moderately to very limey and lime cemented, brown to pale brown	352	382
Siltstone, very sandy, very fine to fine, moderately limey, brown	382	392
Sandstone, very fine to fine, lime cemented, moderately to very silty with siltstone, brown	392	400
Tertiary System, White River Group, Brule Formation:		
Siltstone to silt, slightly clayey, yellow brown to reddish brown	400	420

Test Hole 94-HP-80

Location: T. 17N., R. 39W., 3CBC
Date drilled: 9-23-80
Ground altitude: 3620 feet (Bear Hill 7.5 minute quadrangle)
Depth to water:
Total depth: 600 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, slightly to moderately silty, yellow brown	0	48
Sand, very fine to fine, trace medium, moderately to very silty, slightly to moderately clayey, grayish brown	48	70
Silt, very clayey, slightly to moderately sandy, grayish brown	70	74
Sand, very fine to medium, trace coarse to very coarse, slightly to moderately silty, grayish brown	74	82
Silt, very sandy, very fine to medium, trace coarse, slightly clayey, grayish brown	82	88
Sand and gravel, very fine to very coarse sand and fine to medium gravel, silt seams at 93 feet	88	98
Silt, very sandy, very fine to medium, trace coarse, slightly to moderately clayey, grayish brown	98	109
Sand, very fine to very coarse, slightly to moderately silty, grayish brown	109	120
Silt, very sandy with interbedded sand, very fine to medium, grayish brown	120	127
Sand, very fine to coarse, trace very coarse sand and fine gravel	127	136
Sand, very fine to medium, trace coarse to very coarse, trace fine gravel, moderately to very silty, grayish brown	136	150
Sand and gravel, very fine sand to fine gravel, silt seam at 161 feet	150	164
Silt, moderately to very clayey, slightly sandy, gray	164	167
Sand and gravel, very fine to very coarse sand and fine to medium gravel	167	182
Silt, very sandy, very fine medium, trace coarse, trace sandstone, trace rootlets, slightly to moderately clayey	182	213
Silt, moderately to very clayey, brown	213	216
Sand and gravel, very fine sand to fine gravel, slightly silty	216	230
Silt, moderately to very clayey, slightly sandy, yellow brown	230	240
Tertiary System, Ogallala Group:		
Sand, very fine to medium, trace coarse, slightly silty, grayish brown	240	245
Silt, moderately clayey, slightly to moderately sandy, grayish brown	245	249
Sand to sandstone, very fine to medium, trace coarse sand to fine gravel, slightly to moderately silty, rootlets, brown	249	340

Silt, slightly clayey, moderately to very sandy, very fine to fine, brown	340	344
Sand, very fine to medium, trace coarse, rootlets, trace sandstone, brown	344	358
Sandstone, very fine to fine, moderately to very silty, slightly clayey, brown	358	375
Sand to sandstone, very fine to very coarse, much medium, rootlets, slightly silty, brown	375	410
Clay, moderately silty, slightly sandy, light olive gray	410	423
Sand and gravel, very fine to very coarse sand and fine to medium gravel	423	467
Sand to sandstone, very fine to fine, trace medium to coarse, slightly to moderately silty, brown	467	480
Sand to sandstone, very fine to fine, lime cemented, slightly to moderately silty, pale brown gray	480	500
Sandstone, very fine to fine, moderately to very silty, lime cemented, light gray	500	506
Sandstone, very fine to fine, slightly to moderately silty, lime cemented, light gray	506	540
Silt, moderately to very sandy, very fine to fine, moderately to very limey, light brownish gray	540	562
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, moderately clayey, moderately limey, dark brown	562	600

Test Hole 95-HP-80

Location: T. 21N., R. 34W., 20AC
Date drilled: 9-24-80
Ground altitude: 3400 feet (Carr Lake 15 minute quadrangle)
Depth to water:
Total depth: 1000 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, very sandy, very fine to fine, slightly clayey, yellow brown	0	20
Sand, very fine to fine, moderately silty, yellow brown	20	66
Silt, moderately to very sandy, very fine to fine, slightly clayey, bluish gray	66	68
Sand, very fine to medium, moderately silty, bluish gray	68	92
Silt, very sandy, very fine to fine, moderately clayey, bluish gray	92	104
Sand, very fine to fine, moderately silty, bluish gray	104	108
Silt, moderately sandy, slightly to moderately clayey, bluish gray	108	113
Sand, very fine to fine, moderately silty, slightly clayey, bluish gray	113	124
Silt, slightly to moderately clayey, moderately to very sandy, very fine to fine, blue gray to gray	124	136
Sand, very fine to fine, trace medium, slightly silty, gray	136	146
Silt, moderately clayey, slightly to moderately sandy, bluish gray	146	152
Sand, very fine to fine, moderately to very silty, slightly clayey, gray	152	161
Silt, moderately to very clayey, slightly sandy, gray	161	180
Sand, very fine to fine, moderately clayey, bluish gray	180	186
Silt, slightly to moderately clayey, moderately sandy, gray	186	190
Sand, very fine to fine, moderately clayey, gray	190	194
Silt, slightly sandy, moderately clayey, gray	194	200
Sand, very fine to medium, slightly to moderately silty, silt seam at 210 feet, gray	200	228
Silt, very sandy, moderately clayey, gray	228	233
Sand, very fine to fine, trace medium to very coarse, moderately silty, slightly clayey, gray	233	246
Silt, moderately clayey, slightly to moderately sandy, gray	246	249
Sand, very fine to very coarse, trace fine to medium gravel, slightly silty	249	290
Tertiary System, Ogallala Group:		
Sand to sandstone, very fine to fine, rootlets, slightly to moderately silty, greenish gray	290	374
Sand to sandstone, very fine to coarse, trace fine gravel, rootlets, slightly silty, greenish gray	374	415
Sand to sandstone, very fine to medium, slightly silty, slightly clayey, greenish gray	415	460
Sandstone, very fine to medium, trace coarse, moderately silty, very limey, lime cemented, light gray	460	505

Sand, very fine to medium, trace coarse to very coarse, rootlets, slightly to moderately silty, slightly limey, gray	505	535
Silt, very sandy, very fine to medium, moderately clayey, gray	535	548
Sand to sandstone, very fine to medium, trace coarse, rootlets, slightly to very silty, clay seam at 626 feet, gray	548	637
Silt, moderately to very clayey, moderately sandy, very limey, gray	637	642
Sand to sandstone, very fine to medium, in part limey, silt and siltstone seams, gray	642	688
Sandstone, very fine to medium, trace coarse, very silty, moderately to very limey, lime cemented, light gray	688	723
Sand to sandstone, very fine to fine, moderately silty, slightly to moderately clayey, slightly limey, trace rootlets, gray	723	745
Sandstone, very fine to fine, moderately to very silty, very limey, lime cemented, light gray	745	765
Sand, very fine to medium, trace coarse, slightly to moderately silty, gray	765	784
Silt, very sandy, very fine to medium, in part limey, slightly to moderately clayey, gray	784	834
Sand to sandstone, very fine to fine, trace medium, rootlets, slightly silty, slightly clayey, olive	834	871
Silt to siltstone, moderately sandy, very fine to medium, slightly to moderately clayey, olive	871	902
Silt, moderately to very sandy, very fine to medium, in part limey, olive	902	914
Silt to siltstone, slightly sandy, slightly clayey, olive gray	914	929
Sand, very fine to medium, moderately to very silty, trace rootlets, light olive gray	929	954
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, in part limey, gray brown to reddish brown	954	1000

Test Hole 102-HP-80

Location: T. 19N., R. 27W., 1AAA
Date drilled: 10-10-80
Ground altitude: 2880 feet (Hoagland 15 minute quadrangle)
Depth to water:
Total depth: 800 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Top soil, silt, moderately clayey, dark gray brown	0	3
Sand, very fine to fine, very silty with black clay layers	3	10
Clay, very silty, dark gray to black	10	18
Sand, very fine to medium, trace coarse to very coarse, slightly silty	18	26
Silt, moderately sandy, pale yellow	26	40
Sand, very fine to medium, moderately to very silty, pale yellow to yellow	40	49
Silt, moderately to very sandy, very fine to fine, slightly clayey, pale yellow	49	74
Sand, very fine to fine, moderately to very silty, pale yellow	74	83
Silt, moderately sandy, very fine to fine, trace medium to coarse, pale yellow	83	93
Sand, very fine to fine, trace medium to coarse, moderately to very silty, pale yellow	93	96
Silt, moderately sandy, very fine to medium, pale brown	96	104
Sand, very fine to medium, moderately to very silty, slightly limey, pale brown	104	111
Silt, clay streaks, slightly to moderately sandy, white to gray to pale yellow	111	150
Sand, very fine to very coarse, trace fine gravel, moderately silty	150	175
Sand and gravel, fine sand to fine gravel, trace medium gravel, much very coarse sand to fine gravel	175	190
Tertiary System, Ogallala Group:		
Sandstone, very fine to fine, moderately silty, trace rootlets and seed fragments, grayish brown	190	206
Silt, very sandy, very fine to medium, trace coarse, slightly clayey, trace rootlets, pale olive yellow	206	219
Sandstone, very fine to medium, limey, lime cemented, pale olive to pale olive gray	219	241
Silt, very sandy, very fine to medium, moderately limey, white to pale olive	241	251
Sand to sandstone, very fine to medium, trace coarse, lime cemented 254 to 255 feet, pale olive to white	251	261
Silt, moderately to very sandy, very fine to medium, pale olive yellow	261	267
Sand, very fine to medium, much fine, slightly silty, brown	267	305
Sandstone to sand, very fine to fine, slightly silty, brown	305	313
Sand, very fine to medium, slightly to moderately silty, yellow brown	313	325

Sandstone, very fine to fine, slightly to moderately silty, limey and lime cemented, white to brownish yellow to very pale brown	325	352
Silt to siltstone, moderately sandy, moderately clayey, moderately limey, white to pale yellow	352	358
Sand to sandstone, very fine to medium, trace coarse, trace rootlets, slightly silty, light yellow brown	358	399
Silt, slightly to moderately sandy, very fine to fine, slightly clayey, pale yellow	399	410
Sandstone, very fine to fine, slightly limey, pale olive	410	420
Sand to sandstone, very fine to medium, slightly silty, trace rootlets, brown	420	473
Sandstone, very fine to medium, lime cemented, white	473	475
Sand to sandstone, very fine to medium, slightly silty, slightly limey, pale olive	475	490
Silt, moderately to very sandy, very fine to fine, slightly clayey, slightly limey, pale yellow	490	499
Sandstone to sand, very fine to medium, trace coarse to very coarse, moderately to very silty, moderately limey, trace rootlets, olive to pale olive gray	499	522
Silt with interbedded sand and sandstone, very fine to medium, trace coarse, slightly limey, trace olive siltstone, pale olive to pale brown	522	592
Sand, very fine to fine, olive gray	592	603
Sandstone to sand, very fine to medium, much fine, very silty, trace rootlets, slightly clayey, in part limey, pale olive to olive	603	655
Tertiary system, Arikaree Group:		
Silt to siltstone, slightly to moderately sandy, trace pale olive claystone, gray brown to pale olive gray	655	678
Sandstone, very fine to fine, moderately silty with siltstone seams, pale brown	678	720
Sand, very fine to very coarse, trace fine gravel, much fine, moderately silty, in part limey, olive to pale brown	720	754
Silt to siltstone, slightly to moderately clayey, slightly sandy, light yellow brown to pale brown	754	778
Sand, very fine to medium, moderately to very silty, brown	778	800

Test Hole 3-B-72

Location: T., 16N, R. 41W, 30DDD
Date drilled: 5-24-72
Ground Altitude: 3304 feet (Ruthton 7.5 minute quadrangle)
Depth to water: 79 feet
Total Depth: 140 feet

Material description	Depth in feet	
	From	To
Quaternary System, Undifferentiated:		
Top soil, sandy, fine to medium, slightly to moderately silty, dark olive	0	1.5
Sand, medium to very coarse, trace fine gravel, much coarse gravel	1.5	27
Silt, very sandy, medium to coarse, slightly clayey, dark brown	27	38
Sand and gravel, medium to very coarse sand and fine gravel, rootlets, brown	38	45
Tertiary System, White River Group, Brule Formation:		
Siltstone, slightly sandy, limey lenses, moderately clayey, dark yellow brown	45	140

Test Hole 4-B-72

Location: T. 16N., R. 41 W., 7DDD
Date Drilled: 5-25-72
Ground Altitude: 3573 feet (Ruthton 7.5 minute quadrangle)
Depth to Water: 61.8 feet
Total Depth: 310 feet

Material description	Depth in Feet From	To
Quaternary System, Undifferentiated:		
Silt, moderately sandy, medium sand, slightly clayey, dark gray to olive gray	0	6.5
Sand and gravel, medium to very coarse sand and fine to medium gravel	6.5	30
Clay, slightly silty, reddish brown	30	42
Silt, slightly clayey, slightly sandy, very fine, dark reddish brown	42	50
Sand, medium to coarse	50	52
Silt, moderately clayey, reddish brown	52	53
Sand, medium to coarse	53	55
Silt, moderately clayey, reddish brown	55	59
Sand, medium to very coarse, trace gravel, slightly silty, reddish brown	59	62
Silt, moderately to very sandy, very fine to fine, pale brown	62	86
Tertiary System, Ogallala Group:		
Sand to sandstone, fine to coarse, trace very coarse sand and fine gravel, trace rootlets, pale brown	86	109
Sand to sandstone, fine to coarse, much medium, trace very coarse sand and fine gravel, moderately silty, pale brown	109	118
Sand, fine to coarse, slightly silty, light yellow brown	118	122
Sandstone to sand, fine to coarse, slightly to moderately silty, seed fragments, light yellow brown	122	144
Sand to sandstone, very fine to medium, rootlets, trace seeds, light yellow brown	144	152
Sandstone, very fine to medium, trace coarse, rootlets, slightly silty, light brown	152	186
Tertiary system, White River Group, Brule Formation:		
Silt to siltstone, in part ashy and limey, slightly sandy, very fine, yellow brown	186	310

Test Hole 5-B-72

Location: T. 17N., R. 41W., 28CCB
Date Drilled: 5-20-72
Ground Altitude: 3668 feet (Old Baldy 7.5 minute quadrangle)
Depth to Water: 89.5 feet
Total Depth: 320 feet

Material description	Depth in Feet	
	From	To
Quaternary System, Undifferentiated:		
Road fill	0	3
Sand, fine to very coarse, slightly to moderately silty, trace gravel, dark to light olive brown	3	8
Sand and gravel, medium to very coarse sand and fine to medium gravel, trace coarse gravel	8	16
Sand, fine to coarse, trace very coarse sand and fine gravel, slightly silty, brown	16	32
Silt, moderately to very sandy, very fine to medium, light olive brown	32	84
Sand and gravel, fine sand to fine gravel, trace rootlets	84	117
Silt, very sandy, very fine to medium, light gray to light reddish brown	117	130
Tertiary System, Ogallala Group:		
Sandstone to sand, very fine to fine, rootlets, seed fragments, brown	130	146
Sandstone to sand, very fine to fine, rootlets, hackberry seeds, light gray to light reddish brown	146	172
Sand to sandstone, very fine to very coarse, trace fine gravel, slightly silty, very pale brown	172	187
Sandstone, very fine to fine, moderately to very silty, limey concretions, light gray to yellow brown	187	204
Sand and gravel, very fine to very coarse sand and fine gravel	204	213
Silt, very sandy, very fine to fine, very pale brown	213	216
Sandstone to sand, very fine to fine, trace rootlets, slightly silty, slightly to moderately limey, very pale brown	216	230
Silt, very sandy, very fine to fine, very slightly clayey, light gray to reddish brown	230	232
Sandstone to sand, very fine to fine, slightly silty, olive green to pale brown	232	240
Silt, moderately to very sandy, very fine to fine, moderately limey, pale brown	240	246
Sandstone to sand, very fine to fine, pale olive brown	246	250
Siltstone to silt, moderately to very sandy, very fine to fine, moderately limey, pale brown	250	263
Tertiary System, White River Group, Brule Formation:		
Siltstone, slightly sandy, slightly ashy, dark brown	263	320

Test Hole 6-B-72

Location: T. 17 N., R. 41W., 11CCC
Date Drilled: 5-27-72
Ground Altitude: 3682 feet (Old Baldy 7.5 minute quadrangle)
Depth to Water: 40 feet
Total Depth: 400 feet

Material description	Depth in Feet From	To
Quaternary System, Undifferentiated:		
Road fill, very sandy	0	6
Sand, very fine to fine, moderately silty, slightly clayey, light yellow brown	6	10
Sand, very fine to fine, trace medium to coarse, light yellow brown	10	23
Sand, very fine to medium, moderately silty	23	27
Sand, very fine to medium, slightly to moderately silty, light olive gray	27	33
Sand, very fine to medium, trace coarse, moderately to very silty, light olive gray	33	38
Sand and gravel, medium to very coarse sand and fine gravel	38	58
Sand, very fine to medium, trace coarse, moderately to very silty, pale olive to light olive gray	58	114
Sand and gravel, fine to very coarse sand and fine gravel	114	135
Silt, slightly to very sandy, very fine to medium, slightly to very clayey, brown to yellow brown	135	174
Sand, fine to coarse, trace very coarse sand and fine gravel, slightly to moderately silty, trace rootlets	174	180
Siltstone, slightly to moderately sandy, very fine to fine, in part lime cemented, brown to very pale brown	180	190
Tertiary System, Ogallala Group:		
Sandstone, very fine sand, moderately to very silty, rootlets, moderately to very limey, pale brown	190	225
Sandstone, very fine to fine, trace siltstone, in part limey, light olive brown to light olive gray	225	243
Siltstone, moderately clayey, trace managanese stain, brown	243	245
Sandstone to sand, very fine to fine, slightly to moderately silty, brown	245	254
Sandstone, very fine to fine, moderately to very silty, slightly clayey, in part moderately to very limey, siltstone seams with manganese staining, brown to very pale brown to brownish gray to white	254	308
Tertiary System, White River Group, Brule Formation:		
Siltstone, very slightly sandy, very fine, limey, in part ashy, brown to pale brown to yellow brown	308	400

Test Hole 7-B-72

Location: T. 18N., R. 41W., 26DDC
Date drilled: 5-28-72
Ground Altitude: 3705 feet (Old Baldy 7.5 minute quadrangle)
Depth to Water: 70 feet
Total Depth: 530 feet

