Iowa-9566

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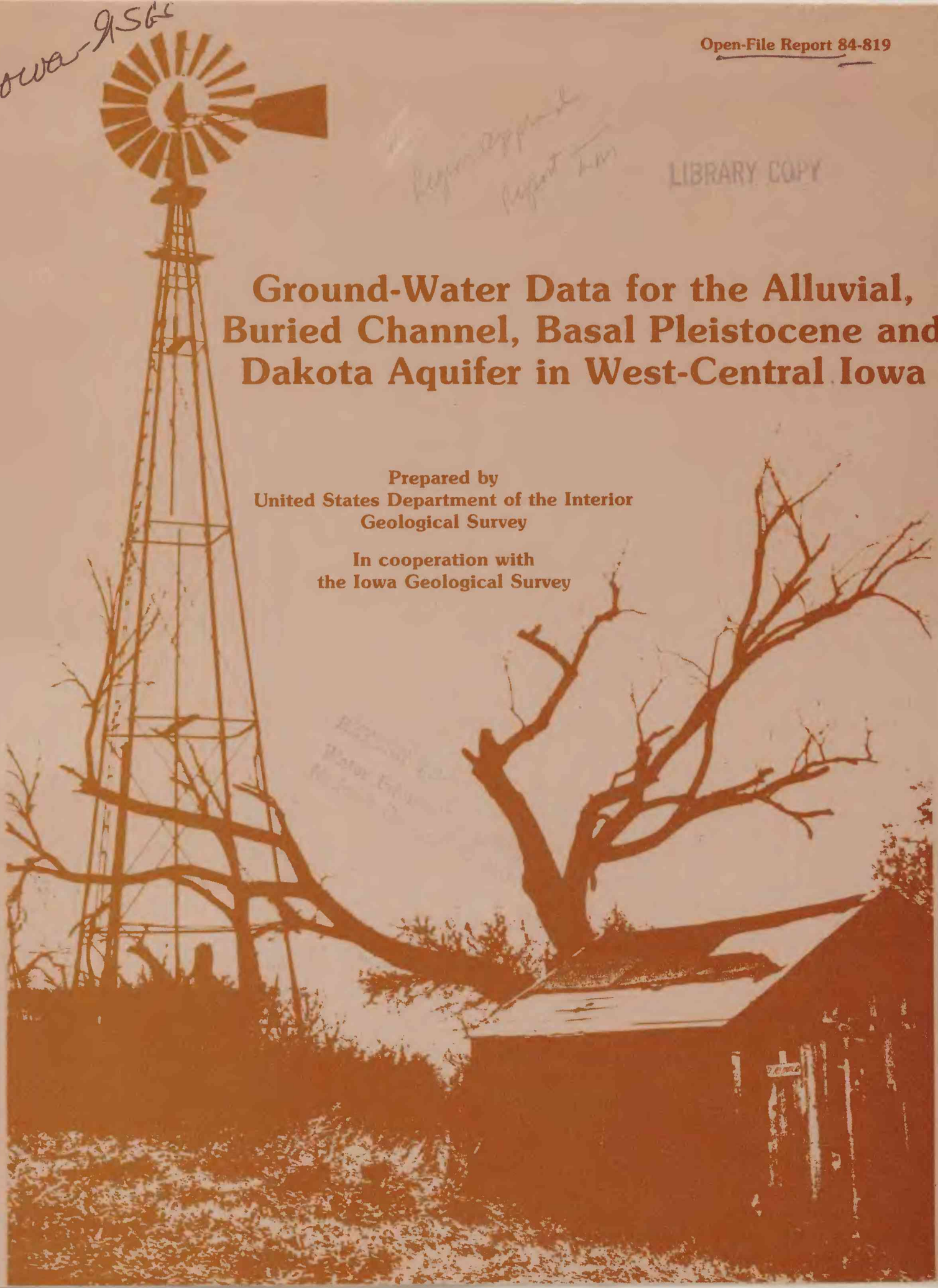
Ground-Water Data for the Alluvial, Buried Channel, Basal Pleistocene and Dakota Aquifer in West-Central Iowa

Prepared by
United States Department of the Interior
Geological Survey

In cooperation with
the Iowa Geological Survey



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OFR 84-819

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By
Pamela K.B. Hunt and Donna L. Runkle

INTRODUCTION

Scope and Purpose

The purpose of the investigation was to determine the availability, quantity and quality of ground water from three principal aquifers in West-Central Iowa, the alluvial, buried channel, Basal Pleistocene and the Dakota aquifers. Specific objectives were to: (1) determine the location; extent and the nature of these aquifers; (2) evaluate the occurence and movement of ground water, including the sources of recharge and discharge; (3) estimate the quantities of water stored in the aquifers; (4) estimate the potential yields of wells tapping the aquifers; (5) estimate the water use; and (6) describe the chemical quality of the ground water. This report is the compilation of the data collected during the investigation and has the purpose of providing a reference for an interpretive report describing ground-water resources and a bedrock topography map of the study area.

Acknowledgments

The data collection for this report was made possible with the cooperation of residents of west-central Iowa, municipal water superintendents and county engineers.

Location-Numbering System

The location-numbering system used in this report is based on the system of land survey used by the Bureau of Land Management and the and the Iowa District of the U.S. Geological Survey. The first number indicates the township north of a base line, the second number indicates the range west of the fifth principal meridian, and the third number indicates the section in which the well is located. The letters A, B, C and D designate the northeast, north-west, southwest and southeast quarters of a section or quarters of any smaller square area section. The from left to right. The first letter designates the 160 acre quarter, the second designates the 40 acre quarter, the third designates the 10 acre quarter, and the fourth designates the 2½ acre quarter. For example,in figure 2, well 70-29-34 CCB is in the NW ¼ of the SW ¼ of the SW ¼ of section 34, in township 70 north and range 29 west.

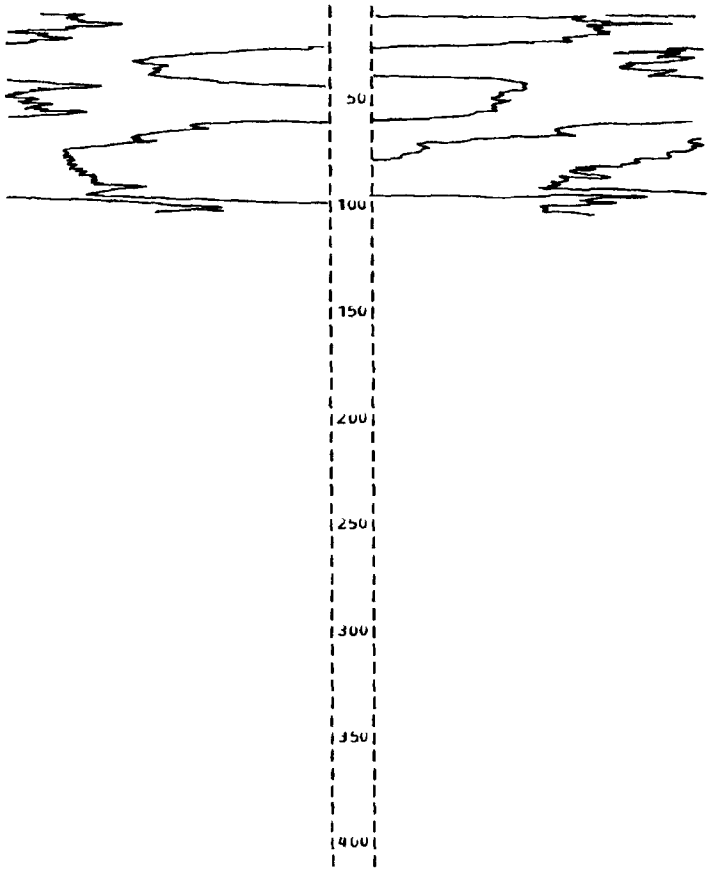
Explanations of Tables and Methods of Data Collection

The data in this report, which were collected between 1981 and 1984, are listed in tables 2, 3 and 4. The data consists of the following: (1) lithologic driller's logs and geophysical logs of 241 test holes and wells (table 2); (2) water-level measurements in 87 observation wells (table 3); (3) chemical analyses of 118 ground-water samples (table 4). The sites of collection are mapped on figure 1. The data may be used in evaluating hydrologic and geologic conditions in West-Central Iowa. Plate 1 can be used with tables 2, 3 and 4 to locate a potential construction site of a new well. By comparing water-levels, water quality and lithologies of nearby wells and test holes penetrating the different aquifers, an assessment can be made regarding some local fac-

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-34-02BABB WC-150 STATION ID: 415659-0944642-01

ALTITUDE: 1180 FEET (NGVD 1929) DEPTH: 101 FEET DATE COMPLETED: September 28, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Fill; road bed
5-10	Clay, silty, soft, dark brown to brown
10-22	Clay, silty, yellow-brown, brown at top
22-26	Sand and gravel, fine to coarse, brown, yellow-brown
26-38	As above, yellow-tan; lignite trace
38-41	Clay, silty, yellow-brown, yellow-gray
41-52	Clay or till, sandy, soft, yellow-gray; sand and gravel layers
52-57	As above, blue-gray
57-60	Sand, fine to coarse, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
60-61	Sand and gravel, iron cemented; boulders; shale at base
61-65	Sandstone, fine to coarse, brown; shale trace
65-70	Sandstone, fine to medium, tan
70-80	Sandstone, fine to coarse, tan
80-85	Sandstone, fine to coarse, brown
85-93	Sandstone, fine to coarse, some very coarse, yellow-brown
	PENNSYLVANIAN
93-96	Shale, silty, yellow-gray
96-98	Shale, silty, yellow-gray; sandstone, 6 inch, fine at base
98-101	Shale, silty, sandy, gray-green

LOCATION: 082-37-20AAAB WC-19 STATION ID: 415425-0951018-01

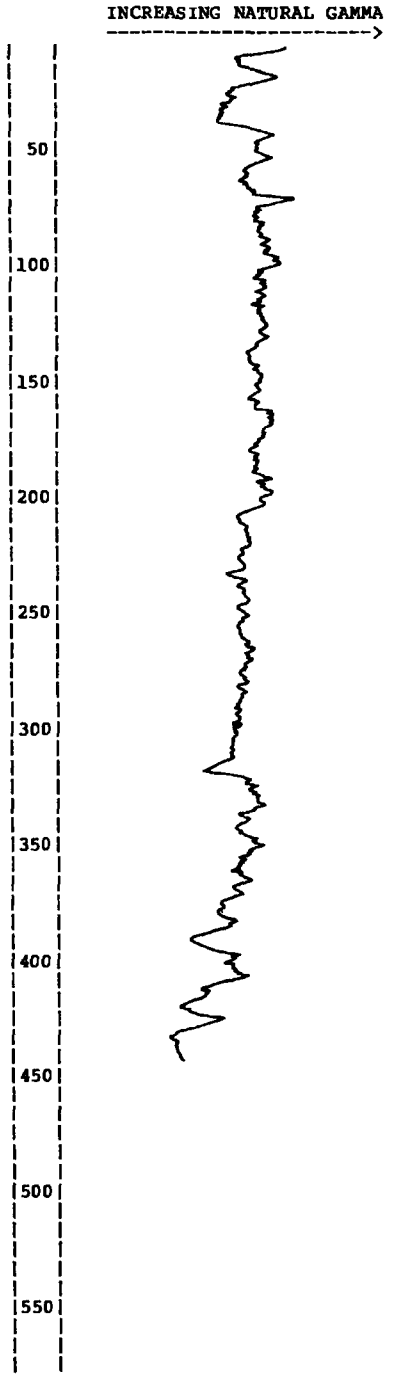
ALTITUDE: 1420 FEET (NGVD 1929) DEPTH: 461 FEET DATE COMPLETED: August 26, 1981

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-9	Till, yellow-brown, gray; iron concretions
9-11	Till, olive
11-16	Till, blue-gray, few sand grains
16-18	Clay, silty, gray-brown
18-19	Clay, silty, sandy, blue-gray
19-20	Clay, silty, gray-brown
20-26	Clay, gray, blue-gray
26-29	Till, sandy, gray-green, light blue-gray
29-75	Till, olive grading to yellow-brown; gypsum crystals
75-94	Till, yellow-brown, yellow-gray, blue-gray; gypsum crystals
94-121	Till, blue-gray
121-140	Till, blue-gray
140-145	Clay, silty, organic, brown; wood
145-155	Till, sandy, light blue-gray
155-164	Till, yellow-gray
164-167	Clay, silty, sandy, gray-brown
167-186	Till, yellow-brown
186-280	Till, very gravelly at bottom, blue-gray
280-305	Till, gravelly, blue-gray
305-308	Sand and gravel, fine; occasional boulder
308-370	Till, gravelly, sandy, blue-gray
370-442	Till, silty, sandy, gray-brown, blue-gray
	PENNSYLVANIAN
442-446	Shale, gray
446-450	Shale, black; coal
450-461	Shale, gray, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-38-23AAAA WC-225 STATION ID: 415424-0951340-01

ALTITUDE: 1320 FEET (NGVD 1929) DEPTH: 481 FEET DATE COMPLETED: July 8, 1983



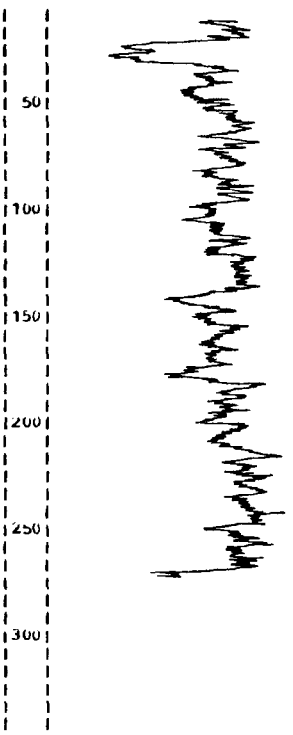
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Top soil; fill, sandy
10-14	Clay, silty, sandy, dark gray
14-16	Sand and gravel, fine to coarse, gray
16-20	Clay, silty, yellow-gray, yellow-tan
20-23	Clay, silty, blue-gray
23-25	Sand and gravel, fine to medium, tan
25-26	Clay, silty, sandy, gray
26-30	Sand and gravel, fine to very coarse, gray; clay at base
30-40	Sand and gravel, fine, some medium, yellow-brown
40-42	As above, gray-tan; boulders
42-45	Till, tough, blue-gray
45-56	Till, light blue-gray
56-72	Till, olive to yellow-brown
72-79	Clay or till, gray
79-95	Till, yellow-brown
95-200	Till, blue-gray; boulder, occasional
200-231	Till, sandy, gravelly, blue-gray
231-234	Sand, fine to coarse
234-280	Till, sandy, gravelly, blue-gray
280-316	As above; sand layers
316-321	Sand and gravel, fine, gray-tan
321-353	Till, very sandy, gravelly, blue-gray; sand layers; boulder occasional; limestone; wood
353-360	Sand, fine to coarse, possibly cemented, gray-tan
360-381	Till, very sandy; sand layers; shale; lignite; wood
381-395	Sand, mostly fine to coarse, gray; wood; lignite
395-409	Clay or till, sandy
409-413	Sand, fine to coarse, cemented, gray-tan
413-416	Clay or till, sandy
416-460	Sand and gravel, fine, cemented, gray-tan; till layers at top
	PENNSYLVANIAN
460-470	Shale, silty, gray-green; siltstone possible
470-481	Shale, reddish-brown

Casing record: set 2 inch pipe to 470 feet, slotted from 429 to 439 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-39-15CBAB WC-12 STATION ID: 415451-0952247-01

ALTITUDE: 1250 FEET (NGVD 1929) DEPTH: 285 FEET DATE COMPLETED: June 23, 1982

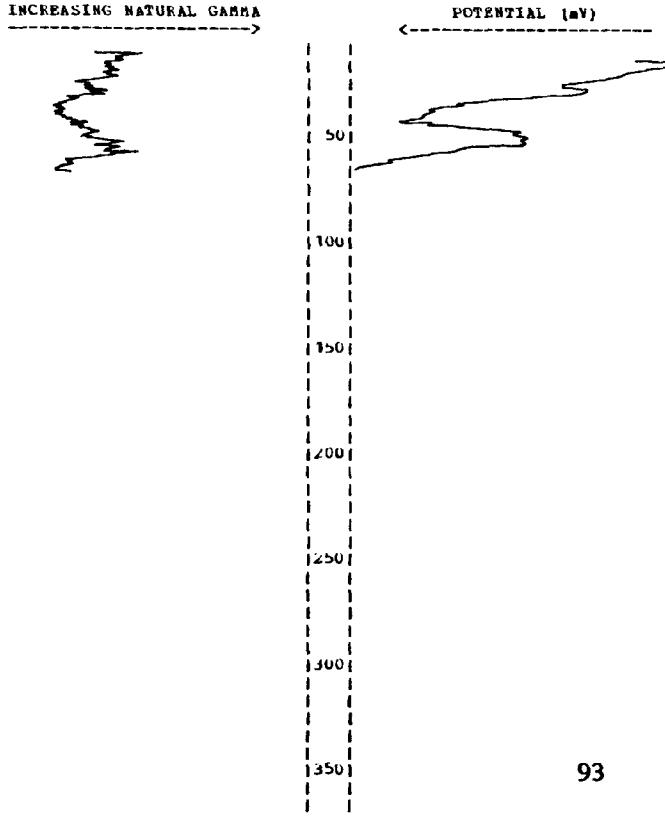


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-12	Clay, silty, yellow-gray
12-15	Clay, silty, sandy, very soft, yellow
15-18	Sand and gravel, fine to coarse, oxidized, brown, yellow-brown
18-21	Sand and gravel, fine to coarse, tan, gray; occasional boulders
21-25	Sand and gravel, fine to medium, olive
25-26	Till, olive
26-81	Till, blue-gray
81-131	Till, blue-gray; occasional boulders
131-135	Sand and gravel, fine to medium, gray
135-150	Till, sandy, gravelly, blue-gray
150-160	As above, much sandier; sand and gravel layer
160-264	Sand and gravel, fine; till or clay mixed; wood; lignite; sand and gravel, occasional layer
	CRETACEOUS
	DAKOTA FORMATION
264-273	Sandstone, tan
	PENNSYLVANIAN
273-285	Shale, silty, gray
285-285	Limestone

Casing record: set 2 inch pipe to 285 feet, slotted from 268 to 285 feet, gravel packed

LOCATION: 082-40-07DDAA WC-45 STATION ID: 415531-0953215-01

ALTITUDE: 1116 FEET (NGVD 1929) DEPTH: 76 FEET DATE COMPLETED: May 26, 1982

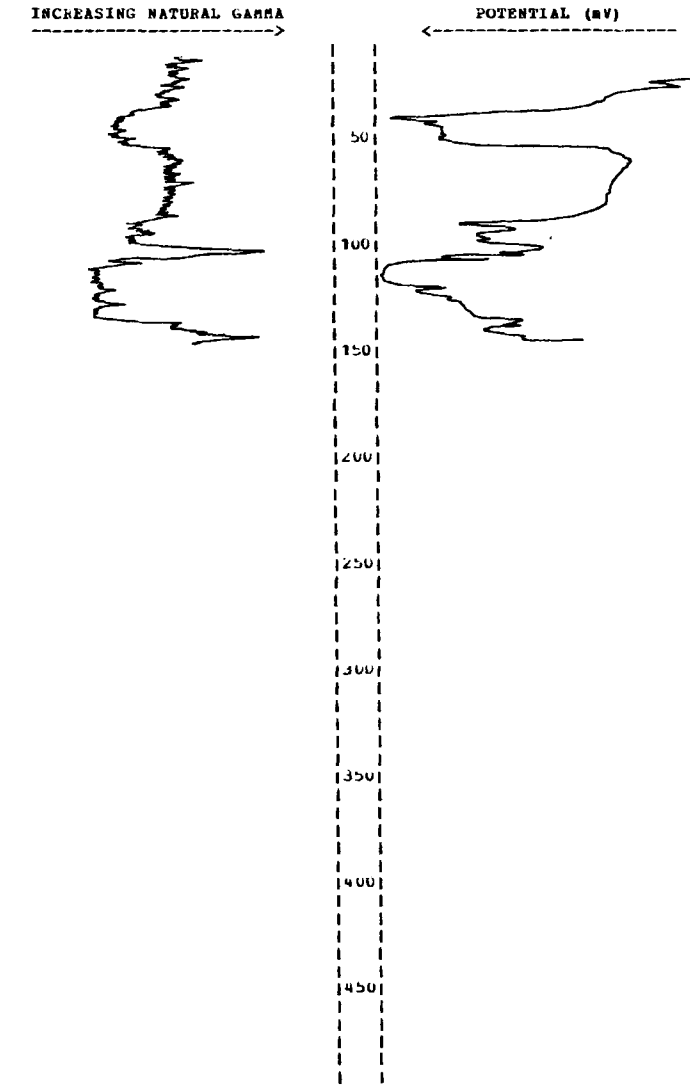


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-10	Clay, silty, soft, very dark gray, blue-gray
10-12	As above with wood chunks
12-17	As above, no wood
17-19	As above with wood chunks
19-21	Sand and gravel, fine to medium, gray
21-24	As above, fine to coarse
24-26	Clay, silty, blue-gray
26-34	Sand and gravel, fine, yellow-tan
34-37	Sand, fine to coarse, tan
37-41	Sand and gravel, fine, gray, tan; occasional boulders
41-48	Sand, fine to coarse, mostly quartz with dark grains; clay near top, gray-green
48-49	Clay, sandy, gray-green
49-51	Sand, very fine to medium, mostly quartz with dark grains, gray-green
	CRETACEOUS
	DAKOTA FORMATION
51-54	Sandstone, fine grading to medium, tan grading to yellow-brown; shale
54-60	Sandstone, fine to very coarse, oxidized, orange-brown
60-70	Sandstone. fine to coarse, oxidized, yellow-brown
70-76	Sandstone, fine to coarse, tan

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-40-08BBBB WC-44 STATION ID: 415609-0953215-01

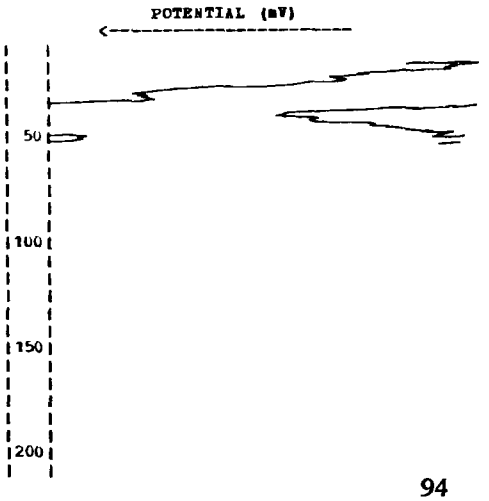
ALTITUDE: 1160 FEET (NGVD 1929) DEPTH: 141 FEET DATE COMPLETED: May 26, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-30	Loess, yellow-brown, brown
30-32	Clay, silty, very sandy, yellow-brown
32-40	Sand and gravel, fine, yellow-brown
40-44	As above, yellow-tan
44-49	Sand and gravel, fine to coarse, yellow-brown
49-56	Clay, hard, gray-tan
56-60	Clay, silty, hard, gray, some dark mottling
60-77	Clay, silty, sandy, light gray-green, tan
77-79	Sand and gravel, fine to coarse, dark grains
79-81	Clay, silty, sandy, gray-green
81-83	Clay, very sandy, gray-green
83-91	Sand and gravel, fine, mostly quartz with dark grains
91-92	Clay, sandy, yellow-green
	CRETACEOUS
	DAKOTA FORMATION
92-93	Shale, silty, yellow-brown
93-95	Shale, silty, gray-yellow, blue-gray
95-99	Shale, silty, blue-gray
99-100	Shale, yellow-gray; sandstone, iron cemented
100-102	Sandstone, fine to medium, tan; shale
102-115	Sandstone, fine to medium, tan; shale trace, light gray-green
115-117	Shale, gray-green; sandstone
117-131	Sandstone, fine to medium, occasional shale streak, tan
	PENNSYLVANIAN
131-134	Shale, silty, yellow-gray, blue-gray
134-138	Shale, silty, gray-green
138-139	Shale, gray-green
139-141	Shale, reddish-brown, yellow-gray

LOCATION: 082-40-08CACC WC-48 STATION ID: 415530-0953154-01

ALTITUDE: 1115 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 1, 1982

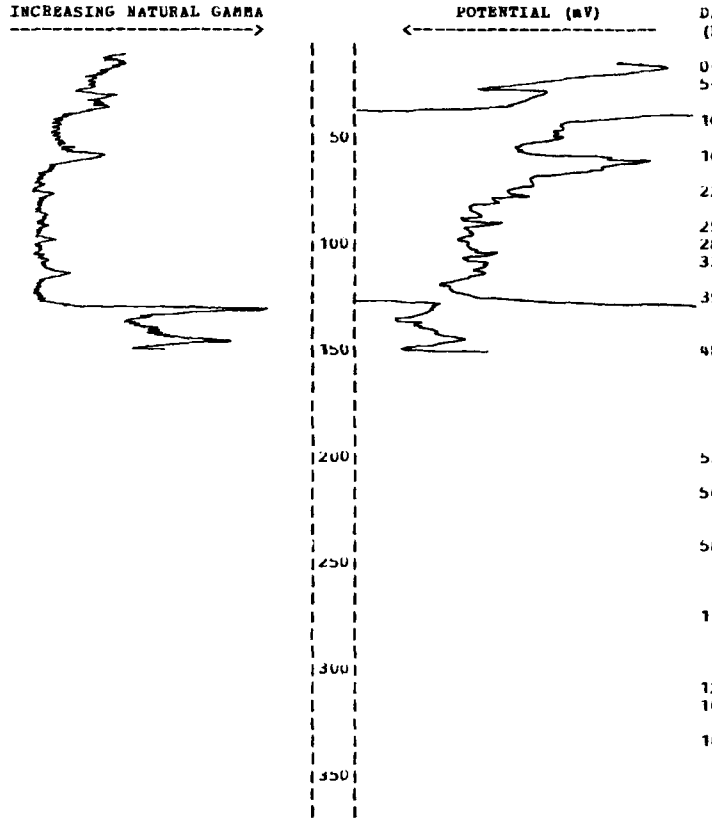


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-8	Clay, silty, soft, brown
8-19	Clay, silty, sandy, dark blue-gray; wood chunks at bottom
19-21	Sand, fine to coarse, gray
21-27	Sand and gravel, fine, gray; clay at bottom
27-35	Sand and gravel, fine to coarse, tan
35-40	Sand and gravel, fine to coarse, gray
40-53	Sand and gravel, coarse to medium, gray-tan; reworked shale, silty, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
53-55	Shale, silty, sandy, light gray
55-61	Sandstone, yellow-brown

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-40-08DCCB WC-46 STATION ID: 415521-0953139-01

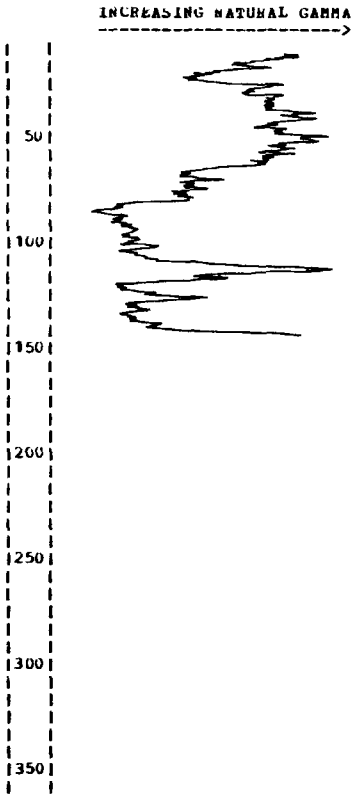
ALTITUDE: 1115 FEET (NGVD 1929) DEPTH: 148 FEET DATE COMPLETED: May 27, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-10	Clay, silty, soft, dark gray-brown
10-16	As above, very silty, softer
16-22	Sand, brown; clay, silty, dark gray
22-25	Sand, fine to medium, brown
25-28	Clay, silty, gray-green
28-33	Clay, silty, olive
33-39	Sand and gravel, fine to coarse, gray
39-48	Sand and gravel, fine to coarse, tan, yellow-brown
48-53	Sand and gravel, fine to coarse, oxidized, yellow-brown, orange
	CRETACEOUS
	DAKOTA FORMATION
53-54	Sandstone, iron cemented; boulder
54-58	Sandstone, fine to coarse, oxidized orange, brown
58-110	Sandstone, fine to coarse, tan, yellow-brown; shale, occasional streak
110-123	Sandstone, fine to coarse, tan
	PENNSYLVANIAN
123-142	Shale, silty, blue-gray
142-144	Shale, yellow-brown, reddish-brown
144-146	Shale, silty, gray-green, reddish brown at bottom; siltstone; limestone layer

LOCATION: 082-40-17AAEB WC-9 STATION ID: 415514-0953120-01

ALTITUDE: 1150 FEET (NGVD 1929) DEPTH: 141 FEET DATE COMPLETED: June 5, 1981



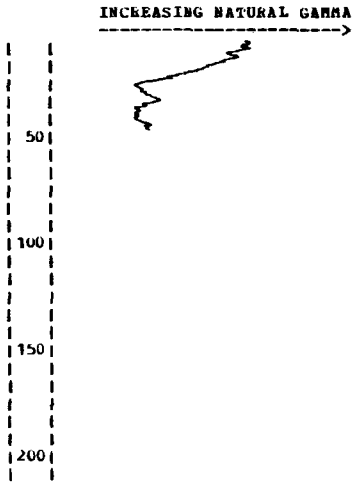
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Fill; clay, silty, sandy
7-19	Sand and gravel, fine to coarse, tan to yellow-brown
19-22	Till, tan
22-24	Sand and gravel, fine to coarse, cemented, iron oxidized, brown
24-30	Clay, tan to light gray
30-40	As above, silty, sandy
40-50	Sand, very fine; silt
50-60	Sand, fine, tan, light brown, dark specks
60-70	Sand, fine to coarse, as above
	CRETACEOUS
	DAKOTA FORMATION
70-75	Sandstone, coarse, hard, iron, oxidized, brown
75-80	Sandstone, coarse, oxidized, yellow-brown
80-90	Sandstone, medium to coarse, light yellow-brown
90-104	Sandstone, medium to coarse, tan
104-112	Shale, silty, sandy, gray; sandstone layers, thin
112-136	Sandstone, medium, tan; occasional shale layer, silty
136-141	Shale, blue-gray, reddish-brown

Casing record: set 2 inch pipe to 141 feet, slotted from 123 to 141 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-40-17ABBC WC-188 STATION ID: 415512-0953138-01

ALTITUDE: 1122 FEET (NGVD 1929) DEPTH: 46 FEET DATE COMPLETED: May 26, 1983

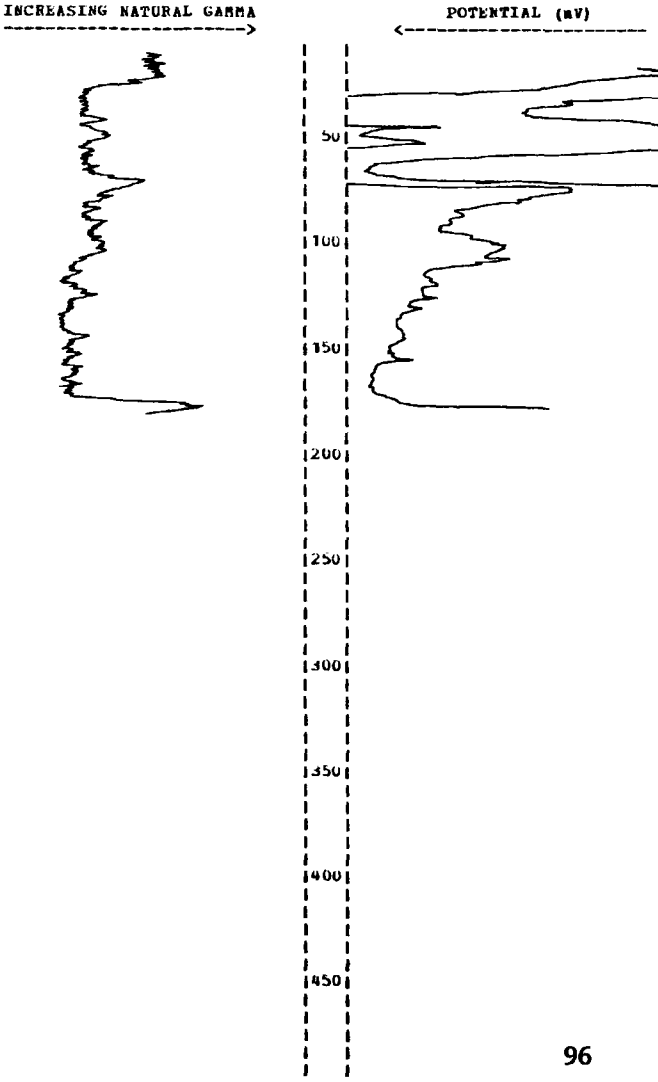


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-8	Clay, silty, dark brown
8-12	Clay, silty, dark gray
12-15	Clay, silty, gray
15-20	Clay, silty, gray-brown
20-25	Clay, silty, sandy, brown; sand, fine to coarse
25-27	Clay, silty, sandy, very dark gray
27-29	Clay, silty, gray-green
29-33	Clay, silty, sandy, gray, yellow-brown; sand layers
33-35	Clay, silty, sandy, gray; gravel at base
35-46	Sand and gravel, fine to coarse, brown, yellow-brown

Casing record: set 2 inch pipe to 46 feet, slotted from 40 to 46 feet, gravel packed

LOCATION: 082-40-17ACBC WC-47 STATION ID: 415458-0953138-01

ALTITUDE: 1165 FEET (NGVD 1929) DEPTH: 178 FEET DATE COMPLETED: May 27, 1982

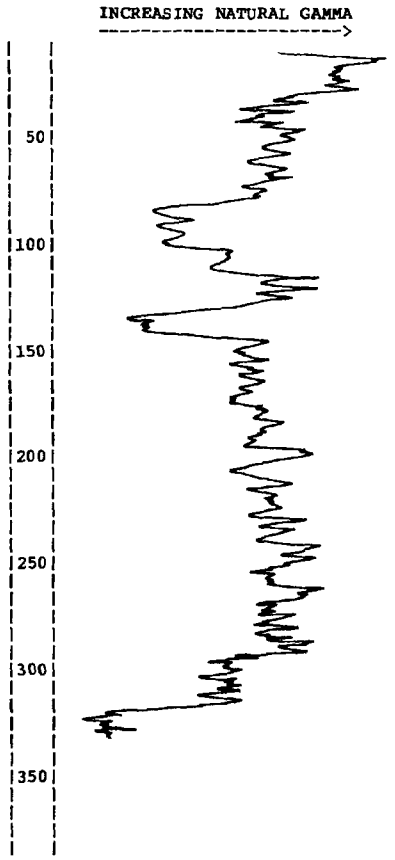


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Road bed
6-20	Loess, yellow-brown
20-35	Sand, fine to coarse, yellow-tan, yellow-brown
35-38	Clay, sandy, yellow-brown, gray
38-42	Sand, fine to coarse, yellow-brown
42-49	Clay, silty, very sandy, yellow-gray; sand layers
49-60	Sand and gravel, fine to coarse, yellow-brown
60-65	As above, oxidized; clay
65-66	Clay, tan
66-68	Clay, gray-green
68-71	Clay, yellow-tan
71-73	Clay, very silty
73-75	Sand, very fine, yellow-tan with dark grains; silt
75-80	Sand, very fine to medium, gray-tan, dark grains
80-83	As above, coarse
83-86	Sand and gravel, fine to medium, yellow-brown
86-87	Boulder, pink quartzite
87-100	Sand, very fine to coarse, gray-tan
	CRETACEOUS
	DAKOTA FORMAION
100-102	Sandstone, iron cemented, brown
102-103	Shale, reddish-brown, yellow-brown
103-108	Sandstone, fine, yellow-tan; shale
108-118	Sandstone, fine to medium, yellow-brown, tan
118-119	Sandstone, iron cemented
119-121	Sandstone, fine to medium, oxidized, yellow-brown
121-170	Sandstone, fine to coarse (coarser at bottom), yellow-brown, tan
170-175	Shale, silty, blue-gray
175-177	Sandstone, very coarse
	PENNSYLVANIAN
177-178	Shale, gray-green

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-42-14ADCA WC-4 STATION ID: 415456-0954141-01

ALTITUDE: 1340 FEET (NGVD 1929) DEPTH: 341 FEET DATE COMPLETED: April 28, 1981



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Loess, tan
5-15	Loess, yellow-tan, yellow-brown
15-48	Loess, yellow-tan with brown mottling
48-60	Till, yellow-tan
60-75	Till, yellow-brown, gravel at 64 feet
75-90	Sand and gravel, fine to coarse; occasional boulders
90-95	As above, till mixed; boulders
95-104	Till, olive
104-107	Sand, fine to medium
107-112	Till, blue-gray
112-114	Sand, fine to medium
114-116	Till, olive, blue-gray
116-118	Sand, fine to coarse; gravel
118-128	Till, blue-gray; sand layers
128-141	Sand and gravel, fine
141-240	Till, blue-gray
240-250	Clay, gray-tan; sand grains
250-280	Clay, silty, gray-tan; sand grains
280-286	Clay, silty, gray-green
286-295	Sand, fine, cemented, gray to gray-green
295-310	Sand, fine to coarse, cemented, dark specks
	CRETACOUS
	DAKOTA FORMATION
310-330	Sandstone or cemented sand, tan
330-334	Shale, light blue-gray
334-341	Shale, reddish-brown

Casing record: set 2 inch pipe to 336 feet, slotted from 311 to 336 feet, gravel packed

LOCATION: 082-43-10AADD WC-2 STATION ID: 415557-0954941-01

ALTITUDE: 1115 FEET (NGVD 1929) DEPTH: 233 FEET DATE COMPLETED: April 20, 1981

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-30	Loess, yellow-tan
30-35	Clay, silty, gray
35-39	Clay, silty, blue-gray; some wood at bottom
39-45	Sand and gravel, fine to very coarse; clay mixed; occasional boulders
45-48	Clay, some sandy, gray, blue-gray
48-52	Sand and gravel, fine to very coarse; boulders
52-53	Till, olive
53-63	Till, blue-gray
63-64	Sand and gravel, fine to coarse
64-116	Till, blue-gray
116-117	Sand and gravel, gray
117-118	Till, blue-gray
118-120	Boulder
120-123	Till, blue-gray
123-153	Sand and gravel, fine, gray
	PENNSYLVANIAN
153-154	Limestone, shaly, silty, gray to gray-green
154-156	Shale, reddish-brown, yellow
156-158	Shale, gray, yellow; limestone
158-159	Shale, blue-gray
159-163	Limestone, shaly, gray
163-166	Shale, yellow-gray
166-167	Limestone, shaly, gray
167-168	Shale, gray
168-170	Shale, black
170-171	Shale, blue-gray
171-176	Shale, yellow-gray grading to yellow-brown
176-180	Shale, reddish-brown
180-195	Shale, light gray, yellow, reddish-brown
195-210	Shale, yellow, gray, trace of reddish-brown
210-215	Shale, yellow-gray
215-227	Shale, reddish-brown
227-233	Shale, yellow-gray, gray, trace of red

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-43-31CDCC WC-181 STATION ID: 415148-0955357-01

ALTITUDE: 1075 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: May 20, 1983

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-9	Clay, silty, brown
9-14	Clay, silty, yellow-gray
14-17	Clay, silty, yellow-brown
17-20	Clay, silty, gray to gray-green
20-30	Clay, gray, yellow-brown, gray-green
30-35	Sand, fine to coarse; wood; silt; clay
35-40	Sand and gravel (mostly sand), very fine to medium, gray
40-50	Sand and gravel (mostly sand), fine to coarse, yellow-gray
50-70	As above, coarser at base, yellow-brown
70-74	Sand and gravel, brown, yellow-brown; boulders
74-78	Sand and gravel, fine to very coarse, gray; till or clay, mixed, blue-gray; boulders
78-81	Till, sandy, blue-gray

LOCATION: 082-43-31DDDD WC-182 STATION ID: 415151-0955311-01

ALTITUDE: 1170 FEET (NGVD 1929) DEPTH: 121 FEET DATE COMPLETED: May 20, 1983

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-45	Loess, brown to yellow-tan
45-60	Loess, yellow-tan, brown streaks
60-65	Clay, silty, gray, yellow-gray
65-69	Clay, silty, hard, gray
69-75	Clay, silty, hard, gray-tan
75-85	Clay, silty, yellow-tan, yellow-gray
85-90	Clay, silty, yellow brown, yellow-tan
90-104	Clay, silty, yellow-tan grading to gray, yellow-brown at base
104-111	Sand and gravel, fine to coarse, yellow-brown
111-113	Till, yellow-brown to yellow-gray
113-121	Till, blue-gray

LOCATION: 082-44-35DDDC WC-180 STATION ID: 415148-0955535-01

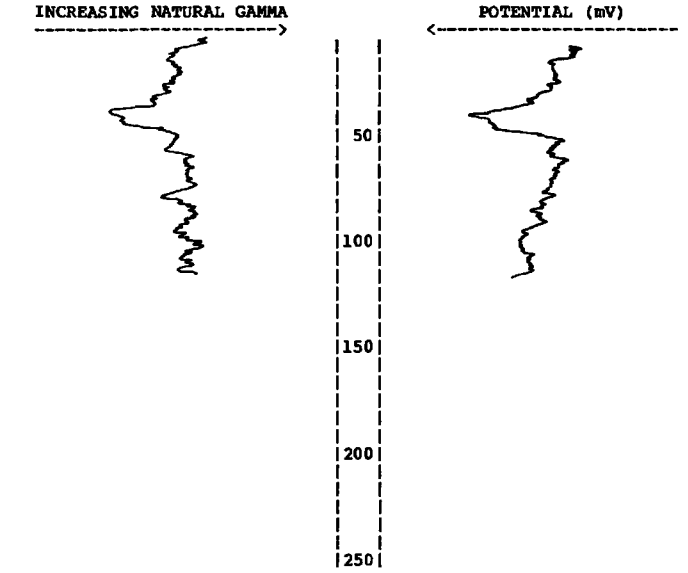
ALTITUDE: 1120 FEET (NGVD 1929) DEPTH: 120 FEET DATE COMPLETED: May 19, 1983

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Road bed; top soil
10-60	Loess, brown to yellow-brown
60-80	Loess, yellow-tan, yellow-brown
80-88	Loess, yellow-gray
88-93	Clay, silty, gray-green
93-96	Sand, fine to coarse, tan; clay
96-101	Sand and gravel, fine to very coarse; boulders; till at base, yellow
101-120	Till; blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-44-36DDDC WC-178 STATION ID: 415148-0955427-01

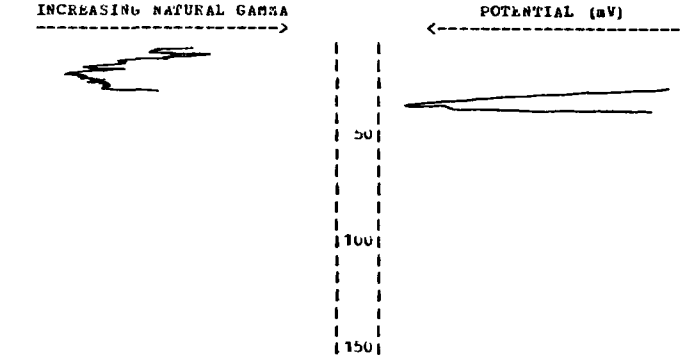
ALTITUDE: 1075 FEET (NGVD 1929) DEPTH: 120 FEET DATE COMPLETED: May 18, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-9	Clay, gray-brown
9-14	Clay, silty, yellow-gray
14-25	Clay, silty, blue-gray
25-32	Clay, silty, gray-green; shells
32-36	Clay, silty, brown, gray; wood
36-45	Sand and gravel, fine to coarse, yellow-brown
45-48	Sand and gravel, oxidized, brown, yellow-brown
48-78	Till, blue-gray; sand layers at 55 58 feet
78-80	Sand and gravel, fine, gray-tan
80-94	Till, sandy, gravelly, blue-gray
94-114	Till, sandy, gravelly, gray-brown; shale, reworked
	PENNSYLVANIAN
114-117	Limestone, gray-green
117-118	As above, shaly
118-120	Limestone, tan; shale streaks

LOCATION: 083-31-03CBCB WC-123 STATION ID: 420134-0942718-01

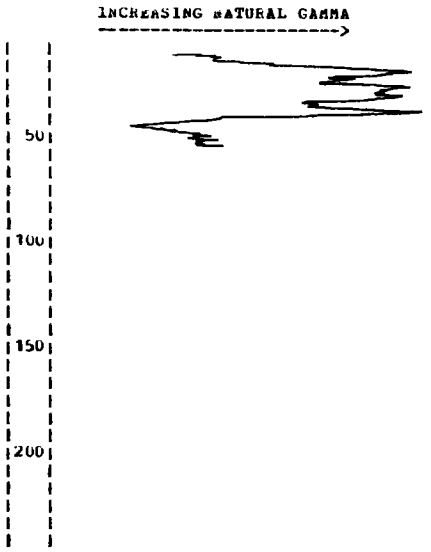
ALTITUDE: 995 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: August 31, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-8	Fill; road bed
8-9	Clay, silty, dark gray
9-11	Clay, silty, brown
11-15	Sand and gravel, fine to medium, tan, brown; shells
15-20	Sand and gravel, fine to coarse, tan, brown
20-25	As above, gray; shells
25-32	Sand and gravel, fine to very coarse, coarser at base
32-36	Till, gravelly, blue-gray
36-38	Sand and gravel, fine to medium, tan
38-41	Till, blue-gray, tan

LOCATION: 083-31-04ADDB WC-120 STATION ID: 420146-0942723-01

ALTITUDE: 1000 FEET (NGVD 1929) DEPTH: 54 FEET DATE COMPLETED: August 30, 1982



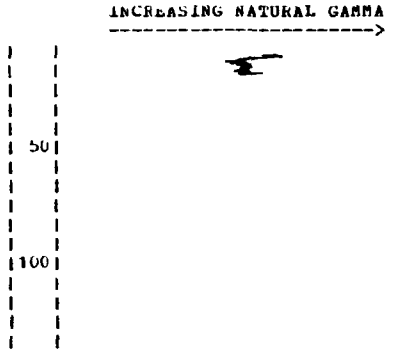
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-1	Top soil, sandy, gravelly
1-13	Sand and gravel, fine to very coarse, tan
13-14	Till, yellow-gray
14-23	Till, blue-gray
23-27	Clay, gray to blue-gray, dark at top
27-28	Clay, gray, very sandy
28-35	Sand, fine to coarse; clay, occasional layer, gray
	CRETACEOUS
	DAKOTA FORMATION
35-51	Sand and gravel or sandstone, fine, some coarse, tan, yellow-brown
	PENNSYLVANIAN
51-53	Shale, light blue-gray
53-54	Shale, reddish-brown

Casing record: set 2 inch pipe to 51 feet, slotted from 40 to 51 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 083-31-10AABB WC-121 STATION ID: 420121-0942625-01

ALTITUDE: 1012 FEET (NGVD 1929) DEPTH: 21 FEET DATE COMPLETED: August 30, 1982

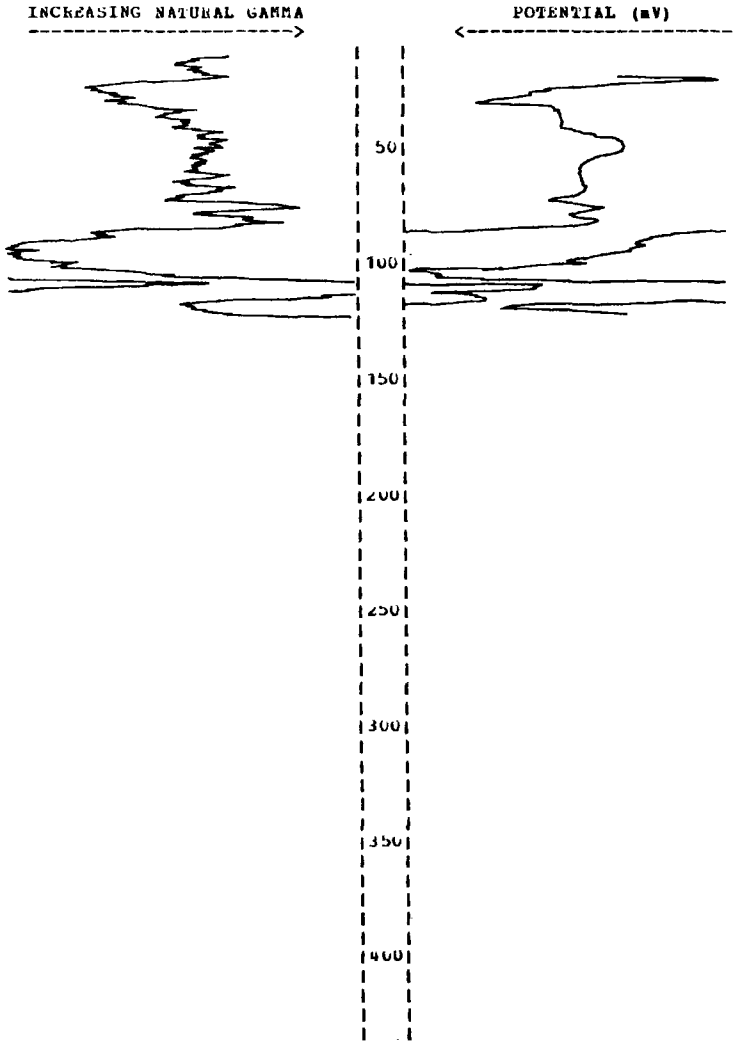


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-1	Top soil, sandy, gravelly
1-3	Sand and gravel, fine to medium, silty, brown
3-17	Sand and gravel, fine to very coarse, yellow-brown
17-18	Clay or till, silty, yellow-gray
18-21	Till, blue-gray

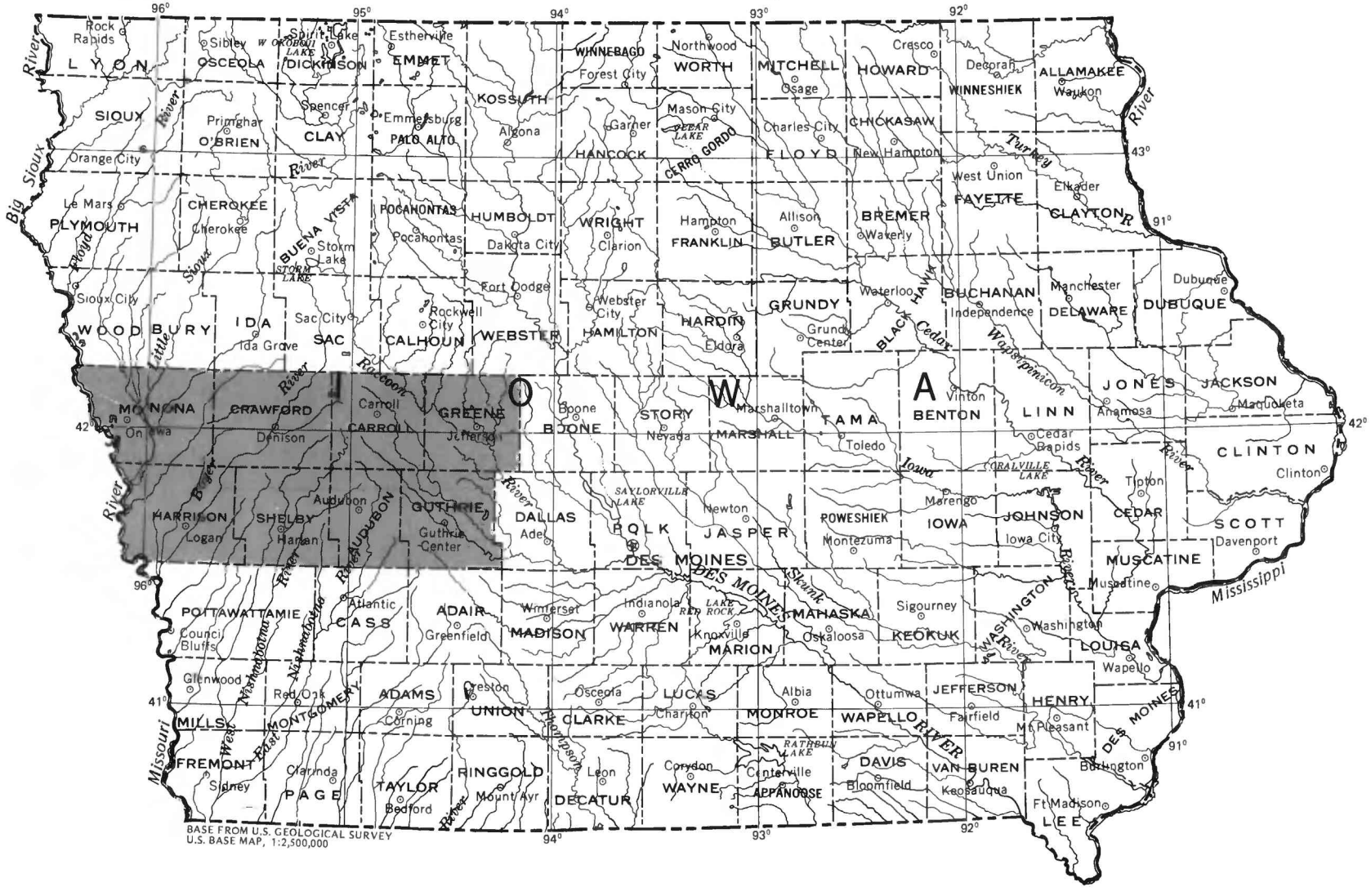
Casing record: set 2 inch pipe to 17 feet, slotted from 7 to 17 feet, gravel packed

LOCATION: 083-31-10BBBB WC-122 STATION ID: 420118-0942714-01

ALTITUDE: 1060 FEET (NGVD 1929) DEPTH: 121 FEET DATE COMPLETED: August 31, 1981



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-14	Till, blue-gray, yellow-brown
14-15	Till, yellow-gray
15-19	Till, yellow-brown
19-23	Sand and gravel, fine to coarse, yellow-brown; till mixed
23-26	Till, sandy, gray, yellow-brown
26-28	Sand and gravel, fine to coarse; till mixed, yellow-brown
28-34	Till, olive
34-39	Till, blue-gray
39-40	Clay or gumbo, very dark gray
40-42	Till, blue-gray, yellow-brown
42-48	Till, sandy, light blue-gray
48-66	Till, yellow-brown
66-67	Till, sandy, brown, gray
67-69	Sand and gravel, fine, yellow-brown
69-70	Till, blue-gray, brown
70-73	Till, blue-gray
73-74	Sand, fine to coarse, tan
74-80	Clay, dark blue-gray; sand grains
	CRETACEOUS
	DAKOTA FORMATION
80-90	Sandstone, fine to coarse, brown, tan
90-95	Sandstone, very fine to very coarse, tan
95-103	Sandstone (gravel), tan
	PENNSYLVANIAN
103-113	Shale, light blue-gray, reddish-brown, yellow-brown
113-114	Limestone, sandy, tan
114-121	Shale, silty, sandy, light gray; siltstone or sandstone, occasional thin streaks



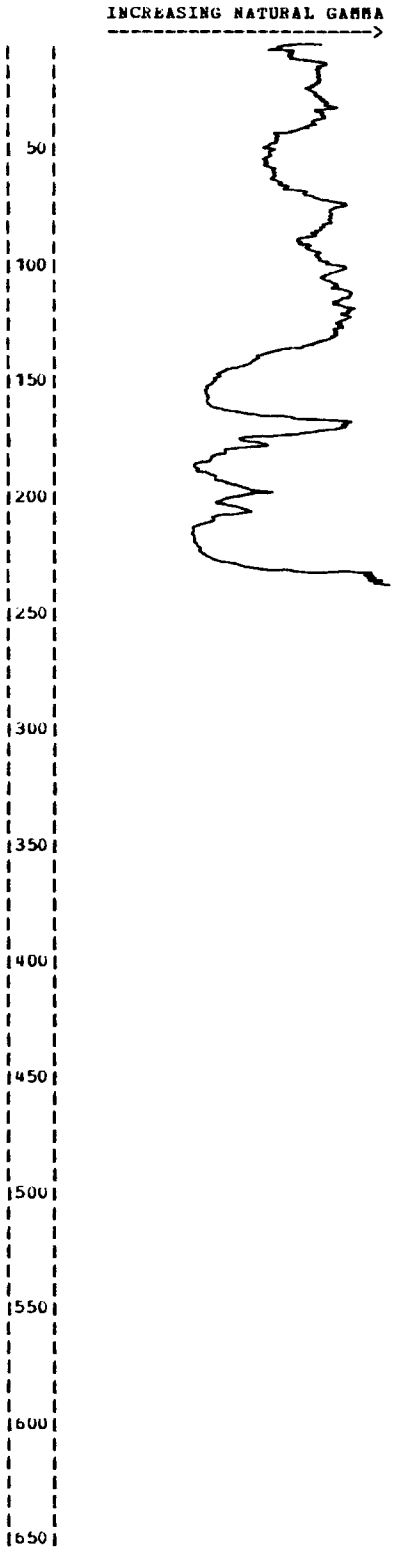
BASE FROM U.S. GEOLOGICAL SURVEY
U.S. BASE MAP, 1:2,500,000

Figure 1. Location of study area (shaded).

Table 2. Logs of wells and test holes--Continued.

LOCATION: 083-32-04ACCC WC-228 STATION ID: 420149-0943447-01

ALTITUDE: 1202 FEET (NGVD 1929) DEPTH: 240 FEET DATE COMPLETED: July 26, 1982



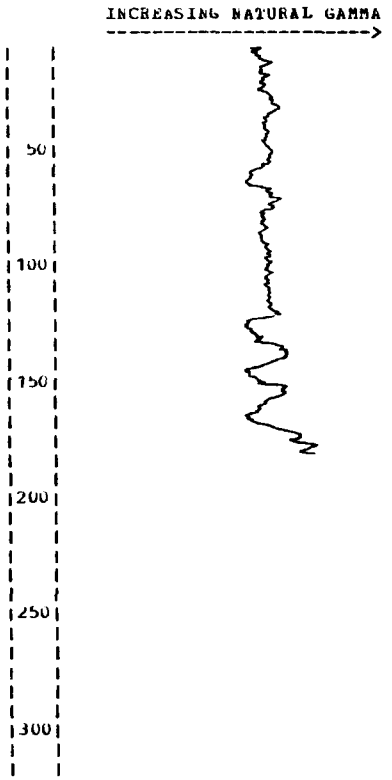
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Clay, silty, sandy, brown
3-6	Clay or till, sandy, gray, yellow-gray
6-10	Till, yellow-brown
10-14	Till, gray-brown
14-16	Clay, silty, oxidized streaks, gray
16-34	Clay, silty, sandy, blue-gray
34-36	Clay, silty, brown, gray-green
36-38	Clay, silty, dark brown
38-45	Till, sandy, gray-green
45-70	Till, sandy, gravelly, light blue-gray
70-73	Till, gray
73-74	Clay, silty, brown; organics
74-81	Clay, gray; sand grains, few
81-94	Till, gray-green
94-100	Till, olive
100-111	Till, light blue-gray
111-116	Till, yellow-brown, yellow-gray
116-123	Clay, gray
123-130	Clay, silty, dark brown; organics
130-132	Clay, gray, yellow-brown
132-136	Clay or till, sandy, blue-gray
136-138	Till, olive, gray-green
138-139	Till, blue-gray
139-143	Sand and gravel, fine, yellow-brown, brown; clay, mixed; sandstone, shaly
	CRETACEOUS
	DAKOTA FORMATION
143-150	Sandstone, coarse, tan, yellow-brown
150-167	Sandstone, coarse, tan, yellow-brown
167-170	Sandstone, fine to coarse, tan, yellow-brown
170-173	Shale, silty, gray, yellow-brown
173-177	Sandstone, fine to coarse, tan
177-178	Shale, sandy, gray
178-182	Limestone, fine to coarse; shale
182-185	Sandstone, fine to coarse, tan
185-190	Sandstone, fine to coarse, yellow-brown
190-195	Sandstone, fine to coarse, oxidized, well cemented, yellow-brown, brown
195-199	Sandstone, fine to coarse, tan
199-201	Shale, sandy, yellow-gray, gray-green
201-206	Sandstone, fine to coarse; shale
206-208	Shale, sandy, light gray; gravel
208-234	Sandstone, fine to coarse, grading to coarser at base, tan
	PENNSYLVANIAN
234-235	Shale, yellow-brown
235-238	Shale, reddish-brown
238-240	Shale, gray, reddish-brown

Casing record: set 2 inch pipe to 240 feet, slotted from 220 to 240 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 083-32-08BBBC WC-229 STATION ID: 420116-0943634-01

ALTITUDE: 1135 FEET (NGVD 1929) DEPTH: 181 FEET DATE COMPLETED: July 27, 1983



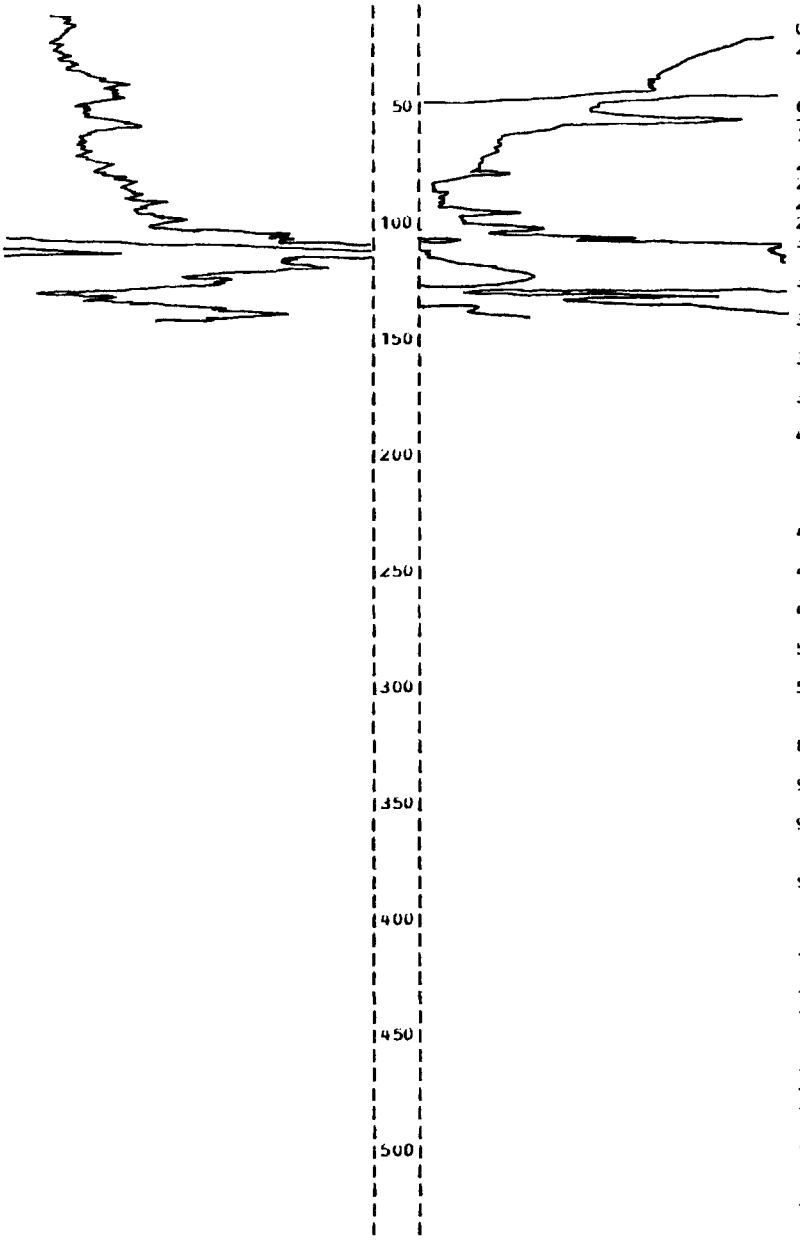
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil
2-12	Till, light yellow-brown
12-19	Till, yellow-gray grading darker
19-62	Till, blue-gray
62-65	Sand and gravel, fine to coarse, yellow-tan
65-88	Till, sandy, gravelly, blue-gray
88-90	Till, olive
90-91	Till, gray
91-92	Clay, silty, brown
92-117	Till, blue-gray
117-122	Clay, silty, gray
122-135	Sand and gravel; clay, silty, layers
135-140	Clay, silty, brown, gray; organics; wood
140-150	Sand, fine to very coarse; clay, layers
150-162	Clay, silty, soft, brown; organics
162-171	Sand and gravel; boulders at base
	PENNSYLVANIAN
171-180	Shale, silty, sandy, gray-brown; sandstone, very fine layers
180-181	Shale, silty, sandy, hard, light green

Casing resord: set 2 inch pipe to 181 feet, slotted from 161 to 171 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 083-34-36CCCC WC-151 STATION ID: 415700-0944552-01

ALTITUDE: 1206 FEET (NGVD 1929) DEPTH: 141 FEET DATE COMPLETED: September 29, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Road bed
2-6	Till, yellow-brown; sand and gravel layer at 5 feet
6-7	Clay or gumbo, gray
7-17	Till, yellow-brown
17-20	Till, yellow-gray
20-23	Till, yellow-brown
23-26	Till, yellow-gray
26-29	Till, blue-gray
29-32	Till, yellow-gray
32-34	Till, blue-gray, yellow-gray
34-35	Till, sandy, gray, yellow-gray layers
35-37	Till, yellow-gray, blue-gray
37-39	Clay, gray; sand grains
39-40	Clay or till, sandy, yellow-brown
40-41	Clay or till, sandy, gray-brown
	CRETACEOUS
	DAKOTA FORMATION
41-42	Shale, sandy, light gray, yellow-brown
42-44	Shale, sandy, light gray
44-54	Sandstone, very fine, tan, light gray
54-56	Shale, sandy, yellow-gray
56-80	Sandstone, fine to coarse, creviced at top, tan
80-95	Sandstone, fine to very coarse, tan
95-96	Shale, sandy, gray-green
96-97	Sandstone, iron cemented, dark brown; shale, sandy
97-105	Sandstone, very coarse (gravel), shaly at base
	PENNSYLVANIAN
105-107	Shale, silty, gray-green
107-109	Shale, yellow-brown
109-125	Shale, silty, blue-gray; dolomite streaks near base
125-128	Shale, dark blue-gray
128-129	Coal; pyrite
129-132	Shale, silty, sandy, gray-green
132-140	Shale, silty, gray-green, darker at base
140-141	Shale, olive, gray-green

Table 2. Logs of wells and test holes--Continued.

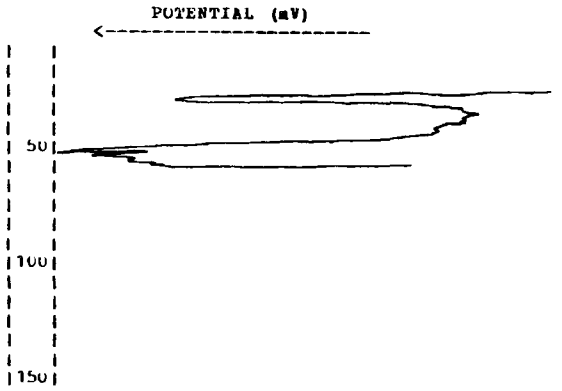
LOCATION: 083-37-06AABB WC-20 STATION ID: 420211-0951136-01

ALTITUDE: 1355 FEET (NGVD 1929) DEPTH: 572 FEET DATE COMPLETED: September 7, 1981

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Topsoil, roadbed
3-9	Clay, silty, hard, gray-brown
9-15	Clay, silty, oxidized, soft, yellow-brown
15-19	Clay, silty, soft, tan grading to blue-gray
19-23	Clay, silty, sandy, blue-gray
23-32	Till, gravelly at top, yellow-brown
32-34	Till, silty, sandy, light blue-gray
34-39	Till, blue-gray
39-41	Sand and gravel; till mixed; boulders
41-50	Till, olive, blue-gray
50-70	Till, blue-gray
70-75	Sand and gravel, coarse; till mixed
75-86	Till, silty, gray-brown
86-88	Clay, silty, organic, dark
88-92	Clay, blue-gray
92-102	Till, silty, some gravelly, light blue-gray; sand and gravel, thin layers
102-147	Till, sandy, gravelly, yellow-brown; occasional boulders
147-160	Till, gravelly, sandy, blue-gray
160-271	Till, sandy, gravelly, blue-gray; occasional boulders
271-274	Sand and gravel; wood; lignite
274-282	Till, very sandy, gravelly, blue-gray
282-285	Sand and gravel, fine to medium
285-435	Till, sandy, gravelly, blue-gray
435-437	Till or clay, hard
437-520	Sand, fine to coarse; gravel, fine grading coarser to the botttom
520-562	Sand and gravel, fine; till mixed
	PENNSYLVANIAN
562-572	Shale, very dark gray, black streaks

LOCATION: 083-38-03CCBC WC-62 STATION ID: 420133-0951557-01

ALTITUDE: 1260 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 16, 1982

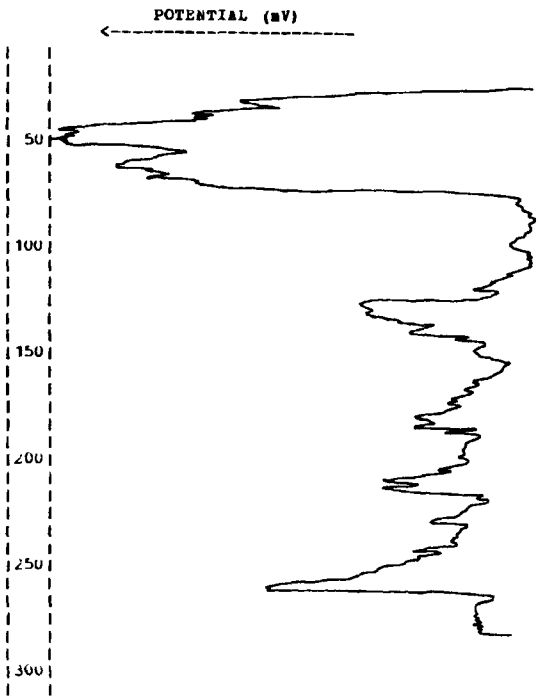


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-17	Loess, yellow-brown
17-24	Sand, fine to coarse, yellow-tan
24-28	Clay, sandy, silty, yellow-brown
28-41	Clay, silty, hard, yellow-tan; sand grains
41-44	Sand, fine to coarse, yellow-tan
44-50	Sand and gravel, fine to coarse, yellow-brown
50-53	As above, coarser; clay mixed; boulders
53-54	Till, yellow-gray
54-61	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 083-38-04ADBC WC-60 STATION ID: 420158-0951614-01

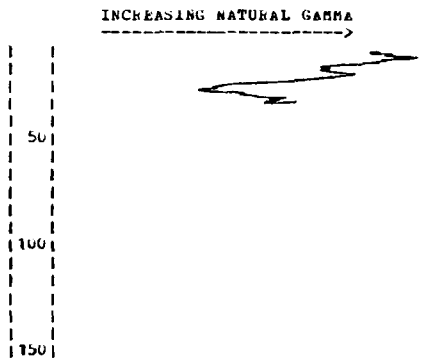
ALTITUDE: 1240 FEET (NGVD 1929) DEPTH: 276 FEET DATE COMPLETED: June 15, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-14	Clay, silty, brown; loess
14-21	Clay, silty, yellow-brown; loess; snails
21-30	Sand, fine to coarse, tan
30-53	Sand and gravel, fine to coarse, yellow-brown, mostly sand
53-63	Sand and gravel, fine to very coarse, oxidized, brown, yellow-brown; occasional boulders
63-68	Sand and gravel, fine to coarse, gray-tan grading to gray-brown
68-100	Till, blue-gray, olive layers
100-120	Till, blue-gray
120-130	Sand, silty, very fine to fine; sandy, silty; till layers
130-140	Till, very silty, sandy, blue-gray
140-200	Till, sandy, blue-gray; gravel layers at 160, 170, 173, 180 feet
200-201	Sand; wood; lignite
201-210	Sand, fine to coarse, gray; till layers
210-276	Till, sandy, gravelly, blue-gray; sand layers

LOCATION: 083-38-04DABC WC-63 STATION ID: 420147-0951613-01

ALTITUDE: 1220 FEET (NGVD 1929) DEPTH: 30 FEET DATE COMPLETED: June 16, 1982

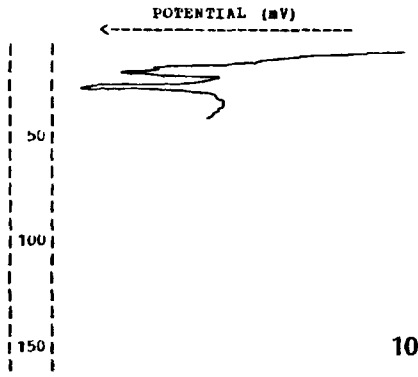


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Clay, silty, dark
6-9	Clay, silty, hard, gray
9-13	Clay, silty, yellow-gray
13-16	Clay, silty, soft, blue-gray
16-20	Clay, silty, soft, gray, gray-green
20-26	Sand and gravel, fine to coarse; boulders at base
26-30	Till, blue-gray

Casing record: set 2 inch pipe to 29 feet, slotted from 20 to 29 feet, gravel packed

LOCATION: 083-38-04DADA WC-61 STATION ID: 420142-0951557-01

ALTITUDE: 1215 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 15, 1982

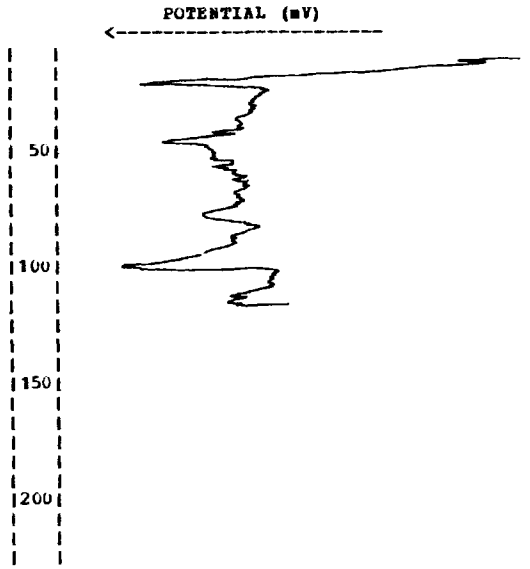


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-8	Road bed
8-13	Clay, silty, dark gray-brown
13-15	Clay, silty, dark blue-gray
15-18	Sand and gravel, very fine to medium, dark gray; clay and wood mixed
18-20	Sand and gravel, fine to very coarse, gray; clay, gray-green
20-23	Clay, silty, sandy, gray-green; shells
23-27	Sand and gravel, fine to coarse, yellow-tan; shells
27-41	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 083-39-30DCBB WC-49 STATION ID: 415804-0952548-01

ALTITUDE: 1150 FEET (NGVD 1929) DEPTH: 112 FEET DATE COMPLETED: June 1, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Road bed; top soil
6-8	Clay, silty, yellow-gray; gravel
8-12	Sand and gravel, fine to coarse, yellow-brown; boulders
12-30	Till, blue-gray
30-32	Sand, fine to coarse, gray
32-48	Till, blue-gray; sand, thin layers
48-54	Till, gray-green
54-55	Clay, gray
55-67	Till, yellow-gray, blue-gray
67-68	Sand
68-72	Clay, dark gray-brown
72-100	Clay, silty, sandy, reworked, gray, tan
100-103	Sand, very fine
103-104	Sand, fine, gray
	PENNSYLVANIAN
104-105	Shale, yellow-tan
105-112	Shale, yellow-brown, reddish-brown

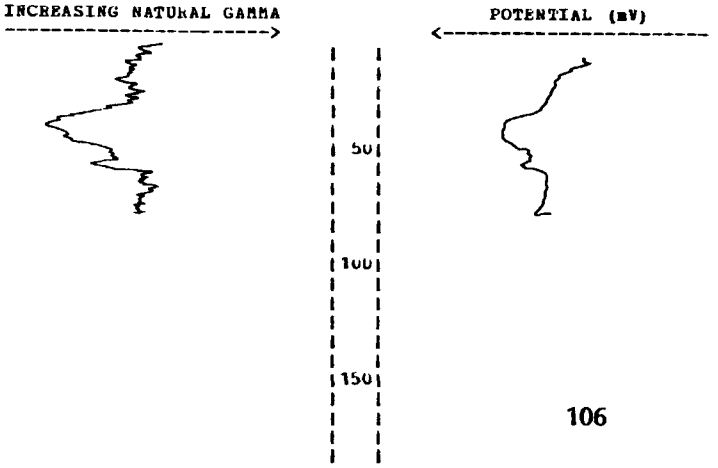
LOCATION: 083-40-15CCDC WC-13 STATION ID: 415938-0952943-01

ALTITUDE: 1198 FEET (NGVD 1929) DEPTH: 173 FEET DATE COMPLETED: July 6, 1981

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Loess, tan
10-15	Loess, brown grading to gray
15-28	Loess, yellow-brown
28-31	Clay, silty, sandy, blue-gray
31-35	Sand and gravel, fine to coarse, gray; occasional boulders
35-50	Till, blue-gray
50-56	Clay, silty, gray, gray-green
56-67	Sand and gravel, fine to medium, gray, reddish color
67-82	Clay, sandy, gray, gray-green
82-132	Sand, very fine to fine, silty, red, gray, dark grains
132-164	As above, gray, brown
	CRETACEOUS
	DAKOTA FORMATION
164-173	Sandstone; possible shale layers

LOCATION: 083-42-17ACCC WC-175 STATION ID: 420004-0954529-01

ALTITUDE: 1135 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: May 13, 1983

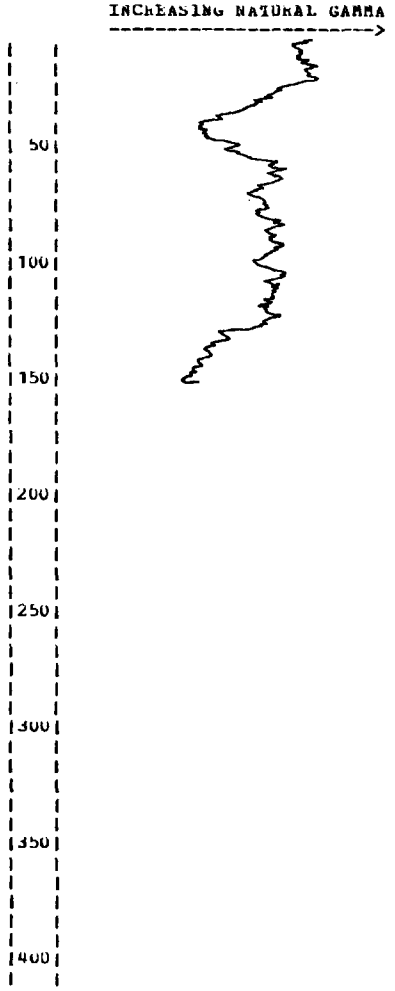


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-8	Clay, silty, brown
8-16	Clay, silty, yellow-gray
16-20	Clay, silty, blue-gray
20-22	Sand, fine to coarse; clay, blue-gray; wood
22-30	Clay, silty, gray-green
30-35	Clay, sandy, silty, gray; wood
35-40	Sand and gravel, fine to coarse, yellow-brown; boulders
40-51	Sand and gravel, fine to medium, some coarse, yellow-brown, brown
51-57	Clay, sandy, silty, gray
57-60	Sand and gravel, fine, gray
60-61	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 083-42-17ACDD WC-176 STATION ID: 420004-0954515-01

ALTITUDE: 1160 FEET (NGVD 1929) DEPTH: 161 FEET DATE COMPLETED: May 16, 1983

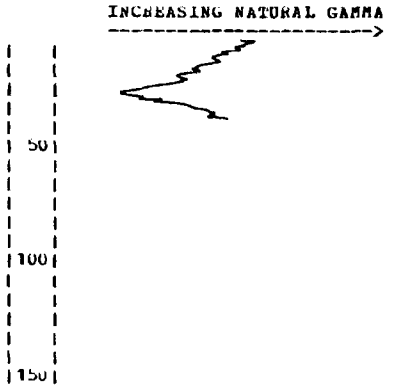


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil
2-10	Clay, silty, brown; loess
10-20	Clay, silty, yellow-brown; loess
20-35	Loess, yellow-tan
35-40	Sand, very fine to coarse; clay; silt
40-45	Sand, very fine to coarse, yellow-tan
45-50	Sand and gravel, fine, oxidized yellow-brown
50-55	Wood; sand
55-56	Gravel; boulder; till, yellow
56-93	Till, blue-gray
93-95	Clay, gray, sand grains
95-97	Clay, yellow-brown, gray
97-100	Clay, gray, yellow-brown trace
100-118	Clay, gray, blue-gray
118-128	Clay, silty, gray
128-140	Sand, very fine to medium, some silty, cemented, dark specks, gray-green
140-153	As above, grading coarser, fine gravel near base
	PENNSYLVANIAN
153-154	Shale; limestone streak at base; gravel, fine
154-156	Shale, yellow-gray, gray-green, reddish-brown trace
156-157	Limestone, tan
157-158	Shale, gray-green, tan
158-159	Shale, black; coal, thin streaks
159-161	Shale, gray

Casing record: set 2 inch pipe to 161 feet, slotted from 149 to 154 feet, gravel packed

LOCATION: 083-42-17CABB WC-173 STATION ID: 420004-0954548-01

ALTITUDE: 1140 FEET (NGVD 1929) DEPTH: 37 FEET DATE COMPLETED: May 12, 1983



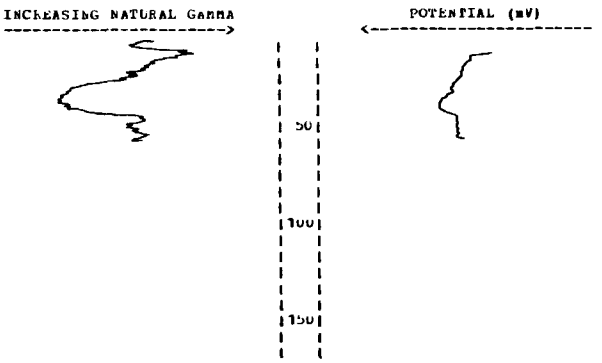
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Top soil, dark gray
3-6	Clay, silty, gray
6-10	Clay, silty, yellow-gray
10-16	Clay, silty, yellow-brown
16-26	Clay, silty, sandy at base, gray to blue-gray
26-32	Sand and gravel, fine to medium, some coarse, yellow-gray
32-37	Till, blue-gray

Casing record: set 2 inch pipe to 37 feet, slotted from 23.5 to 26 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 083-42-17CBAB WC-174 STATION ID: 420004-0954557-01

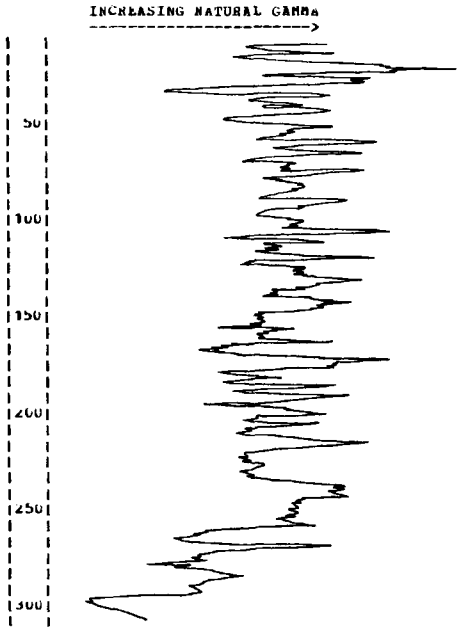
ALTITUDE: 1150 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: May 13, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-8	Road bed; top soil
8-14	Clay, silty, very dark
14-18	Clay, silty, gray
18-22	Clay, silty, yellow-gray
22-28	Clay, sandy, silty, gray-green; wood; sand layers
28-33	Sand, fine to coarse, gray
33-40	Sand and gravel, fine, medium to coarse at base, yellow-brown
40-43	Sand and gravel, fine to coarse, yellow-brown; boulders
43-45	Till; yellow-gray
45-61	Till, blue-gray; boulder at 59 feet

LOCATION: 083-43-04CBCB WC-5 STATION ID: 420139-0955157-01

ALTITUDE: 1235 FEET (NGVD 1929) DEPTH: 321 FEET DATE COMPLETED: May 4, 1981

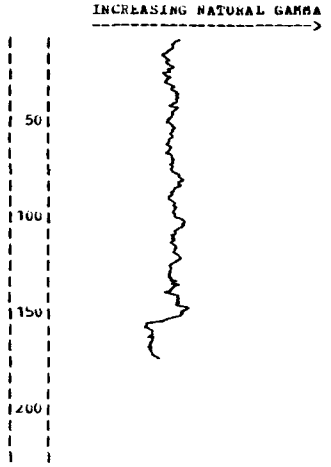


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Fill; loess, brown
10-30	Loess, brown, tan
30-35	Loess, yellow-brown
35-36	Loess, blue-gray
36-38	Loess, gray
38-43	Loess, yellow-brown
43-53	Till, yellow-brown
53-65	Clay or till, sandy, soft, yellow-gray
65-69	Till, yellow-brown
69-71	Gravel; boulder
71-81	Till, yellow-gray to blue-gray
81-235	Till, blue-gray
235-253	Till, blue-gray
253-264	Sand and gravel, fine to medium
	CRETACOUS
	DAKOTA FORMATION
264-321	Sandstone, fine, tan

Casing record: set 2 inch pipe to 315 feet, slotted from 297 to 315 feet, gravel packed

LOCATION: 084-29-16CBAB WC-233 STATION ID: 420507-0941419-01

ALTITUDE: 1075 FEET (NGVD 1929) DEPTH: 181 FEET DATE COMPLETED: August 4, 1983



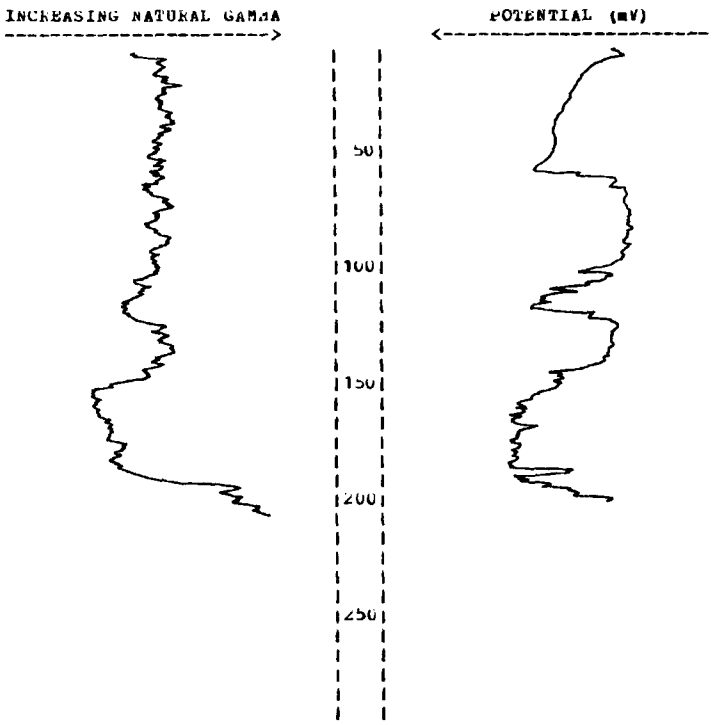
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-14	Till, yellow-brown
14-30	Till, brown, blue-gray
30-32	Boulder
32-47	Till, blue-gray
47-49	Sand and gravel, fine to coarse
49-50	Till, olive
50-130	Till, blue-gray, layer of olive at 95 feet
130-137	Till, gray
137-139	Till, light blue-gray
139-143	Till, blue-gray
143-145	Wood; gravel; sand
145-177	Sand and gravel, fine to coarse
	PENNSYLVANIAN
177-179	Shale, gray-tan
179-181	Shale, yellow-reddish-brown, gray-green

Casing record: set 2 inch pipe to 181 feet, slotted from 161 to 176 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-29-31DAAD WC-234 STATION ID: 420227-0941542-01

ALTITUDE: 1027 FEET (NGVD 1929) DEPTH: 201 FEET DATE COMPLETED: August 8, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-6	Till, yellow-gray
6-10	Sand and gravel, fine to medium, brown
10-56	Till, blue-gray
56-60	Till, yellow-brown
60-68	Till, hard, gray-green
68-70	Till, blue-gray, olive
70-102	Till, blue-gray
102-104	Sand and gravel, fine to medium, gray-tan
104-110	Till, blue-gray; gravel layers
110-120	Sand and gravel, fine to coarse; till, mixed, blue-gray
120-144	Till, blue-gray; sand and gravel
144-145	Clay, silty, gray
145-155	Sand, fine to coarse, possibly cemented, gray-tan
155-188	Sand and gravel, fine to coarse, gray-brown; till or clay layer at 169 feet
	PENNSYLVANIAN
188-189	Shale, silty, gray
189-191	Sandstone, fine, hard, gray
191-201	Shale, blue-gray, gray; sandstone, fine, interbedded; siltstone

LOCATION: 084-30-19AAAA WC-230 STATION ID: 420440-0942243-01

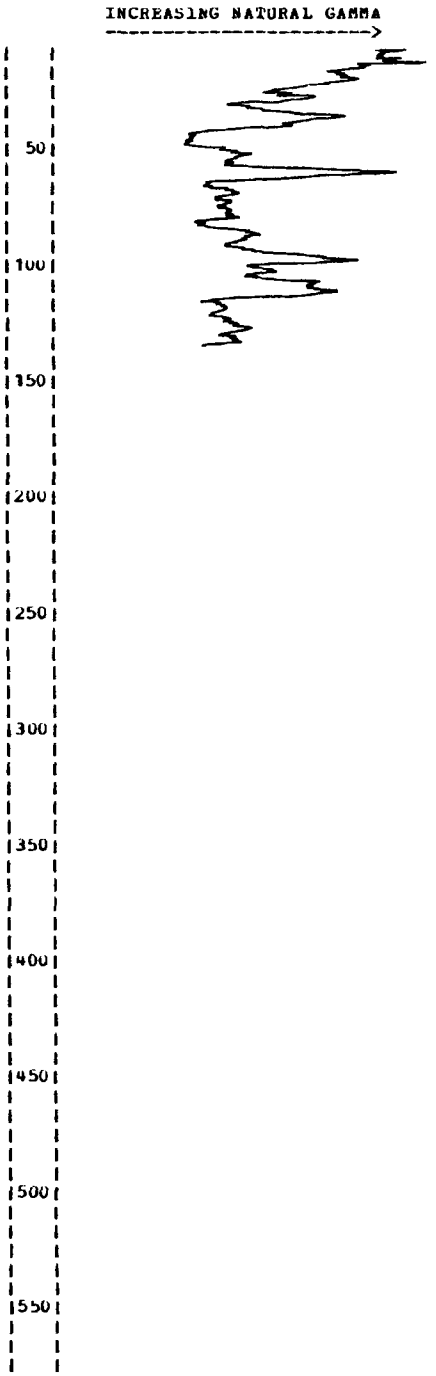
ALTITUDE: 1065 FEET (NGVD 1929) DEPTH: 201 FEET DATE COMPLETED: July 28, 1983

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil
2-5	Till, sandy, gravelly, yellow-gray
5-10	Sand and gravel, tan, yellow-brown
10-12	Till, sandy, gravelly, yellow-gray
12-20	Sand and gravel, fine to coarse, gray-tan
20-21	Till, sandy, gravelly, yellow-gray
21-24	Sand and gravel, fine, brown
24-25	Till, brown
25-44	Till, blue-gray; sand layer at 38'
44-62	Sand and gravel, fine to coarse, gray-tan
62-72	Till, blue-gray
72-74	As above; sand and gravel
74-94	Till, blue-gray
94-99	Sand and gravel, very fine to fine, gray-tan
99-100	Till, olive
	CRETACEOUS
	DAKOTA FORMATION
100-108	Till, yellow-gray, gray; clay or shale
108-112	Clay or shale, silty, gray, yellow-gray
112-114	Shale, sandy, yellow-brown, gray
114-120	Sandstone, fine to very coarse
120-124	Sandstone, very coarse, brown, yellow-brown
124-135	Sandstone, well cemented, brown; shale, thin layers
135-137	Shale, silty, gray
137-141	Sandstone, very fine, tan, yellow-brown
	PENNSYLVANIAN
141-150	Shale, silty, gray, yellow-gray; sandstone, fine, interbedded; organics, dark specks
150-157	Sandstone, fine to medium, hard, gray; organics
157-161	Shale, gray-brown; shale, streaks
161-163	Coal; pyrite
163-170	Shale, gray; organics, dark specks
170-176	Shale, sandy, light blue-gray; pyrite
176-180	Shale, dark gray, gray-brown; pyrite
180-201	Shale, silty, gray; pyrite

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-32-08ACDB WC-124 STATION ID: 420603-0943551-01

ALTITUDE: 1070 FEET (NGVD 1929) DEPTH: 141 FEET DATE COMPLETED: September 1, 1962



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-12	Till, yellow-brown, yellow-gray; boulder at 3 feet
	CRETACEOUS
	DAKOTA FORMATION
12-15	Sand or sandstone, fine to medium, brown
15-20	Sandstone, fine to coarse, yellow-brown, tan
20-24	Sandstone, fine to coarse, tan; shale, thin layers, tan
24-28	Sandstone, fine to very coarse, yellow-brown
28-33	Shale, silty, sandy, light gray; sandstone layers, fine to medium, tan
33-40	Sandstone, fine to medium, some coarse, yellow-brown; shale at top, yellow
40-45	Sandstone, fine to coarse, brown
45-46	Shale, silty, yellow-brown
46-48	Sandstone, yellow-brown; shale
48-53	Sandstone, fine to very coarse, brown, yellow-brown
53-56	Shale, silty, sandy, light gray
56-60	Sandstone, fine to coarse, tan, brown at top
60-65	Sandstone, fine to coarse, yellow-brown; shale, thin streaks
65-70	Sandstone, brown (as above)
70-79	Sandstone, fine to coarse, tan, yellow-brown
79-89	Sandstone, fine to very coarse (gravel), tan, yellow-brown
89-91	Shale, silty, sandy, gray
91-105	Sandstone, fine to very coarse (gravel), tan; shale at base
105-115	Sandstone, fine to coarse, tan
115-127	Sandstone, fine to very coarse, (gravel at base), yellow-brown
	PENNSYLVANIAN
127-141	Sandstone, fine, silty, gray; organic streaks

Casing record: set 2 inch pipe to 129 feet, slotted from 119 to 129 feet, gravel packed

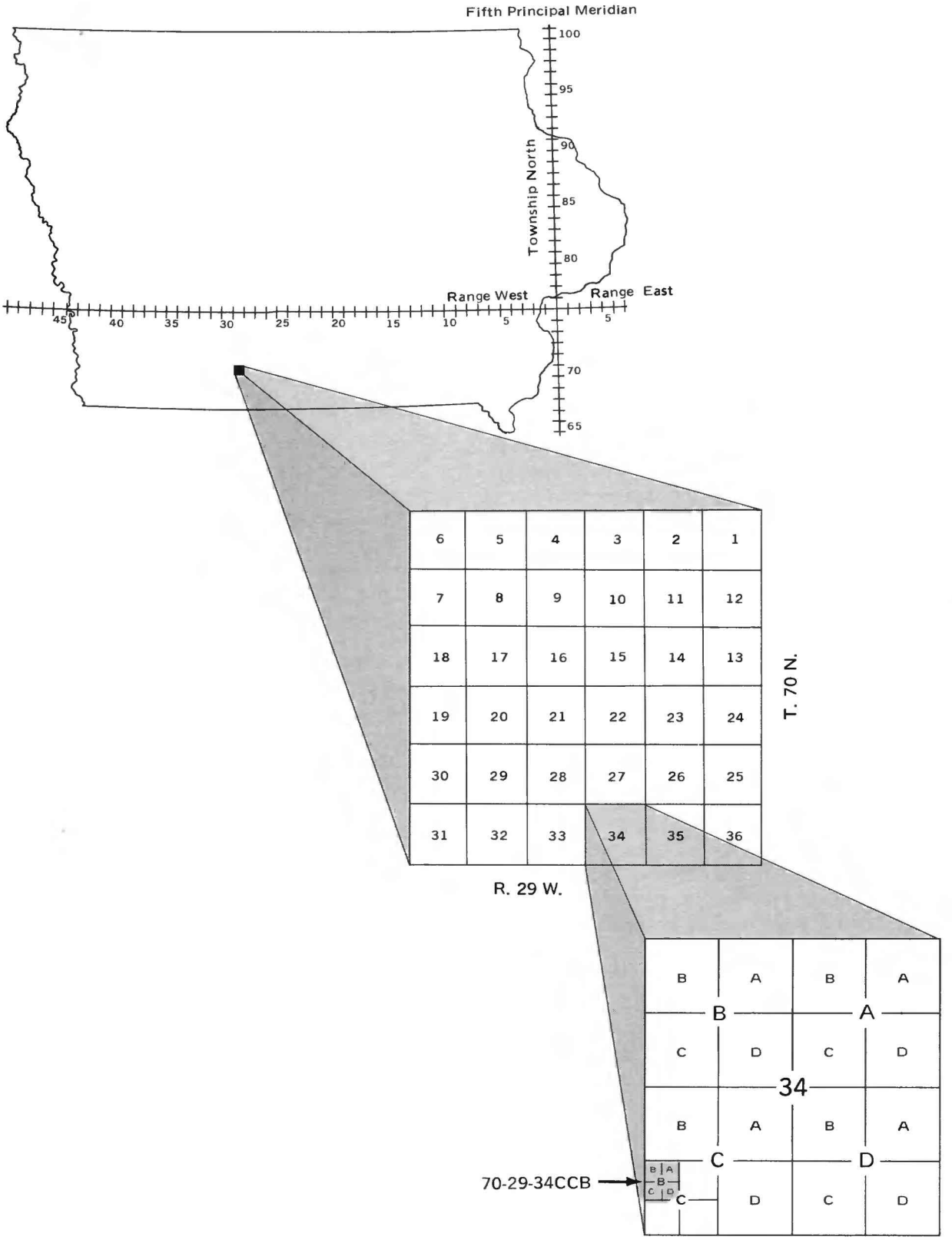


Figure 2. Federal system of land subdivision in Iowa

Table 2. Logs of wells and test holes--Continued.