Material description	Depth in Feet From	To
Quaternary System, Undifferentiated:		
Silt, very sandy, very fine to medium, limey zones, dark gray to gray to light brownish gray	0	10
Sand, very fine to coarse, slightly silty, light brown	10	48
Sand and gravel, medium to very coarse sand and fine gravel	48	75
Sand, very fine to coarse, trace very coarse sand and fine gravel	75	90
Sand, very fine to very coarse, trace fine to medium gravel, slightly to moderately silty	90	124
Sand and gravel, fine to very coarse sand and fine gravel, yellow silt 144.8 to 145.2 feet	124	163
Sand, very fine to coarse, trace very coarse sand and fine gravel, slightly silty, gray green to light olive green	163	206
Sand, very fine to medium, trace coarse to very coarse, moderately silty, trace light green siltstone, light brown to pale olive	206	222
Sand, fine to very coarse, trace fine gravel, trace rootlets, in part slightly silty, light brown	222	295
Tertiary System, Ogallala Group:		
Siltstone, moderately sandy, very fine to fine, very limey, light gray	295	302
Sand to sandstone, very fine to fine, trace medium to coarse, pale olive	302	306
Silt, slightly sandy, very fine, slightly to moderately clayey, pale yellow	306	312
Sand to sandstone, very fine to medium, limey and lime cemented, rootlets, seed and bone fragments, light olive and brown	312	360
Tertiary System, Arikaree Group:		
Sandstone, very fine to fine, slightly to moderately limey, slightly silty, brown	360	378
Silt, slightly limey, very pale brown	378	380
Sandstone, very fine to medium, slightly to moderately silty, in part limey, light brownish gray	380	445
Sandstone, very fine to fine, some black sand, slightly to moderately silty, light brownish gray	445	456
Silt, slightly to moderately sandy, very fine, trace sandstone seams, slightly to moderately limey, very pale to pale brown	456	480

Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, very slightly sandy, in part limey, with managanese stain, light yellow brown	480	530

Test Hole 8-B-72

Location: T. 18N., R. 41W., 11DBC
Date drilled: 5-28-72
Ground Altitude: 3716 feet (Rackett 15 minute quadrangle)
Depth to Water: 14.6 feet
Total depth: 600 feet

Material description	Depth in Feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, trace coarse to very coarse, slightly to moderately silty, grayish brown	0	61
Silt, very sandy, very fine to fine, grayish brown	61	66
Sand and gravel, fine to very coarse sand and fine to medium gravel	66	106
Silt, very sandy, fine to very coarse, slightly clayey, olive yellow	106	108
Sand, fine to very coarse, trace fine gravel	108	115
Clay, slightly silty, slightly sandy, very fine, olive gray	115	121
Sand and gravel, fine to very coarse sand and fine gravel	121	134
Sand, medium to very coarse, trace fine gravel, moderately silty, light yellow brown	134	140
Silt, very sandy, fine to medium, light grayish brown	140	150
Sand and gravel, medium to very coarse sand and fine gravel	150	170
Sand to sandstone, very fine to medium, trace coarse to very coarse sand and fine gravel, trace rootlets and trace siltstone seams, light olive to brown	170	202
Sandstone, very fine to fine, moderately silty, light brown	202	218
Silt and siltstone, slightly clayey, moderately sandy, very fine to fine, light gray to pale olive	218	232
Tertiary System, Ogallala Group:		
Sand, very fine to very coarse, trace fine gravel, slightly clayey with reworked siltstone fragments, trace rootlets, pale yellow	232	252
Siltstone, slightly sandy, very fine, trace manganese staining, brown	252	264
Sand, medium to very coarse, trace fine gravel	264	268
Sandstone, fine to very coarse, moderately silty with siltstone seams, many rootlets, yellow brown to brown	268	280
Silt, very sandy, very fine to medium, light brown	280	287
Sand and gravel, fine to very coarse sand and fine gravel, thin silt lenses	287	304
Sandstone, very fine to fine, trace medium, slightly to moderately silty, rootlets, light brown to brown	304	383
Tertiary System, Arikaree Group:		
Silt, moderately sandy, very fine, rootlets, brownish yellow	383	386
Sandstone, very fine to fine, slightly to moderately silty, slightly to very limey, in part lime cemented, trace rootlets, pale brown to brown to yellow brown	386	512
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, slightly to moderately clayey, in part limey and very slightly sandy, very fine, pale brown to yellow brown	512	600

Test Hole 9-B-72

Location: T. 19N., R. 40W., 30CCC
Date Drilled: 6-5-72
Ground Altitude: 3740 feet (Velma 15 minute quadrangle)
Depth to Water:
Total Depth: 640 feet

Material description	Depth in Feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, trace medium to coarse, slightly silty, paleosol 15 to 18 feet, brown to dark gray brown	0	32
Sand, very fine to medium, moderately silty, light brown	32	37
Sand, fine to coarse, trace very coarse, slightly silty, light brown to pale yellow	37	64
Sand, very fine to coarse, slightly clayey, moderately silty, light olive gray to olive green	64	76
Silt, very sandy, very fine to fine, trace medium to coarse, slightly clayey, pale olive	76	106
Sand, very fine to fine, trace medium, slightly silty, pale olive	106	122
Silt, very sandy, very fine to fine, very slightly clayey, pale olive	122	125
Sand and gravel, fine to very coarse sand and fine to medium gravel, trace coarse gravel	125	176
Silt, very sandy, very fine to medium, slightly clayey, light olive gray	176	179
Sand and gravel, fine to very coarse sand and fine gravel	179	192
Sand, very fine to medium, slightly to moderately silty, pale olive	192	203
Sand and gravel, fine to very coarse sand and fine to coarse gravel, slightly silty	203	213
Sand, very fine to medium, trace coarse, limey fragments with manganese stain, rootlets, light brown to pale olive	213	234
Tertiary System, Ogallala Group:		
Silt, diatomaceous, white	234	244
Sand, very fine to medium, moderately silty, light gray	244	252
Sandstone to sand, very fine to medium, trace coarse, rootlets, trace olive green silt, brown to pale olive	252	300
Silt, very sandy, very fine to fine, pale yellow	300	305
Sand, very fine to medium, light brown	305	312
Sandstone, very fine to fine, rootlets, seed fragments, slightly silty, pale olive to olive	312	360
Silt, very sandy, very fine to fine, slightly clayey, pale yellow	360	364
Sandstone, very fine to fine, trace rootlets, slightly silty, olive to olive yellow	364	409
Silt, very sandy, very fine to fine, trace medium, pale yellow	409	413

Sandstone, very fine to fine, slightly silty, olive	413	419
Silt, very sandy, very fine to fine, pale yellow	419	421
Sandstone, very fine to fine, trace medium to coarse, trace rootlets, slightly silty, light gray	421	470
Tertiary System, Arikaree Group:		
Sandstone, very fine to fine, moderately to very silty, slightly to very clayey, slightly to very limey and lime cemented, interbedded silts and sands, brown to light gray to pale olive to white	470	598
Silt, slightly sandy, very fine, very limey, white	598	605
Siltstone, slightly sandy, very fine, moderately limey, slightly clayey, brown	605	640

Test Hole 16-B-70

Location: T. 17N., R. 28W., 34DDD
Date drilled: 8-8-70
Ground altitude: 3050 feet (Stapleton 7.5 minute quadrangle)
Depth to water: 285 feet (caved)
Total depth: 770 feet

Material description	Depth in Feet	
Quaternary System, Undifferentiated:		
Silt, slightly clayey, slightly sandy, very fine, dark brown to brownish gray	0	18
Sand, very fine to fine, trace medium	18	21
Silt, slightly clayey, very sandy, very fine, iron staining, pale yellow to yellow brown	21	25
Sand, very fine to fine, much very fine, trace medium, slightly silty, brownish yellow	25	40
Silt, slightly to moderately clayey, slightly sandy, very fine, pale brown to brown	40	70
Silt, moderately to very sandy, very fine to fine, trace limey areas, slightly clayey, pale brown	70	86
Silt, slightly to moderately clayey, with thin interbedded very sandy seams, very fine to fine, trace medium, gray to light greenish gray	86	125
Sand, very fine to fine, trace medium, much very fine, slightly silty, olive	125	130
Silt, slightly to moderately clayey, moderately sandy, very fine to fine, light greenish gray	130	142
Sand, very fine to fine, trace medium, much fine, light gray to olive	142	160
Silt, very sandy, very fine to fine, slightly clayey, light olive gray	160	164
Sand, very fine to fine, much very fine, light olive gray	164	182
Silt, slightly clayey, very sandy, very fine to fine, very limey, light gray	182	194
Sand, very fine, trace medium, slightly silty, in part limey, light olive gray	194	218
Silt, slightly to moderately sandy, very fine to fine, slightly to moderately clayey, limey areas, light brownish gray	218	242
Sand and gravel, very fine sand to medium gravel, trace coarse to very coarse gravel, approximately 70% gravel	242	273
Silt, slightly clayey, brownish gray	273	275
Sand and gravel, very fine sand to medium gravel, trace coarse to very coarse gravel, rare silt seams, approximately 70% gravel	275	330
Tertiary System, Ogallala Group:		
Sand to sandstone, very fine to coarse, trace very coarse, trace rootlets, olive	330	373
Sand and gravel, very fine sand to fine gravel, trace medium to coarse gravel, approximately 50% gravel	373	387

Silt, very sandy, very fine to medium, trace coarse, much medium, light olive gray	387	402
Sand and gravel, very fine to medium sand and fine to medium gravel, slightly silty, slightly limey	402	420
Sandstone, very fine to fine, slightly to moderately silty, lime cemented, light gray	420	430
Sand, very fine to medium, rootlets, limey areas, pale yellow	430	444
Silt, slightly clayey, moderately to very sandy, very fine to fine, with sandstone seams, limey, pale yellow	444	456
Sand, very fine to coarse, much medium	456	484
Sandstone, very fine, very silty, very limey to lime cemented, white	484	486
Sand to sandstone, very fine to medium, trace coarse, in part silty, olive	486	517
Silt, slightly clayey, very sandy, very fine to fine, limey, olive and white	517	526
Sandstone, very fine to fine, moderately silty, very limey, ashy, light gray to olive gray	526	531
Silt, slightly clayey, very sandy, very fine to fine, trace medium, pale yellow	531	540
Sand to sandstone, very fine to medium, trace coarse, much medium, slightly silty, trace rootlets, olive to pale yellow	540	590
Sand, very fine to very coarse, much medium, trace fine gravel, trace rootlets, slightly silty	590	633
Silt, moderately clayey, moderately to very sandy, very fine to medium, limey, light olive gray to pale yellow	633	642
Sandstone to sand, very fine to medium, trace coarse, much medium, in part lime cemented, trace rootlets, light brown to olive gray	642	653
Silt, slightly clayey, very sandy, very fine to fine, limey, white to pale yellow	653	658
Sandstone, very fine to medium, much fine, rootlets, limey areas, pale yellow	658	677
Silt, slightly clayey, very sandy, very fine to fine, limey, light gray	677	694
Sand to sandstone, very fine to medium, moderately silty, limey, olive gray	694	701
Silt, moderately sandy, very fine to fine, marly, white	701	704
Sand to sandstone, very fine to medium, lime cemented, light olive gray	704	714
Silt, slightly clayey, very sandy, very fine to fine, in part limey with sand to sandstone seams, light olive gray to pale yellow	714	738
Sandstone, very fine to fine, trace medium, slightly silty, in part limey, light olive gray	738	746
Silt, slightly clayey, very sandy, very fine to fine, trace medium, in part limey, light gray to pale yellow	746	770

Test Hole 17-B-70

Location: T. 19N., R. 28W., 36CCD
Date drilled: 8-10-70
Ground altitude: 2952 feet (Hoagland 15 minute quadrangle)
Depth to water: 23.47 feet
Total depth: 700 feet

Material description	Depth in Feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to coarse, slightly to very silty, dark grayish brown to brown	0	8
Silt, slightly to moderately clayey, slightly sandy, grayish brown	8	15
Sand, very fine to medium light gray to light brown	15	60
Sand, very fine to medium, slightly to very silty, slightly clayey, light gray	60	110
Sand, very fine to medium, slightly silty, light gray	110	137
Sand, very fine to medium, moderately silty, light gray	137	140
Sand, very fine to fine, light gray	140	152
Silt, slightly clayey, very sandy, very fine to fine, trace medium, light brown	152	190
Sand and gravel, very fine sand to medium gravel, 60 to 70% gravel	190	228
Silt, slightly clayey, light brown	228	231
Sand and gravel, very fine sand to medium gravel, 75% gravel	231	245
Tertiary System, Ogallala Group:		
Silt, slightly to very clayey, moderately to very sandy, very fine to medium, rootlets, pale yellow to light brownish gray	245	275
Sandstone to sand, very fine to medium, in part limey, rootlets, light olive gray	275	402
Silt, moderately clayey, very sandy, very fine to fine, trace sandstone, limey to lime cemented, pale yellow to white	402	410
Sandstone to sand, very fine to medium, slightly to moderately silty, in part lime cemented, rootlets, pale yellow	410	422
Silt, slightly clayey, very sandy, very fine to medium, pale yellow	422	442
Sandstone to sand, very fine to medium, moderately silty, thin limey silt seams, pale olive to pale yellow to light gray	442	498
Sand to sandstone, very fine to very coarse, much medium, pale olive	498	542
Sand, very fine to medium, trace coarse to very coarse, rootlets, pale olive	542	554

Sandstone to sand, very fine to medium, trace coarse to very coarse, slightly to moderately silty, trace rootlets, pale olive	554	568
Sand, very fine to medium, trace coarse, trace rootlets, light gray	568	592
Sandstone to sand, very fine to medium, trace coarse, slightly silty, light gray	592	599
Sand, very fine to coarse, trace very coarse, light gray	599	620
Sandstone to sand, very fine to very coarse, slightly silty, light gray	620	630
Silt, very sandy, very fine to medium, trace rootlets, pale yellow to pale olive	630	654
Sandstone to sand, very fine to medium, moderately silty, trace rootlets, pale olive	654	668
Silt, slightly to moderately clayey, slightly sandy, very fine to fine, pale yellow.	668	700

Test Hole 18-B-70

Location: T. 21N., R. 28W., 35DBA
Date drilled: 8-17-70
Ground altitude: 2983 feet (Cody Lake 15 minute quadrangle)
Depth to water: 97.1 feet
Total depth: 700 feet

Material description	Depth in Feet From	To
Quaternary System, Undifferentiated:		
Silt, very sandy, very fine to fine, trace ironstone, dark grayish brown to pale brown	0	21
Sand, very fine to medium, trace coarse, slightly to moderately silty, light gray	21	60
Silt, slightly to moderately clayey, very sandy, very fine to fine, light olive gray to light brown	60	96
Sand, very fine to coarse, trace very coarse, much medium, slightly silty, light gray	96	104
Silt, moderately clayey, slightly to very sandy, very fine to medium, trace coarse to very coarse and fine gravel, brown	104	142
Sand, very fine sand to fine gravel, moderately silty, trace medium gravel, much coarse sand	142	150
Sand, very fine sand to fine gravel, very silty, much medium sand	150	157
Sand and gravel, very fine sand to medium gravel, trace coarse gravel, much very coarse sand, slightly silty, approximately 60% gravel	157	190
Tertiary System, Ogallala Group:		
Silt, slightly to moderately clayey, very sandy, very fine to medium, light gray to pale olive	190	203
Sandstone, very fine to medium, trace coarse to very coarse, moderately to very silty, rootlets, olive to olive gray	203	215
Sand, very fine to medium, trace coarse, much medium, slightly silty, olive gray	215	238
Silt, moderately clayey, lime cemented, slightly to moderately sandy, very fine to fine, pale yellow	238	245
Sand to sandstone, very fine to medium, much medium, trace coarse to very coarse, rootlets, in part lime cemented, olive gray to pale yellow	245	299
Sandstone, very fine to medium, slightly silty, limey, rootlets, pale olive to pale yellow	299	334
Silt, slightly to moderately clayey, slightly sandy, very fine to fine, slightly limey, pale yellow	334	342
Sand to sandstone, very fine to medium, limey areas, rootlets, pale olive	342	357
Silt, slightly clayey, moderately sandy, very fine to medium, pale olive	357	362

Sandstone to sand, very fine to fine, many rootlets, slightly to moderately silty, pale olive	362	372
Silt, slightly clayey, very sandy, very fine to medium, pale olive	372	376
Sandstone, very fine to medium, lime cemented, pale yellow	376	388
Sandstone, very fine to medium, moderately to very silty, marly to limey, slightly clayey, pale olive gray to pale yellow	388	422
Sand, very fine to very coarse, trace fine gravel, much medium, rootlets, olive	422	442
Sandstone, very fine to coarse, much fine, moderately to very silty, pale olive	442	448
Sand to sandstone, very fine to coarse, slightly silty, pale olive	448	458
Silt to siltstone, limey, light gray	458	468
Sand, very fine to medium, much fine, olive	468	480
Sand and gravel, very fine sand to fine gravel, much coarse to very coarse sand, trace siltstone fragments	480	500
Sandstone to sand, very fine to medium, trace coarse, in part lime cemented, moderately silty, light gray	500	570
Silt to siltstone, moderately clayey, limey, very pale brown to white	570	582
Interbedded silt and sandstone, very fine to coarse sand, moderately clayey silt, in part limey, light olive gray	582	608
Sand to sandstone, very fine to very coarse, much coarse, slightly silty, light olive gray	608	630
Silt to siltstone, moderately clayey, in part limey, pale yellow	630	638
Sand, very fine to very coarse, trace fine gravel, much coarse, reworked siltstone	638	668
Silt to siltstone, moderately clayey, light olive gray	668	700

Test Hole 34-B-71

Location: T. 20N., R. 32W., 2BAA
Date drilled: 8-22-71
Ground altitude: 3330 feet (Tryon 15 minute quadrangle)
Depth to water: 47 feet
Total depth: 800 feet

Material description	Depth in Feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, slightly to moderately silty, dark brown to olive	0	12
Sand very fine to medium, very silty, olive	12	15
Sand, very fine to medium, slightly silty, pale olive	15	40
Sand, very fine to medium, very silty, olive gray	40	44
Sand, very fine to medium, slightly silty, pale olive	44	50
Sand, very fine to medium, slightly to moderately silty, pale olive	50	73
Silt, very sandy, very fine to medium, pale yellow	73	82
Sand, very fine to medium, slightly silty, pale yellow	82	101
Silt, very sandy, very fine to medium, pale olive	101	104
Sand, very fine to medium, slightly silty, pale olive	104	114
Silt, very sandy, very fine to medium, trace rootlets, olive gray	114	116
Sand, very fine to medium, slightly to moderately silty, pale olive	116	212
Sandstone, very fine to medium, moderately to very silty, slightly clayey, pale olive to brown	212	242
Sand, very fine to medium, slightly silty, pale olive	242	252
Sandstone, very fine to medium, moderately silty, slightly clayey, pale olive	252	256
Sand to sandstone, very fine to medium, slightly to moderately silty, slightly clayey, pale olive to light gray	256	275
Tertiary System, Ogallala Group:		
Sand, very fine to medium, very silty, slightly to moderately clayey, light brown to reddish yellow	275	303
Sandstone, very fine to medium, trace coarse, moderately clayey, yellow red to brown	303	333
Sand to sandstone, very fine to medium, trace coarse to very coarse, slightly silty, rootlets, light gray brown to olive	333	352
Sand and gravel, very fine sand to coarse gravel, trace very coarse gravel, 25 to 30% gravel	352	364
Sand, very fine to very coarse, trace fine gravel, very silty, pale olive	364	393
Siltstone, moderately sandy with sandstone seams, very fine to medium, trace rootlets, light olive gray	393	416
Sand to sand and gravel, very fine sand to fine gravel, moderately silty, rootlets, olive	416	434

Silt, very sandy, very fine to very coarse, olive	434	438
Sand, very fine to medium, trace coarse to very coarse and fine gravel, slightly silty, olive	438	464
Silt, very sandy, very fine to medium, olive	464	467
Sand to sandstone, very fine to medium, moderately limey, gray to olive	467	482
Sandstone, very fine to medium, slightly to moderately silty, moderately limey, olive to light gray	482	489
Sandstone to sand, very fine to medium, slightly silty, white siltstone seam at 537 feet, slightly to moderately limey, olive to light gray to white	489	534
Sandstone, very fine to medium, moderately to very silty, marly, limey, white	534	544
Sandstone, very fine to fine, slightly silty, lime cemented, white	544	550
Silt to siltstone, moderately to very sandy, very fine to fine, slightly to moderately clayey, slightly to moderately limey, trace manganese stain, light yellow brown to reddish brown to pale olive to white	550	620
Sand to sandstone, very fine to medium, slightly to moderately silty, pale yellow to pale olive	620	630
Siltstone, very sandy, very fine to medium, light olive gray and reddish yellow	630	634
Sand to sandstone, very fine to medium, slightly to moderately silty, light olive gray with reddish yellow silts	634	654
Siltstone, slightly to very sandy, moderately limey, slightly to moderately clayey, olive gray to brown	654	667
Sand to sandstone, very fine to medium, very silty, light olive gray with reddish yellow	667	673
Siltstone, slightly to moderately sandy, very fine to medium, light olive gray with reddish yellow	673	676
Sand to sandstone, very fine to coarse, slightly moderately silty with siltstone seams, in part slightly limey, brown and olive to pale olive	676	760
Silt, very sandy, very fine to fine, trace medium, slightly to moderately clayey, in part slightly limey, pale olive yellow to very pale olive	760	775
Sand, very fine to fine, very silty, moderately to very limey, rootlets, pale olive to olive brown	775	784
Silt, moderately sandy, very fine to fine, moderately limey, pale yellow	784	790
Sand to sandstone, very fine to fine, trace rootlets, slightly to moderately silty, pale olive green	790	800

Test Hole 35-B-71

Location: T. 18N., R. 32W., 1CCC
Date drilled: 8-30-71
Ground altitude: 3240 feet (Tryon 15 minute quadrangle)
Depth to water:
Total depth: 800 feet

Material Description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, moderately to very sandy, very fine to fine, brown	0	8
Sand, very fine to medium, moderately to very silty, light brown	8	21
Sand, very fine to medium, trace coarse, light brown	21	26
Sand, very fine to medium, moderately silty, light brown	26	50
Sand, very fine to medium, light brown	50	56
Sand, very fine to medium, in part moderately silty, light brown	56	79
Silt, moderately clayey, slightly sandy, very fine to fine, pale yellow	79	89
Sand, very fine to medium, light brown	89	100
Sand, very fine to medium, much fine, slightly to moderately silty, silty seams, trace snail shells, light brown	100	226
Tertiary System, Ogallala Group:		
Silt, moderately clayey, very sandy, very fine to medium, limey, light gray to white	226	238
Sand to sandstone, very fine to coarse, trace very coarse, slightly to moderately silty in places, rootlets, light brown	238	250
Silt, moderately to very clayey, very sandy, very fine to very coarse, trace rootlets, light brown	250	256
Sand and gravel, fine sand to medium gravel, granitic	256	272
Silt, slightly to moderately clayey, slightly to moderately sandy, very fine, light gray	272	276
Sand, fine to very coarse, slightly to moderately silty, rootlets, pale brown	276	280
Sandstone to sand, very fine to medium, in part lime cemented, many rootlets, pale brown to reddish brown	280	296
Silt, slightly to moderately sandy, very fine to fine, slightly to moderately clayey, reddish brown with light olive	296	305
Sandstone, very fine to fine, clayey silt seams, many rootlets, reddish brown and olive	305	330
Sand to sandstone, very fine to fine, in part lime cemented, rootlets, brown to olive	330	385
Sandstone to sand, very fine to fine, trace medium, slightly silty, in part moderately limey, brown to olive	385	488
Sandstone to sand, very fine to fine, trace medium, rootlets, moderately silty, light brown to light olive brown	488	550
Sandstone, very fine to fine, very limey, white	550	553
Sandstone to sand, very fine to fine, trace medium, trace rootlets, moderately silty, light brown to brown	553	604
Sand, very fine to medium, much medium, light brown	604	620
Silt, very sandy, very fine to medium, very pale olive	620	628

Sand, very fine to medium, trace coarse, trace red silt, brown	628	644
Sand, very fine to very coarse, much medium to coarse, trace rootlets	644	666
Interbedded sand, very fine to very coarse, much medium to coarse, trace fine gravel, and silt, moderately clayey, trace rootlets, pale olive	666	680
Sand, very fine to coarse, much medium, brown	680	750
Silt, very sandy, very fine to fine, slightly to moderately clayey, light brown	750	752
Sand, very fine to medium, trace rootlets, brown	752	759
Sand, very fine to medium, slightly to moderately silty, brown to light brown to white	759	765
Sand, very fine to medium, slightly silty, brown	765	771
Silt, moderately to very sandy, very fine to medium, pale brown to pale olive	771	779
Sand, very fine to medium, trace coarse to very coarse, slightly silty	779	786
Silt, moderately sandy, very fine to fine, very pale olive	786	790
Sand, very fine to medium, moderately silty, brown	790	800

Test Hole 36-B-71

Location: T. 19N., R. 38 W., 34ABC
Date drilled: 9-2-71
Ground altitude: 3655 feet (Arthur 15 minute quadrangle)
Depth to water:
Total depth: 800 feet

Material Description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine, very silty, dark brown to brown	0	12
Sand, very fine to coarse, much medium, light brown	12	50
Sand, very fine to fine, trace medium, moderately silty with silty seams, silt slightly to moderately clayey, light gray to brown	50	142
Silt, slightly to moderately clayey, slightly to very sandy, very fine, interbedded sand seams, dark greenish gray	142	160
Sand, very fine to medium, much fine, slightly silty, brown	160	174
Silt, slightly to moderately clayey, very sandy, very fine, light brown to brown	174	187
Sand and gravel, very fine sand to fine gravel, trace medium gravel, gray green	187	220
Tertiary System, Ogallala Group:		
Silt, very sandy, very fine to fine, trace medium, slightly to moderately clayey, gray green to olive green	220	247
Sand, very fine to medium, slightly silty, light brown	247	256
Silt, moderately clayey, very sandy, very fine to medium, trace coarse to very coarse, light brown	256	270
Sand and gravel, very fine sand to fine gravel, trace medium gravel, slightly silty, reddish brown	270	302
Silt, moderately clayey, slightly sandy, very fine to fine, brown to olive	302	310
Sand to sandstone, very fine to fine, trace medium to very coarse, slightly to moderately silty, trace rootlets, brown reddish brown	310	333
Silt, moderately clayey, moderately sandy, very fine to medium, pale yellow	333	336
Sandstone, very fine to fine, rootlets, seeds, slightly silty, brown	336	342
Sand to sandstone, very fine to medium, rootlets, brown	342	408
Sandstone to sand, very fine to medium, silty, in part limey, rootlets, olive brown	408	457
Silt, very sandy, very fine to fine, moderately clayey, pale olive to pale yellow	457	476
Sand, very fine to medium, slightly silty, trace rootlets, brown	476	483

36-B-71

Silt, very sandy, very fine to fine, moderately clayey, pale olive to pale yellow	483	488
Sand, very fine to medium, slightly to moderately silty, silt is pale olive to pale yellow, sand is brown	488	517

Silt to siltstone, slightly to moderately sandy, very fine to fine, slightly clayey, pale yellow to pale olive	517	527
Sand, very fine to medium, moderately silty, pale yellow to olive brown	527	533
Silt to siltstone, moderately to very clayey, slightly sandy, very fine to fine, manganese stains, pale olive to pale yellow	533	536
Sand to sandstone, very fine to medium, trace coarse, rootlets, pale gray to brown	536	556
Sandstone, very fine to medium, slightly silty, limey to lime cemented, rootlets, pale gray to white	556	572
Sand to sandstone, very fine to medium, rootlets, brown	572	586
Silt to siltstone, slightly sandy, very fine to medium, marly, olive green to white	586	596
Sand, very fine to medium, brown	596	605
Silt, moderately clayey, pale yellow to brown	605	608
Sand, very fine to very coarse, trace fine gravel, much medium, interbedded thin yellow to brown silt seams, brown	608	646
Silt, slightly to moderately sandy, very fine to medium, lime cemented, pale yellow to white	646	655
Sand to sandstone, very fine to very coarse, much medium to coarse, slightly silty, rootlets, brown	655	672
Silt, with interbedded sand, very fine to medium, lime cemented, moderately to very clayey, olive to white	672	682
Sand to sandstone, very fine to very coarse, trace fine gravel, rootlets	682	698
Silt, very sandy, very fine to fine, moderately clayey, pale olive to brown	698	702
Sand, very fine to fine, moderately silty, brown	702	705
Silt, moderately to very sandy, very fine to fine, brown to reddish brown	705	746
Silt to siltstone, moderately to very clayey, moderately to very limey, light brown and white	746	765
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, moderately to very clayey, slightly limey, light to dark reddish brown	765	800

Test Hole 33-B-71

Location: T. 22N., R. 32 W., 8BDD
Date drilled: 8-10-71
Ground altitude: 3255 feet (Dismal River Ranch 15 minute quadrangle)
TDepth to water:
Total depth: 777.5 feet

Material Description	Depth in feet	
	From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, much fine, brown	0	68
Sand, very fine to medium, slightly silty, light gray	68	74
Sand, very fine to medium, moderately silty, light gray	74	86
Sand, very fine to medium, moderately to very silty, dark gray	86	100
Sand, very fine to medium, slightly silty, trace rootlets, light gray	100	116
Silt, moderately to very sandy, very fine to medium, slightly to moderately clayey, gray	116	126
Sand, very fine to medium, slightly silty, gray	126	148
Silt, very sandy, very fine to fine, light brownish gray	148	154
Sand, very fine to very coarse, much fine to medium	154	175
Sandstone to sand, very fine to medium, moderately to very silty, yellow brown	175	190
Sand, very fine to coarse, slightly to moderately silty, yellow brown to olive	190	224
Silt, very sandy, very fine to medium, moderately to very clayey, pale brown to brown	224	245
Tertiary System, Ogallala Group:		
Sandstone, very fine to medium, slightly to moderately silty, trace seeds, pale yellow	245	266
Sand to sandstone, very fine to medium, slightly silty, pale olive	266	298
Silt, slightly sandy, very fine to medium, pale yellow	298	301
Sand to sandstone, very fine to medium, slightly silty, seeds, olive	301	334
Sandstone, very fine to medium, moderately silty, olive	334	344
Sand to sandstone, very fine to medium, slightly silty, seeds, olive	344	354
Sandstone, very fine to medium, slightly to moderately silty, rootlets, slightly limey, olive	354	412
Sandstone, very fine to medium, moderately to very silty, brown and olive	412	442
Sand to sandstone, very fine to very coarse, slightly silty, olive	442	458
Sandstone, very fine to coarse, moderately silty, olive	458	464
Sand to sandstone, very fine to very coarse, slightly silty, seeds, olive	464	484

Sandstone, very fine to coarse, moderately silty, olive	484	489
Sand to sandstone, very fine to coarse, slightly silty, seeds, olive to pale olive	489	500
Sandstone to sand, very fine to medium, slightly to moderately silty, in part lime cemented, light gray to olive	500	553
Sand, very fine to medium, slightly silty, olive gray	553	582
Sandstone, very fine to medium, moderately silty, limey from 598 feet, light gray brown to olive	582	608
Sandstone, very fine to medium, slightly to moderately silty, slightly to very limey, light gray brown to olive	608	678
Sand to sandstone, very fine to coarse, slightly silty, pale olive	678	711
Sandstone, very fine to coarse, slightly to moderately silty, pale olive	711	740
Sand to sandstone, very fine to coarse, slightly silty, pale olive	740	751
Sandstone to quartzite, very fine to fine, hard, olive	751	770
Quartzite, very fine to coarse, very hard, ruined bit, no penetration, abandoned hole	770	777.5

Test Hole 37-B-71

Location: T. 20N., R. 38 W., 5DAA
Date drilled: 9-7-71
Ground altitude: 3680 feet (Arthur 15 minute quadrangle)
Depth to water: 11.9 feet
Total depth: 800 feet

Material Description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, slightly to very silty, brownish black to gray brown	0	15
Sand, very fine to fine, trace medium, in part slightly silty, light grayish brown	15	67
Sand, very fine to medium, very silty, slightly clayey, dark grayish brown	67	80
Sand, very fine to medium, light gray brown	80	92
Silt, very sandy, very fine to medium, greenish gray	92	101
Sand, very fine to fine, trace medium, slightly silty, light grayish brown	101	128
Silt, very sandy, very fine to fine, slightly clayey, greenish gray	128	130
Sand, very fine to fine, slightly to moderately silty, greenish gray	130	136
Silt, very sandy, very fine to fine, slightly clayey, greenish gray	136	140
Sand, very fine to fine, in part silty, light gray brown	140	233
Sand, very fine to fine, moderately to very silty, trace sandstone and rootlets, greenish gray	233	240
Sand, very fine to very coarse, trace fine gravel, 10 to 20% gravel, greenish gray	240	246
Sand, fine to medium, moderately to very silty, greenish gray	246	253
Sand and gravel, very fine sand to fine gravel, much coarse to very coarse sand, greenish	253	296
Sand, very fine to medium, moderately silty, greenish gray	296	317
Sand and gravel, very fine sand to fine gravel, greenish gray	317	335
Tertiary System, Ogallala Group:		
Sandstone, very fine to medium, moderately to slightly silty, rootlets, seeds, brown	335	390
Sand to sandstone, fine to coarse, rootlets, olive brown	390	433
Sand, fine to medium, slightly to moderately silty, moderately limey, light brown to olive brown	433	445
Sand, very fine to medium, trace coarse, moderately to very silty, slightly clayey, trace rootlets, light olive gray to olive	445	484

Sand, fine to very coarse, much medium to coarse, rare fine gravel, trace thin siltstone seams, rootlets, olive	484	557
Silt, slightly clayey, light olive gray	557	561
Sand, very fine to coarse, much medium to coarse, thin olive silt seams, olive to brownish gray	561	584
Silt, moderately clayey, slightly sandy, pale olive	584	588
Sand to sandstone, very fine to coarse, trace very coarse, trace silt seams, rootlets, brownish gray	588	645
Sand to sandstone, very fine to medium, trace rootlets, trace seeds, moderately limey, brown to pale yellow	645	684
Tertiary System, Arikaree Group:		
Siltstone, very sandy, very fine, moderately to very limey, lime cemented, brown to very light brown	684	720
Tertiary System, White River Group, Brule Formation:		
Siltstone, in part limey, slightly sandy, very fine, dark brown	720	800

Test Hole 35-B-75

Location: T. 15N., R. 39 W., 24DDA
Date drilled: 9-22-75
Ground altitude : 3285 feet (Martin 7.5 minute quadrangle)
Depth to water: 30 feet
Total depth: 550 feet

Material Description	Depth in feet	
	From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, gray to brown	0	6
Sand, very fine to fine, slightly silty, yellow brown	6	9
Sand, very fine to medium, trace coarse, brown	9	24
Sand, very fine to medium, trace coarse, slightly silty, brown	24	44
Sand, very fine to coarse, trace very coarse, slightly to moderately silty, brown	44	68
Sand and gravel, fine sand to medium gravel, much fine gravel	68	84
Tertiary System, Ogallala Group:		
Silt, slightly to moderately clayey, moderately sandy, very fine to very coarse, trace rootlets, pale olive to olive yellow	84	103
Sandstone, very fine to very coarse, moderately to very silty, slightly to moderately limey to lime cemented, olive gray to pale olive to white	103	122
Sand to sandstone, very fine to coarse, limey seams, moderately silty with silt seams, pale olive yellow to pale olive to white with reddish brown silts	122	216
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, slightly to very clayey, limey zones, pale brown to brown	216	460
Silt to siltstone, moderately to very clayey, iron stains, pale olive to pale olive yellow	460	486
Siltstone to claystone, hard, variegated, raspberry, yellow, orange, pink to brown, purple, green, light gray	486	493
Siltstone, light brown to light green	493	496
Clay, light gray to light greenish gray	496	507
Silt, moderately to very clayey, iron stains, pale yellow to pale yellow brown	507	518
Cretaceous System, Pierre Formation:		
Chert, variegated, yellow, banded reds, white, very hard	518	519
Clay, variegated, grays, yellows, reds	519	535
Clay, light gray to black	535	550