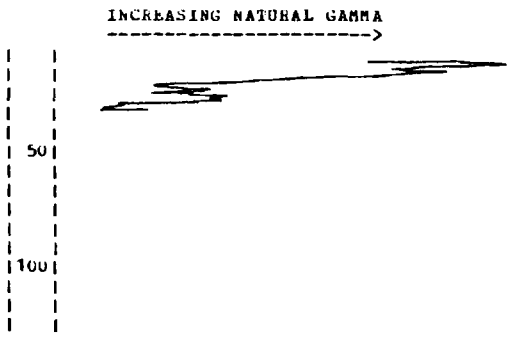
LOCATION: 084-32-08BCBC WC-127 STATION ID: 420606-0943634-01

ALTITUDE: 1070 FEET (NGVD 1929) DEPTH: 107 FEET DATE COMPLETED: September 3, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed; top soil
3-6	Sand and gravel, oxidized, brown, yellow-brown; boulders
6-18	Till, yellow-gray, yellow-tan
18-21	Till, blue-gray, yellow-gray
21-38	Till, blue-gray
38-39	Sand and gravel, fine to coarse, gray
39-54	Till, sandy, gravelly, soft, blue-gray
54-55	Sand and gravel, fine to coarse
55-66	Till, blue-gray
66-72	Sand and gravel, fine to very coarse, mostly lime fragments; boulders at base
72-73	Till, blue-gray
73-74	Sand and gravel, as above
74-77	Till, blue-gray
77-80	Sand and gravel, as above, finer
80-99	Till, sandy, gravelly, hard, blue-gray; sand and gravel, occasional layer
99-106	Sand and gravel, fine to very coarse; boulders
	CRETACEOUS
	DAKOTA FORMATION
106-107	Possible bedrock

LOCATION: 084-32-08BDCA WC-126 STATION ID: 420606-0943613-01

ALTITUDE: 1040 FEET (NGVD 1929) DEPTH: 35 FEET DATE COMPLETED: September 8, 1982

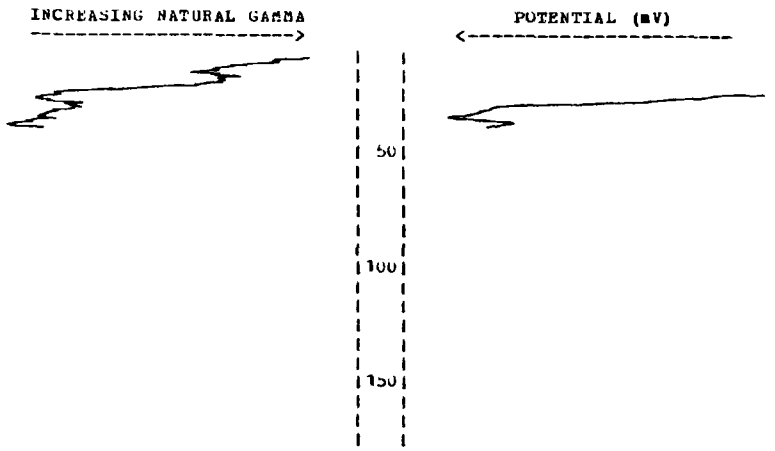


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Road bed
10-13	Clay, silty, sandy, gray-brown
13-17	Sand, fine to coarse, brown
17-28	Sand and gravel, fine to very coarse, silty, gray; wood; shells
28-35	Till, blue-gray

Casing record: set 2 inch pipe to 28 feet, slotted from 23 to 28 feet, gravel packed

LOCATION: 084-32-08BDDA WC-125 STATION ID: 420604-0943603-01

ALTITUDE: 1040 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: September 2, 1982

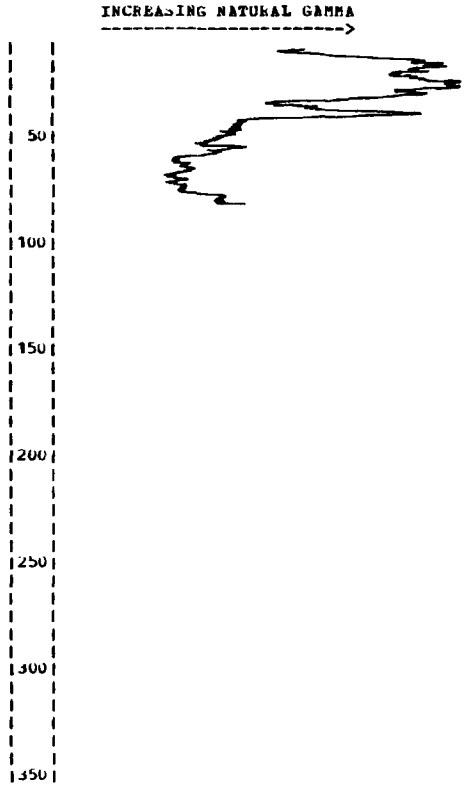


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed
3-7	Clay, silty, sandy, very dark
7-10	Clay, silty, some sandy, dark gray-brown
10-17	Clay, very sandy, gravelly, yellow-brown; sand layers
17-20	Clay, silty, yellow-brown
20-33	Sand and gravel, fine to very coarse, tan, brown, yellow-brown at base; boulders
	CRETACEOUS
	DAKOTA FORMATION
33-41	Sandstone, fine to coarse, yellow-brown; shale, thin streaks

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-33-02BDBA WC-132 STATION ID: 420705-0943945-01

ALTITUDE: 1110 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: September 9, 1982

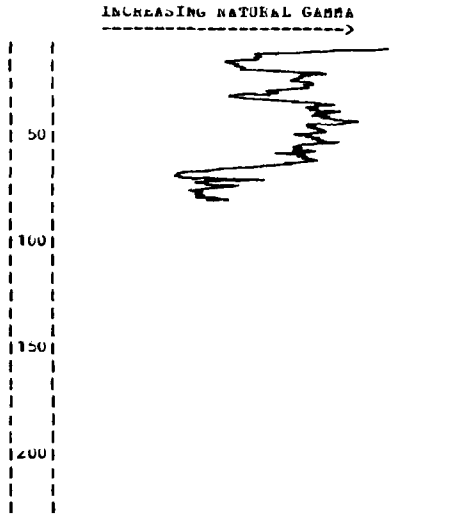


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-1	Top soil; sandy
1-8	Sand, fine to coarse, tan, brown
8-11	As above, gravel, yellow-brown
11-13	Till, yellow-tan
13-14	Till, yellow-gray
14-28	Till, sandy, gravelly, blue-gray
	CRETACEOUS
	DAKOTA FORMATION
28-34	Sandstone, fine to coarse, iron cemented, oxidized, brown
34-36	Shale, hard, tan, brown; sandstone at base
36-38	Sandstone, fine to coarse, oxidized, brown
38-40	Sandstone, fine to coarse, hard, iron cemented
40-50	Sandstone, fine to coarse, iron cemented layers, brown
50-55	Sandstone, fine to very coarse (gravel), brown, yellow-brown
55-75	Sandstone, fine to coarse, iron cemented layers, yellow-brown
75-78	Sandstone, fine to very coarse (gravel); shale trace
78-81	No sample

Casing record: set 2 inch pipe to 78 feet, slotted from 73 to 78 feet, gravel packed

LOCATION: 084-33-03AABC WC-129 STATION ID: 420708-0944009-01

ALTITUDE: 1069 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: September 7, 1982

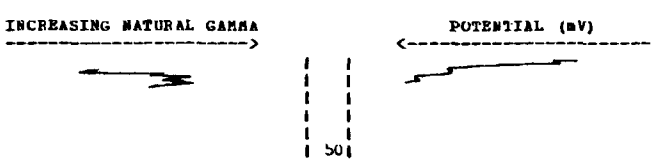


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil, black
2-4	Clay, sandy, brown
4-12	Sand and gravel, fine to coarse
12-14	Sand and gravel, fine to coarse, yellow-brown
14-15	Till, yellow-gray
15-23	Till, blue-gray
23-24	Sand, fine to coarse, gray
24-25	Till, yellow-gray
25-26	Sand, fine to coarse, gray
26-56	Till, very sandy, gravelly, blue-gray
56-78	Sand and gravel, fine to coarse tan, brown
	PENNSYLVANIAN
78-81	Shale, gray-brown, reddish-brown trace

Casing record: set 2 inch pipe to 77 feet, slotted from 72 to 77 feet, gravel packed

LOCATION: 084-33-03ABDD WC-128 STATION ID: 420708-0944022-01

ALTITUDE: 1060 FEET (NGVD 1929) DEPTH: 21 FEET DATE COMPLETED: September 7, 1982

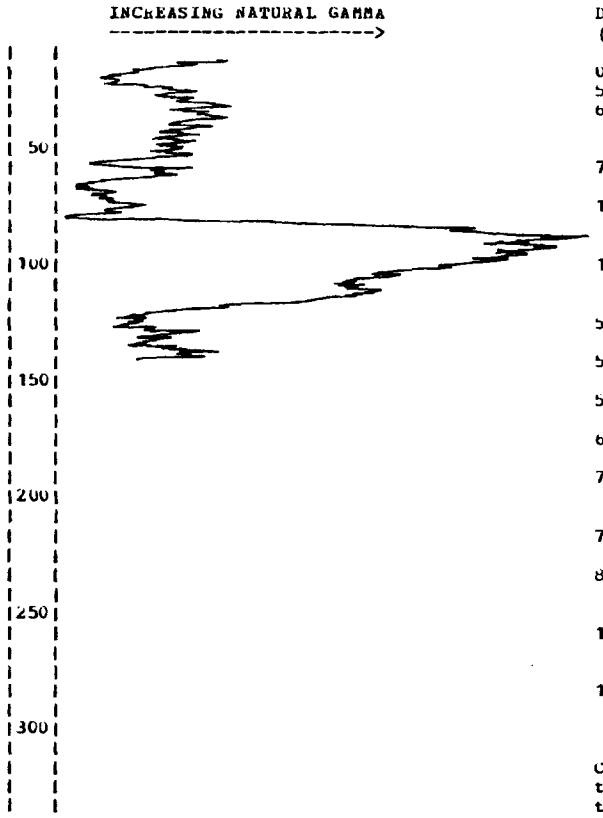


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-1	Top soil, sandy
1-8	Sand and gravel, fine to very coarse, brown; boulders
8-21	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-33-03BDAA WC-130 STATION ID: 420702-0944040-01

ALTITUDE: 1065 FEET (NGVD 1929) DEPTH: 135 FEET DATE COMPLETED: September 8, 1982

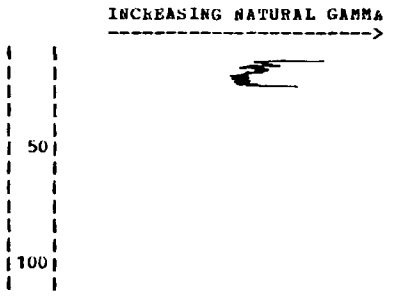


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-6	Clay, silty, dark brown
6-7	Clay, silty, sandy, some gravelly, yellow-brown
7-10	Sand and gravel, fine to coarse, tan, brown
10-16	Sand and gravel, fine to very coarse, brown; boulder at base
16-50	Till, sandy, gravelly, blue-gray; boulder at 37 feet
50-53	Sand and gravel, fine to coarse
53-56	Till, very sandy, gravelly, blue-gray
56-65	Sand and gravel, fine to coarse
65-76	As above, coarser; boulders at base
76-78	Till; boulders; shale
	PENNSYLVANIAN
78-81	Shale, silty, gray-brown
81-100	Shale, silty, gray; siltstone streaks; pyrite
100-110	Shale, silty, gray; siltstone and sandstone layers; pyrite
110-135	Sandstone, hard; siltstone; pyrite

Casing record: set 2 inch pipe to 135 feet, slotted from 115 to 135 feet, gravel packed

LOCATION: 084-33-03CADA WC-131 STATION ID: 420643-0944037-01

ALTITUDE: 1090 FEET (NGVD 1929) DEPTH: 21 FEET DATE COMPLETED: September 9, 1982



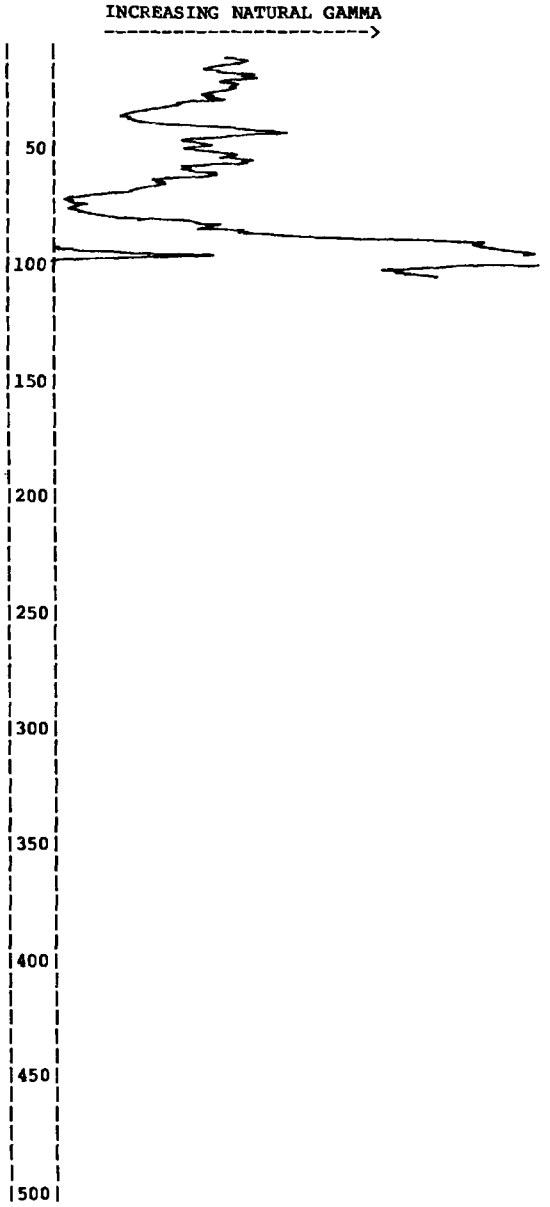
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil, dark
2-5	Till, yellow-tan
5-15	Sand and gravel, fine to very coarse, yellow-brown; boulders at base
15-21	Till, blue-gray

Casing record: set 2 inch pipe to 15 feet, slotted from 13 to 15 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-34-35BCDC WC-148 STATION ID: 420233-0944759-01

ALTITUDE: 1225 FEET (NGVD 1929) DEPTH: 100 FEET DATE COMPLETED: September 27, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil; clay, silty, brown
2-5	Clay, sandy, gravelly, yellow-tan
5-6	Till, yellow-tan; boulders
6-15	Till, sandy, gravelly, yellow-tan
15-20	As above, iron concretions
20-27	Till, olive, blue-gray
27-30	Sand and gravel, fine to medium, yellow-brown
30-36	As above, to gray; boulders at base
36-38	Till; boulders; reworked shale, reddish-brown, dark gray
38-40	Till, blue-gray
40-46	Sand and gravel, fine to medium, gray
46-49	Clay or till, very sandy, gravelly, iron, brown, gray-green; sand and gravel layer
49-50	Till, sandy, gray-green, olive
50-55	Till, sandy, blue-gray, olive
55-57	As above, with sand and gravel, fine to medium, brown; boulders
57-65	Sand and gravel, fine, brown, tan; clay mixed
	CRETACEOUS
	DAKOTA FORMATION
65-70	Sandstone, fine to medium, tan
70-75	Sandstone, fine to coarse, brown, tan
75-80	Sandstone, fine to very coarse, shaly, oxidized, brown
	PENNSYLVANIAN
80-87	Shale, yellow-brown
87-90	Shale, reddish-brown
90-95	Shale, sandy at base, gray, blue-gray
95-97	Coal; shale, gray
97-100	Shale, silty, gray to gray-green

Casing record: set 2 inch pipe to 99 feet, slotted from 72 to 76 feet, gravel packed

LOCATION: 084-34-35BDCD WC-147 STATION ID: 420232-0944639-01

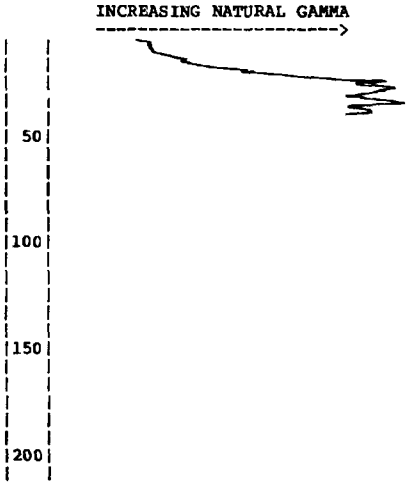
ALTITUDE: 1195 FEET (NGVD 1929) DEPTH: 101 FEET DATE COMPLETED: September 24, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed; top soil
3-9	Clay, silty, very soft, gray; shells at base
9-14	Clay, silty, sandy, very soft, yellow-gray; shells
14-18	Sand and gravel, fine
18-19	Clay, silty; wood; shells
19-56	Till, very sandy, gravelly
56-60	Sand and gravel, fine to medium; till layers
60-80	Sand and gravel, fine to medium (mostly sand)
80-84	Till, sandy, gravelly, blue-gray; boulders
	PENNSYLVANIAN
84-93	Shale, gray, yellow-gray
93-97	Shale, blue-gray
97-100	Shale, gray-green, yellow trace, reddish-brown
100-101	Shale, gray-green, reddish-brown, yellow-brown

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-34-35DAAA WC-146 STATION ID: 420230-0944551-01

ALTITUDE: 1190 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: September 23, 1982

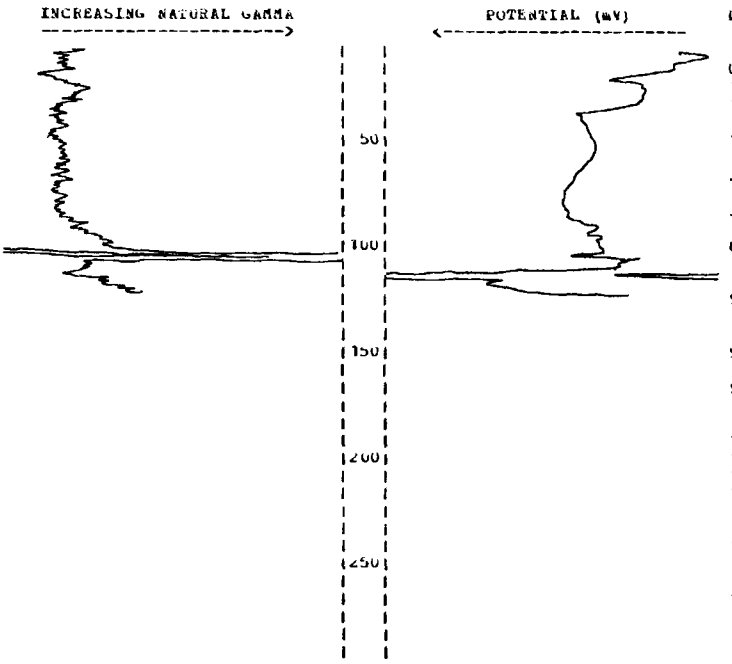


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Top soil; clay, dark gray
3-9	Clay, silty, soft, yellow-gray
9-12	Sand, fine to coarse, gray; clay at top, gray-green; shells
12-20	Sand and gravel, fine, gray; clay; shells; wood
20-29	Clay, sandy, silty, very soft, gray; sand layers, fine to coarse
29-31	Sand and gravel, fine, gray
31-36	Till, sandy, blue-gray
36-37	Sand and gravel, fine, gray
37-41	Till, sandy, blue-gray

Casing record: set 2 inch pipe to 40 feet, slotted from 28 to 40 feet, gravel packed

LOCATION: 084-34-35DABB WC-145 STATION ID: 420231-0944607-01

ALTITUDE: 1195 FEET (NGVD 1929) DEPTH: 121 FEET DATE COMPLETED: September 23, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-14	Fill
14-16	Clay, silty, very dark
16-19	Sand, fine to coarse, gray
19-34	Clay, silty, crumbly, gray
34-35	Sand and gravel, fine to coarse
35-80	Till, sandy, gravelly, blue-gray
80-90	As above, olive layers
	PENNSYLVANIAN
90-94	Shale, silty, yellow-gray, blue-gray at top
94-97	Shale, silty, brown, reddish-brown
97-100	As above, grading to yellow-gray
100-101	Shale, blue-gray
101-102	Limestone; shale, gray
102-103	Shale, black
103-105	Shale, gray
105-107	Shale, yellow-brown
107-109	Shale, silty, sandy, light gray-green
109-113	Siltstone; sandstone, fine, lime-cemented, hard
113-120	Shale, silty, sandy, gray-green
120-121	Shale, gray-green, reddish-brown

LOCATION: 084-35-07AAAA WC-144 STATION ID: 420627-0945725-01

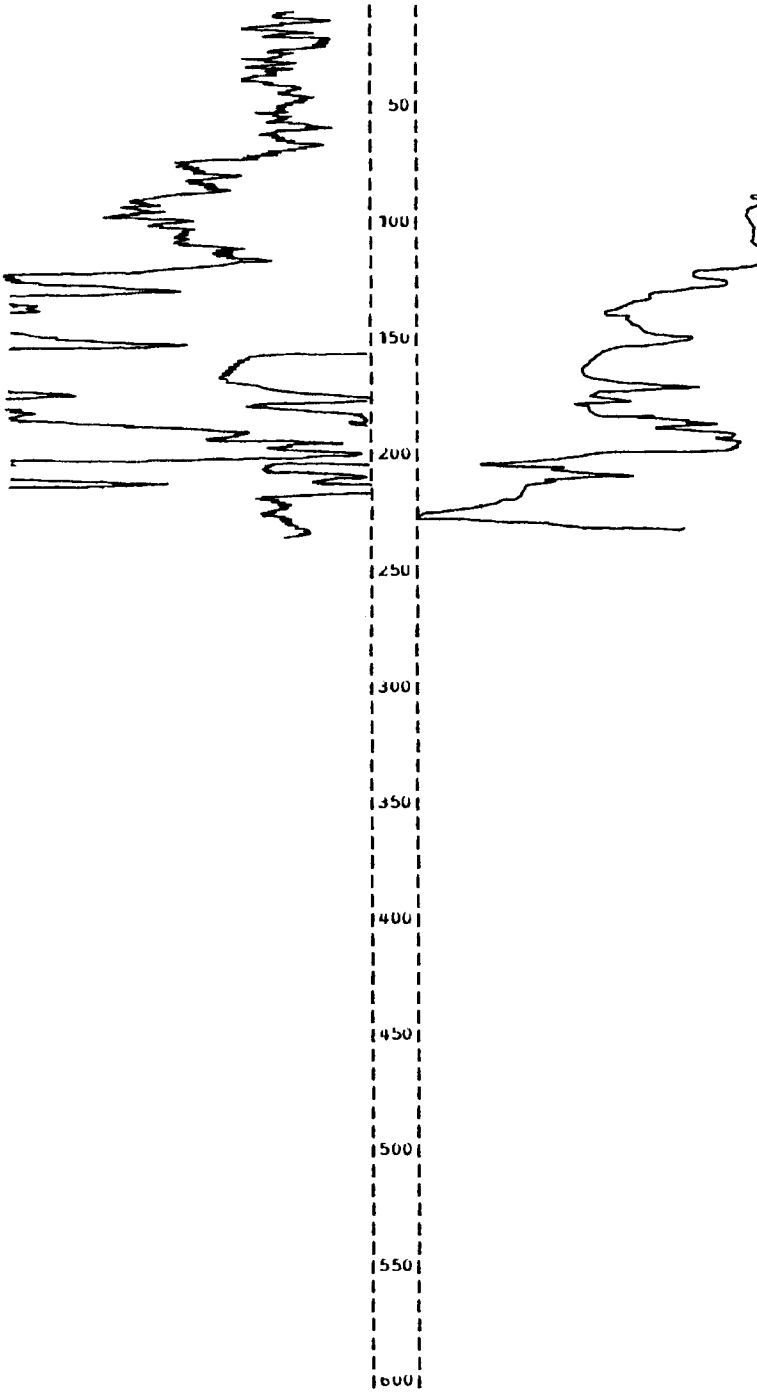
ALTITUDE: 1300 FEET (NGVD 1929) DEPTH: 101 FEET DATE COMPLETED: September 22, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Clay, some sandy, yellow-gray
2-5	As above, sandy, gravelly
5-8	Till, yellow-gray; iron concretions
8-18	Till, yellow-brown; iron concretions, occasional
18-20	Till, blue-gray, gray
20-24	Till, yellow-brown
24-27	Till, blue-gray, yellow-brown
27-37	Till, blue-gray, olive layers
37-62	Till, blue-gray
62-64	Boulder
64-97	Till, blue-gray
97-98	Sand and gravel
98-101	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-35-08ABBB WC-142 STATION ID: 420627-0945643-01

ALTITUDE: 1285 FEET (NGVD 1929) DEPTH: 241 FEET DATE COMPLETED: September 20, 1982

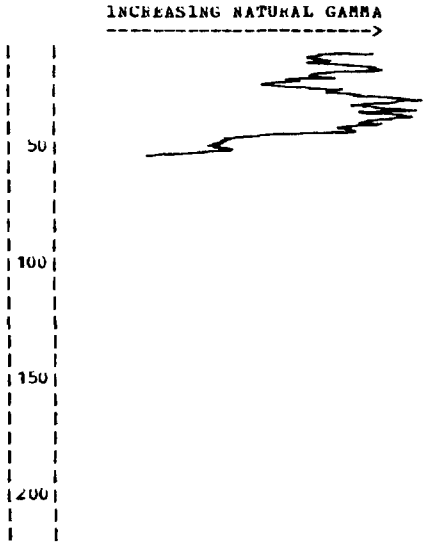


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-15	Clay, silty, yellow-brown
15-22	Till, yellow-brown
22-33	Till, olive or yellow-gray; boulder at 30 feet
33-36	Till, blue-gray, olive
36-74	Till, blue-gray
74-75	Sand, fine to medium, gray
75-90	Till, sandy, blue-gray
90-93	Sand, fine to coarse, gray; till layers
93-97	Till, blue-gray; gravel layers
97-98	Till, yellow-gray, yellow-brown
98-99	Sand and gravel, fine to coarse
99-112	Till, yellow-brown
112-116	Till, blue-gray
116-117	Till, yellow-brown, blue-gray
	CRETACEOUS
	DAKOTA FORMATION
117-119	Shale, silty, sandy, yellow-brown, gray
119-125	Sandstone, fine to medium, tan
125-128	Shale, silty, light gray, yellow-brown
128-150	Sandstone, fine to medium, tan
150-153	Shale, silty, sandy, light gray, yellow-brown
153-172	Sandstone, fine to medium, some coarser than above, tan
172-173	Shale, silty, sandy, gray, yellow
173-178	Sandstone, fine to coarse, yellow-brown
178-179	Shale, sandy, yellow
179-185	Sandstone, very coarse, yellow-brown
185-186	As above, shale mixed
186-200	Shale, oxidized layers, brown, yellow-brown, gray; sandstone, occasional layer, fine, brown
200-205	Sandstone, fine to medium, brown, yellow-brown
205-207	Ironstone
207-210	Sandstone, fine to medium, brown, yellow-brown
210-212	Shale, sandy, silty, yellow-brown
212-220	Sandstone, fine to medium, tan, yellow-brown; ironstone layer at top
220-229	As above, shale streaks
229-230	Shale, silty, sandy
230-241	Sandstone, fine to medium, creviced

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-35-08BAAB WC-141 STATION ID: 420626-0945653-01

ALTITUDE: 1265 FEET (NGVD 1929) DEPTH: 51 FEET DATE COMPLETED: September 20, 1982

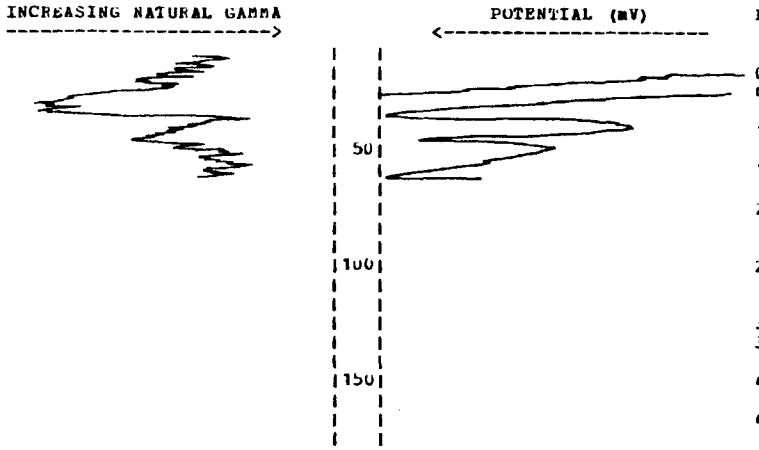


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Clay, very dark gray-brown
4-7	Clay, silty, gray-brown
7-10	Clay, silty, sandy, gray; sand layers
10-14	Clay, silty, sandy, gray-green; shells
14-15	Sand and gravel, fine to coarse, yellow-brown
15-18	Clay, sandy, silty, gray-green; shells; wood at base
18-21	Sand, very fine to medium, gray
21-40	Clay, silty, soft, gray, gray-green
40-49	Sand and gravel, fine to coarse; boulder at base
49-51	Till, blue-gray

Casing record: set 2 inch pipe to 48 feet, slotted from 44.5 to 48 feet, gravel packed

LOCATION: 084-35-08BBAA WC-140 STATION ID: 420627-0945704-01

ALTITUDE: 1272 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: September 17, 1982

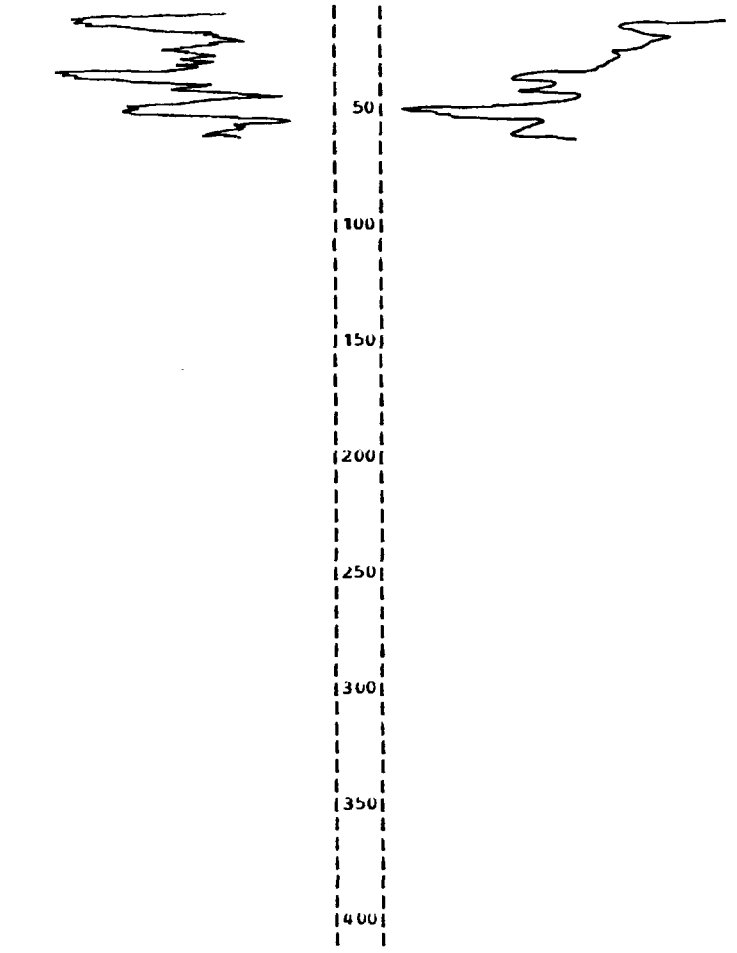


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed
4-12	Clay, silty, very dark gray-brown
12-19	Clay, silty, soft, very dark blue-gray
19-21	Clay, silty, sandy, gray-green
21-24	Sand and gravel, fine to medium; wood; clay, banded, gray
24-30	Sand and gravel, fine to very coarse; clay layers, gray
30-37	Clay, silty, gray-green
37-41	Sand and gravel, fine to medium, yellow-brown
41-42	Till, yellow-brown to brown
42-61	Till, blue-gray fine to medium, yellow-brown

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-35-08BBBA WC-143 STATION ID: 420627-0945716-01

ALTITUDE: 1270 FEET (NGVD 1929) DEPTH: 115 FEET DATE COMPLETED: September 21, 1982

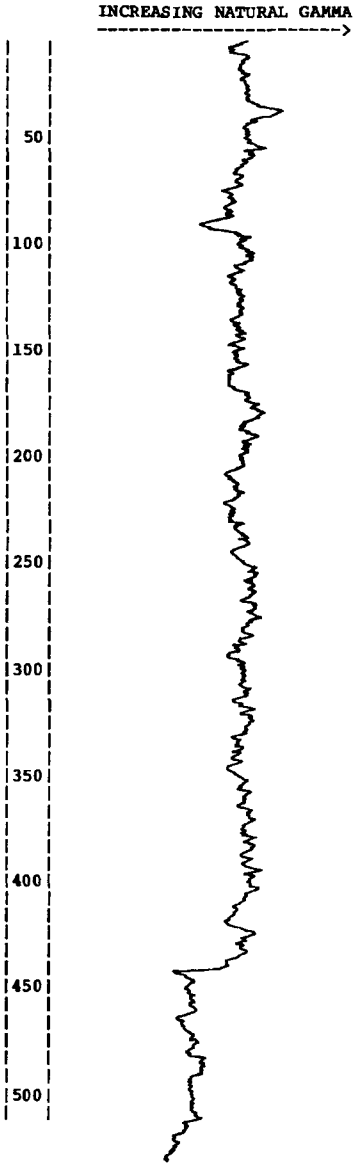


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed
4-7	Clay, sandy, yellow-brown; gravel
7-16	Sand and gravel, fine to coarse, tan yellow-brown
16-18	Clay, silty, yellow-gray
18-29	Clay, silty, soft, blue-gray; sand, very fine, gray; wood
29-34	Sand and gravel, fine, gray
34-45	Clay, silty, soft, gray
45-51	Sand and gravel, fine to coarse, brown, yellow-brown
51-56	Till or clay, very sandy, very gravelly, olive; boulders
56-58	Sand, fine to coarse, oxidized, brown; clay or till
58-62	Boulders; clay or till, sandy, gravelly
62-64	Sand and gravel, fine, brown, yellow-brown
64-66	Clay or till, sandy, gravelly, brown, gray
66-68	Sand and gravel, fine to medium
68-84	Till, blue-gray
84-86	Sand, fine
86-87	Till, gray, yellow-brown
87-90	Till, yellow-brown
90-91	Sand and gravel, fine to medium
91-100	Till, yellow-brown, gray, blue-gray
100-105	Till, blue-gray
	CRETACEOUS
	DAKOTA FORMATION
105-110	Shale, silty, yellow-brown, reddish-brown
110-115	Shale, silty, gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-37-08BCCB WC-226 STATION ID: 420608-0951117-01

ALTITUDE: 1380 FEET (NGVD 1929) DEPTH: 541 FEET DATE COMPLETED: July 12, 1983

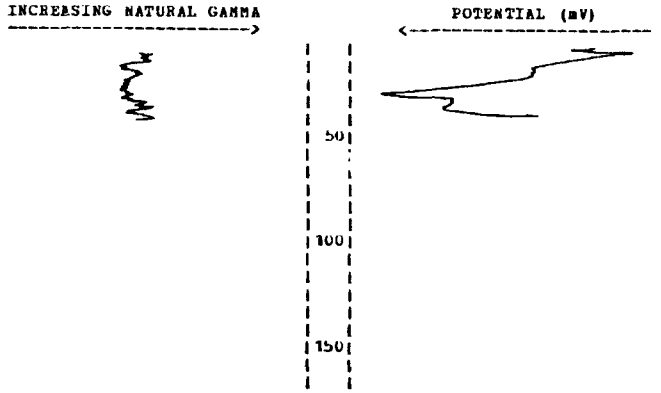


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Clay, silty, yellow-brown; loess
5-31	Till, yellow-brown
31-37	Till, olive grading to blue-gray
37-65	Till, blue-gray
65-66	Sand and gravel, medium, blue-gray
66-74	Till, sandy, blue-gray
74-76	Sand and gravel, fine to coarse, gray
76-80	Till, sandy, gravelly, blue-gray
80-90	Till, sandy, gravelly, gray-brown
90-93	Sand and gravel, fine, gray; wood
93-101	Till, sandy, gravelly, blue-gray
101-108	Clay, tough, gray to blue-gray; gravel; sand, very few grains
108-114	Till, tough, light blue-gray
114-137	Till, yellow-brown
137-139	Clay or till, gray
139-179	Till, yellow-brown
179-200	Till, sandy, gravelly, blue-gray
200-241	Till, very sandy, very gravelly, blue-gray; sand and gravel, layers; boulder, occasional
241-420	Till, very sandy, very gravelly; sand and gravel, layers; boulders, occasional; shale, reworked; wood
420-440	Till, cemented (possibly), thicker than above; sand, layers
440-460	Sand, fine to coarse, cemented
460-485	Sand and gravel, cemented, gray-brown
485-495	Sand and gravel, cemented
495-539	Sand, cemented (possibly)
	PENNSYLVANIAN
539-541	Limestone, sandy, shaly at base, gray, brown

Casing record: set 2 inch pipe to 541 feet, slotted from 527 to 541 feet, gravel packed

LOCATION: 084-37-11BBBB WC-66 STATION ID: 420628-0950748-01

ALTITUDE: 1300 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 17, 1982



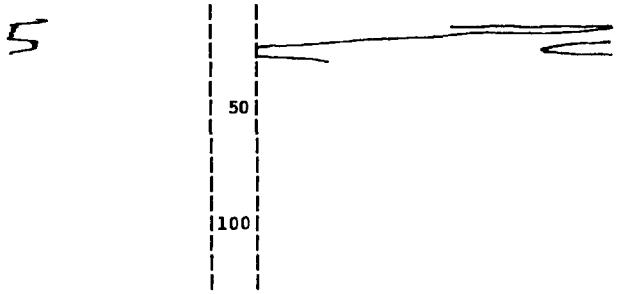
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Road bed; top soil
7-11	Clay, silty, very dark
11-14	Clay, silty, dark; gravel mixed; sand layers
14-16	Clay, silty, sandy, gray-green; sand and gravel layers
16-21	Sand and gravel, fine to coarse, very dark gray; clay; shells
21-26	As above, fine to very coarse
26-30	Till, blue-gray
30-31	Sand and gravel, very fine to coarse, gray-tan
31-41	Till, sandy, gravelly, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-37-14CBBC WC-64 STATION ID: 420506-0950748-01

ALTITUDE: 1300 FEET (NGVD 1929) DEPTH: 21 FEET DATE COMPLETED: June 17, 1982

INCREASING NATURAL GAMMA ----------> POTENTIAL (mV) <----------



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-8	Clay, silty, dark gray
8-11	Clay, silty, sandy, soft, dark gray
11-12	Clay, sandy, gravelly, dark blue-gray
12-15	Sand and gravel, fine to coarse, gray-tan; clay trace
15-16	Sand and gravel, fine to coarse, oxidized, brown
16-17	Till, yellow-gray
17-21	Till, blue-gray

LOCATION: 084-37-14DDCC WC-67 STATION ID: 420446-0950655-01

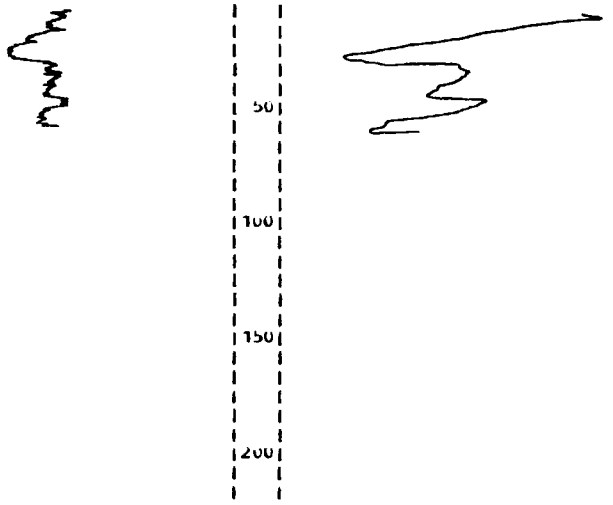
ALTITUDE: 1330 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 18, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-12	Clay or loess, silty, yellow-brown
12-20	Sand, fine to coarse, gravel, fine, yellow-brown
20-23	Clay, silty, sandy, gray-brown; sand layers
23-26	Sand and gravel, fine to coarse, yellow-brown
26-27	Till, brown
27-37	Till, blue-gray
37-39	Till, sandy, olive; sand layers, fine to medium
39-41	Till, blue-gray

LOCATION: 084-37-15DABA WC-65 STATION ID: 420511-0950757-01

ALTITUDE: 1300 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 17, 1982

INCREASING NATURAL GAMMA ----------> POTENTIAL (mV) <----------



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed; top soil
4-7	Clay, silty, dark gray
7-9	Clay, silty, gray-brown
9-11	Clay, silty, soft, blue-gray
11-15	Clay, silty, sandy, soft, gray-green; sand layers
15-19	Sand and gravel, fine to coarse, gray-tan
19-22	As above, oxidized, yellow-brown
22-26	Sand and gravel, fine, yellow-tan, gray at base
26-40	Clay, very silty, sandy, blue-gray
40-41	Sand, fine to coarse, gray
41-44	Clay or till, light blue-gray; sand grains
44-50	Till, light blue-gray, yellow-gray
50-61	Till, yellow-gray or olive

tors needed to plan a production well. However, the data should be used only as a guide to conditions at different sites and with caution because of the discontinous nature of the aquifers and varying water quality in some aquifers.

Records of Wells and Test Holes

Table 2 lists the lithologic and borehole geophysical logs of the observation wells and test holes. The lithologic descriptions are from the driller's log provided by Darwin Evans of the Iowa Geological Survey Staff. The geologic interpretation was assisted by Greg Ludvigson and Mike Bounk of the Iowa Geologic Survey Staff. The geophysical logs represented are natural-gamma and spontaneous potential logs. Natural-gamma logs are records of the amount of gamma radiation that is naturally emitted by all rocks. The chief uses of natural-gamma logs are for the identification of lithology and stratigraphic correlations in open or cased holes. Spontaneous potential logs are records of the natural potentials developed between the borehole fluid and the surrounding rock material. The spontaneous potential is used chiefly for geologic correlation, and separating non-porous and porous rocks in sand-clay, shale-sandstone and shale carbonate sequences. Selected test holes were constructed with 2-inch PVC (plastic) and 2 and 5-inch steel casing with slots perforated at the appropriate depths.

Water Levels in Selected Wells

Monthly water-levels in selected wells from May, 1981 through March, 1984 are listed in table 3. The measurements were obtained by steel tape or electric line. A digital recorder is maintained on well 79-42-19BADC to continuously monitor the water level. Measurements will continue in several wells as part of the state well observation-well network to monitor fluctuations of water levels.

Water Quality

Selected dissolved chemical constituents and observed physical properties of water samples are reported in table 4. In most cases water samples from the observation wells were airlifted and then a Geofilter[1]/ squeeze pump or suction pump were used to prevent further aeration of the water sample. The wells were pumped until the water cleared and specific conductance and pH stabilized. Water samples from municipal water supplies were collected from raw water taps located before the distribution system and treatment. The chemical analyses were analyzed by the personnel of the University Hygienic Laboratory and U.S. Environmental Protection Agency. Methods of analyses were generally those described by Brown and others (1970) or U.S. Environmental Protection Agency (1974a).

Drinking water standards were established by the National Academy of Sciences-Natural Academy of Engineering (1972) at the request of Environmental Protection Agency and are applicable to public water supplies. The primary and secondary standards are shown in table 1. Primary standards pertain to constituents and regulations affecting the health of consumers and are enforceable by U.S. Environmental Protection Agency or the states which have accepted the primary standards. Secondary standards refer to the esthetic qualities of drinking water intended as a guideline for the states. Selected mineral constituents and physical properties are summarized as follows from U.S. Environmental Protection Agency (1976) and U.S. Public Health Service (1962).

pH

pH is a mathematical expression indicating hydrogen ion activity. pH of 7.0 is neutral, pH less than 7.0 is acidic, pH greater than 7.0 is basic or alkaline. The hydrogen ion concentrations affect the corrosiveness of water.

Temperature

Temperature is an important factor in evaluating the usefulness of water. Water temperature is evaluated for industrial coolants, the influence upon concentrations of dissolved gases and mineral matter.

Specific Conductance

Specific conductance is a measure of the ability of water to conduct an electric current. By multiplying specific conductance by a conversion factor of 0.55 to 0.75 an estimation for dissolved solids can be approximated.

Dissolved Solids

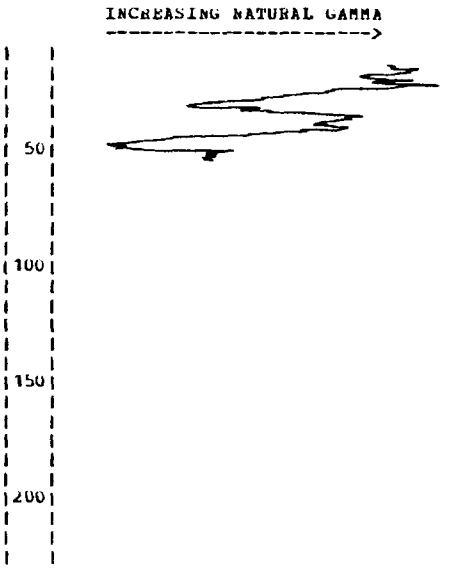
The concentration of dissolved solids is determined from the weight of the dry residue after evaporation from a known quantity of water. Dissolved solid concentrations of 1000-3000 mg/l is considered slightly saline and 3000-10,000 mg/l is moderately saline.