Test Hole 13-S-82

Location: T. 20N., R. 40W., 31DDA
Date drilled: 6-24-82
Ground altitude: 3780 feet (Velma 15 minute quadrangle)
Depth to water:
Total depth: 720 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, moderately sandy, very fine, in part limey, pale olive	0	22
Sand, very fine to medium	22	30
Sand, very fine to medium, moderately silty, pale olive	30	46
Sand, very fine to medium, slightly silty, light gray	46	77
Silt, slightly moderately sandy, olive and brown	77	95
Sand, very fine to fine, moderately to very silty, especially at 101 feet, olive and brown	95	131
Silt, brown	131	135
Sand, very fine to fine, moderately silty, pale olive	135	154
Silt, clayey, limey, pale yellow	154	160
Sand, very fine to fine, moderately silty, pale olive	160	167
Silt, pale yellow	167	169
Sand and gravel, very fine sand to fine gravel, trace medium gravel	169	195
Tertiary System, Ogallala Group:		
Silt, clayey, pale yellow	195	200
Sandstone and sand, very fine to medium, slightly silty, rootlets and seed fragments, especially sandy and coarse, trace fine gravel 244 to 248 feet, olive brown	200	248
Sandstone, very silty, olive	248	253
Sand and sandstone, very fine to medium, trace coarse, rootlets, olive	253	272
Sand, very fine, to medium very silty, olive	272	274
Sand and sandstone, very fine to medium, trace coarse, slightly silty rootlets, pale olive	274	290
Sandstone to sand, very fine to medium, trace coarse, rootlets, slight to moderately silty, brown	290	315
Sand, very fine to medium, trace hackberry seed fragments, pale olive	315	324
Sandstone, very fine to medium rootlets, slightly silty, olive	324	328
Sand, very fine to medium, rootlets, olive	328	333
Sandstone and sand, very fine to medium, with interbedded olive silt seams, olive to pale olive	333	375
Sand, very fine to medium, trace olive silt, pale olive	375	393
Sandstone, very fine to medium, moderately silty, very sandy at 397 feet	393	401
Sand, very fine to medium, trace coarse, trace silt, pale olive to brown	401	441
Sand, very fine to medium, moderately silty, pale olive to pale yellow	441	445
Sand, very fine to medium, slightly silty, pale yellow	445	453

Sand, very fine to medium, moderately to very silty, pale yellow	453	456
Interbedded silt, olive, and sand, very fine to medium, pale olive	456	467
Sand and sandstone, very fine to medium, trace coarse to very coarse, with rare fine gravel, occasional silt, siltstone, and claystone seams, rootlets, brown to pale olive	467	617
Siltstone and claystone, pale olive	617	626
Sand and sandstone, very fine to very coarse, trace olive and brown siltstone, brown to pale brown	626	660
Tertiary System, White River Group, Brule Formation:		
Sandstone, very fine to fine, lime cemented, pale gray brown	660	674
Siltstone, limey, pale brown to brown	674	720

Test Hole 14-S-82

Location: T. 14N., R. 41W., 1CCC
Date drilled: 6-28-82
Ground altitude: 3638 feet (Brule NW 7.5 minute quadrangle)
Depth to water:
Total depth: 480 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, slightly to moderately clayey, occasional limey zones, yellow to brown	0	84
Sand, very fine to very coarse, moderately silty, brown	84	91
Silt, moderately clayey, slightly limey, slightly sandy, yellow brown	91	102
Sand and gravel, fine sand to medium gravel, trace coarse gravel, silt seam at 112 feet	102	127
Tertiary System, Ogallala Group:		
Silt, moderately clayey, moderately to very limey, moderately sandy, very fine to medium, pale yellow brown to yellow brown	127	149
Sand and gravel, fine sand to fine gravel, trace medium to coarse gravel, much very coarse sand	149	160
Silt, slightly clayey, moderately sandy, very fine to fine, limey with lime cemented sand, pale reddish brown to reddish brown	160	215
Sand and gravel, fine sand to fine gravel, much very coarse sand, thin silt seams	215	225
Silt, sandy, very fine to coarse, trace very coarse sand to fine gravel, lime cemented, pale brown	225	246
Sand and gravel, fine sand to fine gravel, much coarse to very coarse sand, moderately silty, in part lime cemented	246	265
Sand and gravel, fine sand to fine gravel, moderately to very silty, lime cemented	265	275
Silt, moderately to very sandy, very fine to very coarse sand, lime cemented, pale olive to very pale brown	275	320
Sand and gravel, fine sand to fine gravel, much coarse to very coarse sand, in part lime cemented	320	330
Silt, slightly clayey, moderately to very sandy, very fine to medium, pale reddish brown	330	355
Sand, very fine to very coarse, lime cemented, slightly silty, pale reddish brown	355	381
Silt, moderately to very sandy, very fine to very coarse, moderately limey, reddish brown	381	387
Sand, very fine to very coarse, much medium, reddish brown	387	391
Silt, moderately to very sandy, very fine to very coarse, moderately limey, pale reddish brown	391	394
Sand, very fine to very coarse, trace fine gravel, slightly silty	394	416
Silt to siltstone, slightly sandy, brown to pale brown	416	434
Sand, very fine to coarse, trace very coarse sand to fine gravel, moderately silty, reddish brown	434	446
Tertiary System, White River Group, Brule Formation:		
Silt, slightly to moderately clayey, reddish brown	446	480

Test Hole 15-S-82

Location: T. 14N., R. 40W., 9CDCD
Date drilled: 6-29-82
Ground altitude: 3680 feet (Brule NW 7.5 minute quadrangle)
Depth to water:
Total depth: 220 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Silt, moderately clayey, slightly limey, brown to yellow brown	0	135
Silt, moderately clayey, slightly sandy, very coarse sand to fine gravel, lime cemented, pale yellow brown	135	147
Sand and gravel, fine sand to medium gravel, much very coarse sand, trace coarse gravel	147	174
Tertiary System, Ogallala Group:		
Silt, slightly to moderately clayey, moderately to very sandy, trace lime cement, brown	174	186
Sand and gravel, fine sand to fine gravel	186	194
Silt, moderately clayey with lime cemented streaks, pale reddish brown	194	220

Test Hole 16-S-82

Location: T. 15N., R. 40W., 5BCC
Date drilled: 6-19-82
Ground altitude: 3336 feet (Belmar 7.5 minute quadrangle)
Depth to water:
Total depth: 260 feet

Material description	Depth in feet	
	From	To
Quaternary System, Undifferentiated:		
Sand, very fine to very coarse, much fine to medium, slightly silty, brown	0	25
Silt, very sandy, very fine to fine, very pale brown	25	34
Sand, very fine to very coarse, trace fine gravel, slightly silty	34	44
Silt, slightly to very sandy, very fine to very coarse, most fine to medium, light yellow to light reddish brown	44	49
Tertiary System, Ogallala Group:		
Silt, slightly sandy, trace siltstone, light yellow to light reddish brown	49	52
Sand, very fine to very coarse, moderately silty, pale yellow to light reddish brown	52	59
Silt, slightly sandy, lime cemented, pale olive	59	63
Sand to sandstone, very fine to fine, slightly silty, lime cemented, pale yellow to white	63	82
Sandstone, very fine to fine, moderately silty, lime cemented, pale yellow to brown	82	137
Sandstone and gravel, rounded sandstone fragments, with gravel and siltsone, light reddish brown to brown to white	137	146
Sandstone, very fine to fine, moderately silty and limey, olive	146	154
Sand to sandstone, very fine to fine, slightly silty, olive	154	159
Sandstone, very fine to fine, moderately silty, olive	159	163
Sand, very fine to very coarse, olive	163	169
Siltstone, moderately sandy, very fine to fine, limey concretions, olive to pale olive	169	184
Sand to sandstone, very fine to fine, moderately silty and limey, reddish brown to pale olive	184	201
Sand, very fine to very coarse, much fine to medium, slightly to moderately silty, lime cemented sandstone lenses	201	225
Quartzite, very fine to very coarse sand with trace fine gravel, olive to yellow	225	229
Tertiary System, White River Group, Brule Formation:		
Silt, slightly clayey, slightly sandy, pale olive to pale brown	229	238
Siltstone, slightly clayey, limey zones, light brown to reddish brown	238	260

Test Hole 17-S-82

Location: T. 19N., R. 36W., 29ACAC
Date drilled: 6-30-82
Ground altitude: 3530 feet (Flats 15 minute quadrangle)
Depth to water:
Total depth: 900 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, trace medium to coarse, brown to light brown	0	40
Silt, moderately sandy, slightly clayey, light to blue gray	40	55
Sand, very fine to medium, trace coarse, slightly to moderately silty, brown	55	78
Silt, slightly to moderately clayey, moderately sandy, blue gray	78	81
Sand, very fine to fine, trace medium to coarse, trace brown and blue green silt seams, brown	81	115
Silt, moderately to very sandy, slightly to moderately clayey, gray green	115	117
Sand, very fine to medium, much medium, in part silty, silt is gray green brown	117	166
Silt, slightly clayey, moderately sandy, gray green	166	174
Sand, very fine to medium, brown	174	177
Silt, very slightly clayey, very sandy, very fine to medium sand, blue green	177	185
Sand, very fine to medium, slightly silty, brown	185	203
Silt, very sandy, very slightly clayey, blue green	203	219
Sand, very fine, coarse, much fine, trace very coarse sand to fine gravel, slightly to moderately silty, brown	219	260
Sand and gravel, fine sand to fine gravel, much coarse to very coarse, blue green	260	294
Tertiary System, Ogallala Group:		
Sandstone to sand, very fine to very coarse, much medium to coarse, rare fine gravel, rootlets, slightly silty, trace lime cement, brown	294	340
Sand to sandstone, very fine to very coarse, much fine to medium, rootlets, rare gray green silt seams, brown	340	450
Sandstone to sand, very fine to fine, slightly to moderately silty, moderately to very limey, very pale brown	450	474
Sand, very fine to medium, trace coarse	474	484
Sandstone, very fine to very coarse, much medium, slightly to moderately silty, gray brown to olive	484	546
Sand to sandstone, very fine to coarse, much medium to coarse, slightly to moderately silty, silt is pale olive to pale yellow, sand is gray brown	546	594
Silt, moderately sandy, olive	594	596
Sand to sandstone, very fine to medium, trace coarse, rare fine gravel, occasional brown siltstone to claystone seams, gray brown	596	639
Silt, moderately sandy, very fine to coarse, olive	639	641

Sand to sand and gravel, very fine sand to fine gravel, much coarse sand, rootlets, rare lime cemented seam, trace silt, olive to gray brown	641	724
Silt, slightly clayey, slightly sandy, brown to pale olive gray	724	733
Sand, very fine to coarse, brown	733	736
Silt, slightly to moderately clayey, moderately to very sandy, very fine to medium, pale olive to light gray brown	736	783
Sand to sand and gravel, very fine sand to fine gravel, much coarse to very coarse sand, anorthositic 835 to 840 feet	783	849
Silt, moderately to very sandy, brown with occasional pink streaks	849	853
Sand, very fine to coarse, much brown to pink siltstone	853	857
Silt to siltstone, moderately clayey, brown to pale yellow	857	878
Sand, very fine to very coarse, much reworked brown, olive, and white siltstone, trace rootlets	878	900

Test Hole 18-S-82

Location: T. 19N., R. 38W., 3BBCC
Date drilled: 7-1-82
Ground altitude: 3650 feet (Arthur 15 minute quadrangle)
Depth to water:
Total depth: 910 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, slightly moderately silty, grayish brown	0	69
Sand, very fine to medium, trace coarse, slightly silty, grayish brown	69	75
Sand, very fine to medium, moderately silty, grayish brown	75	78
Sand, very fine to medium, slightly silty, gray brown	78	85
Sand, very fine to medium, moderately silty, gray	85	89
Sand, very fine to medium, slightly silty, greenish gray	89	120
Silt, slightly sandy, gray to green	120	125
Sand, very fine to medium, slightly silty, gray green	125	130
Silt, slightly clayey, gray green	130	132
Sand, very fine to fine, slightly to moderately silty, gray green	132	152
Silt, moderately sandy, very pale brown	152	157
Sand, very fine to fine, trace medium to coarse, slightly to moderately silty, very pale brown	157	185
Silt, moderately sandy, very fine to fine, very pale brown	185	191
Sand, very fine to fine, moderately to very silty, very pale brown	191	201
Silt, moderately to very sandy, very fine to fine, trace medium, very pale brown	201	205
Sand and gravel, very fine to very coarse sand, much very coarse, fine to medium gravel, granitic and anorthositic	205	220
Silt, very sandy, pale brown	220	223
Sand and gravel, very fine to very coarse sand to fine gravel, trace medium gravel, much coarse to very coarse sand	223	232
Sand, very fine to very coarse, much medium to coarse, trace gravel, slightly silty	232	245
Sand and gravel, very fine to very coarse sand to fine gravel, much coarse to very coarse sand	245	303
Tertiary System, Ogallala Group:		
Sand, very fine to medium, moderately silty, pale olive to olive gray	303	315
Sand and sandstone, very fine to very coarse, many rootlets, in part slightly to moderately silty, reddish brown	315	420
Sandstone, very fine to medium, lime cemented, slightly to moderately silty, very pale brown to brown to pale olive	420	451
Sand to sandstone, very fine to coarse sand, slightly to moderately silty, especially at 469 feet, olive	451	471
Sand, very fine to coarse, much medium, trace olive claystone seams, olive to gray brown	471	499
Silt, gray to brown	499	501

Sand, very fine to medium, trace coarse, occasional silt seams, especially at 621 feet, 643 feet and 656 feet, gray to brown	501	564
Sandstone, moderately silty, trace rootlets, pale olive to brown	564	567
Sand to sandstone, very fine to medium, trace coarse, slightly to moderately silty, pale brown to brown	567	615
Sand, very fine to coarse, much medium, trace very coarse, rootlets, occasional sandstone and silt siltstone seams, gray volcanic ash 680 to 690 feet, silts, pale olive to pale yellow, sand is brown	615	700
Siltstone, moderately clayey, reddish brown to pale yellow brown	700	741
Silt, very sandy, much medium, reddish brown and olive	741	744
Sand, very fine to very coarse, much medium to coarse, slightly silty	744	775
Silt, very sandy, very fine to very coarse, slightly to moderately clayey, very pale brown to pale olive	775	782
Sand, very fine to very coarse, much medium, trace fine gravel, occasional thin silt and siltstone seams, reddish brown	782	855
Sandstone, lime cemented with lime cemented siltstone seams, very pale to gray brown	855	873
Tertiary System, White River Group, Brule Formation:		
Siltstone, brown	873	910

Test Hole 19-S-82

Location: T. 20N., R. 36W., 35BCD
Date drilled: 7-2-82
Ground altitude: 3549 feet (Arthur 15 minute quadrangle)
Depth to water:
Total depth: 800 feet

Material description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, trace medium, slightly to moderately silty, pale brown	0	90
Sand, very fine to fine, moderately silty with layers of dark gray brown silt, brown	90	199
Silt, moderately sandy, very fine to fine, gray	199	215
Sand, very fine to fine, trace medium, slightly silty, gray brown	215	223
Sand, very fine to fine, moderately to very silty, gray brown to yellow brown	223	260
Sand, very fine to coarse, much medium to coarse	260	302
Silt, moderately clayey, gray green to yellow brown	302	305
Sand and gravel, fine sand to fine gravel, much coarse to very coarse sand, trace medium gravel, blue green to green	305	332
Tertiary System, Ogallala Group:		
Sandstone, very fine to fine, trace medium, rootlets, slightly silty, brown	332	390
Sandstone, very fine to fine, moderately to very silty, rootlets, limey, pale brown	390	410
Sand, very fine to coarse, much medium, peppery, gray brown	410	425
Sandstone, very fine to medium, trace coarse, in part limey, slightly silty, brown to pale brown	425	540
Sandstone, very fine to fine, trace medium to coarse, moderately to very silty, gray brown to olive gray	540	580
Sand to sandstone, very fine to very coarse, much medium, peppery, olive gray	580	637
Sandstone, very fine to very coarse, very silty, pale olive	637	643
Sand, very fine to very coarse, brown to olive	643	650
Sandstone, very fine to coarse, moderately silty, with siltstone	650	659
Sand to sandstone, very fine to coarse, slightly to moderately silty, trace limey streaks, yellow to brown	659	677
Sandstone, very fine to medium, moderately silty, trace lime cement, rootlets, pale brown to brown	677	682
Sand to sandstone, very fine to coarse, trace white and yellow silts	682	720
Silt and sandstone, interbedded, very fine to medium, lime cemented, pale brown to white	720	758
Tertiary System, White River Group, Brule Formation:		
Siltstone, limey 750 to 755 feet, trace pink centers, brown to reddish brown	758	800

Test Hole 20-S-82

Location: T. 20N., R. 34W., 32DDCC
Date drilled: 7-3-82
Ground altitude: 3420 feet (Flats 15 minute quadrangle)
Depth to water:
Total depth: 780 feet

Material description	Depth in feet	
	From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, brown	0	5
Silt, very sandy, very fine to medium, slightly clayey, olive gray	5	16
Sand, very fine to medium, much medium, gray brown	16	34
Sand, very fine to medium, slightly silty, gray brown	34	40
Sand, very fine to medium, trace coarse to very coarse, gray brown to brown	40	57
Silt, moderately sandy, slightly to moderately clayey, dark gray green	57	62
Sand, very fine to medium, trace coarse, gray brown	62	68
Silt, moderately sandy and clayey, light green	68	72
Sand, very fine to medium, gray brown	72	78
Silt, very clayey, moderately sandy, gray green	78	85
Sand, very fine to medium, gray brown	85	90
Silt, moderately clayey and sandy, gray green	90	93
Sand, very fine to medium, gray brown	93	98
Silt, moderately clayey and sandy, gray green	98	99
Sand, very fine to medium, gray brown	99	120
Interbedded sand, very fine to medium, brown, and silt, moderately clayey, gray green	120	158
Sand, very fine to fine, trace medium, brown	158	171
Sand, very fine to medium, slightly to moderately silty, brown	171	196
Sand, very fine to medium, gray brown	196	200
Silt, slightly clayey, moderately sandy, gray brown	200	203
Sand, very fine to medium, trace coarse, slightly silty, gray brown	203	208
Silt, moderately clayey, reddish brown	208	218
Sandy, very fine to coarse, much medium, gray green	218	221
Silt, moderately clayey, gray green	221	227
Sand, very fine to coarse, much medium, occasional silt seam, gray brown	227	258
Silt, slightly to moderately clayey, gray brown	258	261
Sand and gravel, fine sand to fine gravel, much coarse, trace medium to coarse gravel, trace rootlets, silt seam at 285 feet	261	302
Tertiary System, Ogallala Group:		
Silt, moderately clayey, gray	302	309
Sand, very fine to medium, olive	309	320
Sandstone, very fine to fine, moderately silty, pale brown to brown	320	329
Sand, very fine to very coarse, trace fine gravel, rootlets, brown	329	353

Silt, slightly sandy, pale yellow	353	358
Sand to sandstone, very fine to very coarse, much fine, moderately silty, rootlets, pale yellow to brown	358	367
Sand, very fine to medium, trace coarse to very coarse and fine gravel, peppery	367	386
Silt, gray	386	388
Sand, very fine to medium, trace coarse, peppery	388	407
Sandstone, very fine to fine, moderately silty, rootlets, pale yellow to brown	407	411
Sand, very fine to coarse	411	418
Silt, moderately sandy, gray	418	422
Sand, very fine to coarse, rare very coarse sand to fine gravel, trace yellow siltstone seams, brown	422	465
Sandstone, very fine to fine, lime cemented, pale brown	465	480
Sand, very fine to medium, brown	480	487
Sandstone, very fine to medium, moderately silty, brown to olive	487	495
Sandstone, very fine to fine, slightly silty, rootlets, pale brown	495	502
Sand, very fine to fine, brown	502	511
Sandstone, very fine to fine, moderately to very silty, pale yellow to pale brown	511	518
Sand to sandstone, very fine to medium, rootlets, moderately silty, pale olive to pale yellow and gray	518	543
Sand, very fine to medium, pale olive	543	549
Interbedded sand and sandstone, very fine to medium, trace rootlets, moderately silty, pale yellow to pale olive, brown	549	577
Sand, very fine to very coarse, much medium to coarse, trace rootlets, rare thin silt seam, olive to brown	577	629
Silt to siltstone, olive to pale olive	629	631
Sand, very fine to medium, much fine, thin gray silt seams	631	647
Sandstone to sand, very fine to medium, slightly silty, lime cemented, pale brown	647	664
Sand, very fine to medium, trace coarse, thin interbedded pale yellow and gray silt seams	664	683
Sandstone, very fine to medium, moderately silty, silt is white to pale olive, pale olive	683	709
Sand, very fine to medium, much fine, pale olive	709	715
Sand to sandstone, very fine to medium, trace coarse to very coarse, slightly to moderately silty, silt is gray, olive to pale olive	715	730
Sandstone, very fine to medium, slightly to moderately silty, lime cemented, very pale brown	730	737
Siltstone, limey, pale brown	737	761
Sand, very fine to coarse, moderately silty	761	770
Tertiary System, White River Group, Brule Formation:		
Siltstone, limey, pale brown	770	780

Test Hole 21-S-82

Location: T. 18N., R. 37W.,35DCCA
Date drilled: 7-14-82
Ground altitude: 3525 feet (Spotted Horse Valley 7.5 minute quadrangle)
Depth to water:
Total depth: 740 feet

Material description	Depth in Feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, trace medium, slightly silty, pale yellow silt, brown	0	89
Sand, very fine to medium, slightly to moderately silty, silty seams, gray brown	89	180
Silt, slightly sandy, green to gray	180	188
Sand, very fine to medium, much fine, slightly to moderately silty green to gray	188	193
Silt, slightly sandy, very fine, greenish gray to gray	193	202
Sand, very fine to medium, trace coarse to very coarse, moderately silty, greenish gray	202	212
Silt, slightly sandy, very fine to medium, greenish gray	212	216
Sand, very fine to very coarse, mostly medium to coarse	216	226
Silt, yellow to brown	226	228
Sand and gravel, fine to very coarse sand to fine gravel, trace medium gravel, silt seam at 261 feet	228	272
Silt, slightly clayey, pale brown to pale olive	272	282
Sand and gravel, very fine to very coarse sand, fine to medium gravel, some coarse gravel	282	356
Tertiary System, Ogallala Group:		
Silt, moderately sandy, very fine, reddish brown	356	369
Sand, very fine to coarse, much medium to coarse, slightly to moderately silty, gray brown	369	392
Sandstone, very fine to medium, moderately to very silty, rootlets, olive to yellow olive	392	419
Sand, very fine to coarse, olive gray brown	419	426
Sandstone, very fine to medium, moderately to very silty, olive	426	428
Sand, very fine to very coarse, trace fine gravel, much medium to coarse, rare silt seams, gray brown	428	580
Siltstone, olive to pink	580	581
Sand very fine to very coarse, trace fine gravel, much medium to coarse	581	620
Sand and sandstone, interbedded, very fine to coarse sand, moderately to very silty, volcanic ash at 635 feet, trace lime cemented zones, pale olive yellow to olive	620	647
Sand, very fine to very coarse, trace fine gravel, slightly silty and occasionally lime cemented, especially at 655 and 679 feet	647	698
Tertiary System, White River Group, Brule Formation:		
Sand to sandstone, very fine to very coarse, rare fine gravel, moderately silty, lime cemented, pale olive to pale yellow	698	710
Siltstone to silt, moderately clayey, reddish brown	710	740

Test Hole 22-S-82

Location: T. 21N., R. 32W., 4CDDB
Date drilled: 7-15-82
Ground altitude: 3300 feet (Dismal River Ranch 15 minute quadrangle)
Depth to water:
Total depth: 840 feet

Material description	Depth in Feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, trace coarse, much medium, very slightly silty, light brown	0	104
Silt, moderately sandy, very fine sand, slightly clayey, pale olive brown	104	113
Sand, very fine to medium, trace coarse, slightly to moderately silty, brown	113	133
Silt, slightly to moderately clayey, olive brown	133	136
Sand, very fine to medium, trace coarse, slightly to moderately silty, brown	136	158
Silt, with occasional thin interbedded sands and sandstone seams, iron staining, very fine to medium sand, trace coarse, pale olive to reddish brown to pale gray	158	351
Tertiary System, Ogallala Group:		
Sand, and some sandstone, very fine to medium, with interbedded silty zones, rootlets, olive to pale brown	351	482
Sand, very fine to medium, very silty, pale olive to pale yellow	482	490
Sand, very fine to medium, olive to pale olive	490	498
Sand, very fine to medium, very silty, pale olive to pale yellow	498	500
Sand, very fine to medium, trace coarse, olive	500	520
Sand, very fine to medium, much fine, moderately silty, olive to yellow	520	526
Sand and sandstone, very fine to medium, trace coarse, slightly to moderately silty, rootlets, olive to pale olive	526	605
Sand, very fine to very coarse, much medium, gray	605	642
Sandstone and sand, very fine to very coarse, much medium, slightly to moderately silty, lime cement 680 to 690 feet, gray brown to gray olive	642	717
Silt, moderately to very sandy, very fine to medium, areas of lime cement, olive gray to pale olive gray	717	780
Sand and sandstone, very fine to medium, moderately silty, pale brown	780	800
Sand and sandstone, very fine to medium, moderately silty, pale yellow to gray brown	800	810
Tertiary System, White River Group, Brule Formation:		
Siltstone and silt, clayey, limey zones, brown	810	840

Test Hole 1-S-82

Location: T. 18N., R. 28W., 36CBCC
Date drilled: 6-3-82
Ground altitude: 2890 feet (Stapleton 7.5 minute quadrangle)
Depth to water: 20 feet
Total depth: 760 feet

Material Description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, trace coarse sand, slightly silty, gray to brown	0	40
Sandy, very fine to very coarse, most fine to medium, brown	40	51
Sand, very fine to medium, trace coarse, slightly to moderately silty, trace olive siltstone, brown	51	70
Sand, very fine to very coarse, much medium to coarse, slightly silty, trace light olive gray to brown siltstone, brown	70	89
Sand, very fine to coarse, much medium, slightly to moderately silty	89	102
Sand and gravel, very fine to very coarse sand to fine gravel, much coarse to very coarse sand	102	110
Sand, very fine to very coarse, slightly to moderately silty with claystone seams, light yellow brown to brown	110	115
Sand and gravel, very fine to very coarse sand to fine gravel, much medium to coarse sand, trace medium gravel, rare silt seams, very silty at 144 feet	115	162
Silt, slightly clayey, slightly sandy, slightly limey, light olive gray to white	162	174
Sand and gravel, very fine to very coarse sand to fine to medium gravel, rare silt seam	174	208
Tertiary System, Ogallala Group:		
Sand to sandstone, very fine to medium, rootlets, slightly silty	208	217
Sandstone to sand, very fine to medium, rootlets and seed fragments, in part lime cemented and slightly to moderately silty with occasional siltstone seams, pale brown to pale olive	217	362
Sand, very fine to medium, rootlets, trace pale yellow silt	362	385
Sand, very fine to medium, moderately silty, pale yellow to light gray	385	413
Sandstone to sand, very fine to coarse sand, much medium, trace rootlets, trace olive, pale yellow, and light gray silt to siltstone seams	413	463
Siltstone with interbedded sand, pale yellow to olive and pale brown	463	469
Sand, very fine to medium, slightly to moderately silty, pale yellow to olive	469	477
Siltstone, slightly clayey, moderately limey, pale yellow to pale olive	477	480

Sandstone, very fine sand, very silty, lime cemented, white	480	485
Sand, fine to medium, with sandstone zones, thin seams of olive siltstone, pale olive	485	553
Sandstone, very fine to medium, rare fine to medium gravel 575 to 577 feet and 579 to 581 feet, lime cemented with olive siltstone seams, very pale brown	553	605
Sand to sandstone, very fine to medium, moderately to very silty, with manganese stained siltstone and claystone seams, olive to pale olive	605	667
Sandstone, very fine to medium, very silty, lime cemented, pale olive	667	672
Sandstone, very fine, trace rootlets, moderately silty, brown and olive claystone seams	672	690
Tertiary System, White River Group, Brule Formation:		
Siltstone, very slightly sandy, very fine sand, olive claystone with pink centers, olive to pale olive	690	725
Siltstone, slightly to moderately clayey, pale reddish brown to dark reddish brown at 760 feet.	725	760

Test Hole 2-S-82

Location: T. 20N., R. 28 W., 35DDAC
Date drilled: 6-4-82
Ground altitude: 2958 feet (Cody Lake 15 minute quadrangle)
Depth to water:
Total depth: 800 feet

Material Description	Depth in feet From	To
Quaternary System Undifferentiated:		
Sand, very fine to medium, trace coarse to very coarse, slightly to moderately silty, brown	0	108
Silt, very slightly sandy, sandier 143 to 158 feet, brown to yellow brown	108	158
Sand and gravel, very fine to very coarse sand to fine to medium gravel, most coarse to very coarse sand, silt seam 192 to 194 feet	158	215
Tertiary System, Ogallala Group:		
Sand, fine to medium, with gravel, slightly to moderately silty, trace rootlets	215	240
Sandstone, very fine to fine, trace medium, many siliceous rootlets, gray to green silts 263 to 272 feet, pale brown	240	272
Sand, very fine to medium, trace coarse, rootlets, pale olive silts 279 to 282 feet, brown	272	301
Sandstone, very fine to fine, trace medium, many rootlets, olive to olive brown	301	329
Sandy, very fine to fine, trace medium, trace sandstone, rootlets, pale brown to pale reddish brown	329	347
Sandstone, very fine to fine, trace medium, lime cemented, pale olive gray	347	360
Sand, very fine to fine, pale brown	360	369
Sandstone, very fine to medium, seed fragments, trace rootlets, slightly silty, slightly clayey, slightly lime cemented, pale olive brown	369	380
Sand to sandstone, very fine to fine, rootlets, slightly limey, lime cemented 399 to 403 feet, pale brown	380	413
Sandstone to sand, very fine to medium, slightly silty, slightly limey, occasional lime cemented seams, pale brown	413	500
Siltstone, pale olive to pale yellow	500	502
Sand, very fine to very coarse, much medium to coarse, traces of sandstone and siltstone seams, pale brown	502	548
Sandstone, very fine to fine, moderately silty, pale olive yellow	548	590
Sand, very fine to medium, pale olive brown	590	599
Sandstone, very fine to fine, with olive reddish brown claystone seams, olive brown	599	626
Sand, very fine to fine, trace medium, olive brown	626	656
Sandstone, very fine to fine, moderately to very silty, moderately clayey with claystone, olive brown to olive	656	665
Sand, very fine to fine, slightly to moderately silty, olive brown	665	674

Sandstone, very fine to fine, moderately silty with claystone seams	674	701
Sand, very fine to fine, olive brown	701	709
Sandstone, very fine to fine, moderately silty with claystone seams, olive to pale brown	709	715
Sand, very fine to fine, occasional siltstone and claystone seams, olive to pale brown	715	745
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, moderately sandy, very fine, olive brown with some pink	745	760
Siltstone, reddish brown	760	800

Test Hole 3-S-82

Location: T. 21 N., R. 28W., 3BDA
Date drilled: 6-7-82
Ground altitude: 2940 feet (Thedford 15 minute quadrangle)
Depth to water:
Total depth: 740 feet

Material Description	Depth in feet From	To
Quaternary System Undifferentiated:		
Sand, very fine to fine, trace medium to coarse, very slightly silty, brown	0	72
Silt, slightly to moderately clayey, moderately sandy, very fine to fine, olive to gray	72	87
Sand, very fine to fine, olive gray to brown	87	94
Silt, moderately sandy, very fine to medium, trace coarse, slightly clayey, olive gray	94	108
Sand, very fine to medium, trace coarse to very coarse, slightly to moderately silty, brown to gray brown	108	125
Sandstone, very fine to medium, trace coarse, moderately silty, olive	125	139
Silt, slightly to very sandy, very fine to fine, olive gray	139	149
Sand, very fine to medium, trace coarse, slightly silty, grayish brown	149	168
Silt, with thin interbedded sands, very fine to very coarse, gray to reddish brown	168	194
Silt with thin interbedded sands, very fine to very coarse sand, trace medium gravel	194	200
Tertiary System, Ogallala Group:		
Silt with trace sand and gravel, gray	200	214
Sand and gravel, fine sand to fine gravel, much very coarse sand	214	222
Silt, reddish brown	222	227
Sand, very fine to coarse, moderately silty, pale brown	227	243
Sand to sand and gravel, fine sand to fine gravel, much medium sand, brown	243	280
Sandstone, very fine to medium, many rootlets, slightly silty, olive to yellow	280	285
Silt to siltstone, very sandy, very fine to fine sand, slightly to moderately clayey, pale olive yellow	285	299
Sand, very fine to very coarse, trace fine gravel, rare silt seam	299	330
Silt, very sandy, pale yellow	330	337
Sandstone, very fine to fine, slightly to moderately silty, rootlets, trace lime cement, pale olive	337	350
Sandstone, very fine to fine, thin interbedded silt and siltstone, in part lime cemented, pale yellow to white	350	371
Sand, very fine to medium, moderately silty, trace lime cement, pale olive	371	405
Sand, very fine to medium, trace coarse to very coarse, sandstone seams, rootlets, pale olive	405	450
Sandstone to sand, very fine to fine, slightly to moderately silty, yellow brown with pale yellow silt	450	470

Siltstone, moderately sandy, very fine to medium, olive to white	470	474
Sand, very fine to medium with layers of pale yellow to pale olive silt	474	502
Sandstone, very fine to fine, trace medium, slightly silty, rootlets, olive	502	526
Sand to sandstone, very fine to medium, thin interbedded olive to pale olive yellow claystone seams, brown to gray olive	526	552
Sand to sandstone, very fine to medium, moderately to very silty, in part lime cemented, pale olive to very pale gray brown	552	602
Tertiary System, White River Group, Brule Formation:		
Siltstone, slightly sandy, very fine sand, trace pink silt, rare limey zones, brown to slightly reddish brown	602	740

Test Hole 4-S-82

Location: T. 16N., R. 27W., 24BBB
Date drilled: 6-8-82
Ground altitude: 2930 feet (Kilmer Valley 7.5 minute quadrangle)
Depth to water:
Total depth: 800 feet

Material Description	Depth in feet From	To
Quaternary System Undifferentiated:		
Silt, slightly sandy, very fine sand, slightly clayey, brown to yellow brown	0	45
Sand, very fine to medium with interbedded brown silts	45	73
Silt, slightly sandy, very fine to medium, slightly clayey, pale brown	73	97
Sand, very fine to medium, silty, pale brown to pale olive	97	120
Silt with sandstone seams, slightly limey, olive brown to gray brown	120	174
Sand and gravel, very fine to very coarse sand, fine to medium gravel, silt seam 189 to 190 feet	174	208
Silt, slightly sandy, pale olive	208	212
Sand, very fine to very coarse, much medium to coarse	212	226
Sand and gravel, very fine to very coarse sand, fine to medium gravel	226	248
Sand, very fine to very coarse, much medium to coarse	248	253
Sand and gravel, very fine to very coarse sand, fine to medium gravel	253	272
Silt, slightly sandy, yellow red to olive gray	272	290
Sand, very fine to very coarse with interbedded silt and fine gravel	290	293
Silt, slightly to moderately sandy, reddish brown and white	293	297
Tertiary System, Ogallala Group:		
Sand, very fine to medium, trace coarse to very coarse, slightly silty, slightly limey	297	310
Sandstone, very fine to very coarse, much fine to medium, some lime cement, brown	310	328
Sand, very fine to very coarse, much medium coarse, trace sandstone with trace lime cement	328	342
Sandstone, very fine to medium, moderately to very silty, rootlets and seed fragments, pale olive to gray	342	368
Sand to sandstone, very fine to medium, trace coarse to very coarse, rootlets, trace lime cement, gray	368	404
Sandstone, moderately to very silty, lime cemented, pale brown	404	407
Sand to sandstone, very fine to medium, trace coarse and very coarse, in part silty and lime cemented, volcanic ash 475 to 480 feet, pale brown, partly olive yellow	407	510
Sand to sandstone, very fine to medium, slightly to moderately silty, limey from 585 to 650 feet, olive brown to pale olive brown	510	650
Sand, very fine to medium, pale olive	650	670
Siltstone, moderately sandy, pale olive to olive	670	680

Sand, very fine to medium, slightly to moderately silty with siltstone seams, pale olive to pale brown	680	708
Siltstone, yellow to brown	708	710
Sand, very fine to medium, trace coarse to very coarse with fine gravel	710	740
Silt to siltstone, lime cement 755 to 756 feet, pale yellow to pale brown	740	789
Tertiary System, White River Group, Brule Formation:		
Siltstone to silt, clayey, pale brown to pale yellow	789	800

Test Hole 5-S-82

Location: T. 15N., R. 29W., 23DCDA
Date drilled: 6-10-82
Ground altitude: 2932 feet (Stapleton SE 7.5 minute quadrangle)
Depth to water:
Total depth: 660 feet