1/ Use of brand names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-39-24CCAA WC-57 STATION ID: 420408-0952017-01

ALTITUDE: 1245 FEET (NGVD 1929) DEPTH: 46 FEET DATE COMPLETED: June 10, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Clay, silty, brown
5-14	Clay, silty, soft, tan, yellow-brown
14-20	Sand, fine to coarse, yellow-tan
20-25	Sand and gravel, fine, yellow-brown
25-26	Clay, gray-brown
26-28	Clay, yellow-brown
28-33	Clay, silty, yellow-gray; sand grains
33-34	As above, very sandy
34-38	Sand, fine to coarse, yellow-brown
38-43	Sand and gravel, fine to very coarse, oxidized, brown, yellow-brown; boulders
43-44	Till, yellow-brown
44-46	Till, blue-gray

Casing record: Set 2 inch pipe to 46 feet, slotted from 36 to 46 feet, gravel packed

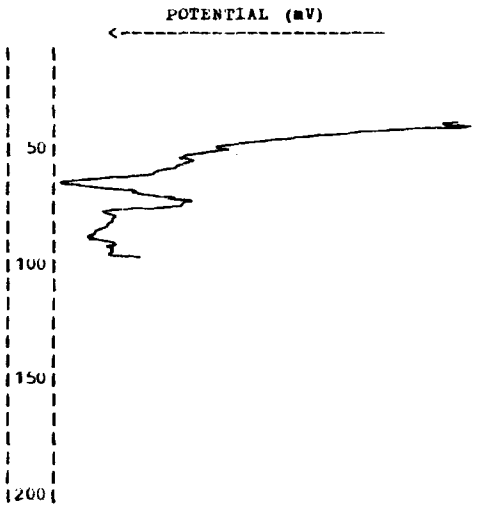
LOCATION: 084-39-26AAAA WC-56 STATION ID: 420355-0952035-01

ALTITUDE: 1175 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 9, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil
2-4	Clay, silty, yellow-brown
4-5	Gravel; boulders; till
5-15	Till, yellow-tan
15-22	Till, yellow-gray
22-41	Till, blue-gray

LOCATION: 084-39-26AABA WC-54 STATION ID: 420356-0952045-01

ALTITUDE: 1185 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: June 8, 1982

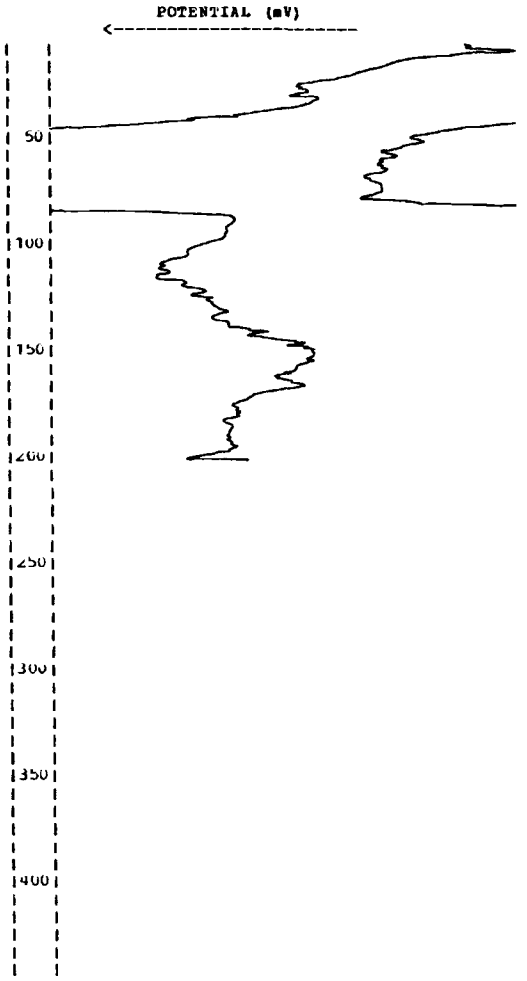


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-7	Clay, dark gray
7-15	Clay, silty, yellow-gray
15-17	Clay, silty, oxidized, brown
17-18	Clay, silty, sandy, gray
18-20	Sand and gravel, fine to medium, yellow-brown; clay
20-30	Clay, silty, blue-gray; sand, fine to medium
30-34	Sand and gravel, fine, gray, blue-gray; clay; wood
34-39	Sand and gravel, fine to coarse, yellow-tan
39-70	Sand and gravel, fine to coarse, yellow-tan; occasional boulders at base
70-81	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-39-26ABAB WC-55 STATION ID: 420356-0952057-01

ALTITUDE: 1190 FEET (NGVD 1929) DEPTH: 215 FEET DATE COMPLETED: June 9, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-9	Road bed; top soil
9-11	Clay, silty, dark gray
11-13	Clay, silty, yellow-gray
13-20	Clay, silty, yellow-brown, yellow-gray
20-23	Clay, silty, yellow-brown; gravel
23-30	Clay, silty, yellow-gray
30-34	Clay, silty, sandy, soft, yellow-gray
34-40	Clay, silty, sandy, soft, gray-green; sand layers; wood; shells
40-47	Sand and gravel, fine to coarse, yellow-brown
47-50	Sand and gravel, fine to coarse, oxidized, brown
50-70	Sand and gravel, fine to medium, some coarse, gray-tan
70-80	Sand and gravel, fine to coarse, gray; boulders at base
80-107	Till, sandy, blue-gray
107-109	Sand and gravel, gray; till; coal fragments
109-155	Till, sandy, gravelly, blue-gray; coal fragment
155-158	Clay, sandy, harder than above, gray-brown
158-160	Clay, sandy, gray-green
160-180	Till, very sandy, gray, blue-gray, gray green; clay
180-190	Till, sandy, light blue-gray, occasional boulders
190-203	Till, sandy, blue-gray, gray, gray-brown; occasional boulders
	PENNSYLVANIAN
203-208	Shale, yellow-brown, reddish-brown
208-215	Shale, silty, light blue-gray grading to gray-green; siltstone

LOCATION: 084-42-10DCCC WC-171 STATION ID: 420544-0954307-01

ALTITUDE: 1182 FEET (NGVD 1929) DEPTH: 221 FEET DATE COMPLETED: May 11, 1983

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-10	Clay, silty, brown
10-15	Clay, silty, yellow-brown
15-25	Clay, silty, oxidized zones, brown, yellow-tan
25-29	Clay, silty, gray
29-33	Sand and gravel, fine to coarse, yellow-brown; boulder at base
33-53	Clay, lime concretions, gray, yellow-gray, gray-brown at base
53-70	Clay or till, yellow-gray
70-88	Clay or till, gray
88-93	Clay or till, gray-tan
93-144	Clay or till, blue-gray
144-146	Clay, gray-green
146-149	Clay, silty, blue-gray
149-155	Clay, silty, very hard, cemented, gray, blue-gray
155-165	Sand, very fine, gray-green, dark gray-green; silt
165-170	As above, very fine to medium, cemented
170-175	As above, coarser
175-178	Sand, fine, cemented, green
	CRETACEOUS
	DAKOTA FORMATION
178-190	Shale, silty, gray-brown
190-195	As above; sandstone, very fine, interbedded, tan
195-208	Shale, silty, gray-brown
208-221	Sandstone, fine to coarse

Table 2. Logs of wells and test holes--Continued.

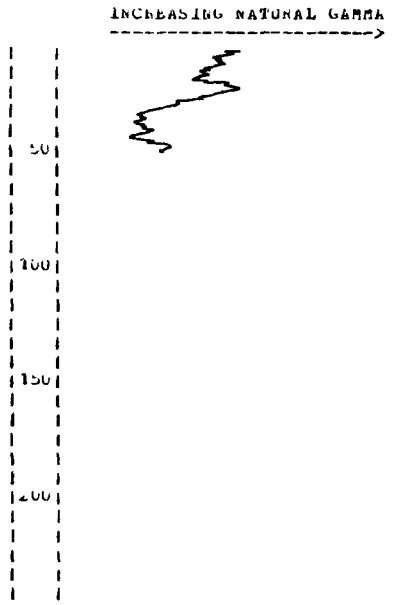
LOCATION: 084-42-10DDDD WC-172 STATION ID: 420545-0954239-01

ALTITUDE: 1195 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: May 12, 1983

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Road bed; top soil
7-20	Clay, silty, yellow-brown; loess
20-30	Loess, yellow-tan
30-38	Loess, yellow-gray, gray
38-41	Clay, silty, gray to blue-gray; loess
41-50	Sand and gravel, fine to medium (mostly fine), yellow-tan
50-65	Sand and gravel, fine to coarse, brown, yellow-brown
65-67	Sand and gravel, fine to coarse; clay mixed, yellow-tan; boulder, occasional
67-71	Sand and gravel, fine to very coarse, yellow-brown; boulders
71-78	Clay, lime concretions, gray to blue-gray
78-81	As above, yellow-tan

LOCATION: 084-42-15AABB WC-170 STATION ID: 420544-0954252-01

ALTITUDE: 1170 FEET (NGVD 1929) DEPTH: 51 FEET DATE COMPLETED: May 10, 1983

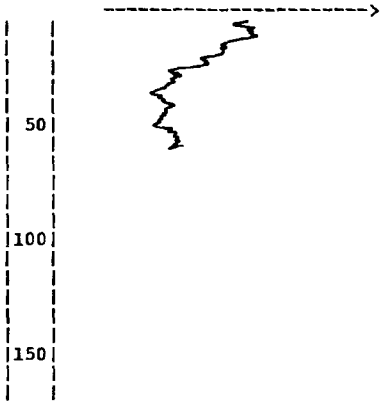


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil
5-15	Clay, silty, brown
15-17	Clay, silty, gray
17-19	Sand and gravel, fine to medium, oxidized, brown, yellow-brown
19-22	Clay, gray-green
22-27	Clay, silty, gray
27-30	Sand, fine to coarse; clay, silty, gray; wood
30-35	Sand and gravel, fine to medium, tan
35-40	Sand and gravel, fine to medium (mostly fine), yellow-brown
40-43	Sand and gravel, fine, tan
43-44	Sand and gravel, fine to very coarse, yellow-brown
44-51	Till, blue-gray, yellow at top

Casing record: set 2 inch pipe to 47 feet, slotted from 40 to 47 feet, gravel packed

LOCATION: 084-43-04ABAA WC-163 STATION ID: 420730-0955107-01

ALTITUDE: 1090 FEET (NGVD 1929) DEPTH: 72 FEET DATE COMPLETED: May 4, 1983



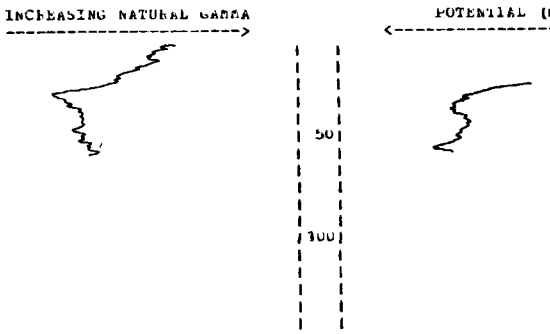
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Fill; top soil
5-15	Clay, silty, gray-brown
15-23	Clay, sandy, silty, blue-gray; wood
23-30	Sand and gravel, fine to medium, gray
30-36	Sand and gravel, fine to coarse, tan; boulders
36-68	Sand and gravel, fine to coarse, yellow-brown; boulders
68-72	Till, blue-gray

Casing record: set 2 inch pipe to 58 feet, slotted from 53 to 58 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-43-04BABA WC-162 STATION ID: 420730-0955130-01

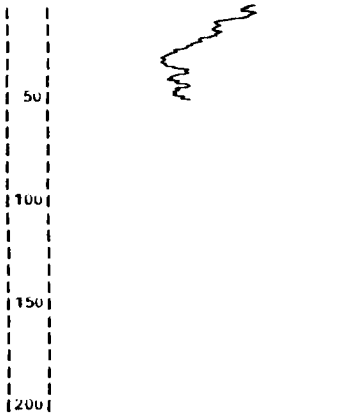
ALTITUDE: 1095 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: May 3, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-9	Road bed; top soil
9-14	Clay, silty, brown
14-20	Clay, silty, yellow-brown grading to yellow-tan
20-28	Clay, silty, yellow-gray
28-30	Sand, fine to coarse, tan
30-36	Sand and gravel, fine to coarse, yellow-tan
36-58	Sand and gravel, fine to coarse, oxidized, yellow-brown, brown
58-67	As above; boulders
67-81	Till, blue-gray

LOCATION: 084-43-04CCBA WC-164 STATION ID: 420649-0955150-01

ALTITUDE: 1085 FEET (NGVD 1929) DEPTH: 52 FEET DATE COMPLETED: May 5, 1983

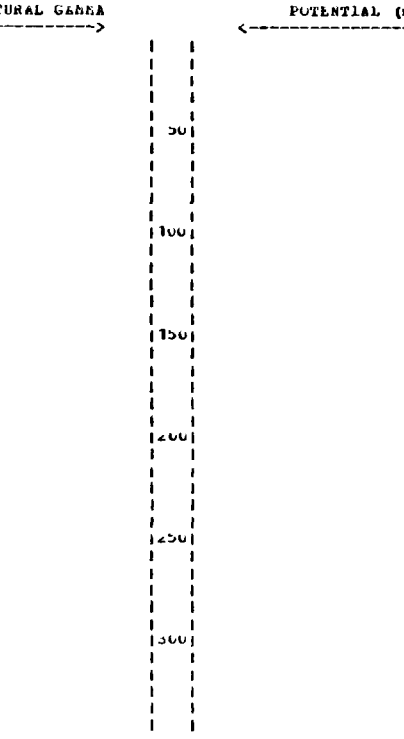


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-8	Fill; top soil
8-12	Clay, silty, dark brown
12-20	Clay, silty, yellow-gray
20-23	Clay, sandy, silty, blue-gray
23-25	Sand and gravel, fine to medium, gray; wood
25-28	Sand and gravel, fine to coarse, gray-tan
28-42	Sand and gravel, fine to coarse, yellow-brown
42-43	Clay or till, yellow-gray
43-49	Sand and gravel, fine to coarse, oxidized, yellow-brown; boulders
49-52	Boulder

Casing record: set 2 inch pipe to 50 feet, slotted from 40 to 50 feet, gravel packed

LOCATION: 084-43-04DDCC WC-165 STATION ID: 420640-0955103-01

ALTITUDE: 1120 FEET (NGVD 1929) DEPTH: 227 FEET DATE COMPLETED: May 5, 1983

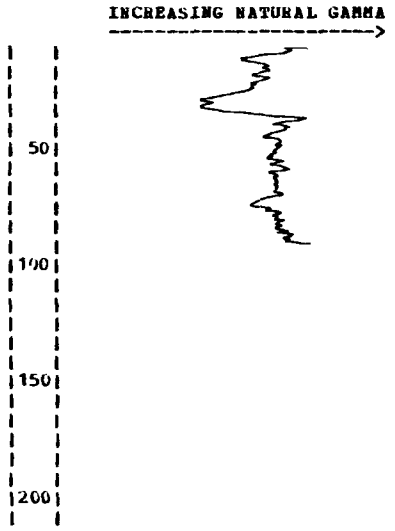


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed; top soil
3-5	Clay, silty, dark brown
5-41	Loess, yellow-tan
41-45	Clay and till, very sandy, yellow-tan; sand layer
45-47	Till, yellow-tan
47-50	Till, olive
50-80	Till, blue-gray
80-82	Clay or till, very hard, light blue-gray
82-132	Till, blue-gray
132-133	Sand and gravel, fine to medium, gray-brown
133-138	Till, sandy, gravelly, blue-gray
138-166	Sand and gravel, fine, gray-tan
	CRETACEOUS
	DAKOTA FORMATION
166-171	Shale, silty, gray
171-175	Sandstone, hard, oxidized, tan; dolomite, sandy
175-179	Shale, silty, gray; sandstone streaks, hard
179-181	Sandstone, very fine, tan
	PENNSYLVANIAN
181-210	As above; shale, interbedded, gray; siltstone
210-217	Shale, silty, gray
217-219	Shale, silty, reddish-brown
219-227	Shale, some silty, reddish-brown, yellow-brown, gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-43-19BBBC WC-167 STATION ID: 420446-0955414-01

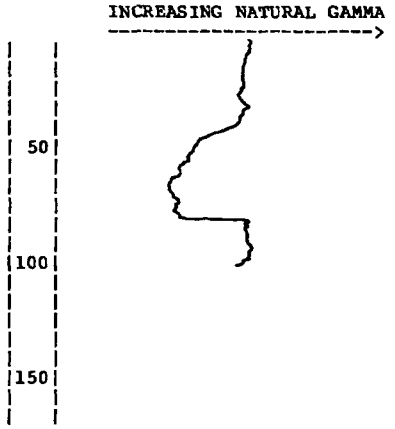
ALTITUDE: 1070 FEET (NGVD 1929) DEPTH: 113 FEET DATE COMPLETED: May 9, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-10	Clay, silty, brown; loess
10-25	Loess, very soft, yellow-tan
25-30	Sand and gravel, fine to coarse, brown
30-34	Sand and gravel, fine to coarse, yellow-tan
34-35	Till, yellow-gray
35-71	Till, blue-gray
71-72	Sand and gravel, fine to medium, tan
72-90	Till, sandy, gravelly, blue-gray
90-92	Clay, gray; sand grains
92-107	Till, blue-gray
107-108	Sand and gravel, fine, gray-green
	PENNSYLVANIAN
108-113	Shale, reddish-brown, light gray

LOCATION: 084-44-23DABC WC-168 STATION ID: 420419-0955544-01

ALTITUDE: 1140 FEET (NGVD 1929) DEPTH: 130 FEET DATE COMPLETED: May 9, 1983

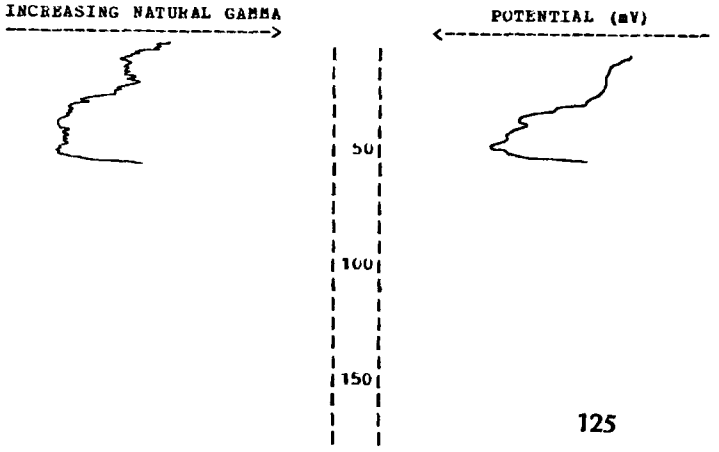


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Top soil; loess, brown
4-10	Loess, yellow-brown
10-90	Loess, yellow-tan
90-110	Loess, yellow-gray, brown
110-112	Sand and gravel, fine to coarse
112-115	As above; clay mixed
115-125	Sand and gravel, fine to very coarse, oxidized zones, brown, yellow-brown; clay streaks
125-130	Till, blue-gray

Casing record: set 2 inch pipe to 126 feet, slotted from 120 to 126 feet, gravel packed

OCATION: 084-44-24CBBD WC-169 STATION ID: 420420-0955517-01

LTITUDE: 1070 FEET (NGVD 1929) DEPTH: 80 FEET DATE COMPLETED: May 10, 1983

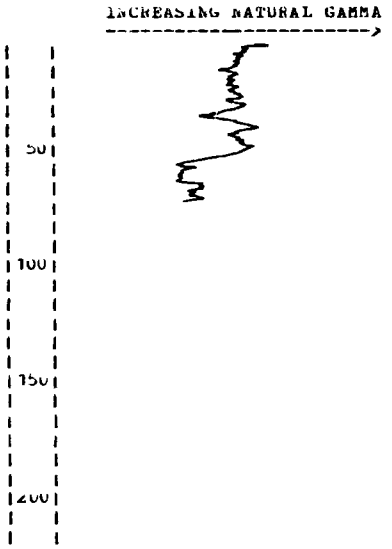


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-13	Clay, silty, gray-brown
13-20	Clay, silty, yellow-brown, yellow-tan
20-25	Clay, silty, gray, tan
25-30	Sand and gravel, fine to medium, tan
30-35	Sand and gravel, fine to coarse, gray
35-56	Sand and gravel, fine to coarse, oxidized, yellow-brown, brown
56-58	Clay or till, yellow-gray
58-71	Sand and gravel, fine to medium, oxidized, yellow-brown, brown; boulders
71-80	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 084-44-24DCAD WC-166 STATION ID: 420406-0955433-01

ALTITUDE: 1105 FEET (NGVD 1929) DEPTH: 74 FEET DATE COMPLETED: May 6, 1983

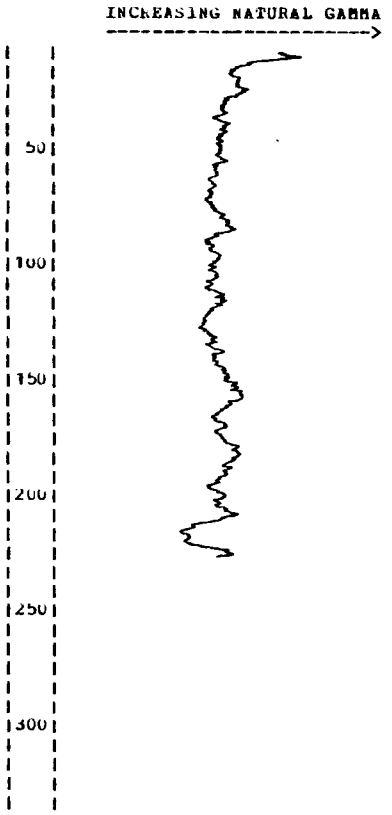


DEPTH (FEET)	DESCRIPTION OF MATERIAL
	QUATERNARY
0-8	Road bed; fill
8-32	Loess, yellow-tan
32-35	Clay or loess, silty, blue-gray
35-37	Sand and gravel, fine to coarse, oxidized, brown
37-53	Clay, silty, yellow-brown; sand grains
53-57	Sand and gravel, fine; clay, layered, tan
57-60	Sand and gravel, fine to coarse, yellow-brown
60-65	As above, oxidized, brown
65-72	Sand and gravel, fine to very coarse, olive; boulders
72-74	No sample description

Casing record: set 2 inch pipe to 71 feet, slotted from 66.5 to 71 feet, gravel packed

LOCATION: 085-29-19BAAa WC-231 STATION ID: 420958-0941622-01

ALTITUDE: 1091 FEET (NGVD 1929) DEPTH: 221 FEET DATE COMPLETED: August 1, 1983



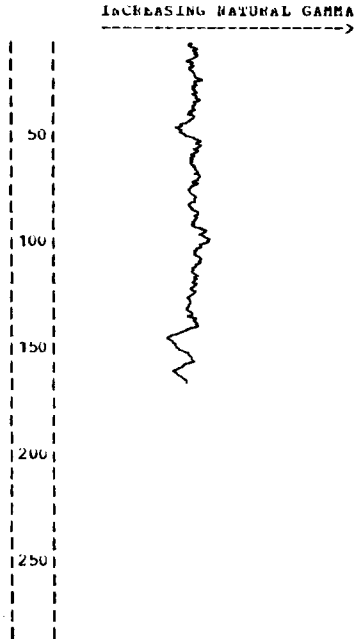
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Top soil, very dark
4-8	Till, yellow-gray
8-35	Till, gravelly, blue-gray
35-37	Till, olive
37-127	Till, sandy, gravelly, blue-gray
127-130	Sand and gravel; boulder
130-136	Till, sandy, gravelly, gray-green, some yellow-brown; boulder, occasional
136-137	Sand and gravel, fine to coarse, yellow-gray
137-150	Till, hard, yellow-brown, gray
150-161	Till, hard, gray; gravel, layer at 153 feet
161-170	As above
170-180	Till, olive, gray; shale, reworked
180-200	Till, gray
200-207	As above, blue-gray, gray
207-210	Sand, fine to coarse; clay, layers
210-216	Sand and gravel, fine, yellow-brown, tan
	PENNSYLVANIAN
216-221	Shale, silty, sandy, dark blue-gray, gray

Casing record: set 2 inch pipe to 221 feet, slotted from 205 to 220 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 085-29-32DDDD WC-232 STATION ID: 420723-0941432-01

ALTITUDE: 1091 FEET (NGVD 1929) DEPTH: 171 FEET DATE COMPLETED: August 3, 1983

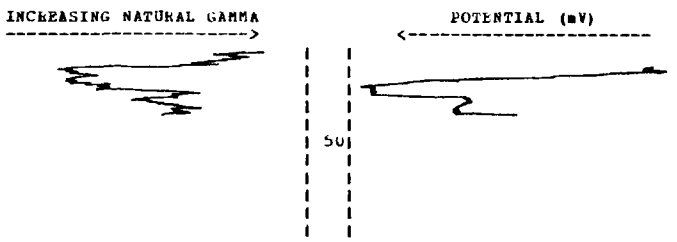


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil
2-8	Till, yellow-brown
8-44	Till, blue-gray
44-50	Sand and gravel, fine to coarse, gray-tan
50-130	Till, sandy, gravelly, gray
130-136	Till, sandy, gravelly, blue-gray
136-139	Till, olive
139-141	Till, blue-gray
141-146	Sand and gravel, fine to coarse, tan
146-155	Clay, silty, sandy, gray; gravel, layers
155-165	Sand and gravel, fine to coarse, tan
	PENNSYLVANIAN
165-166	Shale, silty, gray-green
166-168	Limestone, sandy, gray-tan
168-169	Shale, sandy, silty, light gray
169-170	Limestone, sandy, some shaley, tan, gray
170-171	Shale, gray-green

Casing record: set 2 inch pipe to 171 feet, slotted from 153 to 168 feet, gravel packed

LOCATION: 085-33-06DDCC WC-138 STATION ID: 421143-0944352-01

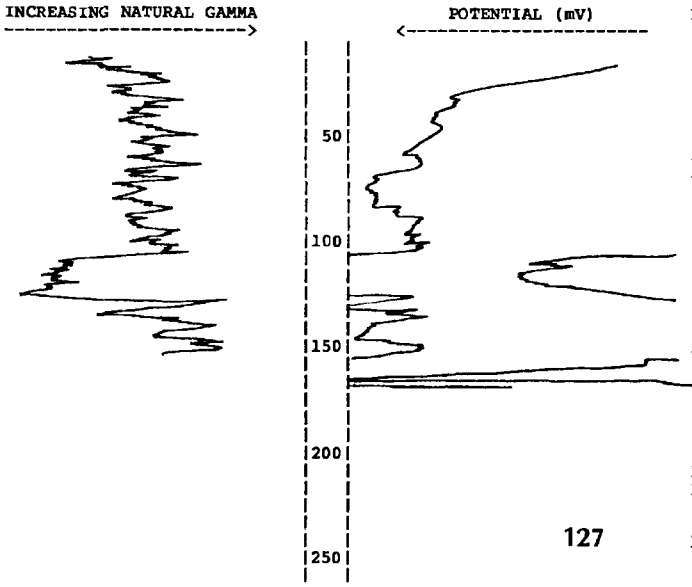
ALTITUDE: 1092 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: September 15, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-8	Road bed
8-11	Clay, silty, dark brown
11-16	Sand and gravel, fine to coarse yellow-brown; shells
16-21	Sand and gravel, fine to very coarse, gray; shells
21-23	As above, boulders
23-41	Till, blue-gray

LOCATION: 085-33-06DDDD WC-137 STATION ID: 421144-0944336-01

ALTITUDE: 1123 FEET (NGVD 1929) DEPTH: 167 FEET DATE COMPLETED: September 14, 1982

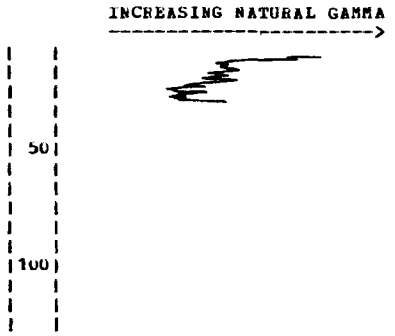


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed
3-5	Sand, fine to medium, brown
5-10	Sand and gravel, fine to very coarse
10-11	Till, yellow-brown
11-101	Till, sandy and gravelly at base, blue-gray
101-120	Sand and gravel, fine to very coarse
120-146	Clay, silty, gray; sand, very fine; organics
146-150	Clay or till, sandy, dark blue-gray
150-152	Clay, silty, sandy, olive
152-157	Clay, sandy, gray-olive; sand layer
	CRETACEOUS
	DAKOTA FORMATION
157-159	Sandstone, very coarse
159-161	Gravel, iron cemented
	PENNSYLVANIAN
161-167	Shale, blue-gray to light blue-gray; lignite at 161 feet

Table 2. Logs of wells and test holes--Continued.

LOCATION: 085-33-07ABBA WC-133 STATION ID: 421143-0944402-01

ALTITUDE: 1090 FEET (NGVD 1929) DEPTH: 32 FEET DATE COMPLETED: September 10, 1982

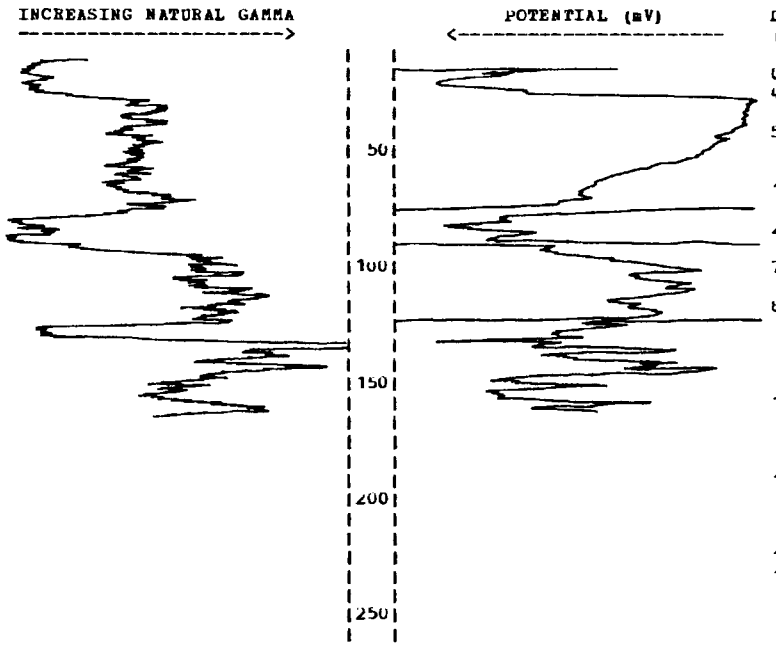


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Top soil; clay, sandy, brown
4-8	Sand and gravel, fine to very coarse
8-9	Boulder
9-27	Sand and gravel (mostly sand), fine, gray, tan
27-32	Till (possible), very sandy

Casing record: set 2 inch pipe to 25 feet, slotted from 22.5 to 25 feet, gravel packed

LOCATION: 085-33-07BAAB WC-134 STATION ID: 421143-0944416-01

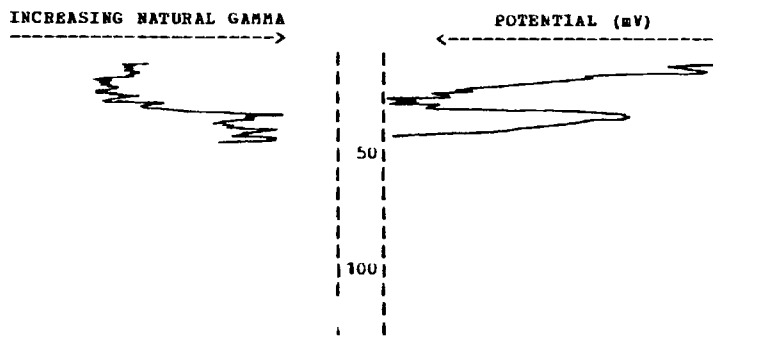
ALTITUDE: 1093 FEET (NGVD 1929) DEPTH: 161 FEET DATE COMPLETED: September 15, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed; top soil
4-5	Clay, sandy, gravelly, yellow-brown
5-15	Sand and gravel, fine to coarse, tan to yellow-brown
15-22	As above, gray; boulders at base
22-73	Till, sandy, gravelly, blue-gray
73-88	Sand and gravel, fine to coarse, brown, tan
88-121	Clay, silty, gray; some sand grains
	CRETACEOUS
	DAKOTA FORMATION
121-127	Sand or sandstone, fine to very coarse, tan
	PENNSYLVANIAN
127-135	Shale, silty, sandy, light blue-gray; siltstone and sandstone interbedded
135-141	As above, brown
141-161	Shale, silty, sandy, gray, brown; sandstone, occasional layer, very fine

LOCATION: 085-33-07BBAA WC-135 STATION ID: 421143-0944428-01

ALTITUDE: 1093 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: September 13, 1982

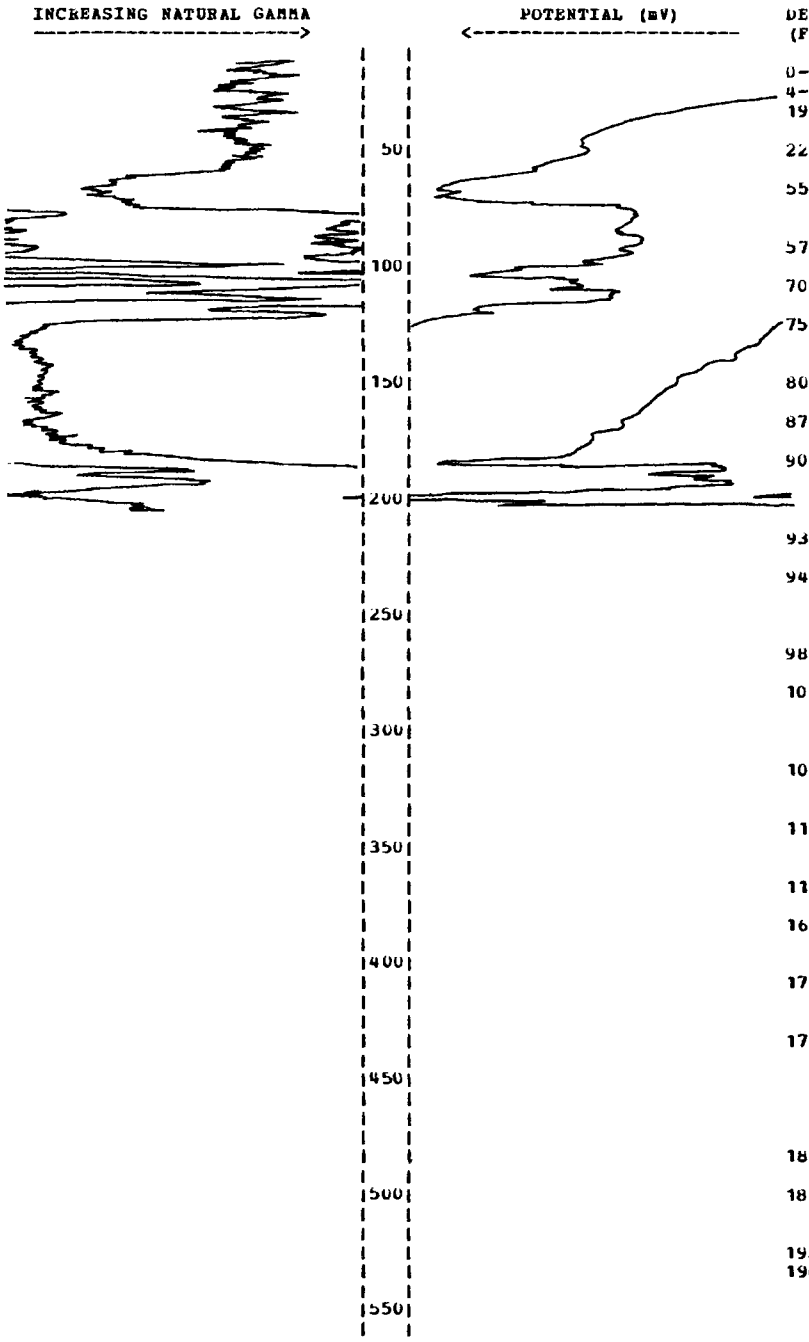


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed; top soil
3-4	Clay, sandy, yellow-brown
4-5	Sand and gravel, fine to very coarse, brown
5-17	Sand and gravel, fine to very coarse, tan, brown
17-20	Sand, fine to coarse, brown
20-28	Sand and gravel, fine to medium, tan to gray
28-41	Till, sandy, gravelly, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 085-34-01DCDC WC-136 STATION ID: 421143-0944504-01

ALTITUDE: 1145 FEET (NGVD 1929) DEPTH: 201 FEET DATE COMPLETED: September 14, 1982

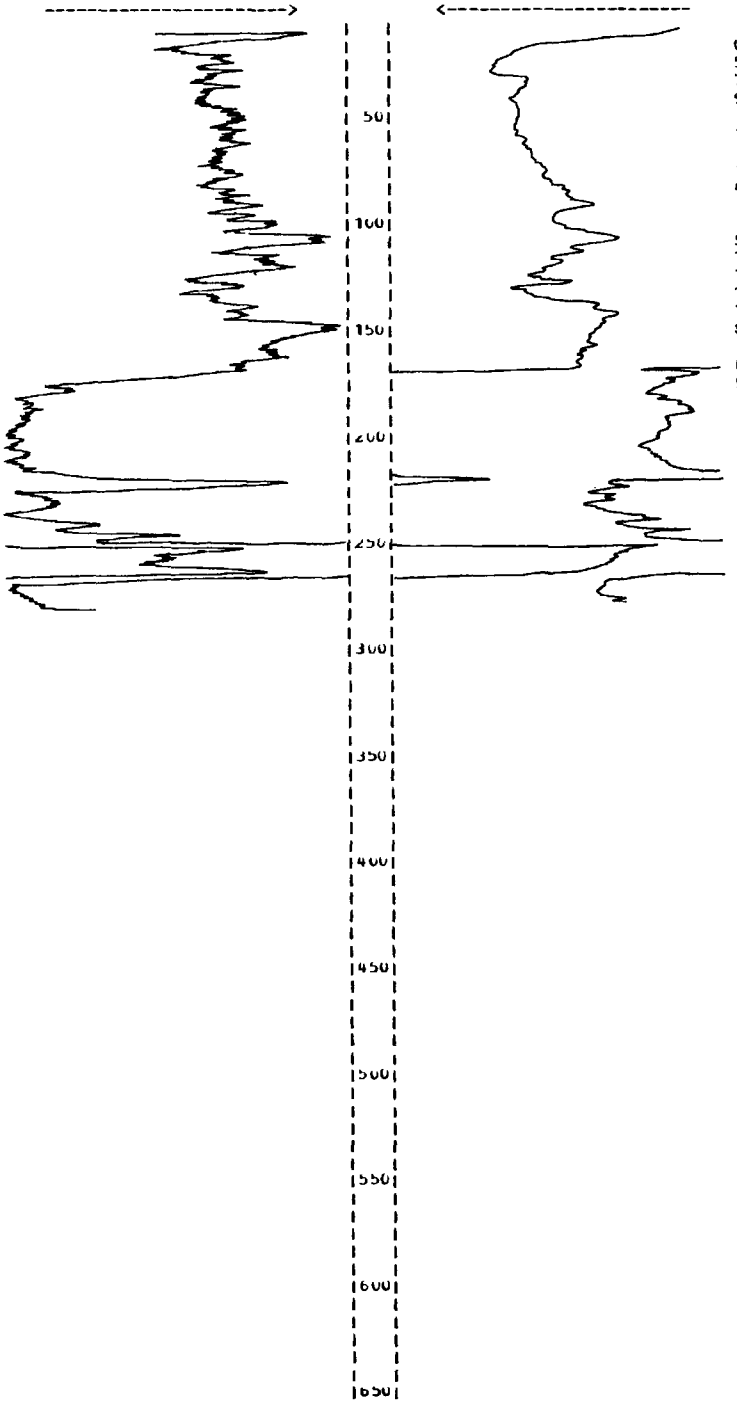


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed; top soil
4-19	Till, yellow-brown
19-22	Till, yellow-brown, blue-gray
22-55	Till, blue-gray; boulder at 54 feet
55-57	Clay or till, very sandy; sand layers, fine to coarse
57-70	Sand, fine to coarse; gravel trace
70-75	Clay, sandy, silty, gray-green
75-80	Clay, silty, gray-green, gray-brown; wood trace; shells
80-87	As above grading to sandy and gravelly
87-90	Till, yellow-brown, gray-green
90-93	Till, olive
	CRETACEOUS
	DAKOTA FORMATION
93-94	Shale, gray-yellow; ironstone at top
94-98	Shale, silty, yellow-brown, gray-brown; sandstone layers, coarse
98-101	Sandstone, fine to medium, oxidized, brown
101-105	Shale, silty, gray, yellow-brown; sandstone, thin layer, very fine
105-111	Shale, silty, gray; dolomite, layer at 108 feet, hard, blue-gray
111-115	Sandstone, fine, tan, yellow-brown; shale trace
115-165	Sandstone, fine to coarse
165-170	Sandstone, fine to medium, some coarse, brown
170-178	Sandstone, fine to coarse, tan, yellow-brown
178-181	Shale, gray; sandstone, very coarse; dolomite, thin layers, dark gray; pyrite
	PENNSYLVANIAN
181-184	Shale, silty, blue-gray; pyrite
184-193	Shale, silty, light blue-gray grading to blue-gray; pyrite
193-196	Siltstone, shaly, gray
196-201	Shale, some sandy, silty, blue-gray, gray; siltstone, occasional layer

Table 2. Logs of wells and test holes--Continued.

LOCATION: 085-35-05DDAA WC-139 STATION ID: 421156-0945610-01

ALTITUDE: 1295 FEET (NGVD 1929) DEPTH: 278 FEET DATE COMPLETED: September 16, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-7	Clay, gray
7-9	Till, gray
9-15	As above, grading to yellow-brown
15-17	Till, yellow-gray or olive
17-48	Till, blue-gray
48-55	Till, gravelly, olive, blue-gray; occasional boulders
55-70	Till, blue-gray
70-71	Till, olive
71-77	Till, olive, blue-gray
77-79	Till, blue-gray
79-82	Till, olive
82-89	Till, gravelly, olive, blue-gray
89-96	Till, yellow-brown
96-105	Till, gravelly, olive, blue-gray, some gray-green
105-107	Clay, gray-tan
107-114	Till, yellow-brown, blue-gray
114-119	Till, hard, blue-gray
119-123	Till, silty, sandy, gray-green, yellow-brown
123-126	Till, hard, yellow-brown
126-128	Sand and gravel, fine to medium; till mixed, yellow-brown; limestone fragments
128-138	Till, yellow-brown
138-143	Till, yellow-gray, yellow-brown
143-150	Till, blue-gray, gray, trace of yellow-brown at top and base
150-164	Till, gravelly, light blue-gray, blue-gray, olive streaks; wood at 157 feet
164-168	Sand and gravel, fine to very coarse; boulders; till
	CRETACEOUS
	DAKOTA FORMATION
168-180	Sandstone, fine to coarse, brown, tan
180-190	Sandstone, fine to very coarse, yellow-brown
190-210	Sandstone, fine to coarse, tan, yellow-brown
210-213	Sandstone, fine to very coarse, brown
213-215	Sandstone, very coarse (gravel); shale, brown, yellow-brown
215-218	Shale, light gray, yellow-gray, brown at base
218-230	Sandstone, fine to coarse grading to very coarse (gravel), tan, yellow-brown
230-234	Shale, yellow-brown; sandstone, very coarse (gravel)
234-247	Sandstone, fine to coarse, oxidized, brown; ironstone at base
247-249	Shale, silty, yellow-brown, gray
249-261	Shale, silty, gray
261-275	Sandstone, fine to medium, tan yellow-brown
275-278	Possible sandstone, creviced
275-278	Possible sandstone, gray

SYSTEM	SERIES	FORMATION, MEMBER, OR DEPOSIT
QUATERNARY	HOLOCENE	ALLUVIUM
	PLEISTOCENE	GLACIAL DRIFT
CRETACEOUS		DAKOTA
PENNSYLVANIAN	UNDIFFERENTIATED	
MISSISSIPPIAN		

Figure 3. Geologic units used in this report

Alkalinity

Alkalinity is defined as the capacity of a solution to neutralize an acid. In moderate concentrations (200-500mg/l), alkalinity has little effect on most uses of water.

Hardness

Calcium and magnesium are the primary causes of hardness. Hardness is a measure of the soap consuming properties of water. As hardness increases, a greater amount of soap is required to produce a lather. Water hardness can contribute to the formation of scale deposits. As a general reference, the U.S. Geological Survey uses the following classification of water hardness.

Calcium and magnesium hardness as $CaCO_3$ (milligrams per liter)	Hardness description
0—60	soft
61—120	moderately soft
121—180	hard
more than 180	very hard

Iron

Iron is dissolved from many rocks and soils. The element can cause a reddish-brown staining on plumbing fixtures and fabrics washed in the water and can cause clogging of water mains. The iron criteria in table 1 is of aesthetic nature (tastes and staining) rather than a toxilogical significance.

Silica

Silica is dissolved from practically all rocks. It is of concern because it contributes to the formation of scale in pipes, water heaters and boilers.

Sodium-Adsorption Ration (SAR)

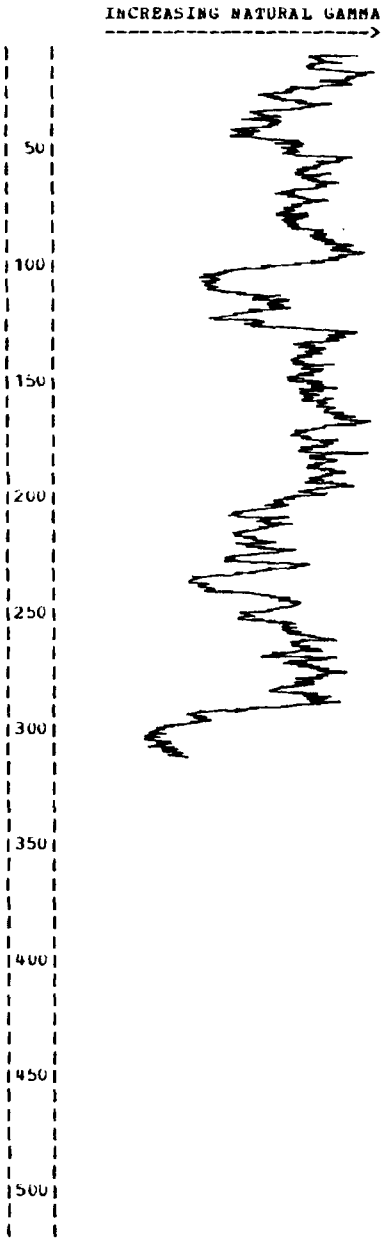
The sodium-adsorption ration (SAR) is a measure of the relative concentrations of the ions calcium, magnesium and sodium. SAR is expressed by the equation:

$$SAR = \frac{Na^{+}}{\sqrt{(Ca^{++} + Mg^{++}/2)}}$$

Table 2. Logs of wells and test holes--Continued.

LOCATION: 085-38-12DCBA WC-14 STATION ID: 421106-0951255-0.