Material Description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, slightly to moderately silty, siltier 55 to 56 feet, brown	0	65
Sand and gravel, fine sand to medium gravel	65	88
Silt, slightly clayey with sand and gravel seams, brown	88	108
Sand and gravel, fine sand to medium gravel	108	118
Silt, slightly clayey, very sandy, brown to olive gray	118	124
Sand and gravel, fine sand to fine gravel, anorthositic	124	157
Silt, slightly to moderately clayey, slightly sandy, very slightly limey, reddish brown	157	185
Sand and gravel, fine sand to fine gravel, silt 207 to 209 feet	185	232
Tertiary System, Ogallala Group:		
Sand, slightly to moderately silty with lime cement and gravel seams	232	250
Sand, sandstone, very fine to very coarse sand, slightly to very silty, rootlets, olive gray to gray brown	250	305
Sandstone, moderately silty, lime cemented, pale gray brown	305	314
Sand, very fine to medium, trace coarse	314	323
Sandstone, very fine to fine, rootlets, moderately silty, limey and lime cemented, pale olive yellow	323	355
Sand to sandstone, very fine to fine, trace medium, rootlets, trace silt and siltstone seams, olive	355	425
Silt and siltstone, pale yellow	425	428
Sand, very fine to coarse, some very coarse, thin pale yellow silt seams	428	475
Sandstone and sand, very fine to coarse, siliceous rootlets, lime cemented, very pale olive brown to white	475	520
Sand, very fine to coarse, much fine to medium, trace sandstone, slightly to moderately silty, with olive siltstone, trace lime cement	520	568
Silt, pale yellow with olive siltstone, trace interbedded sand seams	568	596
Gravel, fine with trace medium, some thin olive siltstone seams	596	610
Tertiary System, White River Group, Brule Formation:		
Siltstone, yellow to brown to pale brown	610	660

Test Hole 6-S-82

Location: T. 17N., R. 31W., 3DCC
Date drilled: 6-14-82
Ground altitude: 3170 feet (North Platte 2 NW 7.5 minute quadrangle)
Depth to water:
Total depth: 760 feet

Material Description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, slightly silty, brown	0	29
Clay, silty with trace sand, blue green	29	42
Sand, very fine to fine, trace medium to coarse, slightly silty, gray to brown	42	61
Silt, moderately clayey, slightly sandy, greenish gray	61	65
Sand, very fine to medium, interbedded green silts, gray brown	65	105
Silt, slightly to moderately, sandy, very fine to fine, pale olive	105	125
Sand, very fine to fine, moderately silty, olive	125	136
Silt, slightly to moderately sandy, very fine to fine, olive	136	142
Sand, very fine to fine, trace medium to coarse, moderately silty, olive	142	246
Sand, very fine to fine, trace medium to coarse, moderately to very silty, olive	246	275
Sand and gravel, fine sand to fine gravel, granitic	275	281
Sand, very fine to medium, moderately to very silty, trace sandstone, brown	281	305
Sand and gravel, fine sand to fine gravel, granitic	305	320
Tertiary System, Ogallala Group:		
Silt to siltstone, very sandy, lime cemented streaks, trace volcanic ash 335 to 340 feet, yellow to brown	320	343
Sand and gravel, fine sand to fine gravel	343	350
Siltstone and silt, moderately sandy, very fine, yellow to brown	350	355
Sand and gravel, fine sand to fine gravel, trace medium to coarse gravel, silt 385 to 390 feet	355	413
Sand, very fine to coarse, slightly silty, rootlets, trace lime cement	413	459
Sandy, very fine to medium, moderately silty, limey to lime cemented, pale to very pale brown	459	473
Sand, very fine to medium, trace coarse, slightly to moderately silty, trace lime cement, olive gray	473	500
Sandstone, very fine to fine, trace medium to coarse, silt, in part cemented, olive gray	500	508
Siltstone, moderately sandy, very fine to medium sand, gray to olive brown	508	518
Sand to sandstone, very fine to coarse, slightly to moderately silty, in part lime cemented, grayish brown	518	622
Siltstone, moderately sandy, pale olive	622	625
Sand to sandstone, very coarse, moderately silty, lime cemented, pale olive	625	655
Silt to siltstone, in part limey, brown to olive yellow	655	735
Tertiary System, White River Group, Brule Formation:		
Siltstone to silt, brown	735	760

Test Hole 7-S-82

Location: T. 21N., R. 30W., 20DBC
Date drilled: 6-15-82
Ground altitude: 3155 feet (Shimmins Lake 15 minute quadrangle)
Depth to water:
Total depth: 820 feet

Material Description	Depth in feet	
	From	To
Quaternary System, Undifferentiated:		
Sand, fine to coarse	0	12
Silt, slightly sandy, green	12	20
Sand, very fine to fine, silty, green clayey silt, especially at 28, 46 and 54 feet	20	77
Sand, very fine to fine	77	81
Sand, very fine to fine, moderately silty	81	96
Silt, green, slightly sandy, very fine to fine	96	102
Sand, very fine to fine, slightly to moderately silty	102	140
Silt, sandy, green with iron oxide staining	140	151
Sand, very fine to medium, slightly to moderately silty	151	165
Silt, moderately sandy, very fine to medium, green	165	170
Sand, very fine to very coarse, trace of gravel	170	181
Silt, moderately sandy, green	181	184
Sand, very fine to very coarse, trace of gravel	184	202
Interbedded silty sand and sandy silt, very fine to medium sand, green	202	243
Sand and gravel, fine sand to fine gravel	243	249
Interbedded sand and silty sand, greenish	249	283
Tertiary System, Ogallala Group:		
Sand, very fine to coarse, in part slightly silty, siliceous rootlets and hackberry seeds, olive	283	338
Sand to sandstone, very fine to coarse, moderately silty, pale olive brown	338	363
Sand to sandstone, very fine to coarse, seed and rootlet fragments, pale olive gray	363	385
Sandstone, lime cemented, pale yellow	385	390
Sandstone, very fine to coarse	390	395
Sandstone, silty, lime cemented, pale yellow	395	405
Sand to sandstone, slightly silty, very fine to medium	405	415
Sandstone, lime cemented, silty	415	420
Sand, slightly to moderately silty, slightly limey, very fine to medium, trace rootlets, pale olive	420	445
Sand to sandstone, very fine to coarse, trace very coarse, rootlets	445	495
Sand, moderately silty, very fine to coarse, light gray	495	515
Sand, very fine to coarse, light gray	515	522
Sand, very fine to very coarse, moderately silty, rootlets, pale olive	522	533
Sand to sandstone, very fine to coarse, silty at 540 feet	533	546
Silt, slightly sandy, pale yellow	546	552
Sand to sandstone, very fine to coarse, rootlets, occasional silty zones, olive	552	660

Sandstone, lime cemented, slightly to moderately silty, rootlets, pale olive	660	710
Sand to sandstone, very fine to coarse, trace silt, pale olive	710	735
Sandstone, very fine, with iron stained siltstone, very sandy 747 to 753 feet	735	753
Sand to sandstone, very fine to fine, trace silt, olive	753	773
Sandstone, very silty to siltstone, olive	773	778
Silt to siltstone, limey, light olive gray	778	795
Tertiary System, White River Group, Brule Formation:		
Siltstone, brown at 802 feet	795	820

Test Hole 8-S-82

Location: T. 19N., R. 32W., 2 DDAA
Date drilled: 6-16-82
Ground altitude: 3310 feet (Tryon 15 minute quadrangle)
Depth to water:
Total depth: 840 feet

Material Description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, slightly silty, pale olive	0	30
Silt, slightly to moderately sandy, very fine to fine, pale olive	30	38
Sand, very fine to fine, very silty, pale olive	38	46
Silt, slightly sandy, very fine, pale olive	46	85
Sand, very fine, slightly to moderately silty, pale olive	85	97
Sand, very fine to fine, moderately to very silty, pale olive	97	134
Sand, very fine to medium, slightly silty, brown to pale olive	134	145
Sand, very fine to medium, moderately to very silty, brown	145	150
Sand, very fine to fine, slightly to moderately silty, brown	150	187
Silt, very sandy, very fine to fine, brown	187	190
Sand, very fine to fine, slightly to moderately silty, brown	190	235
Silt, interbedded sands, very fine to fine, shell fragments, green and olive	235	266
Sand, very fine to fine, trace shell fragments, brown	266	270
Silt, slightly sandy, very fine to fine, green and olive	270	279
Sand, very fine to fine, slightly to moderately silty, brown	279	282
Silt, olive and green	282	283
Sand, very fine to fine, slightly silty, siltier 297 to 301 feet, brown to gray	283	309
Silt, slightly limey, brown and olive	309	318
Sand, very fine to fine, slightly to moderately silty, shell fragments, brown	318	322
Silt, brown and olive	322	328
Sand, very fine to fine, brown	328	338
Silt, brown	338	340
Tertiary System, Ogallala Group:		
Sand and gravel, fine sand to coarse gravel, trace rootlets and sandstone fragments	340	358
Silt, very sandy, very fine to coarse, trace brown sandstone, brown	358	366
Sand and gravel, very fine sand to fine gravel, much coarse to very coarse	366	384
Sandstone, very fine to fine, slightly to moderately silty, marly, olive	384	390
Sand to sandstone, very fine to fine, rootlets, silty at 421 feet, olive gray	390	449
Sandstone, very fine to fine, slightly to moderately silty, brown	449	455

Sand to sandstone, very fine to fine, rare limey gray silt, brown	455	491
Sandstone, very fine to fine, slightly to moderately silty, brown	491	494
Sandstone, very fine to fine, lime cemented, brown to pale brown	494	518
Sandstone, very fine to fine, lime cemented, brown to pale brown	518	526
Sand, very fine to fine, brown	526	535
Sandstone, very fine to fine, moderately silty and limey, pale brown	535	537
Sand to sandstone, very fine to fine, lime cemented, pale brown	537	551
Sandstone, very fine to fine, moderately silty, rootlets, in part limey, brown	551	562
Sand, very fine to fine, rootlets, brown	562	570
Sand to sandstone, very fine to fine, rootlets, trace silt seams, brown	570	604
Sand, very fine to fine, pepper appearance, gray brown	604	633
Silt, very sandy, very fine to fine, yellow	633	636
Sand, very fine to fine, brown to olive	636	641
Silt, very sandy, very fine to fine, light gray	641	644
Sand, very fine to fine, trace medium to coarse, gray brown to olive	644	647
Silt, slightly sandy, very fine to fine, pale olive	647	650
Sand, very fine to coarse, much fine to medium, rootlets, pale olive	650	690
Silt, olive	690	691
Sand, very fine to medium, pale olive	691	695
Silt, olive	695	696
Sandy, very fine to medium, olive	696	700
Silt, slightly to moderately sandy, olive	700	703
Sand, very fine to medium, trace coarse, pale olive	703	732
Sandstone to sand, very fine to fine, olive brown	732	780
Sandstone, very fine to fine, moderately silty and limey, pale brown	780	800
Siltstone, moderately sandy, very fine to fine, limey, pale brown	800	820
Tertiary System, White River Group, Brule Formation:		
Siltstone, brown to dark brown	820	840

Test Hole 9-S-82

Location: T. 16N., R. 31W., 9CBAA
Date drilled: 6-17-82
Ground altitude: 3075 feet (North Platte 2 NE 7.5 minute quadrangle)
Depth to water:
Total depth: 680 feet

Material Description	Depth in feet	
	From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, trace brown silts, olive brown	0	30
Silt, with iron staining, trace sandy zones, brown	30	129
Sand and gravel, fine sand to fine gravel, occasional silt seams especially at 136, 163, 181 and 186 feet	129	220
Tertiary System, Ogallala Group:		
Silt, slightly sandy, light brown to brown	220	255
Sand to sandstone, very fine to medium, trace coarse to very coarse, slightly limey, brownish gray	255	312
Sand, very fine to medium, some coarse to very coarse and fine gravel, trace yellow and olive silt, rootlets	312	373
Sandstone, very fine to medium, trace coarse, many rootlets, brown	373	392
Sandstone, very fine to medium, lime cemented, light brownish gray	392	399
Sand to sandstone, very fine to coarse, trace yellow brown claystone, rootlets, pale olive	399	440
Silt, brown and olive	440	445
Sand to sandstone, very fine to very coarse, slightly silty	445	463
Silt, moderately to very sandy, olive	463	469
Sand and sandstone, very fine to very coarse, rootlets, trace silt seams, in part limey, pale olive to olive	469	541
Sandstone, very silty, lime cemented, rootlets, olive to pale olive	541	574
Tertiary System, Arikaree Group:		
Silt to sandstone, very fine to fine, rootlets, in part moderately to very limey, olive to pale olive	574	620
Silt, trace lime nodules, olive	620	660
Tertiary System, White River Group, Brule Formation:		
Silt, slightly limey, reddish brown	660	680

Test Hole 10-S-82

Location: T. 18N., R. 35W., 36DDD
Date drilled: 6-21-82
Ground altitude: 3348 feet (Big Bald Hill NE 7.5 minute quadrangle)
Depth to water:
Total depth: 720 feet

Material Description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to fine, slightly silty, gray brown to olive	0	64
Silt, very sandy, very fine to fine sand, olive	64	70
Sand, very fine to fine, slightly to moderately silty, especially at 85 feet, gray to pale olive	70	111
Sand, very silty, very fine to fine sand, green to olive	111	121
Sand, very fine to fine, slightly silty, olive brown	121	180
Sand, very fine to very coarse, rootlets	180	185
Silt, very sandy, green and brown	185	189
Sand and gravel, fine sand to fine gravel	189	224
Sand, very fine to very coarse, slightly silty	224	237
Silt, brown, sand and gravel seam 241 to 244 feet	237	254
Sand and gravel, fine sand to fine gravel, trace medium gravel, trace silt seams	254	335
Tertiary System, Ogallala Group:		
Sand to sandstone, very fine to fine, rootlets, pale olive to olive yellow	335	400
Sand to sandstone, lime cemented, slightly to moderately silty, rootlets, pale brown	400	420
Sand to sandstone, slightly silty, olive	420	440
Silt, brown	440	444
Sand to sandstone, very fine to fine, moderately silty, brown and olive	444	463
Silt, moderately sandy, pale olive	463	468
Sand to sandstone, moderately silty, sandier 485 to 486 feet, brown to olive	468	487
Sand to sandstone, very fine to fine, slightly silty, olive	487	525
Sand to sandstone, lime cemented, rootlets, pale olive	525	588
Sand to sandstone, moderately to very silty with brown and olive siltstone and claystone, moderately limey, light yellow brown to pale olive	588	626
Sand to sandstone, slightly silty, pale brown	626	658
Silt, moderately sandy, moderately limey, olive and reddish brown	658	664
Sand to sandstone, slightly silty, slightly limey, brown to pale brown	664	675
Sand to sandstone, moderately silty, very limey to lime cemented, pale brown	675	690
Tertiary System, White River Group, Brule Formation:		
Sand, moderately silty, slightly limey, brown and green	690	694
Silt to siltstone, reddish brown	694	720

Test Hole 11-S-82

Location: T. 16N., R. 39W., 1ADA
Date drilled: 6-22-82
Ground altitude: 3530 feet (Packard Ranch 7.5 minute quadrangle)
Depth to water:
Total depth: 460 feet

Material Description	Depth in feet From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, trace iron oxide staining at 70 feet, brown	0	75
Silt, very sandy, very fine to fine, pale olive	75	80
Sand, very fine to medium, slightly silty, olive	80	90
Silt, very sandy, very fine to fine, gray	90	94
Sand, very fine to medium	94	102
Silt, moderately to very sandy, very fine to fine, slightly clayey, pale brown to pale olive	102	116
Sand, very fine to very coarse, trace fine gravel, slightly to moderately silty 116 to 125 feet, much coarser 125 to 136 feet	116	136
Silt, moderately to very clayey, gray black	136	140
Sand and gravel, fine sand to fine gravel, trace medium gravel, gray to green	140	161
Sand and gravel, fine sand to fine gravel, trace medium gravel, gray to green	161	175
Sand and gravel, fine sand to medium gravel, much fine gravel, trace coarse gravel, gray to green to granitic, rare silt seams	175	270
Tertiary System, Ogallala Group:		
Sandstone to sand, very fine to fine, trace medium, moderately silty, slightly to very limey with lime cement, brown to pale brown to olive	270	335
Sandstone, moderately to very silty, lime cemented, very pale brown to pale olive	335	342
Sandstone, slightly to moderately silty, moderately limey, pale olive	342	366
Sandstone, moderately silty, moderately limey, pale olive	366	370
Sand to sandstone, very fine to medium, trace coarse, slightly silty, slightly limey, brown to pale brown	370	375
Sandstone, moderately silty, moderately limey, pale brown	375	381
Sand and sandstone, very fine to medium, slightly to moderately silty, moderately limey, pale olive	381	415
Sandstone, very fine to fine, lime cemented, interbedded with siltstone, pale olive to pale brown	415	429
Tertiary System, White River Group, Brule Formation:		
Siltstone, limey zones, pale brown to brown	429	460

Test Hole 12-S-82

Location: T. 18N., R. 40W., 36ABBB
Date drilled: 6-23-82
Ground altitude: 3654 feet (Williams Ranch 7.5 minute quadrangle)
Depth to water:
Total depth: 580 feet

Material Description	Depth in feet	
	From	To
Quaternary System, Undifferentiated:		
Sand, very fine to medium, trace coarse to very coarse, in part silty, especially at 35, 61 and 70 feet, olive gray to yellow brown	0	80
Silt, pale yellow to yellow brown	80	113
Silt, pale yellow to yellow brown	113	120
Sand, very fine to very coarse, trace fine gravel, much fine to medium sand, moderately to very silty, pale yellow to reddish brown to dark greenish gray	120	146
Sand, very fine to medium, trace coarse to very coarse and fine gravel, moderately to very silty, reddish brown to yellow	146	180
Silt, slightly sandy, slightly clayey, pale brown to pale olive	180	200
Sand, very fine to coarse, slightly silty	200	214
Sand, very fine to medium, moderately to very silty, trace rootlets, reddish brown	214	245
Tertiary System, Ogallala Group:		
Sand, very fine to coarse, trace very coarse, trace rootlets, trace silt, brown to olive brown	245	309
Sand to sandstone, very fine to coarse, trace very coarse, occasional silt to siltstone seams, gray brown	309	325
Sandstone, very fine to medium, trace coarse to very coarse, moderately silty, trace siltstone, olive brown to gray brown	325	380
Sand to sandstone, very fine to coarse, trace very coarse, much medium, trace brown and gray claystone and siltstone, brown	380	460
Sandstone, very fine to medium, lime cemented, moderately silty, very pale brown to grayish	460	492
Silt to siltstone, limey, brown to very pale brown	492	510
Tertiary System, White River Group, Brule Formation:		
Silt to siltstone, slightly to moderately sandy, very fine sand, limey, pale brown	510	550
Silt to siltstone, limey zones, slightly reddish brown to		

Appendix B. Water-quality data for wells sampled in 1983 in the study area

LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE OF SAMPLE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	HARDNESS (MG/L AS CACO3) (00900)	HARDNESS, NONCARBONATE (MG/L CACO3) (00902)	CALCIUM DISSOLVED (MG/L AS CA) (00915)
ARTHUR										
17N 36W 1BACC1	112SDGV	83-07-20	1730	300	158	6.9	14.0	55	0	17
17N 37W 9CDBA1	112SDGV	83-07-20	1730	351	210	7.3	14.0	72	0	23
17N 38W23BBCC1	121OGLL	78-08-30	--	208	165	7.6	14.0	63	0	20
		83-07-20	1420	220	--	7.8	--	60	0	19
17N 40W 5CA 1	--	83-07-21	1530	208	--	7.8	--	56	0	18
18N 39W 4CCA 1	112SDGV	83-08-08	1400	210	148	7.1	13.0	51	0	16
19N 36W27BB 1	112SDGV	78-08-23	--	360	180	7.1	15.0	69	0	21
		83-07-21	1030	360	188	7.1	13.0	69	0	21
19N 37W31ACDD1	112SDGV	69-06-11	--	290	125	7.7	12.0	47	0	14
		83-07-21	1145	290	139	7.1	13.5	46	0	14
20N 37W34AAAB1	112SDGV	83-07-20	0900	318	188	7.8	13.5	59	0	18
20N 38W29CCC 1	112SDGV	69-06-11	--	320	160	7.8	13.0	64	0	20
		83-07-21	1400	320	168	6.9	13.5	60	0	19
HOOKER										
21N 32W33BBD 1	121OGLL	83-07-13	1730	500	141	7.3	13.0	52	0	17
KEITH										
13N 40W13BABB1	121OGLL	83-07-15	1130	97	1280	7.0	12.5	590	286	180
14N 37W11DACD1	112SDGV	78-08-17	--	100	1300	7.3	--	550	239	170
		83-07-14	1530	100	1500	7.9	14.0	650	322	200
14N 38W18DBAC1	121OGLL	83-07-15	1000	351	665	7.4	14.0	240	40	72
14N 41W33AD 1	112SDGV	83-07-20	0755	362	338	7.6	--	120	0	37
15N 35W 9BC 1	112SDGV	83-08-03	1830	240	242	7.4	13.5	95	0	30
15N 38W25CCDA1	112SDGV	83-07-21	1310	73	530	7.4	--	210	54	71
15N 39W 2AAC 1	112SDGV	83-07-20	1235	210	--	7.4	--	68	0	22
15N 41W35AC 1	121OGLL	83-08-18	1930	505	386	7.7	18.0	140	0	43
16N 36W12AADD1	121OGLL	83-07-20	1630	452	--	7.4	13.5	63	0	20
16N 37W21CB 1	112SDGV	83-07-21	1700	260	215	7.5	14.5	78	0	25
16N 39W10DD 1	112SDGV	78-08-17	--	248	175	7.4	14.0	66	0	22
		83-07-22	0915	248	192	7.7	--	63	0	21
16N 40W14BDB 1	112SDGV	83-08-04	0900	221	179	7.6	14.0	69	0	23
16N 41W27BA 1	112SDGV	83-07-22	0815	141	188	7.2	--	71	0	24
LINCOLN										
12N 26W35CD 1	112SDGV	83-07-15	1130	90	520	7.6	13.0	190	10	58
13N 26W24BAC 1	112SDGV	83-07-15	1030	221	310	7.5	12.5	120	0	39
13N 29W13DCAD1	121OGLL	83-08-14	1345	339	280	7.5	14.5	110	0	36
14N 26W16BB 1	112SDGV	83-07-13	1440	260	215	7.6	14.8	81	0	26
14N 28W14CDD 2	--	83-08-03	0930	--	157	7.2	12.5	52	0	17
14N 34W28ABAB1	121OGLL	83-07-25	1030	130	1330	7.7	13.0	550	371	170
15N 27W 6DCAA1	112SDGV	83-08-03	1100	312	154	7.4	14.0	58	0	19
15N 30W36ACCA1	112SDGV	83-08-13	1745	232	168	7.2	14.0	64	0	21
15N 33W25BBDD1	112SDGV	83-07-12	1315	280	181	7.4	14.5	66	0	22
15N 33W35CBCC1	121OGLL	83-07-14	1100	155	391	7.7	13.0	150	9	50
16N 26W29DAD 1	112SDGV	83-07-13	1310	270	190	7.5	14.3	70	0	23
16N 29W28DBDD1	112SDGV	78-08-14	--	360	180	6.8	15.0	66	0	22
		83-07-12	2000	360	137	7.4	12.5	49	0	16
16N 31W23CBA 1	--	83-08-09	1400	--	175	7.3	13.5	67	0	22
LOGAN										
17N 26W21DAC 1	112SDGV	78-08-24	--	306	310	7.3	14.0	130	0	43
		83-08-27	1415	306	--	7.5	14.0	130	0	44
17N 27W25B 1	112SDGV	83-07-13	1800	277	290	7.6	15.0	100	0	34
17N 28W 7ACDD1	112SDGV	69-06-12	--	207	189	7.9	13.0	76	0	25
		83-07-12	1900	207	192	7.1	13.0	76	0	25
18N 28W14CDB 1	112SDGV	83-08-03	1235	260	128	7.7	13.5	47	0	15
19N 26W18DDC 1	112SDGV	83-07-12	0845	262	120	7.4	14.0	45	0	14
19N 27W 9DAB 1	121OGLL	83-08-23	0915	328	110	7.3	13.0	39	0	12
19N 28W16BC 1	112SDGV	83-08-03	1400	230	124	7.5	13.5	43	0	14
20N 27W14BBC 1	121OGLL	83-07-12	1220	301	160	7.5	13.5	55	0	18
20N 29W31BCAA1	112SDGV	78-08-24	--	206	145	7.4	14.0	58	0	19
		83-07-12	1230	206	110	7.8	13.0	52	0	17

Appendix B. Water-quality data for wells sampled in 1983 in the study area--Continued

LOCAL IDENTIFIER	DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	SODIUM ADSORPTION RATIO (00931)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)
				ARTHUR						
17N 36W 18ACC1	83-07-20	3.0	6.6	.4	3.9	73	3.5	.8	.40	44
17N 37W 9CDBA1	83-07-20	3.5	7.7	.4	7.0	91	5.8	1.0	.40	48
17N 38W23BBCC1	78-08-30	3.1	8.1	.5	5.9	--	4.3	.9	.40	39
	83-07-20	3.0	6.8	.4	6.1	80	4.6	1.0	.40	38
17N 40W 5CA 1	83-07-21	2.6	6.4	.4	6.4	80	--	1.6	.30	47
18N 39W 4CCA 1	83-08-08	2.7	5.7	.4	7.3	71	2.7	.8	.40	35
19N 36W27BB 1	78-08-23	4.0	8.5	.5	4.4	--	2.7	1.1	.40	53
	83-07-21	4.0	7.9	.4	4.4	89	4.2	1.0	.40	52
19N 37W31ACDD1	69-06-11	2.8	5.9	.4	5.5	--	4.3	.7	.30	47
	83-07-21	2.6	5.6	.4	3.7	63	2.7	.8	.50	43
20N 37W34AAAB1	83-07-20	3.5	9.0	.5	4.2	82	4.5	1.2	.40	50
20N 38W29CCC 1	69-06-11	3.4	6.6	.4	5.9	--	4.7	.5	.50	44
	83-07-21	3.1	6.3	.4	5.2	78	3.2	1.0	.50	43
				HOOKER						
21N 32W33BBD 1	83-07-13	2.4	5.7	.4	4.4	63	2.2	.6	.30	57
				KEITH						
13N 40W13ABB1	83-07-15	34	57	1.1	18	304	350	30	.40	55
14N 37W11DACD1	78-08-17	30	97	1.9	7.9	--	400	14	.20	28
	83-07-14	37	93	1.7	7.9	331	500	18	.20	28
14N 38W18DBAC1	83-07-15	15	45	1.3	12	202	130	16	.60	55
14N 41W33AD 1	83-07-20	7.3	17	.7	8.8	147	19	4.3	.60	59
15N 35W 9BC 1	83-08-03	4.9	7.8	.4	6.3	112	6.3	1.1	.50	43
15N 38W25CCDA1	83-07-21	7.7	17	.5	11	155	77	5.7	.50	42
15N 39W 2AAC 1	83-07-20	3.2	6.9	.4	7.4	84	6.6	1.1	.40	40
15N 41W35AC 1	83-08-18	8.9	21	.8	9.1	157	22	5.5	.80	62
16N 36W12AADD1	83-07-20	3.1	7.3	.4	6.3	87	4.3	1.1	.40	43
16N 37W21CB 1	83-07-21	3.7	7.4	.4	6.3	96	7.6	1.1	.40	40
16N 39W10DD 1	78-08-17	2.6	6.3	.4	7.7	--	4.6	.9	.30	43
	83-07-22	2.6	5.9	.3	7.8	81	4.9	1.1	.30	44
16N 40W14BDB 1	83-08-04	2.8	5.9	.3	5.7	86	5.3	.8	.30	49
16N 41W27BA 1	83-07-22	2.7	5.9	.3	5.7	81	4.9	1.3	.30	50
				LINCOLN						
12N 26W35CD 1	83-07-15	9.8	33	1.1	8.0	175	78	10	.50	52
13N 26W24BAC 1	83-07-15	4.8	9.2	.4	7.7	118	6.8	2.8	.30	47
13N 29W13DCAD1	83-08-14	4.6	9.7	.4	6.2	120	11	.8	.30	60
14N 26W16BB 1	83-07-13	4.0	6.9	.3	6.5	87	5.4	1.3	.30	45
14N 28W14CDD 2	83-08-03	2.3	5.9	.4	6.0	59	3.1	1.0	.20	52
14N 34W28ABAB1	83-07-25	31	79	1.5	7.5	182	480	43	.30	35
15N 27W 6DCAA1	83-08-03	2.6	6.5	.4	4.2	73	3.6	1.0	.30	46
15N 30W36ACCA1	83-08-13	2.9	6.3	.4	5.4	76	3.9	.9	.30	49
15N 33W25BBDD1	83-07-12	2.8	5.5	.3	4.6	80	4.0	1.0	.40	52
15N 33W35CBCC1	83-07-14	6.9	12	.4	7.6	145	35	2.4	.30	58
16N 26W29DAD 1	83-07-13	3.0	7.3	.4	4.9	84	2.4	1.2	.30	46
16N 29W28DBDD1	78-08-14	2.6	6.1	.3	5.4	--	3.7	.9	.30	48
	83-07-12	2.3	5.9	.4	5.3	63	2.2	.8	.30	49
16N 31W23CBA 1	83-08-09	2.9	5.9	.3	6.8	81	7.6	.9	.30	47
				LOGAN						
17N 26W21DAC 1	78-08-24	5.5	9.4	.4	6.5	--	5.3	2.1	.30	49
	83-08-27	5.9	10	.4	6.7	150	7.9	2.3	.30	49
17N 27W25B 1	83-07-13	4.4	9.3	.4	5.4	116	4.0	1.4	.30	50
17N 28W 7ACDD1	69-06-12	3.2	8.5	.4	5.3	--	6.2	.8	.40	54
	83-07-12	3.2	7.4	.4	4.9	88	4.4	2.4	.40	55
18N 28W14CDB 1	83-08-03	2.2	5.4	.4	5.0	62	2.0	.6	.30	50
19N 26W18DDC 1	83-07-12	2.4	5.2	.4	3.8	56	1.6	.6	.30	53
19N 27W 9DAB 1	83-08-23	2.2	5.2	.4	4.4	48	3.3	.6	.40	52
19N 28W16BC 1	83-08-03	2.0	5.2	.4	4.4	59	1.9	.7	.20	50
20N 27W14BBC 1	83-07-12	2.4	5.7	.3	4.7	69	3.2	1.0	.30	53
20N 29W31BCAA1	78-08-24	2.6	4.0	.2	4.6	--	2.5	.7	.30	50
	83-07-12	2.2	5.4	.3	4.1	65	2.1	.6	.30	47

Appendix B. Water-quality data for wells sampled in 1983 in the study area--Continued

LOCAL IDENTIFIER	DATE OF SAMPLE	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L) (70301)	SOLIDS, DISSOLVED (TONS PER AC-FT) (70303)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, TOTAL (MG/L AS N) (00600)
				ARTHUR						
17N 36W 1BACC1	83-07-20	--	123	.17	--	<.10	--	--	--	--
17N 37W 9CDBA1	83-07-20	--	151	.21	--	<.10	--	--	--	--
17N 38W23BBCC1	78-08-30	118	129	.16	--	.03	--	--	--	--
	83-07-20	--	127	.17	--	.20	--	--	--	--
17N 40W 5CA 1	83-07-21	--	--	--	--	1.5	--	--	--	--
18N 39W 4CCA 1	83-08-08	--	113	.15	--	.30	--	--	--	--
19N 36W27BB 1	78-08-23	141	146	.19	--	.01	--	--	--	--
	83-07-21	--	148	.20	--	<.10	--	--	--	--
19N 37W31ACDD1	69-06-11	116	117	.16	--	--	--	--	--	--
	83-07-21	--	111	.15	--	<.10	--	--	--	--
20N 37W34AAAB1	83-07-20	--	140	.19	--	<.10	--	--	--	--
20N 38W29CCC 1	69-06-11	131	133	.18	--	--	--	--	--	--
	83-07-21	--	128	.17	--	<.10	--	--	--	--
				HOOKER						
21N 32W33BBD 1	83-07-13	--	127	.17	--	1.5	--	--	--	--
				KEITH						
13N 40W13BABB1	83-07-15	--	907	1.2	--	11	--	--	--	--
14N 37W11DACD1	78-08-17	892	933	1.2	--	1.2	--	--	--	--
	83-07-14	--	1080	1.5	--	.78	--	--	--	--
14N 38W18DBAC1	83-07-15	--	467	.63	--	1.4	--	--	--	--
14N 41W33AD 1	83-07-20	--	241	.33	--	1.9	--	--	--	--
15N 35W 9BC 1	83-08-03	--	167	.23	--	.46	--	--	--	--
15N 38W25CCDA1	83-07-21	--	325	.44	--	1.2	--	--	--	--
15N 39W 2AAC 1	83-07-20	--	138	.19	--	.26	--	--	--	--
15N 41W35AC 1	83-08-18	--	266	.36	--	3.2	--	--	--	--
16N 36W12AADD1	83-07-20	--	138	.19	--	<.10	--	--	--	--
16N 37W21CB 1	83-07-21	--	149	.20	--	<.10	--	--	--	--
16N 39W10DD 1	78-08-17	129	132	.18	--	.65	--	--	--	--
	83-07-22	--	136	.19	--	1.2	--	--	--	--
16N 40W14BDB 1	83-08-04	--	144	.20	--	.30	--	--	--	--
16N 41W27BA 1	83-07-22	--	143	.20	--	2.0	--	--	--	--
				LINCOLN						
12N 26W35CD 1	83-07-15	--	354	.48	--	1.6	--	--	--	--
13N 26W24BAC 1	83-07-15	--	189	.26	--	3.7	--	--	--	--
13N 29W13DCAD1	83-08-14	--	201	.27	--	2.2	--	--	--	--
14N 26W16BB 1	83-07-13	--	148	.20	--	3.8	--	--	--	--
14N 28W14CDD 2	83-08-03	--	123	.17	--	2.5	--	--	--	--
14N 34W28ABAB1	83-07-25	--	955	1.3	--	2.8	--	--	--	--
15N 27W 6DCAA1	83-08-03	--	127	.17	--	1.4	--	--	--	--
15N 30W36ACCA1	83-08-13	--	135	.18	--	1.5	--	--	--	--
15N 33W25BBDD1	83-07-12	--	140	.19	--	1.3	--	--	--	--
15N 33W35CBCC1	83-07-14	--	259	.35	--	3.4	--	--	--	--
16N 26W29DAD 1	83-07-13	--	138	.19	--	1.5	--	--	--	--
16N 29W28DBDD1	78-08-14	129	131	.18	--	1.4	--	--	--	--
	83-07-12	--	120	.16	--	1.3	--	--	--	--
16N 31W23CBA 1	83-08-09	--	142	.19	--	1.5	--	--	--	--
				LOGAN						
17N 26W21DAC 1	78-08-24	212	205	.29	--	2.3	--	--	--	--
	83-08-27	--	216	.29	--	2.7	--	--	--	--
17N 27W25B 1	83-07-13	--	178	.24	--	2.0	--	--	--	--
17N 28W 7ACDD1	69-06-12	163	156	.22	--	--	--	--	--	--
	83-07-12	--	156	.21	--	1.5	--	--	--	--
18N 28W14CDB 1	83-08-03	--	118	.16	--	.49	--	--	--	--
19N 26W18DDC 1	83-07-12	--	115	.16	--	.72	--	--	--	--
19N 27W 9DAB 1	83-08-23	--	109	.15	--	.96	--	--	--	--
19N 28W16BC 1	83-08-03	--	114	.15	--	.66	--	--	--	--
20N 27W14BBC 1	83-07-12	--	130	.18	--	1.3	--	--	--	--
20N 29W31BCAA1	78-08-24	115	123	.16	--	.36	--	--	--	--
	83-07-12	--	118	.16	--	.38	--	--	--	--

Appendix B. Water-quality data for wells sampled in 1983 in the study area--Continued