ALTITUDE: 1225 FEET (NGVD 1929) DEPTH: 341 FEET DATE COMPLETED: July 9, 1981



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil; fill
5-10	Clay, silty, tan
10-15	Clay, silty, sandy, yellow-tan, brown
15-22	Clay, sandy, yellow-brown
22-30	Clay, very sandy, yellow-brown; sand layers
30-34	Sand and clay mixed, yellow-tan
34-36	Sand and gravel, yellow-brown
36-39	Till, yellow-brown
39-70	Till, blue-gray
70-78	Till, sandy, blue-gray; occasional sand layer
78-81	Sand and gravel, fine to medium, gray
81-94	Till, sandy, gravelly, blue-gray
94-100	Sand and gravel, fine to medium, silty, gray
100-124	Sand and gravel, very fine to fine; occasional till layer, gray
124-129	As above, mostly fine sand and silt, gray
129-161	Till, very sandy, silty, blue-gray; reworked shales, dark; sand layers at 145 feet
161-198	Till, sandy, gravelly, blue-gray; reworked shales, dark
198-202	Sand and gravel, very fine to medium
202-207	Till, blue-gray
207-215	Sand and gravel, fine, gray-brown
215-229	Till, blue-gray; sand and gravel layers
229-235	Sand, fine to medium, some cemented
235-245	As above, with till mixed
245-250	Sand, as above
250-286	Sand and gravel; till mixed;
286-331	Sand, fine to coarse, cemented, gray-tan
	PENNSYLVANIAN
331-335	Limestone, silty, sandy
335-341	Shale, gray

Casing record: set 2 inch pipe to 315 feet, slotted from 300 to 310 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

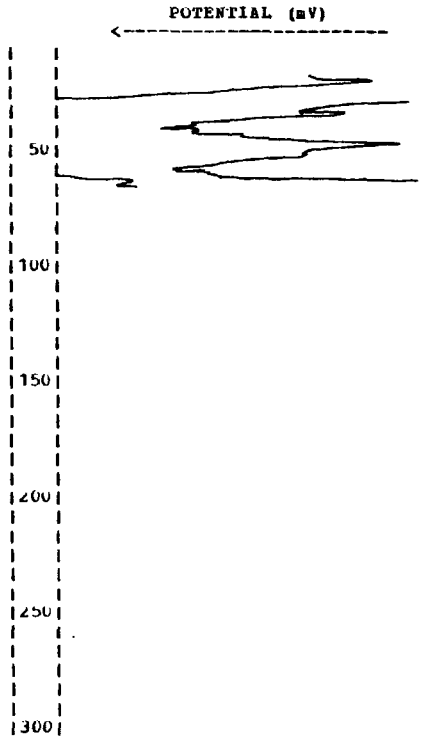
LOCATION: 085-38-13BBBC WC-58 STATION ID: 421051-0951335-01

ALTITUDE: 1220 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: June 11, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-8	Road bed; top soil
8-14	Clay, silty, dark gray
14-17	Clay, silty, soft, dark gray, brown streaks
17-28	Clay, silty, soft, dark blue-gray
28-30	Clay, silty, sandy, soft, gray-green
30-33	Clay, silty, sandy, gray-green; sand layers
33-39	Sand and gravel, fine to medium, gray-green; shells
39-55	Sand and gravel, fine to coarse, yellow-gray
55-72	Sand and gravel, fine to very coarse, yellow-tan; occasional boulders
72-81	Till, blue-gray; sand layers, gray; lignite

LOCATION: 085-38-13BBCC WC-59 STATION ID: 421043-0951335-01

ALTITUDE: 1220 FEET (NGVD 1929) DEPTH: 76 FEET DATE COMPLETED: June 14, 1982

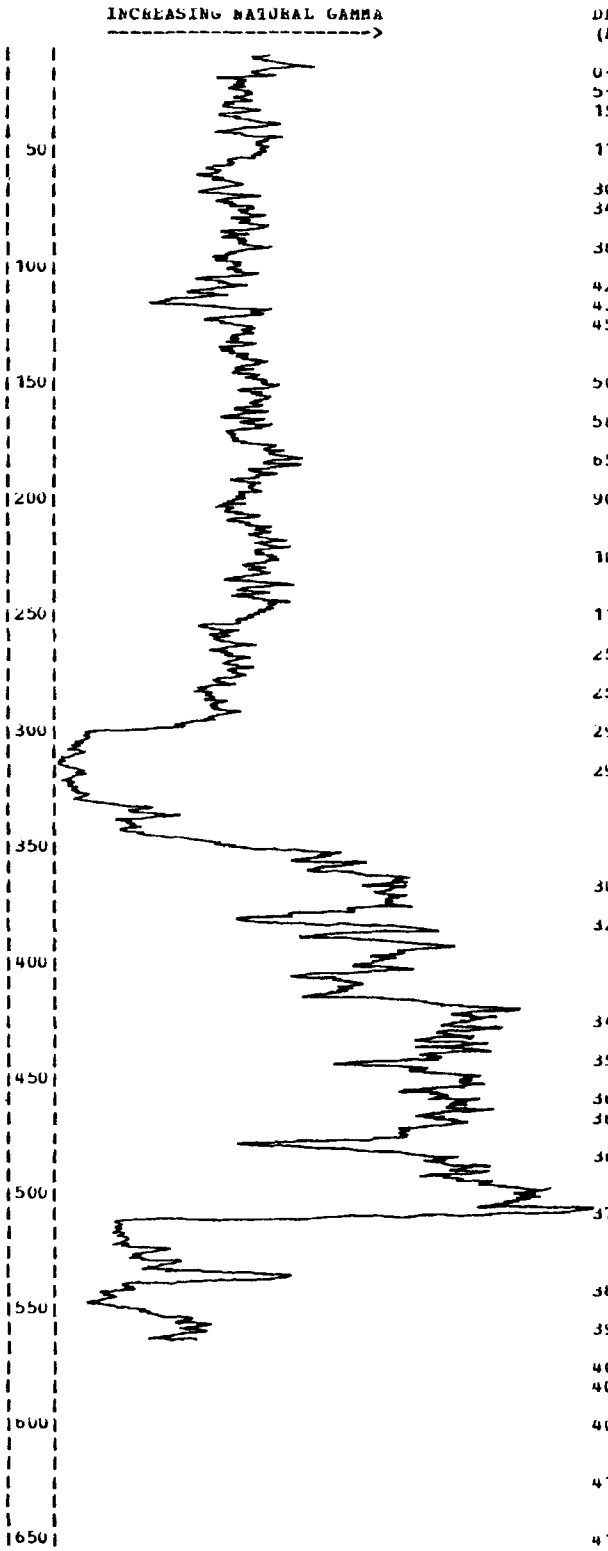


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Road bed; top soil; till
10-12	Clay, silty, sandy, dark
12-14	Clay, silty, sandy, gravelly
14-15	Sand and gravel, oxidized, brown
15-16	Clay, gray
16-17	Clay, sandy, yellow-gray
17-21	Clay, sandy, yellow-brown; possible till
21-27	Sand, fine to coarse, yellow-tan
27-30	Sand and gravel, fine to coarse, oxidized, brown
30-37	Sand and gravel, fine to very coarse, yellow-brown; clay mixed at top
37-42	Sand and gravel, fine to very coarse, yellow-gray
42-44	Till, blue-gray
44-60	Sand and gravel, gray; till layers; occasional boulders
60-62	Till, blue-gray
62-65	Sand, fine to coarse, gray
65-76	Till, blue-gray; sand layers

Table 2. Logs of wells and test holes--Continued.

LOCATION: 085-39-16ADDD WC-7 STATION ID: 421031-0952256-01

ALTITUDE: 1370 FEET (NGVD 1929) DEPTH: 561 FEET DATE COMPLETED: May 22, 1981



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Fill; top soil
5-15	Clay, black, dark gray
15-17	Clay, light blue-gray; sand
17-30	Till, yellow-gray, gray-green to gray
30-34	Till, blue-gray
34-38	Sand and gravel, fine, gray; till mixed
38-42	Till, blue-gray to gray-brown
42-43	Organics, brown
43-45	Clay, silty, brown
45-50	Clay, silty, light blue-gray; grading to till
50-58	Till, very light blue-gray
58-65	Till, light yellow-gray grading to yellow-brown
65-90	Till, yellow-brown; occasional boulders
90-109	Till, yellow-brown; boulders; sand layer at 103 feet
109-114	Sand and gravel, fine, yellow-gray; till mixed
114-250	Till, blue-gray; occasional boulders
250-255	Till, blue-gray; sand layers
255-293	Till, sandy, blue-gray; occasional boulders
293-296	Clay or till, gray-green
296-301	Sand, fine, some cemented, gray-green, dark specks
	CRETACEOUS
	DAKOTA FORMATION
301-320	Sandstone, fine to medium, tan
320-344	Sandstone, fine to coarse, tan to yellow-brown
	PENNSYLVANIAN
344-351	Shale, gray-brown to gray
351-363	Shale, silty, sandy, gray
363-366	Shale, reddish-brown
366-367	Shale, silty, light gray
367-372	Shale, silty, reddish-brown, light gray
372-380	Shale, silty, light gray, red trace; sandstone, occasional streak, hard
380-390	Shale, silty, dark blue-gray
390-400	Shale, silty, dark gray-brown
400-401	Lignite; coal
401-405	Shale, silty, sandy, light gray
405-414	Shale, silty, sandy, very light blue-gray; sandstone layer, fine
414-415	Sandstone, very fine, yellow-brown; shale, some gray
415-421	Shale, yellow-brown

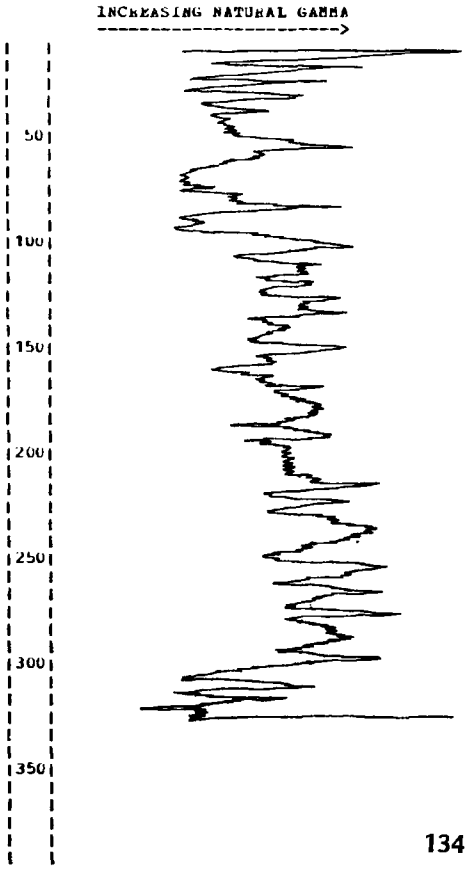
Table 2. Logs of wells and test holes--Continued.

DEPTH (FEET)	DESCRIPTION OF MATERIALS
421-425	Shale, silty, sandy, yellow-brown
425-432	Shale, light gray, red trace
432-437	Shale, dark gray
437-439	Coal; shale, dark gray
439-446	Shale, light gray
446-451	Shale, blue-gray
451-469	Shale, light gray
469-474	Shale, blue-gray grading to dark gray
474-475	Coal
475-480	Shale, silty, light gray
480-500	Shale, gray
500-501	Dolomite, shaly, sandy, brown, tan; pyrite
501-505	Shale, reddish-brown
505-510	Shale, light gray; sandstone layer, hard
510-531	Sandstone, very fine, shaly, light gray
	MISSISSIPPIAN
531-532	Shale, gray-green; limestone, brown
532-551	Limestone, brown
551-554	Limestone, very sandy, brown, tan
554-561	Limestone, brown, tan

Casing record: set 5 inch pipe to 351 feet, slotted from 315 to 330 feet, gravel packed. Set 2 inch pipe to 561 feet, slotted from 543 to 561 feet, gravel packed

LOCATION: 085-41-13CCCC WC-6 STATION ID: 421005-0953428-01

ALTITUDE: 1375 FEET (NGVD 1929) DEPTH: 361 FEET DATE COMPLETED: May 7, 1981



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Fill; top soil
10-15	Clay, silty, gray-brown
15-20	Clay, silty, blue-gray
20-22	Clay, sandy, blue-gray
22-25	Sand and gravel, fine to coarse
25-27	Clay, yellow
27-39	Till, yellow-gray
39-41	Sand and gravel, tan
41-50	Clay or gumbo, gray; sand grains
50-62	Till, yellow-gray, gray mixed
62-69	Sand, fine, yellow-brown
69-81	Till, yellow-brown
81-84	Sand, fine, yellow-brown
84-90	Till, very sandy, yellow-brown
90-100	Till, yellow-brown grading to blue-gray
100-149	Till, blue-gray
149-161	Clay or gumbo, dark gray to gray
161-165	Clay, silty, gray-green
165-200	Clay, silty, tan
200-250	As above, softer, siltier
250-297	Clay, very silty, gray, gray-green
297-320	Sand, fine, some cemented, gray to gray-green, dark specks
	CRETACEOUS
	DAKOTA FORMATION
320-340	Sandstone, fine to coarse, tan
340-361	Shale, reddish-brown, light gray

Casing record: set 2 inch pipe to 322 feet, slotted from 307 to 322 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 085-43-24CCBB WC-1 STATION ID: 420926-0954825-01

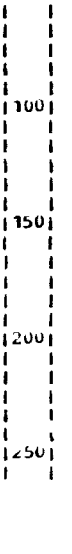
ALTITUDE: 1110 FEET (NGVD 1929) DEPTH: 261 FEET DATE COMPLETED: April 16, 1981

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Clay, silty, yellow-tan
6-10	Clay, silty, sandy, blue-gray, brown
10-12	Clay, silty, brown
12-16	Clay, silty, sandy, yellow-tan
16-20	Sand, fine to coarse, tan
20-28	Sand and gravel, fine to coarse, oxidized, yellow-brown
28-33	Clay, silty, sandy, blue-gray
33-36	Clay, silty, sandy, tan
36-40	Sand and gravel, fine to very coarse, oxidized, yellow-brown
40-60	Sand and gravel, fine to coarse, yellow-brown; occasional boulder
60-72	As above, coarser, tan
72-81	Till, blue-gray
81-152	Till, sandy, blue-gray
152-173	Sand and gravel, fine to medium, gray; occasional boulders
	PENNSYLVANIAN
173-194	Shale, light gray grading to dark gray
194-195	Limestone layer, dark
195-217	Shale, dark blue-gray
217-224	Shale, gray
224-226	Shale, black; coal
226-239	Shale, light gray; pyrite
239-247	Shale, light gray-green
247-250	Shale, dark blue-gray
250-258	Shale, gray-brown
258-260	Shale, dark gray-brown, hard
260-261	Shale, gray

LOCATION: 085-43-33CCCB WC-161 STATION ID: 420734-0925155-01

ALTITUDE: 1135 FEET (NGVD 1929) DEPTH: 175 FEET DATE COMPLETED: May 3, 1983

INCREASING NATURAL GAMMA ----------> POTENTIAL (mV) <----------

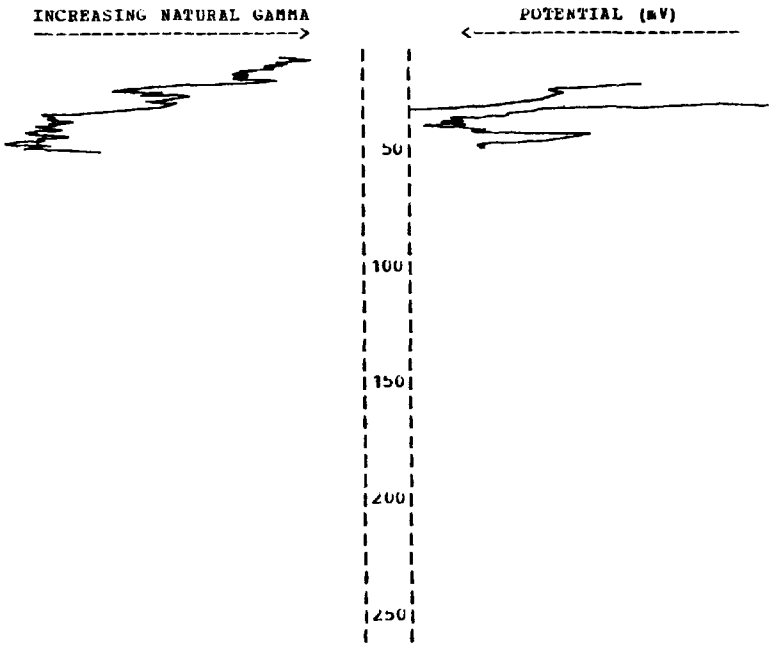


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil; fill
5-10	Loess, dark brown
10-18	Loess, yellow-brown
18-40	Loess, oxidized, yellow-tan, brown
40-50	Clay, tan; loess
50-55	Loess, yellow-gray
55-58	Loess, gray to blue-gray
58-67	Clay or loess, silty, blue-gray
67-75	Clay, silty, medium, gray
75-77	Sand and gravel, fine to medium, gray, brown; boulder
77-78	Till, olive
78-140	Till, blue-gray; boulder at 99 feet
140-143	Sand, fine to coarse, gray
143-165	Till, sandy, blue-gray
	PENNSYLVANIAN
165-168	Shale, silty, light gray
168-170	Shale, reddish-brown, light gray, yellow-brown
170-175	Shale, reddish-brown

Table 2. Logs of wells and test holes--Continued.

LOCATION: 085-44-15CCDD WC-157 STATION ID: 421006-0955727-01

ALTITUDE: 1065 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: October 18, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed: top soil
5-7	Clay, silty, dark gray-brown
7-11	Clay, silty, yellow-brown
11-13	Clay, hard, dark gray-brown
13-15	Clay, silty, soft, yellow-brown
15-16	Clay, hard, yellow-gray
16-28	Clay, very silty, very sandy, soft, yellow-brown: sand layers
28-40	Sand and gravel, fine to very coarse, yellow-brown
40-50	Sand and gravel, fine, some medium; occasional boulders
50-57	Sand, fine to coarse, tan, gray
	CRETACEOUS
	DAKOTA FORMATION
57-60	Sandstone, fine to coarse, oxidized, yellow-brown
60-61	Shale, silty, sandy, gray

LOCATION: 085-44-15DDCD WC-160 STATION ID: 421006-0955645-01

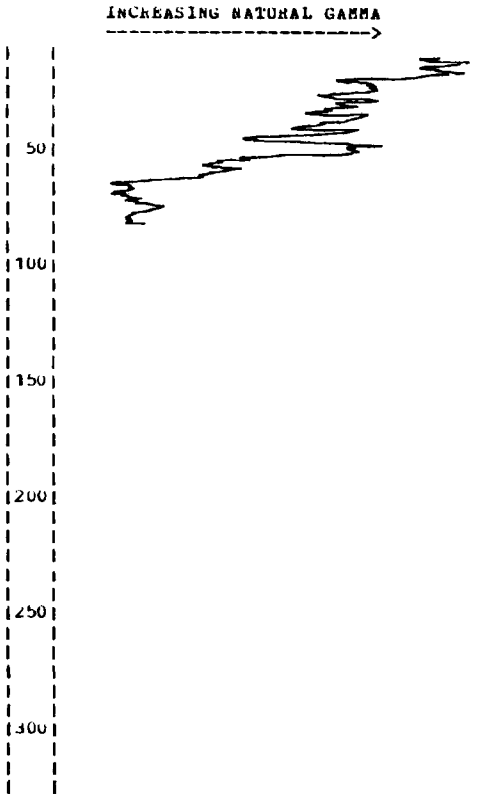
ALTITUDE: 1145 FEET (NGVD 1929) DEPTH: 121 FEET DATE COMPLETED: October 20, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed
3-10	Loess, yellow-tan
10-15	Loess or clay, some sandy, yellow-tan
15-18	Clay, sandy, hard, yellow-tan
18-31	Gravel; boulders; till, yellow-brown
31-33	Sand and gravel, fine to medium, yellow-brown
33-34	Till, olive
34-40	Till, blue-gray, occasional olive streaks
40-41	Sand and gravel, gray
41-85	Till, blue-gray
85-87	Till or clay, very sandy, blue-gray
87-92	Clay, sandy, yellow-brown
	CRETACOUS
	DAKOTA FORMATION
92-114	Sandstone, fine to very coarse, (gravel), brown
114-121	Sandstone, fine to coarse, yellow-brown, tan

Table 2. Logs of wells and test holes--Continued.

LOCATION: 085-44-16CDAa WC-155 STATION ID: 421018-0955820-01

ALTITUDE: 1060 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: October 14, 1982

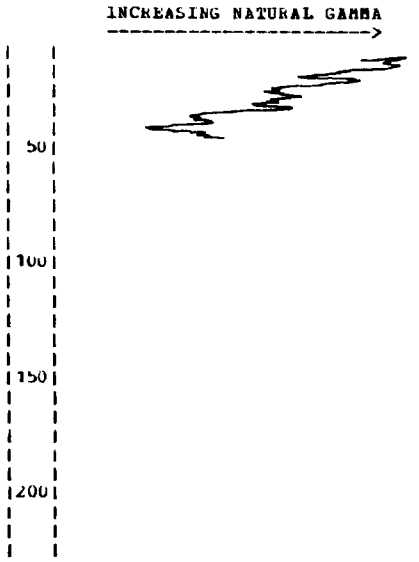


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-8	Clay, very dark gray
8-10	Clay, silty, dark gray-brown
10-21	Clay, silty, sandy, soft, gray, brown
21-26	Clay, silty, sandy, blue-gray; sand layers
26-30	Sand, fine to medium, gray; clay, silty, dark gray; shells
30-36	Clay, silty, sandy, dark gray; shells; gravel layer at base, fine
36-40	As above, sand layers, fine to coarse
40-43	Sand and gravel, fine to coarse, gray
43-46	Clay, silty; wood
46-50	Sand and gravel, fine to coarse, silty; boulders
	CRETACOUS
	DAKOTA FORMATION
50-51	Boulder; gravel, iron cemented, oxidized
51-60	Sandstone, fine to very coarse, yellow-brown
60-81	Sandstone, fine to coarse, tan, yellow-brown

Casing record: set 2 inch pipe to 77 feet, slotted from 67 to 77 feet, gravel packed

LOCATION: 085-44-16DCDD WC-156 STATION ID: 421006-0955803-01

ALTITUDE: 1060 FEET (NGVD 1929) DEPTH: 43 FEET DATE COMPLETED: October 15, 1982



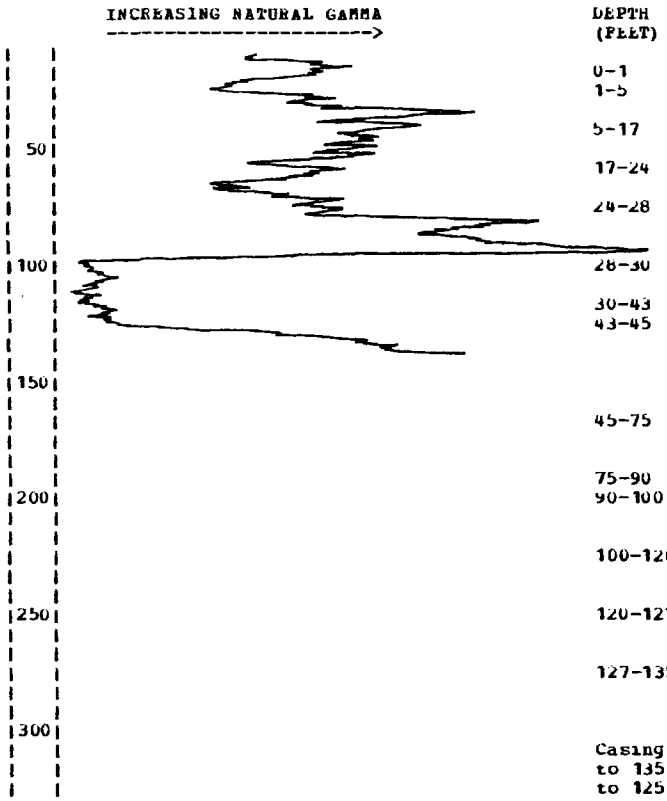
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-8	Clay, silty, dark gray-brown
8-14	Clay, silty, yellow-gray
14-16	Clay, some silty, hard, gray
16-18	Clay, silty, soft, yellow-gray
18-28	Clay, silty, sandy, soft, yellow-brown
28-36	Sand and gravel, fine to medium, some coarse, yellow-brown
36-40	Sand and gravel, fine to coarse, oxidized, brown; boulder at base
	CRETACEOUS
	DAKOTA FORMATION
40-43	Sandstone

Casing record: set 2 inch pipe to 40 feet, slotted from 35 to 40 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 085-44-17DCAA WC-158 STATION ID: 421018-0955913-01

ALTITUDE: 1110 FEET (NGVD 1929) DEPTH: 135 FEET DATE COMPLETED: October 18, 1982

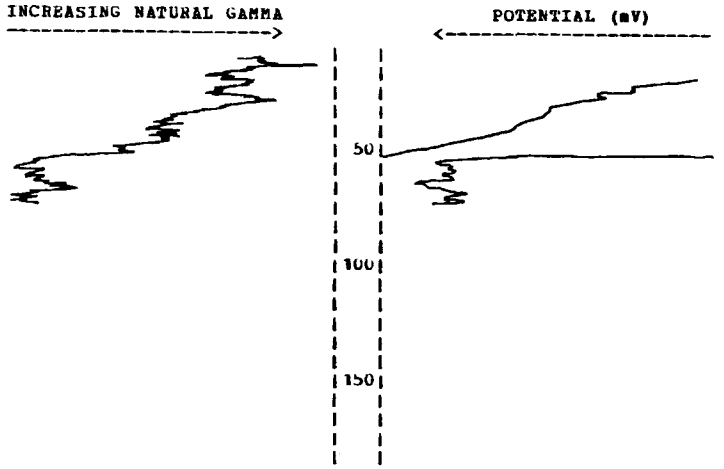


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-1	Top soil
1-5	Sand, fine to medium, yellow-brown
5-17	Sand, fine to coarse, gray
17-24	Sand, fine to coarse, yellow-brown
24-28	Sand and gravel, fine to medium; boulder at base
28-30	Clay, sandy, oxidized, brown
30-43	Till, sandy, blue-gray
43-45	Clay, sandy, brown, yellow-brown
	CRETACOUS
	DAKOTA FORMATION
45-75	Sandstone, fine to very coarse, brown, yellow-brown
75-90	Shale, silty, blue-gray
90-100	Sandstone, fine to medium, yellow-brown; shale at top, brown
100-120	Sandstone, fine to coarse, coarser at base, tan
120-127	Sandstone, fine to very coarse, oxidized, brown, yellow-brown
127-135	Dolomite, brown; shale, sandy, gray

Casing record: set 2 inch pipe to 135 feet, slotted from 115 to 125 feet, gravel packed

LOCATION: 085-44-22ACBB WC-159 STATION ID: 420952-0955706-01

ALTITUDE: 1090 FEET (NGVD 1929) DEPTH: 76 FEET DATE COMPLETED: October 19, 1982

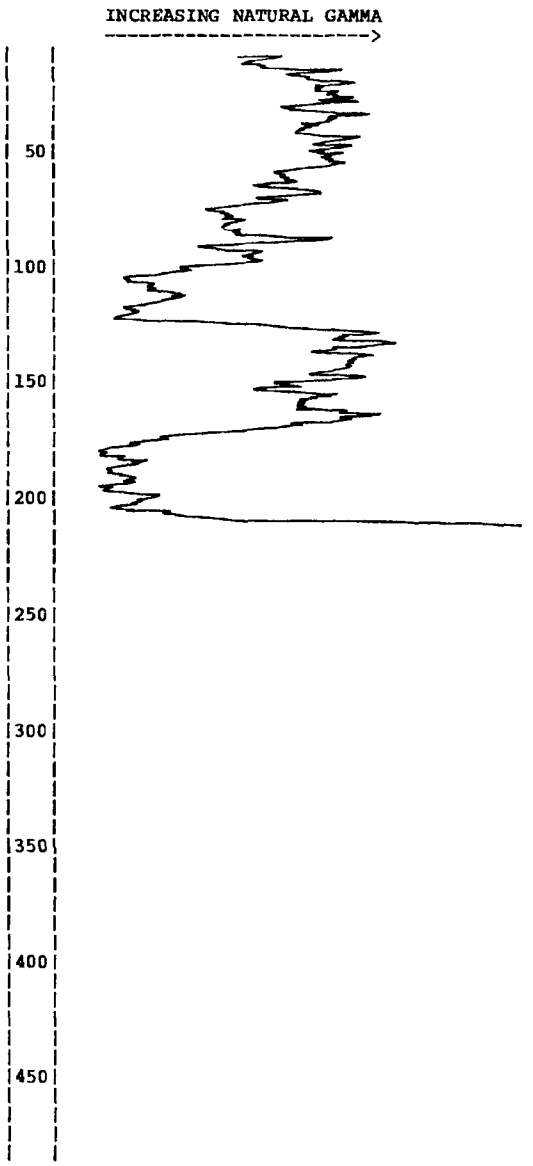


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-10	Clay, silty, dark brown
10-20	Clay, silty, very soft, yellow-brown
20-25	Clay, silty, soft, brown
25-35	Clay, silty, very soft, yellow-brown
35-42	Clay, silty, brown
42-47	Sand, very fine, brown
47-52	Sand and gravel, fine to very coarse, brown; boulder
52-73	Sand and gravel, fine to coarse, tan, yellow; occasional boulder
	CRETACEOUS
	DAKOTA FORMATION
73-76	Shale, silty, gray, yellow at top

Table 2. Logs of wells and test holes--Continued.

LOCATION: 085-44-22ADAA WC-8 STATION ID: 420952-0955634-01

ALTITUDE: 1120 FEET (NGVD 1929) DEPTH: 212 FEET DATE COMPLETED: June 2, 1981



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Loess, tan
7-15	Sand and gravel, fine to coarse
15-27	Clay , silty, tan
27-28	Sand and gravel
28-35	Clay, silty, blue-gray
35-37	Till, sandy, yellow-brown, gray
37-38	Sand and gravel, fine to coarse; till mixed, yellow-gray
38-40	As above, mostly till, yellow-gray
40-60	Till, blue-gray
60-60	Till, yellow-brown
60-63	Sand, fine to coarse, tan
63-66	Clay, silty, tan
66-70	Sand, fine to coarse, tan
70-84	Sand and gravel, fine to medium, tan, yellow-tan
84-90	As above, oxidized, yellow-brown to brown
90-95	Sand and gravel, finer than above, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
95-115	Sandstone, fine to medium, tan
115-123	Sandstone, coarse, tan to yellow-brown
123-128	Shale, silty, sandy, light gray
128-145	Shale, silty, gray
145-150	As above, thin sandstone streaks
150-167	Shale, silty, gray; lignite trace
167-170	Sandstone, fine to medium, well cemented, tan to brown
170-205	Sandstone, fine to medium, tan to brown
	PENNSYLVANIAN
205-208	Shale, light gray; iron pyrite specks
208-212	Shale, very dark gray

Casing record: set 2 inch pipe to 210 feet, slotted from 192 to 210 feet, gravel packed

Table 3. Water levels in selected wells.

Water levels shown have been adjusted to feet below land surface

lsd, land surface datum

MP, measuring point

>, water level below the depth of well

Table 1. Drinking Water Standards for Community Water Systems

Constituents	Maximum contaminant levels in community water supplies[1]	
	Primary Regulations	Secondary Regulations
pH		6.5—8.5
Dissolved solids		500 mg/l[2]
Sodium and Potassium	Not Applicable	
Calcium and Magnesium	Not Applicable	
Iron		300 ug/l
Manganese		50 ug/l
Nitrate as N	10 mg/l[3]	
Fluoride	1.4-2.4 depending on climate	
Chloride		250 mg/l
Sulfate		250 mg/l
Arsenic	50 ug/l	
Barium	1000 ug/l	
Cadmium	10 ug/l	
Chromium	50 ug/l	
Copper		1000 ug/l

[1] National Interim Primary Drinking Regulations (Federal Register, Vol. 48, No. 248 and Vol. 41, No. 133), Proposed Secondary Drinking Regulations (Federal Register Vol. 42 No. 62) and National Revised Primary Drinking Water Regulations: Advance Notice of Proposed Rulemaking (Federal Register Vol. 48 No.194).

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 78-30-06AACA WC-86 Aquifer: South Raccoon
Altitude: 980 feet MP is the top of 2-inch pipe 1.85 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
July 19, 1982...	11.55	Feb. 9.....	11.30	Sep. 6.....	12.61
Aug. 2.....	12.13	Mar. 10.....	9.52	Oct. 3.....	11.97
Sep. 2.....	12.59	Apr. 11.....	7.54	Nov. 7.....	12.65
Oct. 8.....	12.81	May 4.....	8.69	Dec. 8.....	11.82
Nov. 5.....	12.87	June 6.....	8.17	Jan. 10, 1984...	11.60
Dec. 9.....	11.22	July 1.....	8.99	Feb. 9.....	11.09
Jan. 4, 1983...	11.02	Aug. 3.....	11.75	Mar. 6.....	10.97

Location: 78-30-24CAAB WC-238 Aquifer: Dakota
Altitude: 1020 feet MP is the top of 2-inch pipe 2.10 feet above lsd

Aug. 15, 1983...	45.73	Nov. 7.....	44.30	Feb. 9.....	43.06
Sep. 6.....	44.95	Dec. 8.....	43.00	Mar. 6.....	40.18
Oct. 3.....	44.01	Jan. 10, 1984...	43.20		

Location: 78-32-21AAAA WC-239 Aquifer: Dakota
Altitude: 1250 feet MP is the top of 2-inch pipe 1.90 feet above lsd

Aug. 17, 1983...	73.04	Nov. 7.....	72.95	Feb. 9.....	73.12
Sep. 6.....	72.99	Dec. 8.....	73.05	Mar. 6.....	73.22
Oct. 3.....	73.56	Jan. 10, 1984...	73.64		

Location: 78-36-35ADCC WC-69 Aquifer: Dakota
Altitude: 1230 feet MP is the top of 2-inch pipe 2.15 feet above lsd

June 22, 1982...	53.04	Jan. 4, 1983...	52.40	Sep. 6.....	47.95
July 2.....	52.99	Mar. 9.....	51.29	Oct. 3.....	48.16
Aug. 3.....	53.05	Apr. 11.....	51.20	Nov. 10.....	48.72
Sep. 1.....	53.03	May 3.....	49.54	Jan. 10, 1984...	49.40
Oct. 7.....	52.94	June 6.....	48.83	Feb. 6.....	49.52
Nov. 4.....	52.93	July 1.....	47.89	Mar. 6.....	49.20
Dec. 7.....	53.81	Aug. 2.....	47.74		

Location: 78-36-36DABB WC-71 Aquifer: East Nishnabotna
Altitude: 1195 feet MP is the top of 2-inch pipe 3.00 feet above lsd

June 23, 1982...	16.29	Jan. 4, 1983...	16.98	Aug. 2.....	15.98
July 2.....	16.55	Feb. 8.....	16.67	Sep. 6.....	16.78
Aug. 3.....	17.02	Mar. 9.....	15.11	Oct. 3.....	17.22
Sep. 1.....	16.99	Apr. 11.....	12.80	Nov. 10.....	17.37
Oct. 7.....	17.70	May 3.....	12.65	Feb. 6, 1984...	17.24
Nov. 4.....	17.84	June 6.....	15.04	Mar. 6.....	16.61
Dec. 7.....	17.56	July 1.....	14.60		

Location: 78-37-17DDDD WC-16 Aquifer: Dakota
Altitude: 1208 feet MP is the top of 2-inch pipe 2.80 feet above lsd

Aug. 19, 1981...	42.85	Sep. 1.....	41.42	June 6.....	39.19
Sep. 24.....	42.86	Oct. 7.....	41.89	July 1.....	39.08
Nov. 3.....	42.73	Nov. 4.....	42.00	Aug. 2.....	40.01
Feb. 5, 1982...	42.13	Dec. 7.....	41.71	Sep. 6.....	40.32
Apr. 6.....	41.83	Jan. 4, 1983...	41.27	Oct. 3.....	41.33
May 6.....	42.06	Feb. 8.....	41.18	Nov. 10.....	41.42
June 7.....	40.83	Mar. 10.....	39.93	Jan. 10, 1984...	41.24
July 7.....	41.07	Apr. 11.....	39.57	Feb. 6.....	40.77
Aug. 3.....	41.48	May 3.....	38.65	Mar. 6.....	40.78

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 78-38-11CCBC WC-227 Aquifer: Fremont
Altitude: 1310 feet MP is the top of 2-inch pipe 1.65 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
July 21, 1983...	149.12	Oct. 3.....	147.56	Feb. 9.....	150.58
Aug. 2.....	151.07	Nov. 8.....	150.98	Mar. 6.....	149.63
Sep. 6.....	146.61	Jan. 12, 1984...	150.40		

Location: 78-39-10BBBA WC-200 Aquifer: West Nishnabotna
Altitude: 1168 feet MP is the top of 2-inch pipe 2.50 feet above lsd

June 7, 1983...	20.12	Sep. 6.....	21.97	Jan. 12, 1984...	21.85
July 6.....	19.57	Oct. 3.....	22.29	Feb. 9.....	21.66
Aug. 2.....	21.00	Nov. 8.....	22.29	Mar. 6.....	21.14

Location: 78-39-13BCCC WC-204 Aquifer: West Nishnabotna
Altitude: 1180 feet MP is the top of 2-inch pipe 2.55 feet above lsd

June 9, 1983...	17.58	Sep. 6.....	20.31	Feb. 9, 1984...	21.33
July 6.....	12.79	Oct. 3.....	26.00	Mar. 6.....	21.11
Aug. 2.....	18.53	Nov. 8.....	21.29		

Location: 78-39-32DDAA WC-197 Aquifer: West Nishnabotna
Altitude: 1144 feet MP is the top of 2-inch pipe 1.95 feet above lsd

June 6, 1983...	12.04	Oct. 3.....	16.51	Feb. 9.....	15.71
July 6.....	9.52	Nov. 8.....	15.12	Mar. 6.....	15.17
Aug. 2.....	12.10	Dec. 13.....	15.37		
Sep. 6.....	14.08	Jan. 12, 1984...	15.70		

Location: 78-41-31DDDD WC-27 Aquifer: Basal Pleistocene
Altitude: 1158 feet MP is the top of 2-inch pipe 2.05 feet above lsd

Jan. 13, 1982...	57.49	Dec. 2.....	57.59	Sep. 7.....	56.93
Apr. 6.....	56.84	Jan. 4, 1983...	57.75	Oct. 3.....	57.38
May 6.....	56.70	Feb. 8.....	57.73	Nov. 8.....	57.41
June 3.....	55.94	Mar. 10.....	57.48	Dec. 13.....	57.50
July 7.....	55.26	Apr. 12.....	56.97	Jan. 12, 1984...	57.87
Aug. 3.....	55.31	May 2.....	56.33	Feb. 9.....	58.03
Sep. 9.....	55.36	June 1.....	56.33	Mar. 6.....	57.82
Oct. 7.....	55.39	July 6.....	56.35		
Nov. 1.....	55.33	Aug. 2.....	56.76		

Location: 78-43-05ACDD WC-33 Aquifer: Dakota
Altitude: 1080 feet MP is the top of 2-inch pipe 2.35 feet above lsd

May 13, 1982...	73.76	Jan. 3, 1983...	73.00	Sep. 7.....	73.72
June 3.....	72.79	Feb. 8.....	73.14	Oct. 4.....	73.91
July 7.....	72.94	Mar. 10.....	72.02	Nov. 8.....	73.50
Aug. 3.....	73.64	Apr. 12.....	71.04	Dec. 13.....	73.30
Sep. 9.....	74.19	May 2.....	71.38	Jan. 12, 1984...	73.54
Oct. 7.....	73.70	June 1.....	71.95	Feb. 8.....	73.59
Nov. 1.....	73.17	July 6.....	71.79	Mar. 6.....	72.34
Dec. 2.....	72.82	Aug. 2.....	72.87		

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 78-43-05BCDD WC-32 Aquifer: Boyer
Altitude: 1010 feet MP is the top of 2-inch pipe 3.10 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
May 13, 1982...	4.71	Jan. 3, 1983...	4.74	Sep. 7.....	6.09
June 3.....	4.18	Feb. 8.....	4.89	Oct. 4.....	6.44
July 7.....	4.31	Mar. 10.....	3.65	Nov. 8.....	5.32
Aug. 3.....	5.66	Apr. 12.....	2.71	Dec. 13.....	5.20
Sep. 9.....	5.99	May 2.....	3.26	Jan. 12, 1984...	5.45
Oct. 7.....	5.19	June 1.....	4.29	Feb. 8.....	5.40
Nov. 1.....	4.81	July 6.....	4.13	Mar. 6.....	4.12
Dec. 2.....	4.40	Aug. 2.....	5.16		

Location: 79-30-22BAAC WC-109 Aquifer: Dakota
Altitude: 1140 feet MP is the top of 2-inch pipe 1.85 feet above lsd

Aug. 18, 1982...	141.65	Apr. 11.....	140.17	Nov. 7.....	139.57
Sep. 2.....	140.22	May 4.....	140.06	Dec. 8.....	139.68
Oct. 8.....	138.50	June 7.....	140.17	Jan. 10, 1984...	140.15
Nov. 5.....	139.85	July 1.....	139.77	Feb. 9.....	139.58
Jan. 4, 1983...	140.14	Aug. 3.....	139.72	Mar. 6.....	139.83
Feb. 9.....	140.08	Sep. 6.....	139.89		
Mar. 9.....	140.25	Oct. 3.....	139.83		

Location: 79-31-14CBCC WC-82 Aquifer: South Raccoon Terrace and Dakota
Altitude: 1090 feet MP is the top of 2-inch pipe 2.50 feet above lsd

July 15, 1982...	32.56	Feb. 9.....	32.92	Sep. 6.....	29.43
Aug. 2.....	33.46	Mar. 9.....	32.87	Oct. 3.....	29.64
Sep. 2.....	33.31	Apr. 11.....	32.44	Nov. 7.....	29.86
Oct. 8.....	33.12	May 4.....	31.66	Dec. 8.....	30.06
Nov. 5.....	33.09	June 6.....	31.41	Jan. 10, 1984...	30.36
Dec. 9.....	33.08	July 1.....	30.04	Feb. 9.....	30.57
Jan. 4, 1983...	33.03	Aug. 3.....	29.51	Mar. 5.....	30.64

Location: 79-31-23BBBB WC-85 Aquifer: South Raccoon
Altitude: 1037 feet MP is the top of 2-inch pipe 1.50 feet above lsd

July 19, 1982...	7.75	Feb. 9.....	7.62	Sep. 6.....	9.99
Aug. 2.....	9.43	Mar. 9.....	5.07	Oct. 3.....	10.12
Sep. 2.....	9.66	Apr. 11.....	3.93	Nov. 7.....	8.94
Oct. 8.....	10.17	May 4.....	4.87	Dec. 8.....	8.26
Nov. 5.....	10.47	June 6.....	4.93	Jan. 10, 1984...	7.62
Dec. 9.....	7.22	July 1.....	4.97	Feb. 9.....	7.07
Jan. 4, 1983...	6.55	Aug. 3.....	8.59	Mar. 6.....	6.31

Location: 79-35-10CABB WC-17 Aquifer: Dakota
Altitude: 1280 feet MP is the top of 2-inch pipe 3.70 feet above lsd

Aug. 20, 1981...	37.62	Sep. 1.....	36.81	June 6.....	35.97
Sep. 24.....	36.97	Oct. 7.....	36.40	July 1.....	35.92
Nov. 3.....	37.59	Nov. 4.....	36.42	Aug. 2.....	36.27
Feb. 1, 1982...	37.04	Dec. 7.....	36.25	Sep. 6.....	36.39
Apr. 6.....	37.44	Jan. 4, 1983...	36.03	Oct. 3.....	36.44
May 17.....	37.27	Feb. 8.....	35.94	Nov. 10.....	36.09
June 7.....	37.28	Mar. 9.....	36.06	Jan. 10, 1984...	36.35
July 2.....	36.90	Apr. 11.....	35.95	Feb. 6.....	36.12
Aug. 3.....	36.79	May 3.....	35.82	Mar. 6.....	36.09

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 79-35-15DCDD WC-75 Aquifer: East Nishnabotna
Altitude: 1245 feet MP is the top of 2-inch pipe 1.50 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
June 29, 1982...	16.17	Jan. 4, 1983...	15.75	Aug. 2.....	16.87
July 1.....	15.07	Feb. 8.....	16.03	Sep. 6.....	17.71
Aug. 3.....	15.59	Mar. 9.....	14.24	Oct. 3.....	16.98
Sep. 1.....	15.55	Apr. 11.....	13.61	Nov. 10.....	17.79
Oct. 7.....	17.66	May 3.....	11.28	Jan. 10, 1984...	17.19
Nov. 4.....	17.74	June 6.....	14.75	Feb. 6.....	16.89
Dec. 7.....	16.93	July 1.....	14.54	Mar. 6.....	16.53

Location: 79-38-23DCCC WC-208 Aquifer: West Nishnabotna
Altitude: 1202 feet MP is the top of 2-inch pipe 2.50 feet above lsd

June 13, 1983...	19.83	Sep. 6.....	22.03	Jan. 10, 1984...	20.97
July 7.....	19.87	Oct. 3.....	21.36	Feb. 6.....	20.82
Aug. 2.....	20.51	Nov. 8.....	21.37	Mar. 6.....	20.56

Location: 79-40-09DBCA WC-15 Aquifer: Basal Pleistocene
Altitude: 1205 feet MP is the top of 2-inch pipe 4.10 feet above lsd

July 28, 1981...	19.45	Oct. 7.....	18.74	Aug. 2.....	18.68
Sep. 25.....	19.31	Nov. 1.....	18.63	Sep. 6.....	18.99
Nov. 3.....	19.19	Dec. 2.....	18.50	Oct. 3.....	18.92
Feb. 4, 1982...	18.99	Jan. 4, 1983...	18.40	Nov. 8.....	18.71
Apr. 6.....	19.03	Feb. 8.....	18.20	Dec. 8.....	18.48
May 6.....	18.89	Mar. 10.....	18.45	Jan. 12, 1984...	18.43
June 3.....	18.88	Apr. 12.....	18.01	Feb. 9.....	18.42
July 7.....	18.68	May 2.....	18.07	Mar. 7.....	18.44
Aug. 3.....	18.90	June 2.....	18.31		
Sep. 1.....	18.92	July 6.....	18.39		

Location: 79-42-19BADC WC-196 Aquifer: Boyer
Altitude: 1030 feet MP is the top of 5-inch pipe 3.40 feet above lsd

June 3, 1983...	12.12	Sep. 7.....	13.42	Jan. 12, 1984...	11.98
July 6.....	9.53	Oct. 4.....	13.17	Feb. 7.....	12.67
Aug. 2.....	11.48	Nov. 8.....	12.72	Mar. 6.....	11.09
Aug. 16.....	13.08	Dec. 16.....	11.79		

Location: 80-31-06AAAD WC-114 Aquifer: Dakota
Altitude: 1150 feet MP is the top of 2-inch pipe 2.10 feet above lsd

Aug. 23, 1982...	>100.00	Mar. 9.....	>100.00	Oct. 3.....	>100.00
Sep. 2.....	>100.00	Apr. 11.....	>100.00	Nov. 7.....	>100.00
Oct. 6.....	>100.00	May 3.....	>100.00	Dec. 8.....	>100.00
Nov. 5.....	>100.00	June 7.....	>100.00	Jan. 10, 1984...	>100.00
Dec. 9.....	>100.00	July 1.....	>100.00	Feb. 9.....	>100.00
Jan. 4, 1983...	>100.00	Aug. 3.....	>100.00	Mar. 6.....	>100.00
Feb. 9.....	>100.00	Sep. 6.....	>100.00		

Location: 80-33-12ACCC WC-90 Aquifer: Dakota
Altitude: 1170 feet MP is the top of 2-inch pipe 2.20 feet above lsd

July 22, 1982...	10.51	Feb. 9.....	10.77	Sep. 6.....	9.89
Aug. 2.....	10.27	Mar. 9.....	9.30	Oct. 3.....	10.27
Sep. 2.....	10.60	Apr. 11.....	7.91	Nov. 7.....	10.34
Oct. 6.....	10.85	May 4.....	7.42	Dec. 8.....	10.02
Nov. 5.....	11.00	June 7.....	8.08	Jan. 10, 1984...	10.40
Dec. 9.....	10.84	July 1.....	8.00	Feb. 9.....	9.95
Jan. 4, 1983...	10.83	Aug. 3.....	9.06	Mar. 6.....	9.55

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 80-38-30ACCC WC-221 Aquifer: West Nishnabotna
Altitude: 1220 feet MP is the top of 2-inch pipe 2.30 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
June 16, 1983...	22.54	Oct. 3.....	25.41	Feb. 6.....	24.23
July 7.....	23.80	Nov. 8.....	25.35	Mar. 6.....	24.49
Aug. 2.....	24.76	Dec. 13.....	24.82		
Sep. 6.....	25.43	Jan. 10, 1984...	24.58		

Location: 80-38-33AABB WC-216 Aquifer: West Nishnabotna
Altitude: 1225 feet MP is the top of 2-inch pipe 2.10 feet above lsd

June 15, 1983...	16.23	Sep. 6.....	19.93	Jan. 10, 1984...	23.00
July 7.....	16.16	Oct. 3.....	21.40	Feb. 6.....	23.18
Aug. 2.....	17.84	Nov. 8.....	22.28	Mar. 6.....	20.02

Location: 80-39-06AADC WC-10 Aquifer: Dakota
Altitude: 1305 feet MP is the top of 2-inch pipe 2.60 feet above lsd

June 26, 1981...	94.45	Sep. 1.....	97.88	July 5.....	97.10
July 28.....	93.87	Oct. 7.....	96.76	Aug. 2.....	97.48
Sep. 24.....	97.61	Nov. 1.....	96.43	Sep. 6.....	97.91
Nov. 3.....	98.02	Dec. 2.....	96.36	Oct. 3.....	96.02
Feb. 4, 1982...	99.85	Jan. 4, 1983...	96.29	Nov. 8.....	95.67
Apr. 6.....	97.41	Feb. 8.....	96.40	Dec. 8.....	94.94
May 6.....	97.41	Mar. 10.....	96.53	Jan. 10, 1984...	95.20
June 7.....	97.44	Apr. 12.....	95.30	Feb. 6.....	94.88
July 2.....	97.46	May 2.....	96.27	Mar. 7.....	95.07
Aug. 4.....	97.99	June 2.....	96.43		