LOCAL IDENTIFIER	DATE OF SAMPLE	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
				ARTHUR						
17N 36W 1BACC1	83-07-20	--	--	--	--	--	--	--	--	--
17N 37W 9CDBA1	83-07-20	--	--	--	--	--	--	--	--	--
17N 38W23BBCC1	78-08-30	--	6	--	<20	ND	ND	ND	50	ND
	83-07-20	--	--	--	--	--	--	--	--	--
17N 40W 5CA 1	83-07-21	--	--	--	--	--	--	--	--	--
18N 39W 4CCA 1	83-08-08	--	--	--	--	--	--	--	--	--
19N 36W27BB 1	78-08-23	--	8	--	30	<2	ND	<2	<10	3
	83-07-21	--	--	--	--	--	--	--	--	--
19N 37W31ACDD1	69-06-11	--	--	--	10	--	--	0	90	--
	83-07-21	--	9	51	20	<1	<10	3	16	<1
20N 37W34AAAB1	83-07-20	--	--	--	--	--	--	--	--	--
20N 38W29CCC 1	69-06-11	--	--	--	30	--	--	0	80	--
	83-07-21	--	--	--	--	--	--	--	--	--
				HOOKER						
21N 32W33BBD 1	83-07-13	--	8	38	20	<1	<10	4	6	<1
				KEITH						
13N 40W13BABB1	83-07-15	--	--	--	--	--	--	--	--	--
14N 37W11DACD1	78-08-17	--	2	--	110	ND	ND	4	20	ND
	83-07-14	--	--	--	--	--	--	--	--	--
14N 38W18DBAC1	83-07-15	--	--	--	--	--	--	--	--	--
14N 41W33AD 1	83-07-20	--	9	95	70	<1	<10	3	9	<1
15N 35W 9BC 1	83-08-03	--	--	--	--	--	--	--	--	--
15N 38W25CCDA1	83-07-21	--	--	--	--	--	--	--	--	--
15N 39W 2AAC 1	83-07-20	--	--	--	--	--	--	--	--	--
15N 41W35AC 1	83-08-18	--	--	--	--	--	--	--	--	--
16N 36W12AADD1	83-07-20	--	9	86	30	<1	<10	2	140	<1
16N 37W21CB 1	83-07-21	--	--	--	--	--	--	--	--	--
16N 39W10DD 1	78-08-17	--	12	--	<20	ND	ND	<2	20	ND
	83-07-22	--	--	--	--	--	--	--	--	--
16N 40W14BDB 1	83-08-04	--	--	--	--	--	--	--	--	--
16N 41W27BA 1	83-07-22	--	--	--	--	--	--	--	--	--
				LINCOLN						
12N 26W35CD 1	83-07-15	--	--	--	--	--	--	--	--	--
13N 26W24BAC 1	83-07-15	--	11	220	30	<1	<10	2	5	<1
13N 29W13DCAD1	83-08-14	--	--	--	--	--	--	--	--	--
14N 26W16BB 1	83-07-13	--	--	--	--	--	--	--	--	--
14N 28W14CDD 2	83-08-03	--	--	--	--	--	--	--	--	--
14N 34W28ABAB1	83-07-25	--	--	--	--	--	--	--	--	--
15N 27W 6DCAA1	83-08-03	--	--	--	--	--	--	--	--	--
15N 30W36ACCA1	83-08-13	--	8	90	20	1	10	2	4	1
15N 33W25BBDD1	83-07-12	--	--	--	--	--	--	--	--	--
15N 33W35CBCC1	83-07-14	--	12	180	40	1	<10	6	5	4
16N 26W29DAD 1	83-07-13	--	--	--	--	--	--	--	--	--
16N 29W28DBDD1	78-08-14	--	9	--	<20	ND	ND	2	<10	2
	83-07-12	--	--	--	--	--	--	--	--	--
16N 31W23CBA 1	83-08-09	--	--	--	--	--	--	--	--	--
				LOGAN						
17N 26W21DAC 1	78-08-24	--	5	--	30	<2	<20	<2	<10	5
	83-08-27	--	--	--	--	--	--	--	--	--
17N 27W25B 1	83-07-13	--	--	--	--	--	--	--	--	--
17N 28W 7ACDD1	69-06-12	--	--	--	20	--	--	20	0	--
	83-07-12	--	7	92	20	<1	<10	2	20	<1
18N 28W14CDB 1	83-08-03	--	--	--	--	--	--	--	--	--
19N 26W18DDC 1	83-07-12	--	7	56	20	<1	<10	1	11	<1
19N 27W 9DAB 1	83-08-23	--	--	--	--	--	--	--	--	--
19N 28W16BC 1	83-08-03	--	--	--	--	--	--	--	--	--
20N 27W14BBC 1	83-07-12	--	--	--	--	--	--	--	--	--
20N 29W31BCAA1	78-08-24	--	10	--	<20	ND	ND	ND	20	3
	83-07-12	--	--	--	--	--	--	--	--	--

Appendix B. Water-quality data for wells sampled in 1983 in the study area--Continued

LOCAL IDENTIFIER	DATE OF SAMPLE	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
		ARTHUR				
17N 36W 1BACC1	83-07-20	--	--	--	--	--
17N 37W 9CDBA1	83-07-20	--	--	--	--	--
17N 38W23BBCC1	78-08-30	110	<.1	<1	--	ND
	83-07-20	--	--	--	--	--
17N 40W 5CA 1	83-07-21	--	--	--	--	--
18N 39W 4CCA 1	83-08-08	--	--	--	--	--
19N 36W27BB 1	78-08-23	220	<.1	<1	--	3
	83-07-21	--	--	--	--	--
19N 37W31ACDD1	69-06-11	--	--	--	--	10
	83-07-21	140	<.1	<1	<1	4
20N 37W34AAAB1	83-07-20	--	--	--	--	--
20N 38W29CCC 1	69-06-11	--	--	--	--	0
	83-07-21	--	--	--	--	--
		HOOKER				
21N 32W33BBD 1	83-07-13	<1	<.1	3	<1	<3
		KEITH				
13N 40W13BABB1	83-07-15	--	--	--	--	--
14N 37W11DACD1	78-08-17	100	<.1	<1	--	50
	83-07-14	--	--	--	--	--
14N 38W18DBAC1	83-07-15	--	--	--	--	--
14N 41W33AD 1	83-07-20	1	.1	2	<1	11
15N 35W 9BC 1	83-08-03	--	--	--	--	--
15N 38W25CCDA1	83-07-21	--	--	--	--	--
15N 39W 2AAC 1	83-07-20	--	--	--	--	--
15N 41W35AC 1	83-08-18	--	--	--	--	--
16N 36W12AADD1	83-07-20	<10	<.1	<1	<1	5
16N 37W21CB 1	83-07-21	--	--	--	--	--
16N 39W10DD 1	78-08-17	<10	<.1	1	--	20
	83-07-22	--	--	--	--	--
16N 40W14BDB 1	83-08-04	--	--	--	--	--
16N 41W27BA 1	83-07-22	--	--	--	--	--
		LINCOLN				
12N 26W35CD 1	83-07-15	--	--	--	--	--
13N 26W24BAC 1	83-07-15	<1	<.1	3	<1	26
13N 29W13DCAD1	83-08-14	--	--	--	--	--
14N 26W16BB 1	83-07-13	--	--	--	--	--
14N 28W14CDD 2	83-08-03	--	--	--	--	--
14N 34W28ABAB1	83-07-25	--	--	--	--	--
15N 27W 6DCAA1	83-08-03	--	--	--	--	--
15N 30W36ACCA1	83-08-13	1	.1	1	1	9
15N 33W25BBDD1	83-07-12	--	--	--	--	--
15N 33W35CBCC1	83-07-14	5	<.1	3	<1	9
16N 26W29DAD 1	83-07-13	--	--	--	--	--
16N 29W28DBDD1	78-08-14	<10	<.1	1	--	<20
	83-07-12	--	--	--	--	--
16N 31W23CBA 1	83-08-09	--	--	--	--	--
		LOGAN				
17N 26W21DAC 1	78-08-24	<1	<.1	<1	--	<3
	83-08-27	--	--	--	--	--
17N 27W25B 1	83-07-13	--	--	--	--	--
17N 28W 7ACDD1	69-06-12	--	--	--	--	10
	83-07-12	2	<.1	2	<1	11
18N 28W14CDB 1	83-08-03	--	--	--	--	--
19N 26W18DDC 1	83-07-12	14	<.1	1	<1	9
19N 27W 9DAB 1	83-08-23	--	--	--	--	--
19N 28W16BC 1	83-08-03	--	--	--	--	--
20N 27W14BBC 1	83-07-12	--	--	--	--	--
20N 29W31BCAA1	78-08-24	<10	<.1	<1	--	<20
	83-07-12	--	--	--	--	--

Appendix B. Water-quality data for wells sampled in 1983 in the study area--Continued

LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE OF SAMPLE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	HARDNESS (MG/L AS CACO3) (00900)	HARDNESS, NONCARBONATE (MG/L CACO3) (00902)	CALCIUM DISSOLVED (MG/L AS CA) (00915)
				MCPHERSON						
17N 30W15BCB 1	112SDGV	83-07-13	1700	352	144	7.7	14.0	52	0	17
17N 31W29DBC 1	112SDGV	83-07-14	1300	265	137	7.8	13.5	53	0	17
17N 33W30ACBB1	121OGLL	83-07-22	1100	257	190	7.4	13.5	73	0	23
17N 35W 2DC 1	112SDGV	83-07-22	1000	400	150	7.5	13.0	60	0	19
18N 30W17ACAA1	112SDGV	83-07-13	1300	360	137	7.5	14.0	51	0	16
18N 31W32CAD 1	112SDGV	69-06-12	--	398	191	7.5	13.0	63	0	20
		83-07-14	1200	398	123	7.5	14.5	41	0	13
18N 32W12ACA 1	112SDGV	83-08-08	1230	306	128	7.9	13.0	47	0	15
18N 33W 9DACC1	--	83-07-14	1600	--	--	7.7	12.5	79	0	25
18N 35W17BDAD1	112SDGV	83-08-03	1630	286	112	7.1	12.5	35	0	11
19N 31W12CAB 1	112SDGV	73-07-20	1150	260	160	7.7	13.0	69	0	23
		77-06-21	--	260	178	7.6	14.0	67	0	22
		83-07-13	1530	260	162	7.6	13.0	64	0	21
20N 30W 9DDB 1	112SDGV	78-08-24	--	455	135	7.2	14.0	48	0	15
		83-07-13	1430	455	133	7.2	14.0	48	0	15
20N 33W34DDDB1	112SDGV	83-07-20	1400	400	110	7.0	14.0	31	0	9.6
20N 34W 3DBD 1	112SDGV	83-07-20	1130	340	220	7.6	13.0	71	28	23
20N 34W32DA 1	112SDGV	83-07-13	1545	355	208	7.2	13.0	91	0	28
20N 35W 8ACCC1	112SDGV	78-08-23	--	299	280	7.2	14.5	120	0	38
		83-07-21	0930	299	288	7.2	13.5	110	0	34
				THOMAS						
21N 26W23DC 1	112SDGV	83-08-02	1500	102	124	7.4	12.5	43	0	14
21N 30W19AC 1	112SDGV	83-08-04	1300	400	151	7.0	13.0	53	0	17

LOCAL IDENTIFIER	DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	SODIUM ADSORPTION RATIO (00931)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)
				MCPHERSON						
17N 30W15BCB 1	83-07-13	2.4	5.9	.4	1.1	65	3.1	1.1	.30	50
17N 31W29DBC 1	83-07-14	2.6	5.7	.4	4.7	69	3.1	.7	.30	47
17N 33W30ACBB1	83-07-22	3.8	6.7	.4	6.1	94	5.5	.9	.40	51
17N 35W 2DC 1	83-07-22	3.0	6.8	.4	4.8	77	4.6	1.0	.40	50
18N 30W17ACAA1	83-07-13	2.7	6.4	.4	4.9	68	1.8	1.0	.40	51
18N 31W32CAD 1	69-06-12	3.1	8.6	.5	9.4	--	7.3	.8	.30	46
	83-07-14	2.0	5.8	.4	5.4	58	1.7	.7	.30	49
18N 32W12ACA 1	83-08-08	2.2	5.3	.4	5.0	61	2.1	.7	.40	50
18N 33W 9DACC1	83-07-14	3.9	7.0	.4	3.9	93	5.9	.7	.40	54
18N 35W17BDAD1	83-08-03	1.8	6.4	.5	4.5	43	6.3	.7	.20	53
19N 31W12CAB 1	73-07-20	2.7	6.8	.4	3.9	--	4.0	1.3	.30	54
	77-06-21	3.0	6.7	.4	4.9	--	4.7	1.1	.20	49
	83-07-13	2.9	6.9	.4	3.8	83	2.8	.7	.30	55
20N 30W 9DDB 1	78-08-24	2.5	6.3	.4	4.4	--	2.0	.8	.30	55
	83-07-13	2.6	6.0	.4	4.9	64	2.0	.5	.30	52
20N 33W34DDDB1	83-07-20	1.8	4.9	.4	3.9	44	2.6	.6	.30	51
20N 34W 3DBD 1	83-07-20	3.3	8.4	.5	3.8	43	10	12	.20	33
20N 34W32DA 1	83-07-13	5.2	10	.5	4.2	115	4.1	1.1	.30	58
20N 35W 8ACCC1	78-08-23	6.4	8.2	.3	6.3	--	5.3	1.4	.30	57
	83-07-21	5.8	9.7	.4	6.1	134	5.4	2.3	.30	57
				THOMAS						
21N 26W23DC 1	83-08-02	1.9	4.9	.3	4.7	57	2.4	.8	.30	53
21N 30W19AC 1	83-08-04	2.6	6.6	.4	4.9	66	2.7	1.0	.20	64

Appendix B. Water-quality data for wells sampled in 1983 in the study area--Continued

LOCAL IDENTIFIER	DATE OF SAMPLE	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L) (70301)	SOLIDS, DISSOLVED (TONS PER AC-FT) (70303)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, TOTAL (MG/L AS N) (00600)
				MCPHERSON						
17N 30W15BCB 1	83-07-13	--	120	.16	--	.78	--	--	--	--
17N 31W29DBC 1	83-07-14	--	122	.17	--	.62	--	--	--	--
17N 33W30ACBB1	83-07-22	--	154	.21	--	<.10	--	--	--	--
17N 35W 2DC 1	83-07-22	--	136	.18	--	.18	--	--	--	--
18N 30W17ACAA1	83-07-13	--	125	.17	--	.98	--	--	--	--
18N 31W32CAD 1	69-06-12	158	141	.21	--	--	--	--	--	--
	83-07-14	--	113	.15	--	.92	--	--	--	--
18N 32W12ACA 1	83-08-08	--	117	.16	--	.66	--	--	--	--
18N 33W 9DACC1	83-07-14	--	157	.21	--	<.10	--	--	--	--
18N 35W17BDAD1	83-08-03	--	110	.15	--	1.7	--	--	--	--
19N 31W12CAB 1	73-07-20	155	145	.21	.30	.29	.050	.00	.04	.34
	77-06-21	140	141	.19	.53	.51	.060	.02	.08	.61
	83-07-13	--	143	.19	--	.41	--	--	--	--
20N 30W 9DDB 1	78-08-24	114	122	.16	--	.77	--	--	--	--
	83-07-13	--	122	.17	--	.80	--	--	--	--
20N 33W34DDDB1	83-07-20	--	101	.14	--	.36	--	--	--	--
20N 34W 3DBD 1	83-07-20	--	119	.16	--	7.4	--	--	--	--
20N 34W32DA 1	83-07-13	--	180	.24	--	<.10	--	--	--	--
20N 35W 8ACCC1	78-08-23	196	207	.27	--	.12	--	--	--	--
	83-07-21	--	201	.27	--	.96	--	--	--	--
				THOMAS						
21N 26W23DC 1	83-08-02	--	116	.16	--	.77	--	--	--	--
21N 30W19AC 1	83-08-04	--	139	.19	--	1.6	--	--	--	--

LOCAL IDENTIFIER	DATE OF SAMPLE	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
				MCPHERSON						
17N 30W15BCB 1	83-07-13	--	--	--	--	--	--	--	--	--
17N 31W29DBC 1	83-07-14	--	--	--	--	--	--	--	--	--
17N 33W30ACBB1	83-07-22	--	--	--	--	--	--	--	--	--
17N 35W 2DC 1	83-07-22	--	--	--	--	--	--	--	--	--
18N 30W17ACAA1	83-07-13	--	--	--	--	--	--	--	--	--
18N 31W32CAD 1	69-06-12	--	--	--	40	--	--	20	70	--
	83-07-14	--	--	--	--	--	--	--	--	--
18N 32W12ACA 1	83-08-08	--	--	--	--	--	--	--	--	--
18N 33W 9DACC1	83-07-14	--	10	63	20	<1	<10	2	51	2
18N 35W17BDAD1	83-08-03	--	--	--	--	--	--	--	--	--
19N 31W12CAB 1	73-07-20	.120	8	<100	50	ND	ND	3	<10	2
	77-06-21	.120	7	<100	<20	<2	<20	2	60	2
	83-07-13	--	--	--	--	--	--	--	--	--
20N 30W 9DDB 1	78-08-24	--	8	--	<20	<2	ND	<2	<10	5
	83-07-13	--	--	--	--	--	--	--	--	--
20N 33W34DDDB1	83-07-20	--	--	--	--	--	--	--	--	--
20N 34W 3DBD 1	83-07-20	--	--	--	--	--	--	--	--	--
20N 34W32DA 1	83-07-13	--	--	--	--	--	--	--	--	--
20N 35W 8ACCC1	78-08-23	--	3	--	40	<2	<20	2	170	4
	83-07-21	--	--	--	--	--	--	--	--	--
				THOMAS						
21N 26W23DC 1	83-08-02	--	--	--	--	--	--	--	--	--
21N 30W19AC 1	83-08-04	--	--	--	--	--	--	--	--	--

Appendix B. Water-quality data for wells sampled in 1983 in the study area--Continued

LOCAL IDENTIFIER	DATE OF SAMPLE	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
		MCPHERSON				
17N 30W15BCB 1	83-07-13	--	--	--	--	--
17N 31W29DBC 1	83-07-14	--	--	--	--	--
17N 33W30ACBB1	83-07-22	--	--	--	--	--
17N 35W 2DC 1	83-07-22	--	--	--	--	--
18N 30W17ACAA1	83-07-13	--	--	--	--	--
18N 31W32CAD 1	69-06-12	--	--	--	--	10
	83-07-14	--	--	--	--	--
18N 32W12ACA 1	83-08-08	--	--	--	--	--
18N 33W 9DACC1	83-07-14	67	<.1	<1	<1	13
18N 35W17BDAD1	83-08-03	--	--	--	--	--
19N 31W12CAB 1	73-07-20	<10	<.5	<1	ND	<20
	77-06-21	<10	<.5	1	ND	4
	83-07-13	--	--	--	--	--
20N 30W 9DDB 1	78-08-24	<10	<.1	<1	--	50
	83-07-13	--	--	--	--	--
20N 33W34DDDB1	83-07-20	--	--	--	--	--
20N 34W 3DBD 1	83-07-20	--	--	--	--	--
20N 34W32DA 1	83-07-13	--	--	--	--	--
20N 35W 8ACCC1	78-08-23	270	<.1	<1	--	<20
	83-07-21	--	--	--	--	10
		THOMAS				
21N 26W23DC 1	83-08-02	--	--	--	--	--
21N 30W19AC 1	83-08-04	--	--	--	--	--