Location: 80-42-27CCBA WC-192 Aquifer: Boyer
Altitude: 1050 feet MP is the top of 2-inch pipe 1.80 feet above lsd

June 1, 1983...	9.57	Oct. 4.....	12.86	Feb. 7.....	12.10
July 6.....	9.61	Nov. 8.....	12.62	Mar. 6.....	11.04
Aug. 2.....	11.21	Dec. 13.....	12.26		
Sep. 7.....	12.61	Jan. 11, 1984...	12.20		

Location: 80-42-28DBCD WC-37 Aquifer: Boyer
Altitude: 1060 feet MP is the top of 2-inch pipe 3.00 feet above lsd

May 18, 1982...	20.62	Jan. 3, 1983...	18.24	Sep. 7.....	17.49
June 3.....	18.50	Feb. 8.....	18.47	Oct. 4.....	18.69
July 7.....	18.78	Mar. 10.....	15.39	Nov. 8.....	18.70
Aug. 3.....	20.04	Apr. 12.....	13.75	Dec. 13.....	18.55
Sep. 9.....	20.69	May 2.....	14.07	Jan. 11, 1984...	18.66
Oct. 7.....	18.93	June 1.....	15.12	Feb. 7.....	18.50
Nov. 1.....	18.83	July 6.....	16.39	Mar. 6.....	16.84
Dec. 2.....	18.35	Aug. 2.....	16.78		

Location: 80-42-34ABBB WC-191 Aquifer: Boyer
Altitude: 1045 feet MP is the top of 2-inch pipe 2.30 feet above lsd

May 27, 1983...	5.35	Sep. 7.....	6.85	Jan. 11, 1984...	4.94
June 1.....	5.40	Oct. 4.....	6.34	Feb. 7.....	5.85
July 6.....	5.71	Nov. 8.....	5.79	Mar. 6.....	5.07
Aug. 2.....	6.09	Dec. 13.....	5.86		

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 80-42-35BDCC WC-193 Aquifer: Basal Pleistocene
Altitude: 1140 feet MP is the top of 2-inch pipe 1.70 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
June 1, 1983...	54.55	Oct. 4.....	54.11	Feb. 7.....	53.94
July 6.....	53.69	Nov. 8.....	53.97	Mar. 6.....	52.77
Aug. 2.....	53.76	Dec. 13.....	53.88		
Sep. 7.....	54.01	Jan. 11, 1984...	53.98		

Location: 80-44-04BBDA WC-184 Aquifer: Soldier
Altitude: 1039 feet MP is the top of 2-inch pipe 3.10 feet above lsd

May 24, 1983...	2.49	Sep. 7.....	5.68	Jan. 11, 1984...	4.57
June 2.....	3.11	Oct. 4.....	6.13	Feb. 7.....	5.03
July 6.....	4.59	Nov. 7.....	4.97	Mar. 7.....	4.12
Aug. 2.....	4.51	Dec. 6.....	4.90		

Location: 80-44-09ABBB WC-183 Aquifer: Soldier
Altitude: 1070 feet MP is the top of 2-inch pipe 2.05 feet above lsd

May 23, 1983...	37.71	Sep. 7.....	39.93	Jan. 11, 1984...	40.23
June 2.....	38.17	Oct. 4.....	41.06	Feb. 7.....	39.98
July 6.....	38.40	Nov. 7.....	40.64	Mar. 7.....	38.61
Aug. 2.....	39.53	Dec. 6.....	40.22		

Location: 81-31-22CCCC WC-105 Aquifer: Dakota
Altitude: 1190 feet MP is the top of 2-inch pipe 2.10 feet above lsd

Aug. 12, 1982...	68.39	Mar. 9.....	68.12	Oct. 3.....	65.11
Sep. 2.....	68.39	Apr. 11.....	68.10	Nov. 7.....	64.37
Oct. 8.....	66.50	May 4.....	68.69	Dec. 8.....	64.55
Nov. 5.....	68.96	June 7.....	68.51	Jan. 10, 1984...	64.94
Dec. 9.....	69.88	July 1.....	66.37	Feb. 9.....	64.39
Jan. 4, 1983...	68.21	Aug. 3.....	65.33	Mar. 6.....	64.61
Feb. 9.....	68.34	Sep. 6.....	65.06		

Location: 81-31-32CBCC WC-106 Aquifer: Middle Raccoon
Altitude: 1090 feet MP is the top of 2-inch pipe 2.30 feet above lsd

Aug. 13, 1982...	35.15	Mar. 9.....	32.26	Oct. 3.....	35.36
Sep. 2.....	35.59	Apr. 11.....	32.42	Nov. 7.....	34.96
Oct. 6.....	35.92	May 4.....	31.08	Dec. 8.....	33.89
Nov. 5.....	35.87	June 7.....	31.21	Jan. 10, 1984...	34.17
Dec. 9.....	35.13	July 1.....	30.33	Feb. 9.....	34.06
Jan. 4, 1983...	34.10	Aug. 3.....	33.49	Mar. 6.....	33.30
Feb. 9.....	34.36	Sep. 6.....	34.94		

Location: 81-33-26DDDD WC-93 Aquifer: Dakota
Altitude: 1205 feet MP is the top of 2-inch pipe 2.20 feet above lsd

July 27, 1982...	40.70	Feb. 9.....	40.89	Sep. 6.....	39.37
Aug. 2.....	40.72	Mar. 9.....	40.69	Oct. 3.....	39.63
Sep. 2.....	40.82	Apr. 11.....	40.33	Nov. 7.....	39.84
Oct. 6.....	40.91	May 4.....	39.92	Dec. 8.....	39.00
Nov. 5.....	40.93	June 7.....	38.52	Jan. 10, 1984...	40.12
Dec. 9.....	40.97	July 1.....	39.23	Feb. 9.....	40.18
Jan. 3, 1983...	40.98	Aug. 3.....	39.29	Mar. 6.....	39.93

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 81-33-35ABBC WC-94 Aquifer: South Raccoon
Altitude: 1150 feet MP is the top of 2-inch pipe 2.10 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
July 27, 1982...	15.13	Feb. 9.....	14.83	Sep. 6.....	14.42
Aug. 1.....	15.21	Mar. 9.....	14.21	Oct. 3.....	14.92
Sep. 2.....	15.41	Apr. 11.....	13.31	Nov. 7.....	14.99
Oct. 6.....	15.66	May 4.....	13.16	Dec. 8.....	14.75
Nov. 5.....	15.72	June 7.....	13.92	Jan. 10, 1984...	14.83
Dec. 9.....	15.35	July 1.....	12.80	Feb. 9.....	14.78
Jan. 4, 1983...	14.95	Aug. 3.....	14.22	Mar. 6.....	14.70

Location: 81-36-12CBCA WC-18 Aquifer: Dakota
Altitude: 1393 feet MP is the top of 2-inch pipe 2.50 feet above lsd

Aug. 19, 1981...	166.90	Oct. 7.....	165.40	Aug. 2.....	164.89
Sep. 24.....	165.80	Nov. 4.....	165.12	Sep. 6.....	165.04
Nov. 3.....	165.79	Dec. 10.....	165.39	Oct. 3.....	165.72
Feb. 1, 1982...	165.68	Jan. 4, 1983...	165.15	Nov. 7.....	164.70
Apr. 6.....	165.72	Feb. 8.....	165.21	Dec. 7.....	160.69
May 6.....	165.52	Mar. 9.....	164.91	Jan. 9, 1984...	164.37
June 7.....	165.48	Apr. 11.....	164.67	Feb. 8.....	164.23
July 2.....	165.47	May 3.....	164.73	Mar. 5.....	164.38
Aug. 3.....	165.50	June 7.....	164.61		
Sep. 1.....	165.49	July 7.....	164.69		

Location: 81-38-21ADAD WC-222 Aquifer: Fremont
Altitude: 1370 feet MP is the top of 2-inch pipe 2.90 feet above lsd

July 1, 1983...	253.10	Oct. 3.....	209.75	Feb. 6.....	209.25
July 7.....	251.71	Nov. 8.....	209.61	Mar. 6.....	209.02
Aug. 2.....	209.70	Dec. 0.....	209.14		
Sep. 6.....	209.91	Jan. 10, 1984...	209.43		

Location: 81-41-03ACCC WC-189 Aquifer: Boyer
Altitude: 1095 feet MP is the top of 2-inch pipe 2.20 feet above lsd

May 26, 1983...	11.54	Sep. 7.....	14.11	Jan. 10, 1984...	14.16
June 2.....	11.95	Oct. 4.....	14.28	Feb. 6.....	13.70
July 5.....	11.61	Nov. 8.....	14.09	Mar. 7.....	13.26
Aug. 2.....	13.26	Dec. 8.....	13.85		

Location: 81-41-03CDBB WC-190 Aquifer: Boyer
Altitude: 1090 feet MP is the top of 2-inch pipe 2.30 feet above lsd

May 26, 1983...	8.30	Sep. 7.....	10.96	Jan. 10, 1984...	10.85
June 1.....	8.70	Oct. 4.....	11.36	Feb. 6.....	10.65
July 6.....	8.38	Nov. 8.....	11.07	Mar. 7.....	10.05
Aug. 2.....	9.94	Dec. 8.....	10.84		

Location: 81-41-17ABAA WC-11 Aquifer: Dakota
Altitude: 1135 feet MP is the top of 2-inch pipe 2.55 feet above lsd

June 26, 1981...	72.45	Oct. 7.....	70.37	Aug. 2.....	67.90
July 28.....	71.92	Nov. 1.....	70.40	Sep. 7.....	67.34
Nov. 3.....	72.43	Dec. 2.....	69.97	Oct. 4.....	69.14
Jan. 13, 1982...	72.19	Jan. 3, 1983...	69.38	Nov. 8.....	69.74
Apr. 6.....	71.40	Feb. 8.....	69.47	Dec. 13.....	69.63
May 7.....	71.41	Mar. 10.....	66.99	Jan. 11, 1984...	69.71
June 3.....	69.55	Apr. 12.....	66.47	Feb. 6.....	69.79
July 2.....	70.22	May 3.....	65.77	Mar. 7.....	69.82
Aug. 3.....	70.16	June 2.....	66.75		
Sep. 9.....	70.94	July 6.....	66.73		

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 81-41-31BDDD WC-53 Aquifer: Boyer
Altitude: 1065 feet MP is the top of 2-inch pipe 1.90 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
June 4, 1982...	8.49	Feb. 8.....	8.84	Oct. 4.....	9.70
July 7.....	8.82	Mar. 10.....	5.14	Nov. 8.....	9.73
Aug. 3.....	9.69	Apr. 12.....	4.93	Dec. 13.....	9.45
Sep. 9.....	10.40	May 3.....	4.61	Jan. 11, 1984...	9.35
Oct. 7.....	8.76	June 2.....	6.62	Feb. 7.....	9.24
Nov. 1.....	9.38	July 6.....	6.57	Mar. 7.....	8.48
Dec. 2.....	9.30	Aug. 2.....	8.23		
Jan. 3, 1983...	7.84	Sep. 7.....	9.42		

Location: 81-41-33CAAA WC-52 Aquifer: Dakota
Altitude: 1182 feet MP is the top of 2-inch pipe 2.90 feet above lsd

June 4, 1982...	85.03	Feb. 8.....	81.59	Oct. 4.....	78.79
July 7.....	84.94	Mar. 10.....	80.08	Nov. 8.....	78.30
Aug. 4.....	84.30	Apr. 12.....	78.49	Dec. 13.....	78.47
Sep. 9.....	84.40	May 3.....	77.23	Jan. 11, 1984...	78.65
Oct. 7.....	83.71	June 2.....	76.92	Feb. 7.....	78.92
Nov. 1.....	83.57	July 6.....	77.17	Mar. 7.....	78.28
Dec. 2.....	82.96	Aug. 2.....	77.32		
Jan. 3, 1983...	82.88	Sep. 7.....	77.96		

Location: 81-44-01ABAB WC-177 Aquifer: Soldier
Altitude: 1065 feet MP is the top of 2-inch pipe 1.80 feet above lsd

May 18, 1983...	7.92	Sep. 7.....	10.92	Jan. 11, 1984...	9.37
June 2.....	8.63	Oct. 4.....	10.39	Feb. 7.....	9.42
July 6.....	8.53	Nov. 7.....	9.36	Mar. 7.....	8.37
Aug. 2.....	9.71	Dec. 6.....	8.98		

Location: 82-29-18CBAA WC-115 Aquifer: North Raccoon
Altitude: 965 feet MP is the top of 2-inch pipe 1.45 feet above lsd

Aug. 23, 1982...	18.88	Mar. 11.....	10.01	Oct. 4.....	19.64
Sep. 2.....	19.34	Apr. 13.....	10.17	Nov. 8.....	20.25
Oct. 8.....	17.73	May 4.....	10.77	Dec. 8.....	16.62
Nov. 5.....	17.28	June 3.....	12.53	Jan. 10, 1984...	17.05
Dec. 9.....	16.73	July 5.....	7.84	Feb. 9.....	17.70
Jan. 5, 1983...	15.86	Aug. 1.....	13.15	Mar. 5.....	14.32
Feb. 9.....	16.83	Sep. 8.....	17.94		

Location: 82-29-18DBAA WC-117 Aquifer: Basal Pleistocene
Altitude: 1005 feet MP is the top of 2-inch pipe 1.85 feet above lsd

Aug. 25, 1982...	37.37	Mar. 11.....	34.89	Oct. 5.....	36.55
Sep. 2.....	37.23	Apr. 13.....	33.40	Nov. 8.....	36.24
Oct. 8.....	37.63	May 4.....	33.61	Dec. 8.....	35.16
Nov. 5.....	37.72	June 3.....	33.81	Jan. 10, 1984...	35.70
Dec. 9.....	37.63	July 5.....	32.64	Feb. 9.....	35.63
Jan. 5, 1983...	36.55	Aug. 1.....	34.46	Mar. 5.....	34.33
Feb. 9.....	36.43	Sep. 8.....	36.16		

Location: 82-31-10AAAA WC-235 Aquifer: Dakota
Altitude: 1108 feet MP is the top of 2-inch pipe 2.00 feet above lsd

Sep. 8, 1983...	14.03	Dec. 8.....	13.49	Mar. 5.....	14.43
Oct. 5.....	14.17	Jan. 10, 1984...	13.58		
Nov. 8.....	13.90	Feb. 9.....	13.49		

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 82-34-02ABBB WC-149 Aquifer: Middle Raccoon
Altitude: 1170 feet MP is the top of 2-inch pipe 3.20 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Sep. 29, 1982...	7.62	Apr. 13...	0.98	Nov. 8.....	6.89
Oct. 6.....	7.63	May 4	0.71	Dec. 8.....	6.25
Nov. 5.....	7.66	June 7.....	0.85	Jan. 9, 1984...	6.28
Dec. 9.....	7.83	July 5.....	1.81	Feb. 8.....	6.14
Jan. 5, 1983...	7.10	Aug. 3.....	4.30	Mar. 6.....	4.67
Feb. 9.....	6.91	Sep. 6.....	6.22		
Mar. 11.....	3.38	Oct. 5.....	6.90		

Location: 82-38-23AAAA WC-225 Aquifer: Fremont
Altitude: 1320 feet MP is the top of 2-inch pipe 3.40 feet above lsd

July 11, 1983...	158.49	Oct. 3.....	159.67	Jan. 9, 1984...	159.20
Aug. 2.....	159.42	Nov. 7.....	158.27	Feb. 9.....	159.09
Sep. 6.....	160.92	Dec. 7.....	158.34	Mar. 5.....	160.13

Location: 82-39-15CBAB WC-12 Aquifer: Dakota
Altitude: 1250 feet MP is the top of 2-inch pipe 4.40 feet above lsd

July 28, 1981...	39.19	Oct. 7.....	40.55	Aug. 2.....	40.64
Sep. 23.....	38.76	Nov. 1.....	40.55	Sep. 7.....	40.99
Nov. 3.....	39.64	Dec. 2.....	40.47	Oct. 3.....	41.36
Feb. 4, 1982...	39.94	Jan. 4, 1983...	40.40	Nov. 8.....	40.75
Apr. 6.....	40.22	Feb. 8.....	40.40	Dec. 8.....	40.55
May 6.....	39.86	Mar. 10.....	40.44	Jan. 10, 1984...	40.58
June 7.....	39.97	Apr. 11.....	40.21	Feb. 6.....	40.53
July 2.....	40.04	May 3.....	40.09	Mar. 6.....	40.65
Aug. 3.....	40.45	June 2.....	40.22		
Sep. 9.....	40.61	July 5.....	40.27		

Location: 82-40-17AABB WC-9 Aquifer: Dakota
Altitude: 1150 feet MP is the top of 2-inch pipe 2.50 feet above lsd

June 11, 1981...	43.46	Aug. 3.....	41.77	June 2.....	39.61
June 26.....	43.60	Sep. 9.....	42.33	July 5.....	39.15
July 28.....	43.02	Oct. 7.....	41.55	Aug. 2.....	40.43
Sep. 23.....	43.62	Nov. 1.....	41.73	Sep. 7.....	41.32
Nov. 3.....	43.52	Dec. 2.....	41.60	Oct. 4.....	39.47
Jan. 13, 1982...	43.22	Jan. 3, 1983...	41.17	Nov. 8.....	41.54
Apr. 6.....	42.83	Feb. 8.....	40.86	Dec. 8.....	41.24
May 7.....	42.50	Mar. 10.....	39.34	Jan. 10, 1984...	41.15
June 4.....	40.84	Apr. 11.....	39.06	Feb. 6.....	41.06
July 2.....	40.65	May 3.....	38.15	Mar. 6.....	41.13

Location: 82-40-17ABBC WC-188 Aquifer: Boyer
Altitude: 1122 feet MP is the top of 2-inch pipe 1.90 feet above lsd

May 26, 1983...	22.41	Sep. 7.....	24.21	Jan. 10, 1984...	24.45
June 2.....	22.74	Oct. 4.....	24.80	Feb. 6.....	24.44
July 5.....	22.27	Nov. 8.....	24.92	Mar. 6.....	24.06
Aug. 2.....	23.75	Dec. 8.....	24.56		

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 82-42-14ADCA WC-4 Aquifer: Dakota
Altitude: 1340 feet MP is the top of 2-inch pipe 2.02 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
May 6, 1981...	245.04	Aug. 11.....	244.52	July 5.....	242.86
May 19.....	244.81	Sep. 9.....	244.49	Aug. 2.....	243.20
June 10.....	245.07	Oct. 7.....	243.91	Sep. 8.....	244.29
June 26.....	246.00	Nov. 1.....	243.86	Oct. 4.....	243.94
July 28.....	246.69	Dec. 10.....	244.40	Nov. 8.....	243.63
Nov. 3.....	246.13	Jan. 3, 1983...	244.21	Dec. 8.....	241.73
Feb. 5, 1982...	245.93	Feb. 8.....	243.94	Jan. 10, 1984...	242.71
Apr. 7.....	245.22	Mar. 10.....	243.79	Feb. 6.....	244.76
May 6.....	245.48	Apr. 12.....	243.10	Mar. 7.....	243.51
June 3.....	244.27	May 3.....	242.91		
July 6.....	244.19	June 2.....	242.82		

Location: 83-31-04ADDB WC-120 Aquifer: Dakota
Altitude: 1000 feet MP is the top of 2-inch pipe 2.10 feet above lsd

Sep. 1, 1982...	18.41	Apr. 13.....	9.45	Nov. 8.....	16.00
Oct. 8.....	15.29	May 4.....	10.51	Dec. 8.....	15.81
Nov. 5.....	16.16	June 3.....	14.38	Jan. 10, 1984...	16.79
Dec. 9.....	16.00	July 5.....	6.39	Feb. 9.....	17.13
Jan. 5, 1983...	15.16	Aug. 3.....	15.89	Mar. 5.....	15.18
Feb. 9.....	16.58	Sep. 7.....	18.06		
Mar. 11.....	8.43	Oct. 5.....	17.80		

Location: 83-31-10AABB WC-121 Aquifer: North Raccoon
Altitude: 1012 feet MP is the top of 2-inch pipe 1.50 feet above lsd

Aug. 31, 1982...	9.80	Mar. 11.....	8.59	Oct. 5.....	12.37
Sep. 2.....	10.90	Apr. 13.....	6.19	Nov. 8.....	12.42
Oct. 8.....	>17.00	May 4.....	6.62	Dec. 7.....	>17.00
Nov. 2.....	>17.00	June 3.....	7.65	Jan. 10, 1984...	11.14
Dec. 9.....	>17.00	July 5.....	8.43	Feb. 9.....	11.59
Jan. 5, 1983...	12.23	Aug. 3.....	9.17	Mar. 5.....	9.04
Feb. 9.....	11.98	Sep. 8.....	11.93		

Location: 83-32-04ACCC WC-228 Aquifer: Dakota
Altitude: 1202 feet MP is the top of 2-inch pipe 2.10 feet above lsd

July 29, 1983...	153.93	Oct. 4.....	152.77	Dec. 7.....	153.67
Sep. 8.....	153.72	Nov. 8.....	153.60	Mar. 5, 1984...	153.64

Location: 83-32-08BBBC WC-229 Aquifer: Hardin Creek
Altitude: 1135 feet MP is the top of 2-inch pipe 2.20 feet above lsd

Sep. 7, 1983...	46.82	Dec. 7.....	41.76	Mar. 6.....	41.10
Oct. 5.....	43.46	Jan. 9, 1984...	41.29		
Nov. 8.....	42.19	Feb. 9.....	41.12		

Location: 83-38-04DABC WC-63 Aquifer: Boyer
Altitude: 1220 feet MP is the top of 2-inch pipe 2.00 feet above lsd

June 16, 1982...	7.48	Feb. 9.....	10.59	Oct. 3.....	8.05
July 6.....	8.11	Mar. 11.....	8.09	Nov. 7.....	8.47
Aug. 3.....	8.80	Apr. 12.....	6.78	Dec. 6.....	8.84
Sep. 9.....	9.46	May 4.....	6.16	Jan. 9, 1984...	9.24
Oct. 7.....	9.84	June 3.....	6.46	Feb. 8.....	9.48
Nov. 2.....	10.24	July 1.....	6.04	Mar. 5.....	8.72
Dec. 2.....	10.44	Aug. 2.....	7.03		
Jan. 4, 1983...	10.50	Sep. 7.....	7.80		

Table 1. Drinking Water Standards for Community Water Systems—Continued

Constituents	Maximum contaminant levels in community water supplies[1]	
	Primary Regulations	Secondary Regulations
Lead	50 ug/l	
Mercury	2 ug/l	
Selenium	10 ug/l	
Silver	50 ug/l	
Zinc		5000 ug/l
Aluminum	Not Applicable	
Radium (radium-226 and radium-228 combined)	5 pCi/l[4]	
Gross Alpha activity (including radium 226 but excluding radon and uranium	15 pCi/l	
Gross Beta as CS137	200 pCi/L[5]	

[2] ug/L—micrograms per liter.

[3] mg/L—milligrams per liter.

[4] pCi/l—picocuries per liter.

[5] Annual average concentrations yielding 4 millirems per year for a two liter daily intake. Value calculated from the Maximum Permissable Concentrations listed in NBS Handbook 69.

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 83-42-17ACDD WC-176 Aquifer: Basal Pleistocene
Altitude: 1160 feet MP is the top of 2-inch pipe 2.20 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
May 19, 1983...	60.42	Sep. 7.....	64.09	Jan. 10, 1984...	60.53
June 2.....	60.35	Oct. 4.....	62.10	Feb. 6.....	60.35
July 5.....	60.92	Nov. 7.....	61.25	Mar. 7.....	59.96
Aug. 2.....	61.96	Dec. 8.....	60.43		

Location: 83-42-17CABB WC-173 Aquifer: Soldier
Altitude: 1140 feet MP is the top of 2-inch pipe 1.80 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
May 12, 1983...	16.01	Sep. 7.....	18.61	Jan. 10, 1984...	18.14
June 2.....	17.43	Oct. 4.....	18.66	Feb. 6.....	17.62
July 5.....	17.11	Nov. 7.....	18.61	Mar. 7.....	18.29
Aug. 2.....	18.09	Dec. 8.....	18.16		

Location: 83-43-04CBCB WC-5 Aquifer: Dakota
Altitude: 1235 feet MP is the top of 2-inch pipe 2.53 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
May 6, 1981...	189.01	June 9.....	188.73	Mar. 10.....	187.28
May 19.....	188.92	July 6.....	188.27	Apr. 12.....	187.16
June 10.....	187.55	Aug. 4.....	187.65	May 2.....	186.07
June 25.....	188.59	Sep. 9.....	187.75	June 2.....	185.90
July 28.....	189.59	Oct. 7.....	187.27	July 5.....	186.20
Nov. 3.....	189.88	Nov. 1.....	187.22	Aug. 1.....	186.39
Feb. 2, 1982...	189.96	Dec. 10.....	187.75	Sep. 8.....	186.99
Apr. 7.....	189.00	Jan. 3, 1983...	187.70	Oct. 4.....	186.66
May 6.....	188.99	Feb. 8.....	187.33	Nov. 9.....	186.73

Location: 84-29-16CBAB WC-233 Aquifer: Beaver
Altitude: 1075 feet MP is the top of 2-inch pipe 1.80 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Aug. 5, 1983...	40.69	Nov. 8.....	40.16	Feb. 9.....	39.72
Sep. 8.....	41.18	Dec. 8.....	39.41	Mar. 5.....	38.68
Oct. 5.....	40.86	Jan. 10, 1984...	39.08		

Location: 84-32-08ACDB WC-124 Aquifer: Dakota and Pennsylvanian
Altitude: 1070 feet MP is the top of 2-inch pipe 1.55 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Sep. 2, 1982...	37.37	Apr. 13.....	34.58	Nov. 8.....	37.74
Oct. 8.....	38.47	May 4.....	34.35	Dec. 7.....	37.25
Nov. 5.....	38.08	June 3.....	34.52	Jan. 9, 1984...	37.81
Dec. 9.....	37.92	July 5.....	33.36	Feb. 9.....	37.94
Jan. 5, 1983...	37.62	Aug. 3.....	35.12	Mar. 5.....	37.67
Feb. 9.....	38.09	Sep. 8.....	36.89		
Mar. 11.....	35.48	Oct. 5.....	37.66		

Location: 84-32-08BDCA WC-126 Aquifer: North Raccoon
Altitude: 1040 feet MP is the top of 2-inch pipe 1.00 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Sep. 8, 1982...	14.86	Apr. 13.....	6.77	Nov. 8.....	12.60
Oct. 8.....	11.45	May 4.....	6.15	Dec. 7.....	13.04
Nov. 5.....	13.06	June 3.....	12.19	Jan. 9, 1984...	13.39
Dec. 9.....	13.20	July 5.....	5.71	Feb. 9.....	13.56
Jan. 5, 1983...	12.37	Aug. 3.....	13.44	Mar. 5.....	11.89
Feb. 9.....	13.61	Sep. 8.....	14.68		
Mar. 11.....	6.50	Oct. 5.....	14.40		

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 84-33-02BDBA WC-132 Aquifer: Dakota
Altitude: 1110 feet MP is the top of 2-inch pipe 2.00 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Sep. 9, 1982...	54.40	Apr. 13.....	53.91	Oct. 5.....	51.78
Oct. 8.....	54.58	May 4.....	53.14	Nov. 8.....	52.22
Nov. 5.....	54.72	June 3.....	52.29	Dec. 7.....	52.14
Dec. 9.....	54.57	July 5.....	51.99	Jan. 9, 1984...	52.25
Jan. 5, 1983...	54.74	Aug. 3.....	51.56	Feb. 9.....	52.30
Mar. 11.....	54.44	Sep. 8.....	51.95	Mar. 5.....	52.00

Location: 84-33-03AADC WC-129 Aquifer: Hardin Creek
Altitude: 1069 feet MP is the top of 2-inch pipe 1.30 feet above lsd

Sep. 8, 1982...	12.71	Apr. 13.....	9.58	Nov. 8.....	10.37
Oct. 8.....	11.95	May 4.....	9.39	Dec. 7.....	10.06
Nov. 5.....	11.87	June 3.....	10.23	Jan. 9, 1984...	10.49
Dec. 9.....	11.85	July 5.....	8.93	Feb. 9.....	10.70
Jan. 5, 1983...	11.60	Aug. 3.....	11.18	Mar. 5.....	9.89
Feb. 9.....	11.95	Sep. 8.....	11.12		
Mar. 11.....	10.33	Oct. 5.....	10.77		

Location: 84-33-03CADA WC-131 Aquifer: North Raccoon Terrace
Altitude: 1090 feet MP is the top of 2-inch pipe 2.31 feet above lsd

Sep. 9, 1982...	9.67	Mar. 11.....	9.13	Sep. 8.....	9.66
Oct. 7.....	10.17	Apr. 13.....	8.37	Oct. 5.....	9.11
Nov. 5.....	9.97	May 4.....	7.84	Nov. 8.....	10.51
Dec. 9.....	10.77	June 3.....	8.19	Dec. 7.....	9.92
Jan. 5, 1983...	10.57	July 5.....	7.39	Jan. 9, 1984...	10.09
Feb. 9.....	10.47	Aug. 3.....	8.58	Feb. 9.....	10.21

Location: 84-34-34BCDC WC-148 Aquifer: Dakota
Altitude: 1225 feet MP is the top of 2-inch pipe 2.40 feet above lsd

Sep. 27, 1982...	10.96	Apr. 13.....	15.84	Oct. 5.....	19.26
Oct. 6.....	20.50	May 4.....	15.56	Nov. 8.....	18.03
Nov. 5.....	20.50	June 3.....	16.84	Dec. 8.....	17.27
Dec. 9.....	19.67	July 5.....	15.64	Mar. 6, 1984...	16.64
Jan. 5, 1983...	19.17	Aug. 3.....	17.58		
Mar. 10.....	17.79	Sep. 8.....	19.49		

Location: 84-34-35DAAA WC-146 Aquifer: Middle Raccoon and Pleistocene
Altitude: 1185 feet MP is the top of 2-inch pipe 2.75 feet above lsd

Sep. 27, 1982...	6.58	Apr. 13.....	2.24	Nov. 8.....	5.77
Oct. 6.....	6.31	May 4.....	1.76	Dec. 8.....	3.73
Nov. 5.....	6.51	June 3.....	3.55	Jan. 9, 1984...	4.27
Dec. 9.....	5.15	July 5.....	2.24	Feb. 8.....	4.29
Jan. 5, 1983...	3.97	Aug. 3.....	4.18	Mar. 6.....	3.47
Feb. 9.....	4.36	Sep. 6.....	6.36		
Mar. 11.....	2.61	Oct. 5.....	6.10		

Location: 84-35-08BAAB WC-141 Aquifer: Middle Raccoon
Altitude: 1265 feet MP is the top of 2-inch pipe 3.10 feet above lsd

Sep. 20, 1982...	5.16	Apr. 13.....	2.35	Nov. 8.....	5.50
Oct. 7.....	5.16	May 4.....	2.15	Dec. 7.....	5.15
Nov. 4.....	4.88	June 3.....	3.74	Jan. 9, 1984...	5.26
Dec. 7.....	4.88	July 5.....	2.85	Feb. 8.....	6.59
Jan. 5, 1983...	4.51	Aug. 1.....	4.38	Mar. 5.....	4.50
Feb. 9.....	4.61	Sep. 7.....	5.09		
Mar. 11.....	2.88	Oct. 5.....	7.42		

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 84-37-08BCCB WC-226 Aquifer: Fremont
Altitude: 1380 feet MP is the top of 2-inch pipe 1.65 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
July 13, 1983...	158.58	Oct. 3.....	212.32	Feb. 8.....	211.20
July 22.....	156.37	Nov. 8.....	211.16	Mar. 5.....	211.03
Aug. 1.....	211.29	Dec. 8.....	211.09		
Sep. 7.....	211.56	Jan. 9, 1984...	209.40		

Location: 84-39-24CCAA WC-57 Aquifer: Boyer Terrace
Altitude: 1245 feet MP is the top of 2-inch pipe 2.25 feet above lsd

July 6, 1982...	42.08	Mar. 10.....	42.27	Oct. 3.....	41.80
Aug. 4.....	42.20	Apr. 12.....	42.22	Nov. 8.....	41.55
Sep. 9.....	41.94	May 5.....	42.32	Dec. 7.....	41.64
Nov. 2.....	42.74	June 3.....	41.49	Jan. 9, 1984...	41.62
Dec. 2.....	42.23	July 5.....	41.49	Feb. 8.....	41.69
Jan. 4, 1983...	42.24	Aug. 2.....	41.50	Mar. 5.....	41.69
Feb. 9.....	41.99	Sep. 7.....	41.56		

Location: 84-42-15AABB WC-170 Aquifer: Soldier
Altitude: 1170 feet MP is the top of 2-inch pipe 2.15 feet above lsd

May 10, 1983...	20.56	Sep. 7.....	21.85	Jan. 10, 1984...	21.50
June 2.....	21.26	Oct. 4.....	22.22	Feb. 6.....	21.57
July 5.....	20.72	Nov. 7.....	21.96	Mar. 7.....	21.53
Aug. 1.....	21.44	Dec. 8.....	21.56		

Location: 84-43-04ABAA WC-163 Aquifer: Maple
Altitude: 1090 feet MP is the top of 2-inch pipe 2.40 feet above lsd

May 5, 1983...	6.90	Sep. 7.....	10.66	Jan. 11, 1984...	13.26
June 2.....	8.83	Oct. 4.....	12.57	Feb. 7.....	13.24
July 5.....	7.82	Nov. 9.....	14.13	Mar. 7.....	12.36
Aug. 1.....	9.71	Dec. 7.....	13.28		

Location: 84-43-04CCBA WC-164 Aquifer: Maple
Altitude: 1085 feet MP is the top of 2-inch pipe 2.20 feet above lsd

May 5, 1983...	12.69	Sep. 7.....	22.05	Jan. 11, 1984...	18.62
June 2.....	15.41	Oct. 4.....	24.33	Feb. 7.....	18.37
July 5.....	13.04	Nov. 9.....	25.31	Mar. 7.....	15.58
Aug. 1.....	15.99	Dec. 7.....	21.50		

Location: 84-44-23DABC WC-168 Aquifer: Maple Terrace
Altitude: 1140 feet MP is the top of 2-inch pipe 3.25 feet above lsd

May 10, 1983...	92.50	Sep. 7.....	91.34	Feb. 7.....	89.00
June 2.....	91.38	Oct. 4.....	91.41	Mar. 7.....	88.79
July 5.....	90.75	Nov. 9.....	91.77		
Aug. 1.....	90.86	Jan. 11, 1984...	90.47		

Location: 84-44-24DCAD WC-166 Aquifer: Maple Terrace
Altitude: 1105 feet MP is the top of 2-inch pipe 2.10 feet above lsd

May 10, 1983...	19.56	Sep. 7.....	21.14	Jan. 11, 1984...	20.76
June 2.....	19.92	Oct. 4.....	21.76	Feb. 7.....	20.66
July 5.....	19.95	Nov. 9.....	20.83	Mar. 7.....	20.38
Aug. 1.....	19.36	Dec. 6.....	20.77		

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 85-29-19BAAA WC-231 Aquifer: Beaver Channel
Altitude: 1091 feet MP is the top of 2-inch pipe 2.60 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Aug. 5, 1983...	33.68	Nov. 8.....	30.66	Feb. 9.....	30.36
Sep. 8.....	30.88	Dec. 8.....	30.57	Mar. 5.....	30.37
Oct. 5.....	30.90	Jan. 10, 1984...	30.65		

Location: 85-29-32DDDD WC-232 Aquifer: Beaver Channel
Altitude: 1091 feet MP is the top of 2-inch pipe 2.50 feet above lsd

Aug. 5, 1983...	39.36	Nov. 8.....	39.40	Feb. 9.....	38.79
Sep. 8.....	39.63	Dec. 8.....	39.12	Mar. 5.....	38.79
Oct. 5.....	39.64	Jan. 10, 1984...	39.05		

Location: 85-33-07ABBA WC-133 Aquifer: North Raccoon
Altitude: 1090 feet MP is the top of 2-inch pipe 1.90 feet above lsd

Sep. 13, 1982...	6.87	Apr. 13.....	1.13	Nov. 8.....	6.68
Oct. 8.....	6.58	May 4.....	1.99	Dec. 7.....	5.96
Nov. 4.....	5.56	June 3.....	3.81	Jan. 9, 1984...	6.44
Dec. 9.....	6.02	July 5.....	0.68	Feb. 9.....	6.65
Jan. 5, 1983...	5.71	Aug. 1.....	4.21	Mar. 5.....	4.65
Feb. 9.....	5.91	Sep. 8.....	5.40		
Mar. 11.....	1.51	Oct. 5.....	7.98		

Location: 85-38-12DCBA WC-14 Aquifer: Fremont Channel
Altitude: 1225 feet MP is the top of 2-inch pipe 3.70 feet above lsd

July 28, 1981...	64.61	Oct. 7.....	64.26	Aug. 1.....	63.68
Sep. 22.....	64.86	Nov. 2.....	64.14	Sep. 7.....	63.91
Nov. 3.....	64.68	Dec. 2.....	63.90	Oct. 4.....	64.41
Feb. 5, 1982...	64.55	Jan. 5, 1983...	63.78	Nov. 8.....	63.74
Apr. 6.....	64.50	Feb. 8.....	63.69	Dec. 7.....	63.39
May 6.....	64.35	Mar. 10.....	63.74	Jan. 9, 1984...	63.48
June 9.....	64.17	Apr. 12.....	63.36	Feb. 8.....	64.04
July 6.....	64.10	May 4.....	63.35	Mar. 5.....	63.51
Aug. 5.....	64.37	June 3.....	63.16		
Sep. 8.....	64.44	July 5.....	63.33		

Location: 85-39-16ADDD WC-7A Aquifer: Dakota
Altitude: 1370 feet MP is the top of 5-inch pipe 3.14 feet above lsd

June 10, 1981...	238.35	Sep. 8.....	234.34	July 5.....	233.49
June 25.....	238.26	Oct. 7.....	233.95	Aug. 1.....	234.15
July 28.....	236.80	Nov. 1.....	234.07	Sep. 7.....	234.87
Nov. 3.....	235.43	Dec. 10.....	234.83	Oct. 4.....	236.01
Feb. 5, 1982...	235.40	Jan. 3, 1983...	234.71	Nov. 8.....	234.01
Apr. 6.....	235.34	Feb. 8.....	234.55	Dec. 7.....	233.60
May 6.....	235.22	Mar. 10.....	236.24	Jan. 9, 1984...	233.48
June 9.....	234.40	Apr. 12.....	233.99	Feb. 8.....	233.64
July 6.....	234.05	May 4.....	233.67	Mar. 5, 1994...	233.63
Aug. 5.....	234.27	June 3.....	233.83		

Table 3. Water levels in selected wells--Continued.

Depth to water, in feet below land surface datum

Location: 85-41-13CCCC WC-6 Aquifer: Basal Pleistocene and Dakota
Altitude: 1375 feet MP is the top of 2-inch pipe 3.49 feet above lsd

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
May 19, 1981...	247.69	Aug. 4.....	247.68	June 3.....	246.30
June 10.....	247.79	Sep. 8.....	248.67	July 5.....	246.48
June 25.....	245.42	Oct. 7.....	247.23	Aug. 1.....	246.54
July 28.....	244.23	Nov. 1.....	247.26	Sep. 8.....	246.75
Nov. 3.....	248.81	Dec. 10.....	247.97	Oct. 4.....	248.60
Feb. 5, 1982...	249.05	Jan. 3, 1983...	247.97	Nov. 8.....	246.34
Apr. 7.....	248.88	Feb. 8.....	247.82	Dec. 6.....	245.91
May 6.....	248.77	Mar. 10.....	247.33	Jan. 9, 1984...	246.00
June 9.....	248.57	Apr. 12.....	246.64	Feb. 8.....	245.91
July 6.....	248.46	May 4.....	246.50	Mar. 5.....	245.87

Location: 85-44-16CDAA WC-155 Aquifer: Dakota
Altitude: 1060 feet MP is the top of 2-inch pipe 2.25 feet above lsd

Oct. 18, 1982...	13.85	Apr. 12.....	7.93	Oct. 4.....	13.81
Nov. 2.....	13.92	May 2.....	8.36	Nov. 7.....	13.81
Dec. 2.....	13.50	June 2.....	10.54	Dec. 7.....	13.24
Jan. 3, 1983...	12.88	July 5.....	7.57	Jan. 11, 1984...	13.74
Feb. 8.....	13.16	Aug. 1.....	11.38	Feb. 7.....	13.91
Mar. 10.....	8.48	Sep. 7.....	13.34	Mar. 7.....	12.44

Location: 85-44-16DCDD WC-156 Aquifer: Little Sioux
Altitude: 1060 feet MP is the top of 2-inch pipe 2.50 feet above lsd

Oct. 18, 1982...	10.48	Apr. 12.....	4.82	Oct. 4.....	11.97
Nov. 2.....	11.41	May 2.....	5.51	Nov. 7.....	11.72
Dec. 2.....	11.04	June 2.....	8.53	Dec. 7.....	10.82
Jan. 3, 1983...	10.26	July 5.....	4.37	Jan. 11, 1984...	11.50
Feb. 8.....	10.54	Aug. 1.....	9.48	Feb. 7.....	11.66
Mar. 10.....	3.92	Sep. 7.....	11.49	Mar. 7.....	10.11

Location: 85-44-17DCAA WC-158 Aquifer: Dakota
Altitude: 1110 feet MP is the top of 2-inch pipe 2.70 feet above lsd

Oct. 19, 1982...	55.50	Apr. 12.....	52.28	Oct. 4.....	53.01
Nov. 2.....	55.43	May 2.....	51.80	Nov. 7.....	53.29
Dec. 2.....	55.08	June 2.....	51.36	Dec. 7.....	53.46
Jan. 3, 1983...	54.71	July 5.....	50.85	Jan. 11, 1984...	53.60
Feb. 8.....	54.68	Aug. 1.....	51.43	Feb. 7.....	53.90
Mar. 10.....	53.67	Sep. 7.....	52.57	Mar. 7.....	53.16

Location: 85-44-22ADAA WC-8 Aquifer: Dakota
Altitude: 1120 feet MP is the top of 2-inch pipe 3.24 feet above lsd

June 10, 1981...	67.47	Aug. 4.....	66.07	June 2.....	61.59
June 25.....	67.44	Sep. 8.....	66.54	July 5.....	60.83
July 28.....	67.62	Oct. 7.....	65.91	Aug. 1.....	61.86
Sep. 22.....	68.08	Nov. 1.....	65.68	Sep. 7.....	63.14
Nov. 3.....	68.16	Dec. 2.....	65.35	Oct. 4.....	62.62
Feb. 2, 1982...	68.31	Jan. 3, 1983...	65.03	Nov. 7.....	63.82
Apr. 6.....	67.14	Feb. 8.....	64.93	Dec. 7.....	63.77
May 6.....	67.28	Mar. 10.....	62.95	Jan. 11, 1984...	63.87
June 9.....	66.78	Apr. 12.....	62.22	Feb. 7.....	63.88
July 6.....	66.64	May 2.....	61.40	Mar. 7.....	62.92

Table 4. Chemical analyses of ground-water in observation wells and selected municipalities.

[Chemical analyses are grouped according to aquifers]

Aquifer Units

111, Alluvium
112, Pleistocene
217, Dakota

ANCL, Anthon Aquifer
BGLC, Bagley Aquifer
BLPC, Basal Pleistocene Aquifer
BRRV, Boyer Aquifer
BVCL, Beaver Aquifer
DKOT, Dakota Aquifer
DKPV, Dakota and Pennsylvania Aquifers
ENRV, East Nishnabotna Aquifer
FMCL, Fremont Aquifer
HCKC, Hardin Creek Aquifer
LSRV, Little Sioux Aquifer
MPRV, Maple Aquifer
MRRV, Middle Raccoon Aquifer
MRVT, Maple Terrace Aquifer
NRRV, North Raccoon Aquifer
PLSC, Pleistocene Aquifer
SDRV, Soldier Aquifer
SRRV, South Raccoon Aquifer
WRND, West Nishnabotna Aquifer

Agency Analyzing Code

EPA, U.S. Environmental Protection Agency
UHL, University Hygienic Laboratory

pH, Temperature and Specific Conductance

Values shown were at the well at the time the water was sampled, except for specific conductance values followed by *. * indicates specific conductance was measured by the analyzing lab.

Table 4. Chemical analyses of ground-water in observation wells and selected municipalities--Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE	WELL NAME AND NUMBER	COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANALYZING SAMPLE
413958094544501	217DKOT	81-08-05	07935W10CABB	1981	IGS & USGS WC #17	AUDUBON	210	UHL
414514094381601	217DKOT	82-07-28	08033W12ACCC	1982	IGS & USGS WC #90	GUTHRIE	81	UHL
414624095252301	217DKOT	81-06-11	08039W06AADC	1981	IGS & USGS WC #10	SHELBY	370	UHL
414500095420002	217DKOT	82-03-02	08042W14AACC	1936	WOODBINE NO 1	HARRISON	92	EPA
414821094271301	217DKOT	82-08-12	08131W22CCCC	1982	IGS & USGS WC #105	GUTHRIE	153	UHL
414728094385301	217DKOT	82-07-27	08133W26DDDD	1982	IGS & USGS WC #93	GUTHRIE	75	UHL
415023094593801	217DKOT	81-08-19	08136W12CBCA	1981	IGS & USGS WC #18	AUDUBON	315	UHL
414700095251901	217DKOT	82-03-03	08139W32CBBB	1981	EARLING NO 7	SHELBY	470	EPA
415003095382301	217DKOT	81-06-18	08141W17ABAA	1981	IGS & USGS WC #11	HARRISON	166	UHL
414700095373001	217DKOT	82-08-03	08141W33CAAA	1982	IGS & USGS WC #52	HARRISON	155	UHL

DATE OF SAMPLE	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DISSOLVED (MG/L)	ALKALINITY LAB (MG/L AS CACO3)	HARDNESS (MG/L AS CACO3)	IRON, DISSOLVED (UG/L AS FE)	SILICA, DISSOLVED (MG/L AS SIO2)	POTASSIUM, DISSOLVED (MG/L AS K)	SODIUM ADSORPTION RATIO (SAR)	SODIUM, DISSOLVED (MG/L AS NA)	CALCIUM DISSOLVED (MG/L AS CA)
81-08-05	--	--	3600*	3460	287	1600	240	19	17	4.1	360	380
82-07-28	7.4	12.0	291	184	144	150	110	19	.3	.2	5.6	42
81-06-11	--	--	3400*	3160	204	1200	160	20	11	5.4	410	330
82-03-02	7.2	11.3	722*	476	340	460	<50	13	--	.4	21	120
82-08-12	7.1	17.0	597	333	313	320	1000	24	1.7	.2	6.6	82
82-07-27	8.0	13.0	400*	340	158	190	7400	31	1.8	.2	5.4	56
81-08-19	--	--	3700*	3550	345	1600	10	18	11	4.5	400	430
82-03-03	7.6	12.3	3710*	3170	213	1500	1000	9.8	--	4.4	380	400
81-06-18	--	--	2500*	2250	234	960	30	34	10	3.2	220	250
82-08-03	7.5	22.0	550	342	307	310	610	27	3.5	.2	9.5	84

DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG)	MANGANESE, DISSOLVED (UG/L AS MN)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	FLUORIDE, DISSOLVED (MG/L AS F)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVED (UG/L AS PB)
81-08-05	150	3600	.07	.20	10	2000	10	200	<1	<10	<10	80
82-07-28	10	10	2.2	.30	1.5	6.4	<10	100	<1	<10	<10	<10
81-06-11	86	750	.05	.20	17	1700	<10	<100	<1	<10	<10	<10
82-03-02	38	130	5.1	.28	14	69	<50	210	<2	<5	<2	<50
82-08-12	28	20	.47	.40	1.5	6.2	<10	100	<1	<10	<10	<10
82-07-27	12	230	3.2	.30	4.5	27	<10	200	<1	<10	200	<10
81-08-19	130	580	<.02	.10	22	2000	<10	200	<1	<10	20	<10
82-03-03	110	750	<.04	.17	16	1700	<50	16	<2	<5	<2	<50
81-06-18	82	1500	1.6	.20	20	1100	<10	100	<1	<10	<10	<10
82-08-03	25	40	1.9	.20	1.0	7.8	<10	300	<1	<10	<10	<10

DATE OF SAMPLE	MERCURY DISSOLVED (UG/L AS HG)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	ALUMINUM, DISSOLVED (UG/L AS AL)	GROSS ALPHA, DISSOLVED (PCI/L)	RADIUM 226, DISSOLVED (PCI/L)	RADIUM 228, DISSOLVED (PCI/L)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)
81-08-05	<1.0	<10	<10	40	--	8.8	1.0	3.9	30
82-07-28	<1.0	<10	<10	<10	--	<.1	--	--	1.0
81-06-11	<1.0	<10	<10	<10	--	6.3	.4	--	<.5
82-03-02	<.1	8	<5	<20	<100	3.1	.4	2.4	5.0
82-08-12	<1.0	<10	<10	10	--	1.4	--	--	4.0
82-07-27	<1.0	<10	<10	120	--	1.7	--	--	6.0
81-08-19	<1.0	<10	<10	20	--	22	.9	1.8	24
82-03-03	<.1	<5	<5	240	<300	1.0	--	--	20
81-06-18	<1.0	<10	<10	--	--	7.5	.6	<.6	12
82-08-03	<1.0	<10	<10	130	--	2.3	.2	.7	6.0

Table 4. Chemical analyses of ground-water in observation wells and selected municipalities--Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE	WELL NAME AND NUMBER	COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANALYZING SAMPLE
415608094260701	217DKOT	83-08-10	08231W10AAAA	1983	IGS & USGS WC #235	GREENE	125	UHL
415151094403501	217DKOT	82-03-01	08233W34DCCB	1944	COON RAPIDS #3	CARROLL	126	EPA
415451095224701	217DKOT	81-06-25	08239W15CBAB	1981	IGS & USGS WC #12	CRAWFORD	285	UHL
415514095312001	217DKOT	81-06-05	08240W17AABB	1981	IGS & USGS WC #9	CRAWFORD	141	UHL
420146094272301	217DKOT	82-08-30	08331W04ADDB	1982	IGS & USGS WC #120	GREENE	51	UHL
420149094344701	217DKOT	83-07-28	08332W04ACCC	1983	IGS & USGS WC #228	GREENE	240	UHL
420139095515701	217DKOT	81-05-05	08343W04CBCB	1981	IGS & USGS WC #5	MONONA	315	UHL
420705094394501	217DKOT	82-09-10	08433W02BDBA	1982	IGS & USGS WC #132	CARROLL	76	UHL
420331094440101	217DKOT	82-04-21	08433W30ACBB	1978	GLIDDEN NO 6	CARROLL	183	EPA
420233094475901	217DKOT	82-09-28	08434W34BCDC	1982	IGS & USGS WC #148	CARROLL	99	UHL

DATE OF SAMPLE	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DISSOLVED (MG/L)	ALKALINITY LAB (MG/L AS CACO3)	HARDNESS (MG/L AS CACO3)	IRON, DISSOLVED (UG/L AS FE)	SILICA, DISSOLVED (MG/L AS SIO2)	POTASSIUM, DISSOLVED (MG/L AS K)	SODIUM ADSORPTION RATIO (SAR)	SODIUM, DISSOLVED (MG/L AS NA)	CALCIUM DISSOLVED (MG/L AS CA)
83-08-10	7.4	12.0	812	449	469	440	3400	22	4.1	.6	26	120
82-03-01	7.1	11.0	483*	304	175	230	<50	10	--	.5	18	64
81-06-25	--	--	3600*	3350	197	1200	80	14	15	5.0	390	350
81-06-05	--	--	530*	324	271	290	530	31	3.2	.5	17	82
82-08-30	7.2	13.0	670*	415	280	360	240	25	1.5	.1	4.9	92
83-07-28	7.8	22.0	700	472	414	360	3100	20	6.9	.6	24	95
81-05-05	--	--	870*	612	305	230	20	14	11	3.3	110	61
82-09-10	--	25.0	860	555	305	450	2000	34	3.4	.2	9.0	120
82-04-21	7.0	11.0	912*	524	364	440	<50	9.5	4.0	.5	24	120
82-09-28	7.5	11.0	630	420	289	350	680	27	2.7	.2	8.8	92

DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG)	MANGANESE, DISSOLVED (UG/L AS MN)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	FLUORIDE, DISSOLVED (MG/L AS F)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVED (UG/L AS PB)
83-08-10	34	610	.05	.30	.5	28	<10	200	<1	<10	<10	<10
82-03-01	18	47	3.8	.27	6.0	27	<50	200	<2	<5	9	<50
81-06-25	90	830	.14	.20	22	1900	<10	<100	<1	<10	<10	<10
81-06-05	20	40	.02	.40	1.0	48	<10	200	<1	<10	<10	<10
82-08-30	32	90	.05	.20	11	75	<10	200	<1	<10	<10	<10
83-07-28	30	220	.23	.40	.5	27	<10	800	<1	<10	<10	<10
81-05-05	19	70	<.02	.70	8.0	150	<10	100	<1	<10	<10	<10
82-09-10	37	60	23	.20	26	47	<10	200	<1	<10	<10	<10
82-04-21	33	1300	1.4	.36	2.0	60	<5	150	<2	<5	<10	<50
82-09-28	30	500	<.02	.45	4.0	80	<10	200	<1	<10	<10	<10

DATE OF SAMPLE	MERCURY DISSOLVED (UG/L AS HG)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	ALUMINUM, DISSOLVED (UG/L AS AL)	GROSS ALPHA, DISSOLVED (PCI/L)	RADIUM 226, DISSOLVED (PCI/L)	RADIUM 228, DISSOLVED (PCI/L)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)
83-08-10	<1.0	<10	<10	10	--	3.8	3.0	1.9	8.0
82-03-01	.1	<5	<5	<20	<100	2.4	.4	.7	3.0
81-06-25	<1.0	<10	<10	<10	--	6.6	.4	<.6	26
81-06-05	<1.0	<10	<10	<10	--	2.1	--	--	5.0
82-08-30	<1.0	<10	<10	<10	--	8.5	4.0	1.2	8.0
83-07-28	<1.0	<10	<10	<70	--	2.3	--	--	6.0
81-05-05	<1.0	<10	<10	<10	--	1.8	--	--	11
82-09-10	<1.0	<10	<10	80	--	1.1	--	--	1.0
82-04-21	<.1	<5	<5	<20	<20	1.4	--	--	1.0
82-09-28	<1.0	<10	<10	<10	--	2.3	--	--	4.0

Table 4. Chemical analyses of ground-water in observation wells and selected municipalities--Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE WELL NAME AND NUMBER		COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANALYZING SAMPLE
420316094515801	217DKOT	82-04-19	08435W25DACB	1957	CARROLL NO 11	CARROLL	189	EPA
421103094412201	217DKOT	82-04-21	08533W09DDAB	1954	LANESBORO #2	CARROLL	134	EPA
420733094465301	217DKOT	82-04-21	08534W35CCCB	1956	LIDDERDALE NO 2	CARROLL	240	EPA
421058094582701	217DKOT	82-04-20	08535W07CCCC	1942	BREDA #2	CARROLL	349	EPA
421018095582001	217DKOT	82-10-19	08544W16CDAA	1982	IGS & USGS WC #155	MONONA	77	UHL
421018095591301	217DKOT	82-10-19	08544W17DCAA	1982	IGS & USGS WC #158	MONONA	135	UHL
420952095563401	217DKOT	81-06-03	08544W22ADAA	1981	IGS & USGS WC #8	MONONA	210	UHL
420603094355101	217DKPV	82-09-02	08432W08ACDB	1982	IGS & USGS WC #124	GREENE	129	UHL

DATE OF SAMPLE	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DISSOLVED (MG/L)	ALKALINITY LAB (MG/L AS CACO3)	HARDNESS (MG/L AS CACO3)	IRON, DISSOLVED (UG/L AS FE)	SILICA, DISSOLVED (MG/L AS SIO2)	POTASSIUM, DISSOLVED (MG/L AS K)	SODIUM ADSORPTION RATIO (SAR)	SODIUM, DISSOLVED (MG/L AS NA)	CALCIUM DISSOLVED (MG/L AS CA)
82-04-19	7.4	11.0	693*	408	263	340	55	11	7.0	.2	10	95
82-04-21	7.0	12.0	681*	476	308	340	10800	13	6.0	.2	10	91
82-04-21	7.1	11.0	720*	398	323	370	<50	10	4.0	.3	11	100
82-04-20	7.2	11.5	1830	1480	276	840	320	12	10	1.7	110	210
82-10-19	--	10.0	688	405	386	380	20	26	5.5	.2	8.8	93
82-10-19	--	11.0	657	399	382	380	1100	28	4.8	.2	7.8	91
81-06-03	--	--	1120*	764	360	470	60	20	9.4	1.8	86	130
82-09-02	7.4	11.0	680*	375	364	350	2400	25	4.2	.5	19	92

DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG)	MANGANESE, DISSOLVED (UG/L AS MN)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	FLUORIDE, DISSOLVED (MG/L AS F)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVED (UG/L AS PB)
82-04-19	26	500	<.05	.32	2.0	52	<5	200	<2	<5	<10	<50
82-04-21	27	120	.08	.33	<1.0	6.0	120	420	3	<5	<10	<50
82-04-21	28	410	.33	.31	<1.0	12	<5	280	<2	<5	<10	<50
82-04-20	76	1200	.02	.32	6.0	580	<5	13	<2	<5	<10	<50
82-10-19	36	360	.11	.30	1.5	23	<10	200	<1	<10	<10	<10
82-10-19	37	60	.14	.30	1.0	16	<10	200	<1	<10	<10	<10
81-06-03	35	90	2.9	.40	<.5	250	<10	<100	<1	<10	<10	<10
82-09-02	29	180	<.02	.30	<.5	14	50	300	<1	<10	<10	<10

DATE OF SAMPLE	MERCURY DISSOLVED (UG/L AS HG)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	ALUMINUM, DISSOLVED (UG/L AS AL)	GROSS ALPHA, DISSOLVED (PCI/L)	RADIUM 226, DISSOLVED (PCI/L)	RADIUM 228, DISSOLVED (PCI/L)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)
82-04-19	<.1	<5	<5	<20	<20	2.3	2.3	1.8	5.0
82-04-21	<.1	<5	<5	<20	<20	1.1	--	--	4.0
82-04-21	<.1	<5	<5	<20	<20	9.7	5.5	2.9	9.0
82-04-20	.1	<5	<5	<20	<20	5.5	1.0	1.2	15
82-10-19	<1.0	<10	<10	<10	--	7.2	1.8	1.9	7.0
82-10-19	<1.0	<10	<10	<10	--	2.8	--	--	4.0
81-06-03	<1.0	<10	<10	<10	--	2.7	--	--	22
82-09-02	<1.0	<10	<10	<10	--	4.8	2.0	2.0	9.0

Table 4. Chemical analyses of ground-water in observation wells and selected municipalities--Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE	WELL NAME AND NUMBER	COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANALYZING SAMPLE
413524095490601	111BRRV	82-05-10	07843W05BCDD	1982	IGS & USGS WC #32	HARRISON	51	UHL
413320095533401	111BRRV	82-09-14	07844W15CBAD	1954	MISSOURI VALLEY NO 2	HARRISON	100	EPA
413836095465502	111BRRV	83-06-03	07942W19BADC	1983	IGS & USGS WC #196	HARRISON	49	UHL
413819095471101	111BRRV	82-03-02	07942W19CBAB	1979	LOGAN NO 7	HARRISON	52	EPA
414226095435002	111BRRV	83-06-01	08042W27CCBA	1983	IGS & USGS WC #192	HARRISON	40	UHL
414228095442301	111BRRV	82-05-18	08042W28DBCD	1982	IGS & USGS WC #37	HARRISON	52	UHL
414213095431602	111BRRV	83-05-27	08042W34ABBB	1983	IGS & USGS WC #191	HARRISON	37	UHL
415109095363201	111BRRV	83-05-26	08141W03CDBB	1983	IGS & USGS WC #190	HARRISON	40	UHL
415124095361501	111BRRV	83-05-26	08141W03ACCC	1983	IGS & USGS WC #189	HARRISON	46	UHL
415118095361501	111BRRV	82-03-02	08141W03DBBD	1925	DUNLAP NO 1	HARRISON	85	EPA

DATE OF SAMPLE	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DISSOLVED (MG/L)	ALKALINITY LAB (MG/L AS CACO3)	HARDNESS (MG/L AS CACO3)	IRON, DISSOLVED (UG/L AS FE)	SILICA, DISSOLVED (MG/L AS SIO2)	POTASSIUM, DISSOLVED (MG/L AS K)	SODIUM ADSORPTION RATIO (SAR)	SODIUM, DISSOLVED (MG/L AS NA)	CALCIUM DISSOLVED (MG/L AS CA)
82-05-10	7.5	13.5	693	422	372	360	1300	14	3.6	.7	29	88
82-09-14	7.0	13.0	985	690	407	500	620	11	8.0	.6	32	130
83-06-03	7.2	15.0	819	465	407	420	1400	26	5.1	.5	22	110
82-03-02	7.2	11.7	925	552	355	460	4200	13	--	1.0	49	120
83-06-01	7.3	12.0	591	350	301	300	5000	30	3.6	.3	13	76
82-05-18	7.4	17.0	1000*	619	390	520	260	12	4.8	.5	23	130
83-05-27	7.0	12.0	668	389	327	340	360	22	4.4	.3	12	86
83-05-26	7.2	13.0	1035	689	329	460	490	25	4.8	.6	31	120
83-05-26	7.2	14.0	1137	729	404	570	1100	24	5.1	.5	28	150
82-03-02	7.3	12.5	767*	614	357	520	<50	13	--	.4	22	140

DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG)	MANGANESE, DISSOLVED (UG/L AS MN)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	FLUORIDE, DISSOLVED (MG/L AS F)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVED (UG/L AS PB)
82-05-10	33	280	.11	.30	2.0	28	<10	100	<1	<10	<10	<10
82-09-14	45	230	.92	.27	37	100	<50	170	<2	<5	<10	<50
83-06-03	36	2000	<.02	.30	8.0	52	<10	400	<1	<10	<10	<10
82-03-02	37	2100	1.3	.22	33	93	<50	120	<2	<5	<2	<50
83-06-01	27	2200	<.02	.30	2.0	31	<10	400	<1	<10	<10	<10
82-05-18	47	40	11	.20	15	92	<10	200	<1	<10	<10	<10
83-05-27	30	540	2.0	.20	2.5	30	<10	500	<1	<10	<10	<10
83-05-26	40	210	7.0	.20	35	160	<10	200	<1	<10	<10	<10
83-05-26	48	840	.25	.20	74	130	<10	300	<1	<10	<10	<10
82-03-02	42	87	13	.28	27	62	<50	160	<2	<5	6	<50

DATE OF SAMPLE	MERCURY DISSOLVED (UG/L AS HG)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	ALUMINUM, DISSOLVED (UG/L AS AL)	GROSS ALPHA, DISSOLVED (PCI/L)	RADIUM 226, DISSOLVED (PCI/L)	RADIUM 228, DISSOLVED (PCI/L)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)
82-05-10	<1.0	<10	<10	<10	--	6.9	.4	<.4	4.0
82-09-14	.1	<50	<5	<20	100	5.4	.1	1.1	6.0
83-06-03	<1.0	<10	<10	<10	--	4.7	.3	.6	6.2
82-03-02	<.1	5	<5	<20	<100	7.7	.2	1.5	9.0
83-06-01	<1.0	<10	<10	<10	--	<.2	--	--	4.0
82-05-18	<1.0	<10	<10	<10	--	19	.1	.6	3.0
83-05-27	<1.0	10	<10	<10	--	4.2	.9	.8	3.5
83-05-26	<1.0	<10	<10	<10	--	7.7	.5	.8	6.2
83-05-26	<1.0	<10	<10	10	--	13	1.1	1.0	13
82-03-02	.1	<5	<5	<20	<200	4.1	.8	2.4	10

Sodium-adsorption ratio was introduced by the U.S. Salinity Staff (1954), and was divided into 16 classes, depending on the SAR and specific conductance. The classifications indicate the usefulness of water for irrigation of different crops for different soils.

Potassium and Sodium

Potassium and sodium are dissolved from igneous and sedimentary rocks. Generally, potassium exists in much lower concentrations than sodium. More highly mineralized waters containing a high percentage of sodium salts may be unsatisfactory for irrigation. Low sodium diets are prescribed for certain types of ailments.

Calcium and Magnesium

Limestone, dolomite and gypsum are the principal rocks containing calcium and magnesium. Large concentrations cause water hardness and forms scale. Large concentrations of magnesium cause a laxative effect.

Manganese

Manganese is found in association with salts and iron compounds.The presence of manganese may cause a dark-brown or black stain on laundered fabrics or porcelain fixtures. Small concentrations may be objectionable due to taste.

Nitrate

The occurence of large nitrate concentrations in shallow ground water has been attributed to leaching in feedlots or to fertilizer from fields where nitrogen compounds have been applied. Large nitrate content is undesirable in drinking water because of its bitter taste and is reported to cause methemoglobinemia in infants.

Fluoride

Fluoride in the ground water is probably derived from solution of fluorite, apatite and hornblende minerals. Optimum concentrations of fluoride are effective in reducing dental carries, especially in the adolescents. Excess concentration may cause mottling of children's teeth.

Chloride

Chloride is dissolved from most rocks. Chloride when dissolved from certain chemicals produces a salty taste to water. Under some conditions, it may increase the corrosiveness of water.

Sulfate

Sulfate combined with calcium can form scale. Large concentrations of sulfate have a laxative effect.

Radionuclides

Radionuclides in drinking water are suspected of increasing the risk of various forms of cancer. Radioactivity is monitored through a screening process. When gross alpha activity exceeds 5 picocuries per liter (pCi/l), an equivalent sample is analyzed for radium-226; if the concentration of radium-226 exceeds 3 pCi/l, an equivalent sample is analyzed for radium-228. The combined radium-226 and radium-228 should not exceed 5 pCi/l. The gross alpha activity (including radium-226, but excluding radon and uranium) should not exceed 15 pCi/l. Maximum contaminant levels for gross beta are defined in terms of the annual dose rate (millirem per year) from continuous ingestion. The dose rate is calculated on the basis of 2 liter daily intake. The concentrations of man-made radionuclides (beta) causing 4 millirem per year have been calculated to picocuries/liter. Gross beta as Cesium 137 (Cs 137) should not exceed 200 pCi/l.

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Table 4. Chemical analyses of ground-water in observation wells and selected municipalities–Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE	WELL NAME AND NUMBER	COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANALYZING SAMPLE
414702095395101	111BRRV	82-06-04	08141W31BDDD	1982	IGS & USGS WC #53	HARRISON	30	UHL
415538095294502	111BRRV	82-03-02	08240W10CBAB	1932	DOW CITY NO 1	CRAWFORD	81	EPA
415512095313801	111BRRV	83-05-26	08240W17ABBC	1983	IGS & USGS WC #188	CRAWFORD	46	UHL
420147095161301	111BRRV	82-06-16	08338W04DABC	1982	IGS & USGS WC #63	CRAWFORD	29	UHL
420106095220101	111BRRV	82-03-04	08339W10ADBC	1972	DENISON NO 6	CRAWFORD	71	EPA
420438095055201	111BRRV	82-03-03	08437W24ABDB	1967	WESTSIDE NO 4	CRAWFORD	45	EPA
420328095122401	111BRRV	82-03-03	08437W30CBBB	1962	VAIL NO 2	CRAWFORD	32	EPA
420554095185401	111BRRV	82-03-03	08438W07CADC	1976	DELOIT NO 1	CRAWFORD	65	EPA
413537094532701	111ENRV	82-04-20	07835W04BCBD	1969	EXIRA NO 11	AUDUBON	60	EPA
413234094552401	111ENRV	82-04-20	07835W19BCDB	1976	BRAYTON	AUDUBON	42	EPA

DATE OF SAMPLE	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DISSOLVED (MG/L)	ALKALINITY LAB (MG/L AS CACO3)	HARDNESS (MG/L AS CACO3)	IRON, DISSOLVED (UG/L AS FE)	SILICA, DISSOLVED (MG/L AS SIO2)	POTASSIUM, DISSOLVED (MG/L AS K)	SODIUM ADSORPTION RATIO (SAR)	SODIUM, DISSOLVED (MG/L AS NA)	CALCIUM DISSOLVED (MG/L AS CA)
2-06-04	7.5	13.0	895	621	295	390	140	29	4.8	1.4	61	100
2-03-02	7.3	11.3	740	444	310	430	<50	11	--	.3	14	120
3-05-26	7.1	12.0	772	445	313	380	540	27	4.4	.2	9.4	99
2-06-16	7.2	13.0	1300*	1000	216	570	60	12	<.1	.2	13	160
2-03-04	7.3	10.0	1055	740	334	580	8700	14	--	.6	32	170
2-03-03	7.2	10.5	1086	948	329	680	<50	10	--	.5	26	200
2-03-03	7.2	11.0	869*	572	283	520	62	9.9	--	.3	16	150
2-03-03	7.4	11.0	603	424	264	330	120	11	--	.2	10	88
2-04-20	6.8	9.0	927*	612	233	380	<50	6.8	6.0	.5	20	110
2-04-20	6.9	12.0	917	706	266	450	8600	9.4	<2.0	.5	24	120

DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG)	MANGANESE, DISSOLVED (UG/L AS MN)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	FLUORIDE, DISSOLVED (MG/L AS F)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVED (UG/L AS PB)
2-06-04	34	20	7.0	.40	6.0	170	<10	<100	<1	<10	<10	<10
2-03-02	34	240	1.1	.29	13	75	<50	200	<2	<5	4	<50
3-05-26	33	230	1.7	.30	9.0	71	<10	300	<1	<10	<10	<10
2-06-16	42	40	54	.20	110	31	<10	1000	<1	<10	10	<10
2-03-04	36	1400	<.04	.23	69	120	<50	270	<2	<5	<2	<50
2-03-03	44	130	13	.24	53	170	<50	100	<2	<5	<2	<50
2-03-03	35	320	2.0	.28	24	120	<50	210	<2	<5	3	<50
2-03-03	27	94	1.7	.31	6.0	50	<50	210	<2	<5	<2	<50
2-04-20	23	1200	3.6	.26	44	91	<5	220	<2	<5	<10	<50
2-04-20	37	1100	.15	.31	57	110	<5	340	3	<5	<10	<50

DATE OF SAMPLE	MERCURY DISSOLVED (UG/L AS HG)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	ALUMINUM, DISSOLVED (UG/L AS AL)	GROSS ALPHA, DISSOLVED (PCI/L)	RADIUM 226, DISSOLVED (PCI/L)	RADIUM 228, DISSOLVED (PCI/L)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)
82-06-04	<1.0	<10	<10	10	--	.4	--	--	7.0
82-03-02	.2	5	<5	<20	<100	3.5	.2	.6	5.0
83-05-26	<1.0	<10	<10	<10	--	.4	--	--	3.0
82-06-16	<1.0	<10	<10	10	--	1.4	--	--	4.0
82-03-04	<.1	<5	<5	<20	<100	2.4	.5	.7	6.0
82-03-03	.5	<5	<5	<20	<200	7.5	.2	1.6	4.0
82-03-03	.2	<5	<5	<20	<100	2.5	.3	<.5	8.0
82-03-03	.1	<5	<5	<20	<100	1.0	--	--	3.0
82-04-20	3.1	<5	<5	<20	<20	4.8	.5	<.5	2.0
82-04-20	<.1	<5	<5	<20	<20	2.5	.6	<.5	1.0

Table 4. Chemical analyses of ground-water in observation wells and selected municipalities--Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE WELL NAME AND NUMBER		COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANALYZING SAMPLE
413041094555401	111ENRV	82-06-23	07836W36DABB	1982	IGS & USGS WC #71	AUDUBON	39	UHL
413843094541701	111ENRV	82-07-08	07935W15DCDD	1982	IGS & USGS WC #75	AUDUBON	30	UHL
414216094532301	111ENRV	82-04-20	08035W26CDDA	1977	AUDUBON TOWN WELL #19	AUDUBON	30	EPA
421006095580301	111LSRV	82-10-19	08544W16DCDD	1982	IGS & USGS WC #156	MONONA	40	UHL
420730095510701	111MPRV	83-05-04	08443W04ABAA	1983	IGS & USGS WC #163	MONONA	58	UHL
420649095515001	111MPRV	83-05-05	08443W04CCBA	1983	IGS & USGS WC #164	MONONA	50	UHL
420419095545701	111MPRV	82-03-02	08444W24CAAC		CASTANA NO 1 WEST WELL	MONONA	58	EPA
420950095480201	111MPRV	82-03-02	08543W24BAAA	1964	MAPLETON NO 4 (AIRPORT)	MONONA	72	EPA
414652094293301	111MRRV	82-08-13	08131W32CBCC	1982	IGS & USGS WC #106	GUTHRIE	51	UHL
415659094460601	111MRRV	82-09-29	08234W02AABB	1982	IGS & USGS WC #152	CARROLL	31	UHL

DATE OF SAMPLE	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DISSOLVED (MG/L)	ALKALINITY LAB (MG/L AS CACO3)	HARDNESS (MG/L AS CACO3)	IRON, DISSOLVED (UG/L AS FE)	SILICA, DISSOLVED (MG/L AS SIO2)	POTASSIUM, DISSOLVED (MG/L AS K)	SODIUM ADSORPTION RATIO (SAR)	SODIUM, DISSOLVED (MG/L AS NA)	CALCIUM DISSOLVED (MG/L AS CA)
82-06-23	6.9	13.0	890*	612	226	440	650	15	1.7	.6	30	120
82-07-08	7.3	11.0	810	525	257	450	2000	6.1	2.0	.3	13	130
82-04-20	6.7	10.0	657*	452	221	290	76	10	--	1.8	66	86
82-10-19	--	10.0	510	306	256	270	<10	21	.9	.2	8.5	74
83-05-04	7.5	12.0	1297	964	281	440	1100	27	9.5	3.4	160	120
83-05-05	7.2	12.0	838	533	389	430	650	26	4.8	.4	18	110
82-03-02	7.4	10.0	959*	586	308	510	220	11	--	.3	15	140
82-03-02	7.6	11.0	805	516	284	420	<50	13	--	.6	26	110
82-08-13	8.0	12.0	500	283	297	280	10	19	3.5	.2	6.6	71
82-09-29	7.1	14.0	637	460	304	330	1100	24	4.3	.6	24	91

DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG)	MANGANESE, DISSOLVED (UG/L AS MN)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	FLUORIDE, DISSOLVED (MG/L AS F)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVED (UG/L AS PB)
82-06-23	33	390	6.6	.20	31	190	<10	<100	<1	<10	<10	<10
82-07-08	30	1600	.86	.20	36	130	<10	100	<1	<10	<10	<10
82-04-20	18	600	.20	.21	12	32	<5	150	<2	<5	<10	<50
82-10-19	21	420	1.6	.40	1.5	27	<10	<100	<1	<10	<10	<10
83-05-04	34	180	.07	.40	20	460	<10	100	<1	<10	<10	<10
83-05-05	37	70	2.5	.30	6.0	8.0	<10	300	<2	<10	<10	<10
82-03-02	39	1800	8.6	.31	19	87	<50	400	<2	<5	5	<50
82-03-02	35	<2	9.6	.30	16	71	<50	160	<2	<5	4	<50
82-08-13	25	10	.57	.40	2.5	1.8	<10	400	<1	<10	10	20
82-09-29	26	620	1.2	.40	2.0	58	90	300	<1	<10	<10	<10

DATE OF SAMPLE	MERCURY DISSOLVED (UG/L AS HG)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	ALUMINUM, DISSOLVED (UG/L AS AL)	GROSS ALPHA, DISSOLVED (PCI/L)	RADIUM 226, DISSOLVED (PCI/L)	RADIUM 228, DISSOLVED (PCI/L)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)
82-06-23	<1.0	<10	<10	<10	--	1.1	--	--	3.0
82-07-08	<1.0	<10	<10	<10	--	12	.2	.7	7.0
82-04-20	<.1	<5	<5	<20	25	6.9	.1	<.5	10
82-10-19	<1.0	<10	<10	<10	--	2.2	--	--	3.0
83-05-04	<1.0	<10	<10	20	--	1.3	--	--	10
83-05-05	<1.0	10	<10	10	--	2.5	--	--	5.0
82-03-02	<.1	<5	<5	22	<100	2.5	.4	<.5	7.0
82-03-02	<.1	<5	<5	<20	<100	2.4	.1	.7	4.0
82-08-13	<1.0	<10	<10	50	--	6.1	.3	<.5	5.0
82-09-29	2.0	<10	<10	<10	--	8.0	.3	1.2	4.0

Table 4. Chemical analyses of ground-water in observation wells and selected municipalities--Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE	WELL NAME AND NUMBER	COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANALYZING SAMPLE
415658094462601	111MRRV	82-09-28	08234W02ABBB	1982	IGS & USGS WC #149	CARROLL	105	UHL
420626094565301	111MRRV	82-09-21	08435W08BAAB	1982	IGS & USGS WC #141	CARROLL	48	UHL
420406095543301	111MRVT	83-05-06	08444W24DCAD	1983	IGS & USGS WC #166	MONONA	71	UHL
415448094163401	111NRRV	82-08-24	08229W18CBAA	1982	IGS & USGS WC #115	GREENE	30	UHL
420606094361301	111NRRV	82-09-02	08432W08BDCA	1982	IGS & USGS WC #126	GREENE	28	UHL
421143094440201	111NRRV	82-09-15	08533W07ABBA	1982	IGS & USGS WC #133	CARROLL	25	UHL
414627095584101	111SDRV	83-05-24	08044W04BBDA	1983	IGS & USGS WC #184	HARRISON	73	UHL
414533095581901	111SDRV	83-05-24	08044W09ABBB	1983	IGS & USGS WC #183	HARRISON	96	UHL
415148095545001	111SDRV	83-05-18	08144W01ABAB	1983	IGS & USGS WC #177	HARRISON	58	UHL
415003095552401	111SDRV	82-09-15	08144W13BBBB	1929	PISGAH NO 1	HARRISON	103	EPA

DATE OF SAMPLE	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DISSOLVED (MG/L)	ALKALINITY LAB (MG/L AS CACO3)	HARDNESS (MG/L AS CACO3)	IRON, DISSOLVED (UG/L AS FE)	SILICA, DISSOLVED (MG/L AS SIO2)	POTASSIUM, DISSOLVED (MG/L AS K)	SODIUM ADSORPTION RATIO (SAR)	SODIUM, DISSOLVED (MG/L AS NA)	CALCIUM DISSOLVED (MG/L AS CA)
82-09-28	7.2	11.0	805	449	420	320	8000	36	8.7	.8	33	85
82-09-21	7.4	10.0	577	361	290	300	4200	35	3.6	.3	10	82
83-05-06	8.0	13.0	652	404	370	330	1100	24	6.0	.4	16	89
82-08-24	7.1	15.0	680*	441	264	360	30	22	1.6	.1	5.2	100
82-09-02	7.2	12.0	830*	510	399	460	3300	27	2.7	.2	11	120
82-09-15	7.6	12.0	1100*	729	423	500	190	27	5.5	1.0	52	130
83-05-24	7.1	12.0	746	416	387	360	3200	26	4.9	.3	12	95
83-05-24	7.0	14.0	710*	462	381	350	3300	34	2.4	.4	16	110
83-05-18	7.4	11.0	811	483	462	420	7200	30	4.7	.3	12	99
82-09-15	7.0	12.0	675	470	361	350	<50	12	8.0	.4	15	86

DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG)	MANGANESE, DISSOLVED (UG/L AS MN)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	FLUORIDE, DISSOLVED (MG/L AS F)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVED (UG/L AS PB)
82-09-28	25	120	<.02	.20	1.5	7.2	20	1500	<1	<10	<10	<10
82-09-21	24	80	.16	.20	2.0	32	10	400	<1	<10	<10	<10
83-05-06	26	1100	.25	.30	1.5	7.5	<10	400	<1	<10	10	<10
82-08-24	26	20	.23	.20	6.5	80	<10	<100	<1	<10	<10	<10
82-09-02	39	2100	<.02	.20	20	39	<10	400	<1	<10	<10	<10
82-09-15	43	60	3.2	.20	4.0	170	<10	100	<1	<10	<10	<10
83-05-24	30	660	<.02	.20	<.5	14	<10	400	<1	<10	<10	<10
83-05-24	18	2400	.72	.30	.5	8.2	<10	400	<1	<10	<10	<10
83-05-18	43	960	<.02	.30	2.5	3.0	10	600	<1	<10	<10	<10
82-09-15	32	<2	.23	.26	<1.0	14	<50	220	<2	<5	<10	<50

DATE OF SAMPLE	MERCURY DISSOLVED (UG/L AS HG)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	ALUMINUM, DISSOLVED (UG/L AS AL)	GROSS ALPHA, DISSOLVED (PCI/L)	RADIUM 226, DISSOLVED (PCI/L)	RADIUM 228, DISSOLVED (PCI/L)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)
82-09-28	3.0	<10	<10	<10	--	2.3	--	--	9.0
82-09-21	<1.0	<10	<10	<10	--	2.5	--	--	1.0
83-05-06	<1.0	<10	<10	<10	--	.4	--	--	5.0
82-08-24	<1.0	<10	<10	<10	--	1.3	--	--	1.0
82-09-02	<1.0	<10	<10	<10	--	1.1	--	--	2.0
82-09-15	<1.0	<10	<10	10	--	.4	--	--	6.0
83-05-24	<1.0	<10	<10	<10	--	<.1	--	--	5.0
83-05-24	<1.0	<10	<10	30	--	.7	--	--	11
83-05-18	<1.0	<10	<10	<10	--	.5	--	--	4.0
82-09-15	.2	<50	<5	<20	62	3.5	.4	.9	7.0

Table 4. Chemical analyses of ground-water in observation wells and selected municipalities--Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE	WELL NAME AND NUMBER	COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANALYZING SAMPLE
415518095510001	111SDRV	82-03-02	08243W09DDCD		MOORHEAD NO 2 -WEST WELL	MONONA	76	EPA
420004095454801	111SDRV	83-05-12	08342W17CABB	1983	IGS & USGS WC #173	MONONA	37	UHL
420421095351801	111SDRV	82-03-02	08441W23CABA	1955	CHARTER OAK NO 5	CRAWFORD	47	EPA
420544095425201	111SDRV	83-05-11	08442W15AABB	1983	IGS & USGS WC #170	MONONA	47	UHL
420241095422001	111SDRV	82-03-02	08442W35CABB	1974	UTE NO 3	MONONA	59	EPA
420736095342401	111SDRV	82-03-03	08541W36CCBC	1931	RICKETTS NO 2 (MAIN)	CRAWFORD	30	EPA
413547094202401	111SRRV	82-08-02	07830W06AACA	1982	IGS & USGS WC #86	GUTHRIE	22	UHL
414110094260501	111SRRV	83-08-18	07931W23BBBB	1982	IGS & USGS WC #85	GUTHRIE	27	UHL
414728094392401	111SRRV	82-07-26	08133W35ABBC	1982	IGS & USGS WC #94	GUTHRIE	35	UHL
415435094492801	111SRRV	82-04-19	08234W17DDBA	1969	DEDHAM NO 4	CARROLL	45	EPA

DATE OF SAMPLE	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DISSOLVED (MG/L)	ALKALINITY LAB (MG/L AS CACO3)	HARDNESS (MG/L AS CACO3)	IRON, DISSOLVED (UG/L AS FE)	SILICA, DISSOLVED (MG/L AS SIO2)	POTASSIUM, DISSOLVED (MG/L AS K)	SODIUM ADSORPTION RATIO (SAR)	SODIUM, DISSOLVED (MG/L AS NA)	CALCIU DISSOLVE (MG/L AS CA
82-03-02	7.4	11.0	805	532	333	440	<50	13	--	.4	19	110
83-05-12	7.0	12.0	940*	600	417	490	2000	27	5.2	.2	10	130
82-03-02	7.4	10.0	965	652	390	580	10000	14	--	.3	18	160
83-05-11	7.1	12.0	786	482	301	390	330	28	3.6	.2	8.0	100
82-03-02	6.9	11.0	940	616	373	540	350	11	--	.3	14	150
82-03-03	7.3	11.0	780	478	328	460	<50	11	--	.3	16	120
82-08-02	7.5	13.0	330*	246	124	150	13000	43	2.0	.4	9.7	43
83-08-18	7.0	20.0	300*	156	117	120	14000	25	<.1	.5	13	32
82-07-26	7.1	13.0	356	238	168	170	2000	25	.9	.3	7.8	50
82-04-19	7.2	11.0	693*	390	243	350	<50	9.8	<2.0	.3	11	100

DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG)	MANGANESE, DISSOLVED (UG/L AS MN)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	FLUORIDE, DISSOLVED (MG/L AS F)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVE (UG/L AS PB
82-03-02	40	92	7.1	.30	21	32	<50	360	<2	<5	8	<5
83-05-12	40	1700	<.02	.20	6.0	100	<10	700	<1	<10	<10	<1
82-03-02	42	1500	.23	.25	20	95	<50	650	<2	<5	<2	<5
83-05-11	34	30	15	.30	18	45	<10	700	<1	<10	<10	<1
82-03-02	41	330	5.3	.23	15	66	<50	470	<2	<5	<2	<5
82-03-03	38	370	2.7	.38	23	65	<50	260	<2	<5	<2	<5
82-08-02	9.9	1200	.72	.20	5.0	29	<10	200	<1	<10	<10	<1
83-08-18	9.9	830	.05	.20	5.0	26	<10	200	<1	<10	<10	<1
82-07-26	12	340	2.3	.30	3.5	20	<10	200	<1	<10	<10	<1
82-04-19	24	94	1.4	.24	13	47	<5	260	<2	<5	<10	<5

DATE OF SAMPLE	MERCURY DISSOLVED (UG/L AS HG)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	ALUMINUM, DISSOLVED (UG/L AS AL)	GROSS ALPHA, DISSOLVED (PCI/L)	RADIUM 226, DISSOLVED (PCI/L)	RADIUM 228, DISSOLVED (PCI/L)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)
82-03-02	.1	7	<5	<20	<100	2.9	.1	.6	8.0
83-05-12	<1.0	<10	<10	10	--	2.8	--	--	6.0
82-03-02	.1	<5	<5	<20	<100	1.6	--	--	4.0
83-05-11	<1.0	<10	<10	<10	--	2.1	--	--	2.0
82-03-02	<.1	<5	<5	<20	<100	4.4	.4	1.0	5.0
82-03-03	<.1	8	<5	<20	<100	15	.4	<.5	11
82-08-02	<1.0	<10	<10	20	--	.6	--	--	5.0
83-08-18	<1.0	<10	<10	10	--	<.1	--	--	2.0
82-07-26	<1.0	<10	<10	<10	--	2.0	.1	.4	2.0
82-04-19	<.1	14	<5	<20	<20	--	--	--	--

Table 4. Chemical analyses of ground-water in observation wells and selected municipalities--Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE	WELL NAME AND NUMBER	COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANALYZING SAMPLE
413442095193101	111WNRV	83-06-07	07839W10BBBA	1983	IGS & USGS WC #200	SHELBY	44	UHL
413325095171801	111WNRV	83-06-09	07839W13BCCC	1983	IGS & USGS WC #204	SHELBY	36	UHL
413031095204901	111WNRV	83-06-08	07839W32DDAA	1983	IGS & USGS WC #197	SHELBY	24	UHL
413824095185801	111WNRV	82-03-03	07938W19BDDB	1966	HARLAN NO 16	SHELBY	35	EPA
413752095141401	111WNRV	83-06-13	07938W23DCCC	1983	IGS & USGS WC #208	SHELBY	39	UHL
414238095185101	111WNRV	83-06-30	08038W30ACCC	1983	IGS & USGS WC #221	SHELBY	38	UHL
414211095161701	111WNRV	83-06-15	08038W33AABB	1983	IGS & USGS WC #216	SHELBY	41	UHL
414724095124001	111WNRV	82-09-13	08138W36AAAB	1969	IRWIN NO 4	SHELBY	41	EPA
414932095201801	111WNRV	82-03-03	08139W13CACB		DEFIANCE NO 2	SHELBY	42	EPA
415432095041401	111WNRV	82-04-20	08236W17CCAC	1926	MANNING NO 2	CARROLL	30	EPA

DATE OF SAMPLE	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DISSOLVED (MG/L)	ALKALINITY LAB (MG/L AS CACO3)	HARDNESS (MG/L AS CACO3)	IRON, DISSOLVED (UG/L AS FE)	SILICA, DISSOLVED (MG/L AS SIO2)	POTASSIUM, DISSOLVED (MG/L AS K)	SODIUM ADSORPTION RATIO (SAR)	SODIUM, DISSOLVED (MG/L AS NA)	CALCIUM DISSOLVED (MG/L AS CA)
83-06-07	6.9	12.0	592	391	242	310	2000	21	4.7	.2	9.3	86
83-06-09	7.0	15.0	640*	374	321	340	440	22	4.5	.2	10	93
83-06-08	6.9	12.0	500*	316	207	260	2500	18	1.7	.2	6.9	83
82-03-03	7.2	11.0	762*	522	305	480	4800	7.6	--	.6	30	140
83-06-13	7.5	14.0	565	344	274	320	890	13	3.9	.2	8.8	85
83-06-30	7.1	20.0	803	534	414	440	2800	27	1.6	.2	11	110
83-06-15	7.2	14.0	544	325	252	300	170	19	4.1	.2	8.1	80
82-09-13	7.0	11.0	814	590	319	420	<50	11	4.0	.4	19	120
82-03-03	7.3	11.7	915	668	327	560	3200	14	--	.3	16	150
82-04-20	7.3	10.5	911	654	283	490	130	11	3.0	.2	9.0	140

DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG)	MANGANESE, DISSOLVED (UG/L AS MN)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	FLUORIDE, DISSOLVED (MG/L AS F)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVED (UG/L AS PB)
83-06-07	23	700	<.02	.30	4.5	88	<10	300	<1	<10	<10	<10
83-06-09	26	460	.20	.30	2.0	36	<10	300	<1	<10	<10	<10
83-06-08	13	950	<.02	.20	1.5	58	<10	200	<1	<10	<10	<10
82-03-03	32	1700	.07	.21	34	120	<50	90	<2	<5	<2	<50
83-06-13	25	520	.05	.30	4.0	48	<10	200	<1	<10	<10	<10
83-06-30	39	980	.09	.20	5.5	28	<10	500	<1	<10	<10	<10
83-06-15	24	60	3.6	.30	6.0	30	<10	200	1	<10	<10	<10
82-09-13	32	180	3.4	.25	24	78	<50	420	<2	<5	<10	<50
82-03-03	45	840	<.04	.31	25	130	<50	310	<2	<5	<2	<50
82-04-20	35	260	3.7	.26	41	220	<5	160	<2	<5	<10	<50

DATE OF SAMPLE	MERCURY DISSOLVED (UG/L AS HG)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	ALUMINUM, DISSOLVED (UG/L AS AL)	GROSS ALPHA, DISSOLVED (PCI/L)	RADIUM 226, DISSOLVED (PCI/L)	RADIUM 228, DISSOLVED (PCI/L)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)
83-06-07	<1.0	<10	<10	<10	--	.9	--	--	<.5
83-06-09	<1.0	<10	<10	<10	--	.4	--	--	<.5
83-06-08	<1.0	<10	<10	<10	--	.3	--	--	<.5
82-03-03	<.1	<5	<5	<20	<100	6.0	.3	1.3	13
83-06-13	<1.0	<10	<10	<10	--	2.6	--	--	2.0
83-06-30	<1.0	<10	<10	300	--	1.5	--	--	5.0
83-06-15	<1.0	<10	<10	140	--	2.0	--	--	<.3
82-09-13	<.1	<50	<5	<20	75	<.2	--	--	3.0
82-03-03	.1	<5	<5	130	<200	.5	--	--	5.0
82-04-20	.1	<5	<5	<20	<20	4.1	.1	.6	2.0

Table 4. Chemical analyses of ground-water in observation wells and selected municipalities--Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE	WELL NAME AND NUMBER	COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANALYZING SAMPLE
415343095134901	111WNRV	82-04-20	08238W26ADDB	1932	MANILLA NO 1	CRAWFORD	85	EPA
420423095351801	112ANCL	82-03-02	08441W23CCAD	1953	CHARTER OAK NO 4-DEEP	CRAWFORD	207	EPA
415034094254801	112BGLC	82-03-01	08131W11BDCA	1898	TOWN OF BAGLEY	GUTHRIE	95	EPA
413024095353901	112BLPC	82-11-04	07841W31DDDD	1981	IGS & USGS WC #27	HARRISON	129	UHL
414149095422401	112BLPC	83-06-01	08042W35BDCC	1983	IGS & USGS WC #193	HARRISON	118	UHL
415550094115101	112BLPC	82-04-22	08229W11BDBC	1951	RIPPEY NO 1	GREENE	135	EPA
415449094155601	112BLPC	82-08-26	08229W18DBAA	1982	IGS & USGS WC #117	GREENE	75	UHL
420004095451501	112BLPC	83-05-16	08342W17ACDD	1983	IGS & USGS WC #176	MONONA	161	UHL
420919094281201	112BLPC	82-04-22	08531W21CCAA		CHURDAN NO 1	GREENE	160	EPA
421003095272801	112BLPC	82-03-03	08540W13CCCC	1935	SCHLESWIG NO 4 (WEST)	CRAWFORD	348	EPA

DATE OF SAMPLE	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DISSOLVED (MG/L)	ALKALINITY LAB (MG/L AS CACO3)	HARDNESS (MG/L AS CACO3)	IRON, DISSOLVED (UG/L AS FE)	SILICA, DISSOLVED (MG/L AS SIO2)	POTASSIUM, DISSOLVED (MG/L AS K)	SODIUM ADSORPTION RATIO (SAR)	SODIUM, DISSOLVED (MG/L AS NA)	CALCIUM DISSOLVED (MG/L AS CA)
82-04-20	7.3	11.5	737	504	284	410	1400	14	3.0	.3	12	120
82-03-02	7.5	10.0	3280	3140	195	1600	280	24	--	3.2	290	440
82-03-01	7.2	11.9	608	340	276	340	93	6.7	--	.3	11	91
82-11-04	--	9.0	917	574	380	350	70	16	5.1	2.1	85	93
83-06-01	7.2	15.0	721	388	330	360	120	28	4.1	.4	17	98
82-04-22	7.6	11.0	765	460	379	390	2300	13	6.0	.5	20	100
82-08-26	7.6	15.0	900*	515	502	440	20	23	5.1	.9	42	110
83-05-16	8.2	14.0	1463	1200	336	630	2900	35	11	2.5	140	170
82-04-22	7.6	10.5	1420	972	541	620	5400	17	11	1.4	80	150
82-03-03	7.5	12.0	2470*	2170	232	1100	1600	12	--	2.7	200	300

DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG)	MANGANESE, DISSOLVED (UG/L AS MN)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	FLUORIDE, DISSOLVED (MG/L AS F)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVED (UG/L AS PB)
82-04-20	30	320	.47	.34	9.0	95	<5	160	<2	<5	<10	<50
82-03-02	130	2000	<.04	.25	23	1600	<50	11	<2	<5	<2	<50
82-03-01	28	1300	2.5	.29	5.0	21	<50	240	<2	<5	<2	<50
82-11-04	28	110	1.6	.20	3.5	120	10	100	<1	<10	10	<10
83-06-01	27	60	<.02	.30	.5	42	<10	200	<1	<10	<10	<10
82-04-22	33	390	.02	.44	<1.0	11	<5	710	<2	<5	<10	<50
82-08-26	39	260	.07	.30	1.0	5.5	<10	300	<1	<10	<10	<10
83-05-16	50	860	<.02	.30	4.0	600	<10	400	<1	<10	20	20
82-04-22	62	80	.10	.24	<1.0	200	54	120	<2	<5	<10	<50
82-03-03	91	850	2.4	.28	23	930	<50	65	<2	<5	<2	<50

DATE OF SAMPLE	MERCURY DISSOLVED (UG/L AS HG)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	ALUMINUM, DISSOLVED (UG/L AS AL)	GROSS ALPHA, DISSOLVED (PCI/L)	RADIUM 226, DISSOLVED (PCI/L)	RADIUM 228, DISSOLVED (PCI/L)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)
82-04-20	.1	<5	<5	<20	<20	3.6	1.1	1.0	<.5
82-03-02	.1	<5	<5	130	<300	4.8	.1	1.0	3.0
82-03-01	<.1	<5	<5	<20	<100	8.2	.9	.9	9.0
82-11-04	<1.0	<10	<10	1100	--	2.1	--	--	5.0
83-06-01	<1.0	<10	<10	30	--	1.5	--	--	3.7
82-04-22	.1	<5	<5	<20	<20	2.4	2.1	.7	1.0
82-08-26	<1.0	<10	<10	<10	--	2.3	.7	2.0	4.0
83-05-16	<1.0	<10	<10	120	--	1.8	--	--	9.0
82-04-22	<.1	<5	<5	<20	<20	1.1	--	--	11
82-03-03	.1	<5	<5	94	<200	1.1	--	--	11

Table 4. Chemical analyses of ground-water in observation wells and selected municipalities--Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE	WELL NAME AND NUMBER	COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANALYZING SAMPLE
420632094143001	112BVCL	82-09-16	08429W04CCBB	1980	DANA NO 1	GREENE	186	EPA
420507094141901	112BVCL	83-08-05	08429W16CBAB	1983	IGS & USGS WC #233	GREENE	181	UHL
420958094162201	112BVCL	83-08-05	08529W19BAAA	1983	IGS & USGS WC #231	GREENE	221	UHL
420723094143201	112BVCL	83-08-04	08529W32DDDD	1983	IGS & USGS WC #232	GREENE	171	UHL
413359095182701	112FMCL	83-07-21	07839W11CCBC	1983	IGS & USGS WC #227	SHELBY	541	UHL
415424095134001	112FMCL	83-07-11	08238W23AAAA	1983	IGS & USGS WC #225	CRAWFORD	470	UHL
420608095111701	112FMCL	83-07-21	08437W08BCCB	1983	IGS & USGS WC #226	CRAWFORD	541	UHL
421106095125501	112FMCL	81-07-10	08538W12DCBA	1981	IGS & USGS WC #14	CRAWFORD	315	UHL
420047094223901	112HCKC	82-03-01	08330W07DADA	1953	JEFFERSON TOWN NO 4	GREENE	156	EPA
420116094363401	112HCKC	83-08-09	08332W08BBBC	1983	IGS & USGS WC #229	GREENE	181	UHL

DATE OF SAMPLE	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	SPECIFIC CONDUCTANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DISSOLVED (MG/L)	ALKALINITY LAB (MG/L AS CACO3)	HARDNESS (MG/L AS CACO3)	IRON, DISSOLVED (UG/L AS FE)	SILICA, DISSOLVED (MG/L AS SIO2)	POTASSIUM, DISSOLVED (MG/L AS K)	SODIUM ADSORPTION RATIO (SAR)	SODIUM, DISSOLVED (MG/L AS NA)	CALCIUM DISSOLVED (MG/L AS CA)
82-09-16	7.3	11.0	860	550	368	410	5300	15	11	.7	32	110
83-08-05	7.3	11.5	1270	1020	357	280	5600	11	7.3	2.5	93	68
83-08-05	7.5	12.0	1165	760	574	510	6600	21	7.2	1.7	85	120
83-08-04	7.6	15.0	1060	816	613	460	6300	38	7.3	2.0	95	120
83-07-21	8.0	14.0	3375	2820	212	860	5900	23	14	8.1	530	220
83-07-11	7.7	13.0	2900*	2440	215	850	50	19	14	6.2	400	220
83-07-21	8.1	14.0	2900*	3540	199	920	4900	19	16	5.9	400	240
81-07-10	--	--	3100*	2810	176	1100	820	20	17	4.4	330	300
82-03-01	7.4	11.8	1145	740	358	510	8100	13	--	1.5	77	140
83-08-09	7.3	12.0	671	350	379	320	6800	29	5.5	.5	21	86

DATE OF SAMPLE	MAGNESIUM, DISSOLVED (MG/L AS MG)	MANGANESE, DISSOLVED (UG/L AS MN)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	FLUORIDE, DISSOLVED (MG/L AS F)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COPPER, DISSOLVED (UG/L AS CU)	LEAD, DISSOLVED (UG/L AS PB)
82-09-16	33	170	<.04	.32	6.0	100	<50	190	<2	<5	<10	<50
83-08-05	27	90	.07	1.5	120	460	<10	400	<1	<10	<10	<10
83-08-05	50	70	.16	.30	2.5	110	<10	200	<1	<10	<10	<10
83-08-04	40	270	.16	.40	2.5	32	<10	700	<1	<10	<10	<10
83-07-21	76	270	.02	.20	22	1800	<10	<100	<1	<10	<10	<10
83-07-11	74	130	.05	.20	18	1400	<10	<100	<1	<10	<10	<10
83-07-21	79	150	.05	.30	18	1600	<10	<100	<1	<10	<10	<10
81-07-10	91	160	.05	.20	24	1600	10	<100	<1	<10	<10	<10
82-03-01	41	130	<.04	.22	110	70	<50	850	<2	<5	<2	<50
83-08-09	26	460	.09	.30	.5	4.0	<10	600	<1	<10	<10	<10

DATE OF SAMPLE	MERCURY DISSOLVED (UG/L AS HG)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	ZINC, DISSOLVED (UG/L AS ZN)	ALUMINUM, DISSOLVED (UG/L AS AL)	GROSS ALPHA, DISSOLVED (PCI/L)	RADIUM 226, DISSOLVED (PCI/L)	RADIUM 228, DISSOLVED (PCI/L)	GROSS BETA, DISSOLVED (PCI/L AS CS-137)
82-09-16	<.1	<50	<5	30	57	<.2	--	--	5.0
83-08-05	<1.0	<10	<10	10	--	1.4	--	--	3.0
83-08-05	<1.0	<10	<10	<10	--	1.7	--	--	3.0
83-08-04	<1.0	<10	<10	70	--	1.3	--	--	6.0
83-07-21	1.0	<10	<10	30	--	4.2	.5	<.5	8.0
83-07-11	<1.0	<10	<10	<10	--	<.1	--	--	11
83-07-21	<1.0	<10	<10	50	--	3.7	.4	1.3	13
81-07-10	<1.0	<10	<10	40	--	<.2	--	--	9.0
82-03-01	<.1	<5	<5	<20	<100	.1	--	--	1.0
83-08-09	<1.0	<10	<10	80	--	.6	--	--	4.0

Table 4. Chemical analyses of ground-water in observation wells and selected muri es--Continued.

STATION ID	AQUIFER UNIT	DATE OF SAMPLE	LOCATION	COMPLETION DATE	WELL NAME AND NUMBER	COUNTY	DEPTH OF WELL, TOTAL (FEET)	AGENCY ANA-LYZING SAMPLE
420104094324401	112HCKC	82-04-20	08332W11BDBC		SCRANTON NO 3	GREENE	209	EPA
420706094400901	112HCKC	82-09-08	08433W03AADC	1982	IGS & USGS WC #129	CARROLL	77	UHL
420230094380601	112HCKC	82-09-15	08433W36DBAB		RALSTON #1	CARROLL	160	EPA
420643094403701	112PLSC	82-09-10	08433W03CADA	1982	IGS & USGS WC #131	CARROLL	15	UHL
413223094150801	217DKOT	83-08-15	07830W24CAAB	1983	IGS & USGS WC #238	GUTHRIE	72	UHL
413248094314301	217DKOT	83-08-17	07832W21AAAA	1983	IGS & USGS WC #239	GUTHRIE	135	UHL
413044094565601	217DKOT	82-07-08	07836W35ADCC	1982	IGS & USGS WC #69	AUDUBON	115	UHL
413255095070401	217DKOT	81-07-30	07837W17DDDD	1981	IGS & USGS WC #16	SHELBY	181	UHL
413523095483101	217DKOT	82-05-13	07843W05ACDD	1982	IGS & USGS WC #33	HARRISON	179	UHL
414035094302501	217DKOT	82-04-19	07931W06CDBC	1929	GUTHRIE CENTER NO 1	GUTHRIE	62	EPA

DATE OF SAMPLE	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	SOLIDS, RESIDUE AT 105 DEG. C, DIS-SOLVED (MG/L)	ALKA-LINITY LAB (MG/L AS CACO3)	HARD-NESS (MG/L AS CACO3)	IRON, DIS-SOLVED (UG/L AS FE)	SILICA, DIS-SOLVED (MG/L AS SIO2)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	SODIUM AD-SORP-TION RATIO (SAR)	SODIUM, DIS-SOLVED (MG/L AS NA)	CALCIUM DIS-SOLVED (MG/L AS CA)
2-04-20	7.8	11.0	679	426	301	340	5000	8.6	4.0	.5	19	84
2-09-08	--	11.0	600	458	329	330	1400	32	4.4	.2	9.9	84
2-09-15	7.3	11.5	640	550	334	310	2800	15	8.0	.5	18	85
2-09-10	--	12.0	681	534	200	290	80	23	1.8	.0	3.2	80
3-08-15	7.4	19.0	1500*	1010	430	510	550	17	6.8	3.6	180	120
3-08-17	7.2	23.0	3100*	2790	414	1400	1800	19	10	3.8	310	360
2-07-08	7.2	25.0	351	444	136	170	4800	12	2.5	.2	7.1	45
1-07-30	--	--	520*	248	275	260	80	24	2.3	.4	15	72
2-05-13	--	14.0	644	373	347	340	460	13	3.3	.4	15	89
2-04-19	6.9	13.0	526*	320	115	220	400	10	3.0	.4	12	62

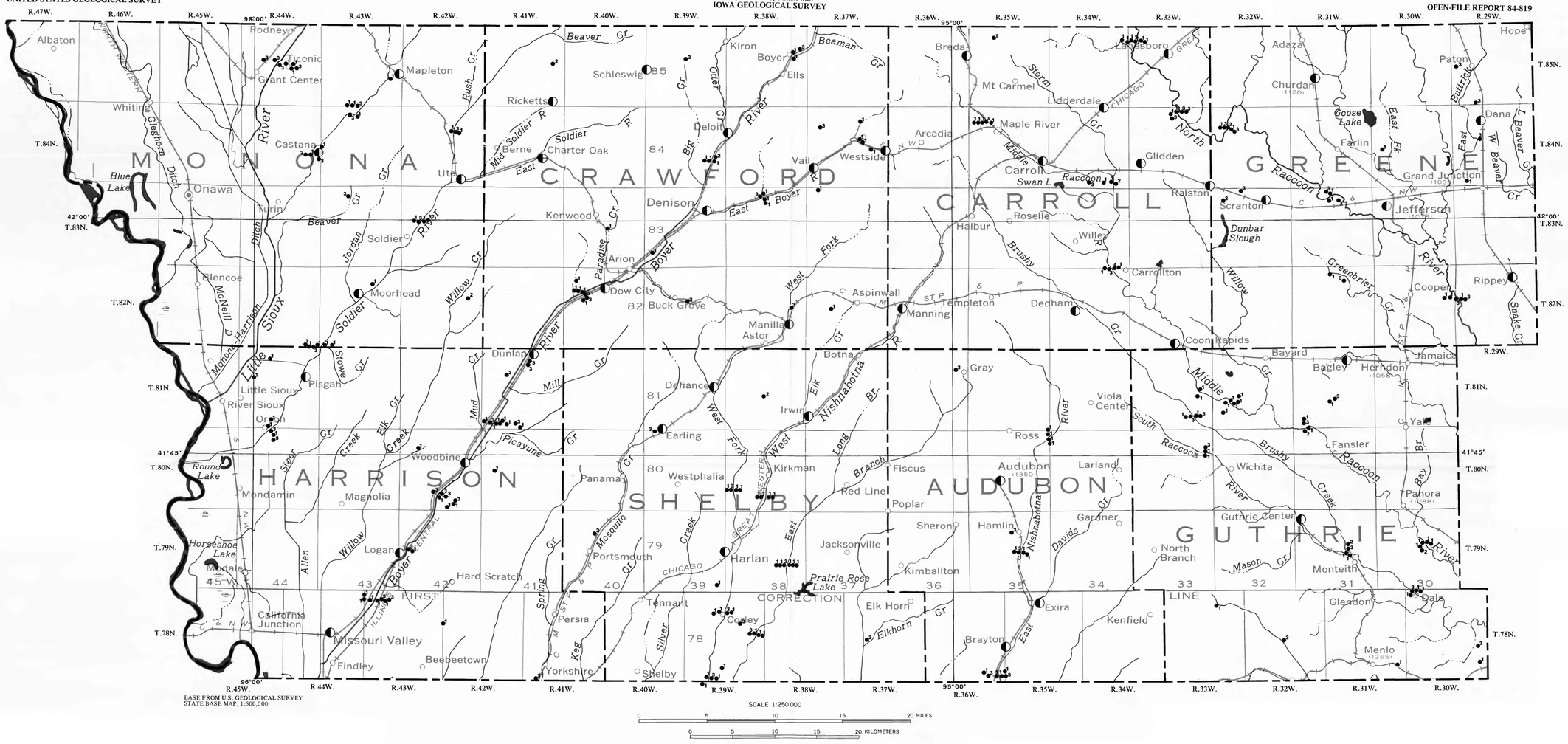
DATE OF SAMPLE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SULFATE DIS-SOLVED (MG/L AS SO4)	ARSENIC DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	LEAD, DIS-SOLVED (UG/L AS PB)
82-04-20	32	130	.02	.33	<1.0	34	75	400	<2	<5	<10	<50
82-09-08	28	110	.02	.40	6.0	24	<10	600	<1	<10	<10	<10
82-09-15	24	240	.09	.35	<1.0	11	<50	200	<2	<5	<10	<50
82-09-10	23	10	15	.20	31	14	<10	100	<1	<10	<10	<10
83-08-15	52	760	.09	.60	7.0	400	<10	<100	<1	<10	<10	<10
83-08-17	110	1400	.02	.40	16	1500	<10	<100	<1	<10	<10	<10
82-07-08	14	80	4.5	.30	3.0	25	<10	<100	<1	<10	<10	10
81-07-30	19	510	.07	.30	1.0	13	30	400	<1	<10	<10	<10
82-05-13	28	70	.02	.20	1.0	15	<10	<100	<1	<10	10	<10
82-04-19	16	340	5.2	.19	11	88	<5	75	<2	<5	<10	<50

DATE OF SAMPLE	MERCURY DIS-SOLVED (UG/L AS HG)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	ZINC, DIS-SOLVED (UG/L AS ZN)	ALUM-INUM, DIS-SOLVED (UG/L AS AL)	GROSS ALPHA, DIS-SOLVED (PCI/L)	RADIUM 226, DIS-SOLVED (PCI/L)	RADIUM 228, DIS-SOLVED (PCI/L)	GROSS BETA, DIS-SOLVED (PCI/L AS CS-137)
82-04-20	<.1	<5	<5	<20	<20	2.4	2.4	1.5	7.0
82-09-08	<1.0	<10	<10	<10	--	3.0	1.2	2.9	4.0
82-09-15	.1	<50	<5	<20	42	<.2	--	--	<.5
82-09-10	<1.0	<10	<10	<10	--	1.0	--	--	<.5
83-08-15	<1.0	<10	<10	140	--	2.6	--	--	6.0
83-08-17	<1.0	<10	<10	130	--	9.3	.9	.9	13
82-07-08	<1.0	<10	<10	470	--	1.6	--	--	13
81-07-30	<1.0	<10	<10	<10	--	1.1	--	--	2.0
82-05-13	<1.0	<10	<10	20	--	3.8	.5	.6	4.0
82-04-19	.1	<5	<5	<20	<20	1.5	--	--	1.0

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared in cooperation with
IOWA GEOLOGICAL SURVEY

OPEN-FILE REPORT 84-819



BASE FROM U.S. GEOLOGICAL SURVEY
STATE BASE MAP, 1:500,000

EXPLANATION

◐ Public Supply

• Test hole, log in table

- •¹ Log only
- •² Log and water-level
- •³ Log, water-level and QW
- •⁴ Log and QW
- ⊕ More than one test hole at this location

PLATE 1. LOCATIONS OF TEST HOLES, WELLS, AND WATER QUALITY FROM SELECTED MUNICIPALITIES

Table 2. Logs of wells and test holes.

Depths are shown in feet below land surface

Natural gamma logs are uncalibrated

In the description of materials, depth intervals which represent less than 1 foot in thickness* are demonstrated below.

260-265 Shale, silty, gray
*265-265 Limestone, hard, dark
265-272 Shale, light blue-gray

Electric logs are uncalibrated

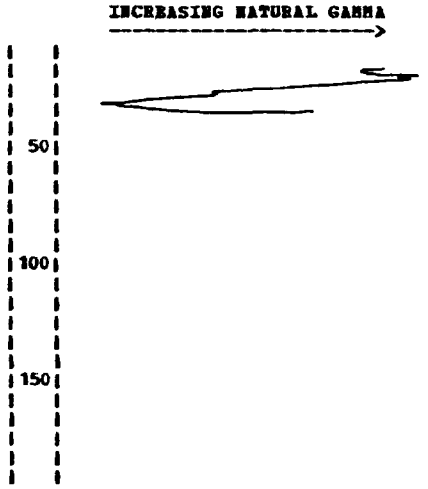
Potential given in millivolts (mV)

Casing records for test holes completed as observation wells are located at the end of the description of materials.

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-30-06AACA WC-86 STATION ID: 413547-0942024-01

ALTITUDE: 980 FEET (NGVD 1929) DEPTH: 23 FEET DATE COMPLETED: July 16, 1982

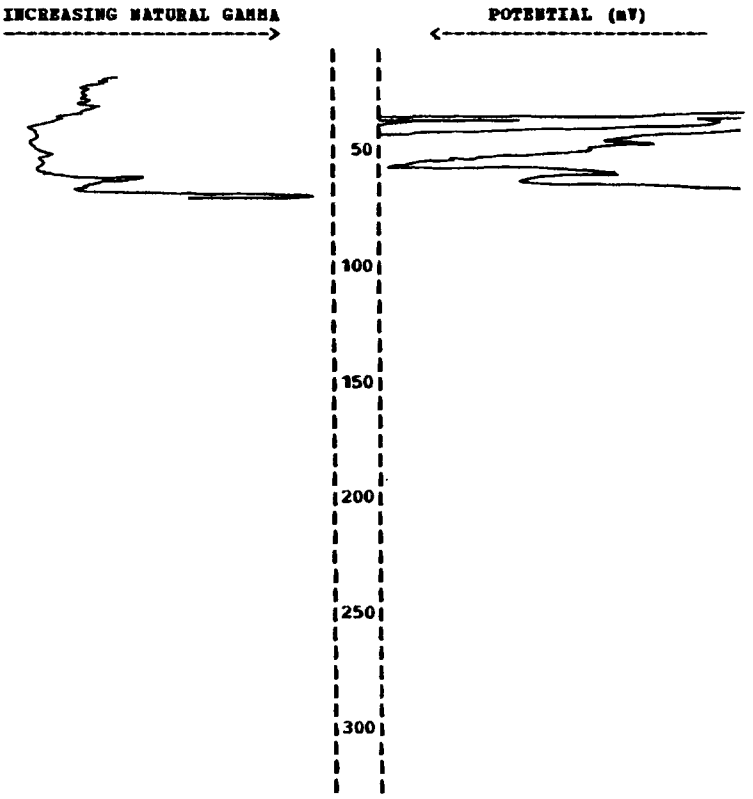


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Clay, silty, brown
5-8	Clay, silty, sandy, dark gray
8-12	Clay, silty, sandy, soft, brown; sand, occasional layer
12-14	Clay, silty, sandy, blue-gray; sand layers
14-18	Sand, fine to coarse, tan
18-21	Sand and gravel, fine to medium, gray, yellow-brown (mostly sand)
	PENNSYLVANIAN
21-23	Shale, light blue-gray

Casing record: set 2 inch pipe to 22 feet, slotted from 17 to 22 feet, gravel packed

LOCATION: 078-30-05BBDA WC-88 STATION ID: 413551-0941958-01

ALTITUDE: 1030 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: July 19, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed
3-5	Clay, silty, dark brown
5-10	Clay, silty, yellow-brown
10-22	Clay, silty, soft, yellow-brown, yellow-gray; iron concretions
22-27	Clay, sandy, soft, brown
27-30	Sand and gravel, fine, brown
30-35	Sand and gravel, fine to coarse, yellow-brown
35-37	Clay, sandy, yellow-tan; gravel mixed
37-39	Sand, fine to coarse, brown
39-44	Clay, sandy, gravelly, gray-brown
44-46	Sand, fine to coarse, oxidized, brown
46-49	Sand and gravel, fine to coarse, oxidized, brown
	PENNSYLVANIAN
49-50	Shale, yellow-gray
50-53	Shale, light blue-gray grading to gray-green
53-54	Limestone, gray
54-56	Shale, light gray-green
56-58	Shale, dark gray, gray-green
58-59	Limestone, shaly, light colored
59-61	Shale, dark gray-green

Ground-Water Data for the Alluvial, Buried Channel, Basal Pleistocene and Dakota Aquifer in West-Central Iowa

By
Pamela K.B. Hunt and Donna L. Runkle

United States Geological Survey

Open-File Report 84-819

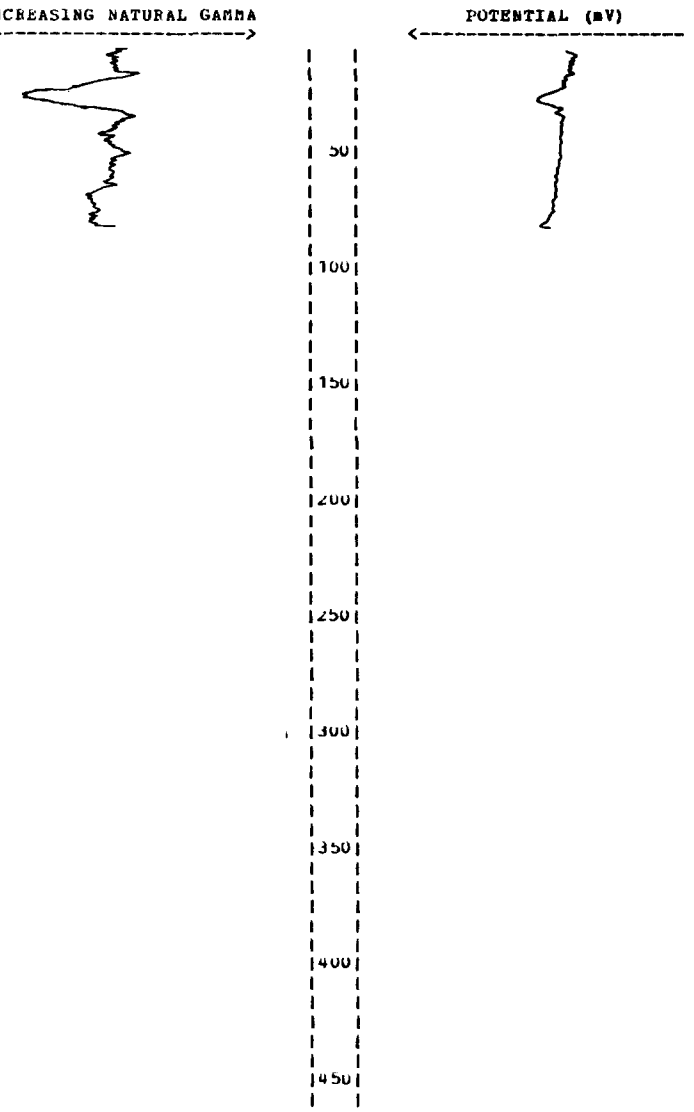
Prepared in cooperation with the Iowa Geological Survey

August, 1985

Table 2. Logs of wells and test holes--Continued.

LOCATION: 077-39-05BAAb WC-223 STATION ID: 413020-0952128-01

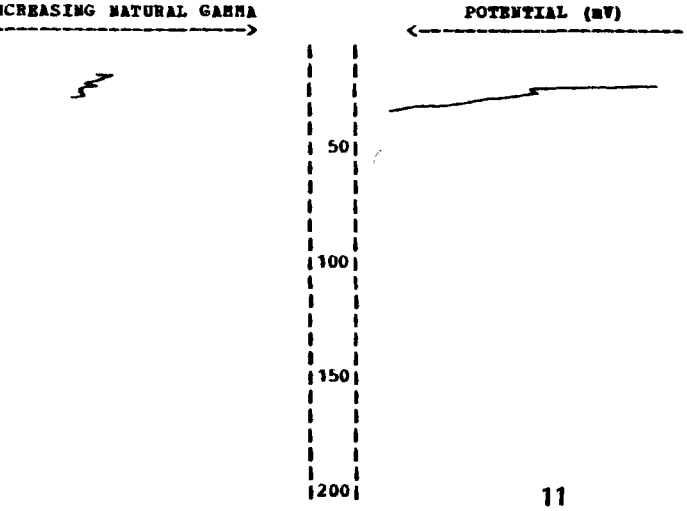
ALTITUDE: 1155 FEET (NGVD 1929) DEPTH: 281 FEET DATE COMPLETED: July 5, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil
2-6	Clay, silty, dark gray
6-13	Clay, silty, gray to yellow-gray
13-15	Clay, silty, yellow-brown
15-20	Clay, silty, oxidized streaks, gray, yellow, brown
20-24	Clay, silty, grading to very sandy at base, blue-gray
24-26	Sand, fine to coarse, gray
26-30	Sand and gravel, fine to medium, yellow-brown
30-30	Till, yellow-gray
30-72	Till, blue-gray
72-73	Sand and gravel, fine to coarse, gray
73 -170	Till, sandy, gravelly, blue-gray; sand and gravel, occasional layer; boulder
170-180	As above; clay, silty; till is lighter than above
180-220	Clay, silty, gray, light blue-gray
220-240	Clay, silty grading to sandy, gray
	PENNSYLVANIAN
240-245	Limestone, light tan, light gray
245-248	Shale, tan, gray; limestone, thin streaks
248-249	Shale, black; coal
249-256	Sandstone, fine, very silty, gray-green
256-266	Shale, very silty layers, gray
266-270	Shale, gray; siltstone; sandstone; limestone, thin layers
270-274	Shale, gray, dark gray, gray-green; siltstone, streaks
274-275	Shale, black; coal
275-276	Limestone, hard, cherty; shale, gray-green
276-281	Limestone, some shaly, light colored

LOCATION: 078-30-05BBCB WC-87 STATION ID: 413550-0942012-01

ALTITUDE: 990 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: July 19, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-10	Clay, silty, dark
10-15	Clay, silty, sandy, blue-gray grading to gray-brown
15-17	Sand, fine to coarse; clay, silty, gray
17-21	Sand and gravel, fine to coarse, tan, yellow-brown
	PENNSYLVANIAN
21-23	Limestone, gray, yellow-brown
23-26	Shale, gray-green, gray
26-28	Shale, dark gray, gray-green
28-32	Shale, gray-green, reddish brown
32-41	Shale, silty, sandy, light gray-green; siltstone, occasional layer; pyrite

Table 2. Logs of wells and test holes--Continued.

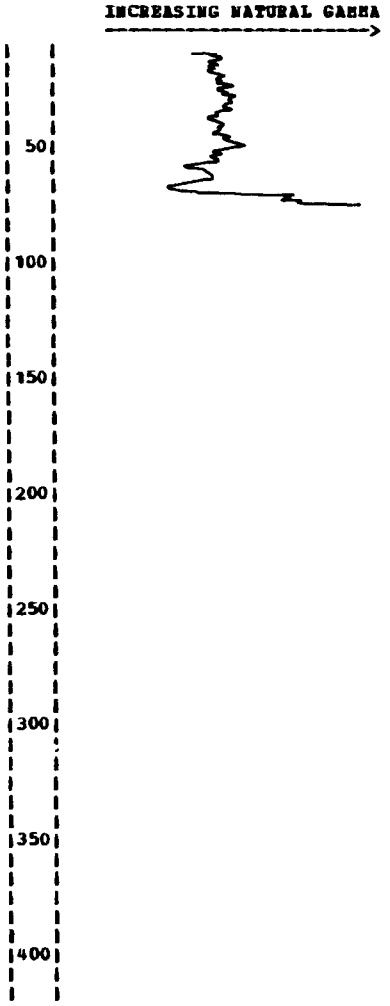
LOCATION: 078-30-06AACC WC-89 STATION ID: 413544-0942029-01

ALTITUDE: 1000 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: July 19, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-14	Fill; road bed
14-15	Clay, very dark, gray-brown
15-17	Clay, tan
17-19	Clay, sandy, oxidized, gray, brown
19-21	As above, gravelly, sandy
	PENNSYLVANIAN
21-22	Shale, yellow-gray
22-23	Shale, gray, maroon
23-25	Shale, maroon
25-35	Shale, silty, light gray-green; siltstone, occasional layer
35-41	Shale, gray-brown reen

LOCATION: 078-30-24CAAB WC-238 STATION ID: 413223-0941508-01

ALTITUDE: 1020 FEET (NGVD 1929) DEPTH: 72 FEET DATE COMPLETED: August 12, 1983



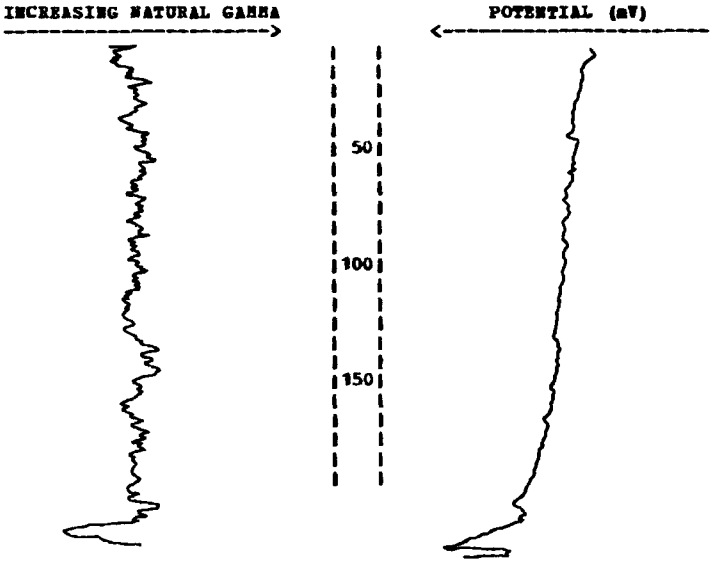
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-22	Till, yellow-brown
22-23	Boulder; limestone
23-25	Till, very sandy, brown, tan
25-27	Till, yellow-tan
27-30	Clay; till, yellow-brown, yellow-gray; shale, reworked
30-45	Clay, gray, yellow-brown, yellow-gray; till
45-46	Clay, gray, gray-green
46-47	Clay or shale reworked, gray-green
47-48	Clay or shale reworked, yellow-brown
48-49	Clay or shale reworked, dark gray
49-50	Clay or shale reworked, light blue-gray
50-52	Clay or shale reworked, gray, blue-gray
52-55	Clay or shale reworked, gray, yellow-gray; limestone fragments
55-58	Clay or shale reworked, dark gray
58-59	Limestone, gray; clay or shale at base
59-61	Clay, dark gray
	CRETACEOUS
	DAKOTA FORMATION
61-65	Sand or sandstone, fine to coarse, reworked, tan
	PENNSYLVANIAN
65-69	Shale, silty, light blue-gray
69-72	Shale, gray, yellow-gray, reddish-brown

Casing record: set 2 inch pipe to 72 feet, slotted from 60 to 68 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-30-25CDAD | WC-237 | STATION ID: 413109-0941505-01

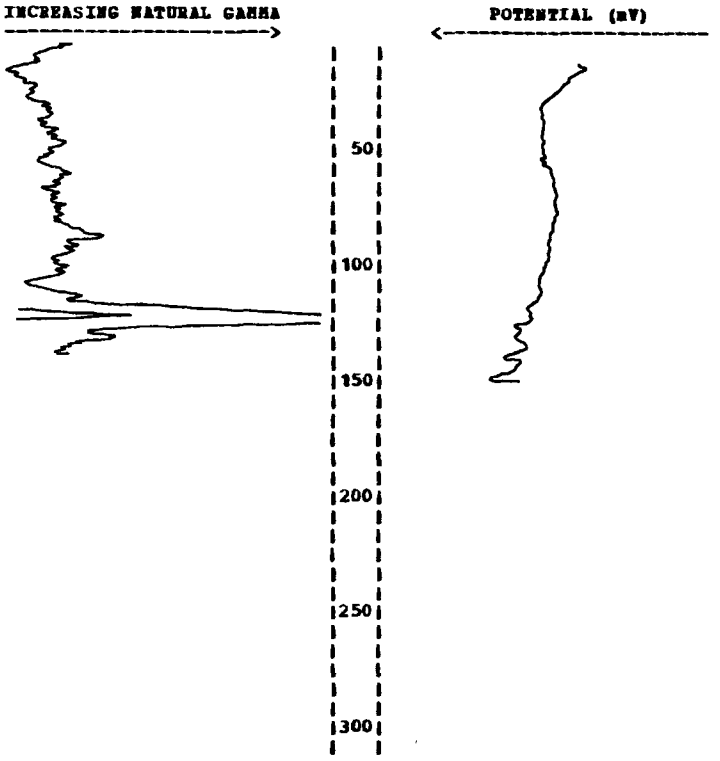
ALTITUDE: 1120 FEET (NGVD 1929) | DEPTH: 221 FEET | DATE COMPLETED: August 11, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Fill; top soil
6-15	Till, yellow-brown
15-20	Clay; till, gray, yellow-gray
20-41	Till, yellow-brown, yellow-gray
41-42	Boulder
42-51	Till, yellow-brown, yellow-gray, blue-gray streaks; boulders
51-150	Till, blue-gray
150-191	Till, as above; reworked shale
191-210	Clay, silty, gray
210-212	Sand and gravel; clay
212-217	Sand and gravel, fine to medium; clay, mixed; limestone fragments
	PENNSYLVANIAN
217-221	Shale, gray-green

LOCATION: 078-31-36BABA | WC-241 | STATION ID: 413104-0942208-01

ALTITUDE: 1235 FEET (NGVD 1929) | DEPTH: 140 FEET | DATE COMPLETED: August 18, 1983

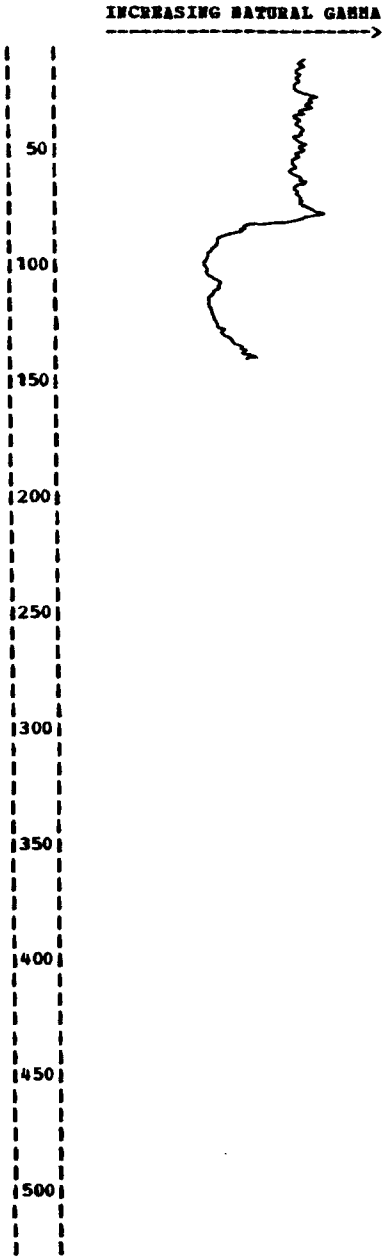


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Clay, yellow-gray
3-6	Clay, yellow-brown
6-12	Clay, yellow-gray
12-15	Till, sandy, yellow-brown
15-17	Clay or till, sandy, tan, yellow
17-20	Clay, sandy, brown, tan; sand, fine to coarse, layers
20-37	Till, yellow-tan
37-47	Till, yellow-brown, yellow-gray
47-50	Till, blue-gray
50-54	Till, yellow-brown
54-60	Till, olive
60-85	Till, yellow-brown, yellow-gray
85-87	Till, yellow-brown, blue-gray
87-107	Till, blue-gray
107-110	Sand and gravel, fine to coarse, gray-tan
110-115	Till, blue-gray
115-118	Boulder, limestone
118-123	Till, blue-gray
	PENNSYLVANIAN
123-124	Shale, gray-green
124-125	Shale, black, dark gray
125-130	Limestone or siltstone, very sandy
130-137	Shale, gray-green
137-139	Limestone, brown, tan
139-140	Shale, gray; limestone; tan

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-32-21AAAA WC-239 STATION ID: 413248-0943143-01

ALTITUDE: 1250 FEET (NGVD 1929) DEPTH: 161 FEET DATE COMPLETED: August 16, 1983



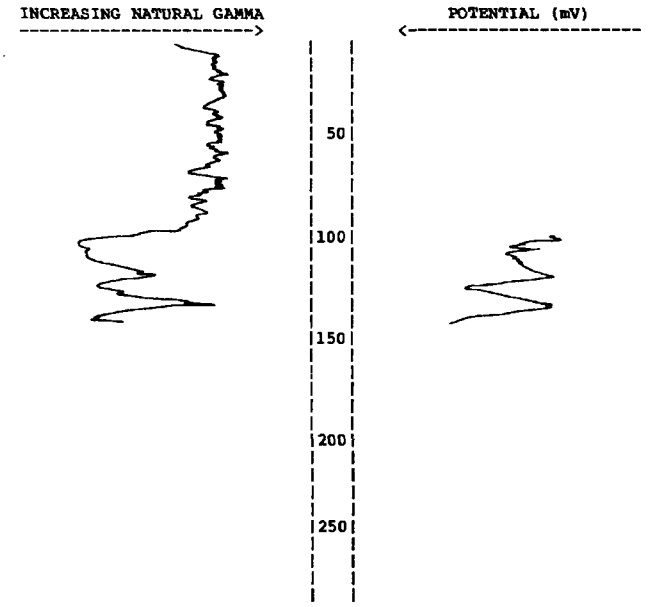
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Clay, sandy, yellow-brown
4-6	Sand and gravel, fine, brown, yellow-brown
6-11	Till, sandy, yellow-tan, yellow-brown
11-14	Till, yellow-gray grading to blue-gray
14-17	Till, blue-gray
17-19	Sand and gravel, fine to coarse, gray
19-22	Till, sandy, gravelly, blue-gray
22-28	Clay, gray to blue-gray
28-30	Till, light blue-gray
30-34	Till, olive
34-50	Till, yellow-brown
50-57	Till, yellow-gray
57-61	Till, blue-gray
61-69	Till, light blue-gray, yellow-brown
69-70	Sand and gravel, fine to coarse, tan
70-76	Till, blue-gray
76-78	Till, yellow-brown
78-79	Till, very sandy, gray, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
79-90	Sandstone, fine to coarse, tan
90-105	As above, yellow-brown
105-106	Shale, yellow-gray
106-133	Sandstone, fine to coarse, tan, yellow-brown
133-135	Gravel, shaly; limestone chips
135-137	Sandstone, fine to medium, tan
137-140	Shale, sandy, light yellow-gray; sandstone layers
140-147	Shale, silty, light-gray; sandstone, fine to medium
147-150	Shale, silty, yellow-brown, light gray; sandstone layers
150-156	Shale, silty, gray
156-158	Gravel; chert
	PENNSYLVANIAN
158-161	Shale, gray to gray-green; siltstone

Casing record: set 2 inch pipe to 135 feet, slotted from 125 to 135 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-33-03DDDD WC-240 STATION ID: 413501-0943727-01

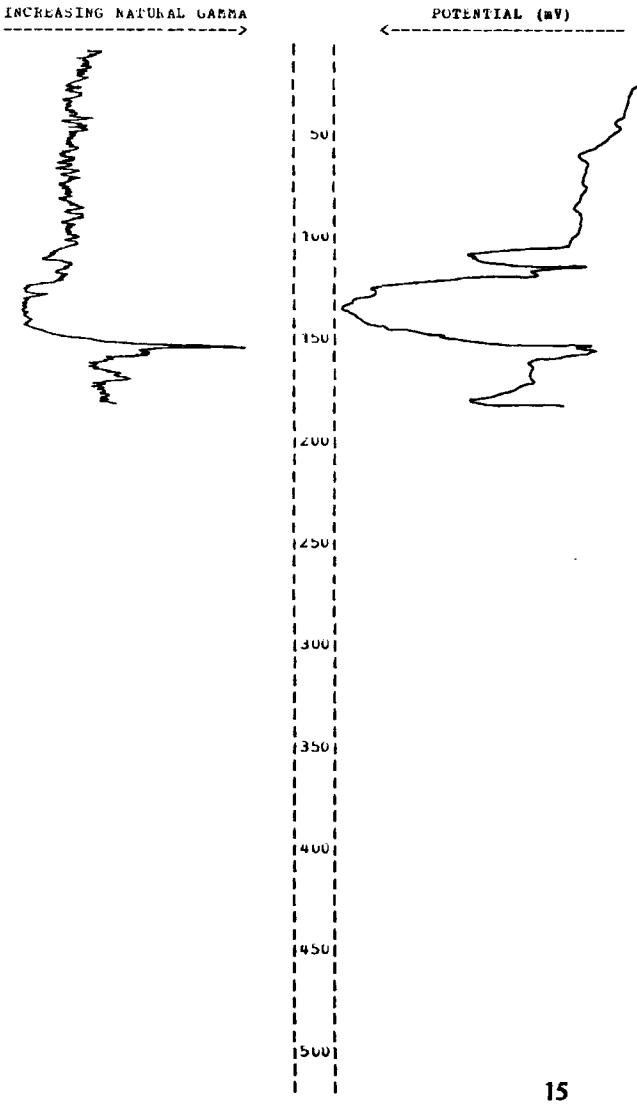
ALTITUDE: 1340 FEET (NGVD 1929) DEPTH: 141 FEET DATE COMPLETED: August 17, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Top soil
3-13	Clay or till, sandy, yellow-brown
13-37	Till, sandy, blue-gray
37-40	Till, olive
40-68	Till, blue-gray
68-70	Clay or peat, silty, brown; wood; organics
70-71	As above, very dark brown
71-80	Clay, gray to blue-gray
80-84	Till, light blue-gray
84-90	Till, olive; boulder at 88 to 89 feet
90-101	Till, yellow-brown
	CRETACEOUS DAKOTA FORMATION
101-115	Sandstone, fine to coarse, yellow-brown
115-118	Sandstone, very coarse, tan
118-121	Shale, sandy, silty, yellow-gray; gravel
121-130	Sandstone, fine to medium, tan
130-133	Shale, very sandy, gray-green; gravel
133-135	Shale, silty, yellow-gray
135-141	Sandstone, very coarse (gravel)

LOCATION: 078-36-35ACBC WC-68 STATION ID: 413050-0945720-01

ALTITUDE: 1240 FEET (NGVD 1929) DEPTH: 181 FEET DATE COMPLETED: June 21, 1982

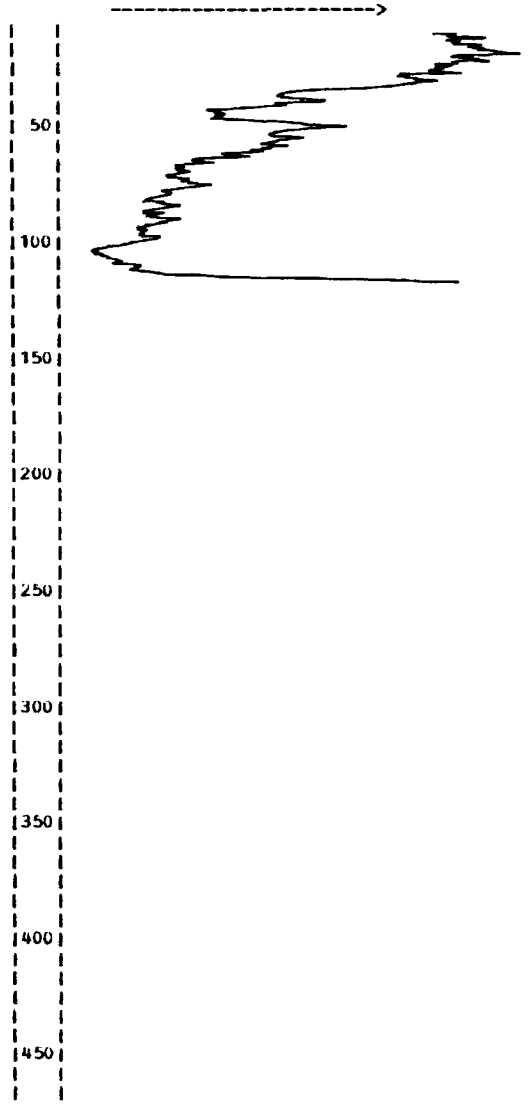


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed; top soil
4-8	Clay, gray
8-12	Clay, silty, yellow-gray
12-17	Clay, silty, sandy, yellow-brown, yellow-tan
17-18	Clay, sandy, very gravelly
18-26	Till, sandy, soft, yellow-brown
26-30	Till, yellow-brown
30-36	Till, yellow-gray
36-38	Till, yellow-brown
38-40	Till, olive grading to blue-gray
40-53	Till, blue-gray
53-56	Sand and gravel; till, mixed, gray
56-103	Till, blue-gray
103-111	Sand and gravel, fine to coarse, gray; till, mixed
111-115	Till, gravelly, blue-gray
115-117	Till, olive
	CRETACEOUS DAKOTA FORMATION
117-118	Shale, silty, oxidized, brown grading to light gray
118-125	Sandstone, medium to coarse, oxidized, yellow-brown
125-146	Sandstone, fine to coarse, oxidized, light tan, grading to yellow-brown
146-149	Sand and gravel, iron cemented; shale, oxidized, mixed, light gray to brown
149-150	Shale, silty, yellow, gray
	PENNSYLVANIAN
150-152	Shale, blue-gray; lignite streak
152-157	Shale, blue-gray to light blue-gray
157-166	Shale, silty, gray-green; limestone trace
166-167	Shale, silty, gray-brown
167-175	Shale, silty, gray-green, light blue-gray
175-181	Shale, yellow, gray-brown

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-36-35ADCC WC-69 STATION ID: 413044-0945656-01

ALTITUDE: 1230 FEET (NGVD 1929) DEPTH: 115 FEET DATE COMPLETED: June 22, 1982

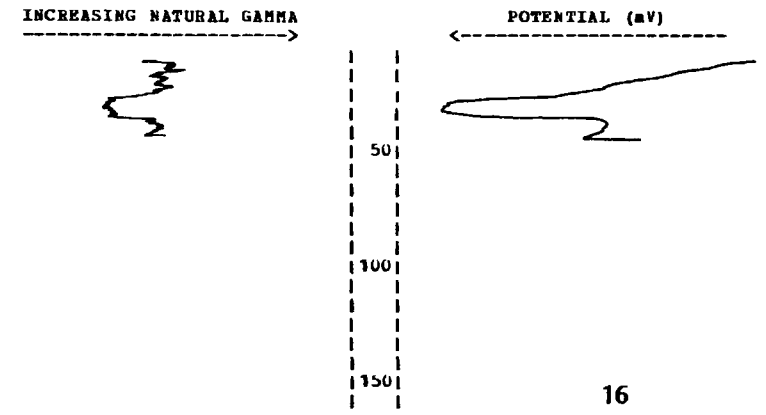


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Clay, silty, yellow-brown; loess
10-16	Clay, silty, soft, yellow-gray, gray; loess
16-17	Clay, yellow-brown
17-27	Clay, hard, gray-brown; few sand grains
27-31	As above, yellow-gray
31-35	Clay, very sandy, yellow-brown; sand layers
35-40	Sand, fine to coarse, gray-tan; clay layers
40-44	Sand and gravel, fine, gray-tan
44-45	Clay, yellow-gray
45-47	Sand, gray-tan, fine to coarse
47-52	Sand and gravel, fine to medium, gray-tan
52-58	Sand and gravel, fine to coarse, iron cemented, oxidized, brown, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
58-58	Shale, sandy, light gray
58-61	Sandstone, fine to coarse
61-70	Sandstone, medium to very coarse, tan
70-75	Sandstone, very coarse; shale trace, light gray
75-105	Sandstone, medium to very coarse, yellow-brown, tan
105-107	Shale, sandy, light gray, yellow; sandstone, very coarse, mixed
107-110	Sandstone, fine to coarse, hard, iron cemented, oxidized, brown
110-111	Shale, sandy, oxidized, brown, yellow-brown
111-115	Shale, silty, gray

Casing record: set 2 inch pipe to 115 feet, slotted from 94 to 101 feet, gravel packed

LOCATION: 078-36-36ACCD WC-72 STATION ID: 413043-0945605-01

ALTITUDE: 1190 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 23, 1982

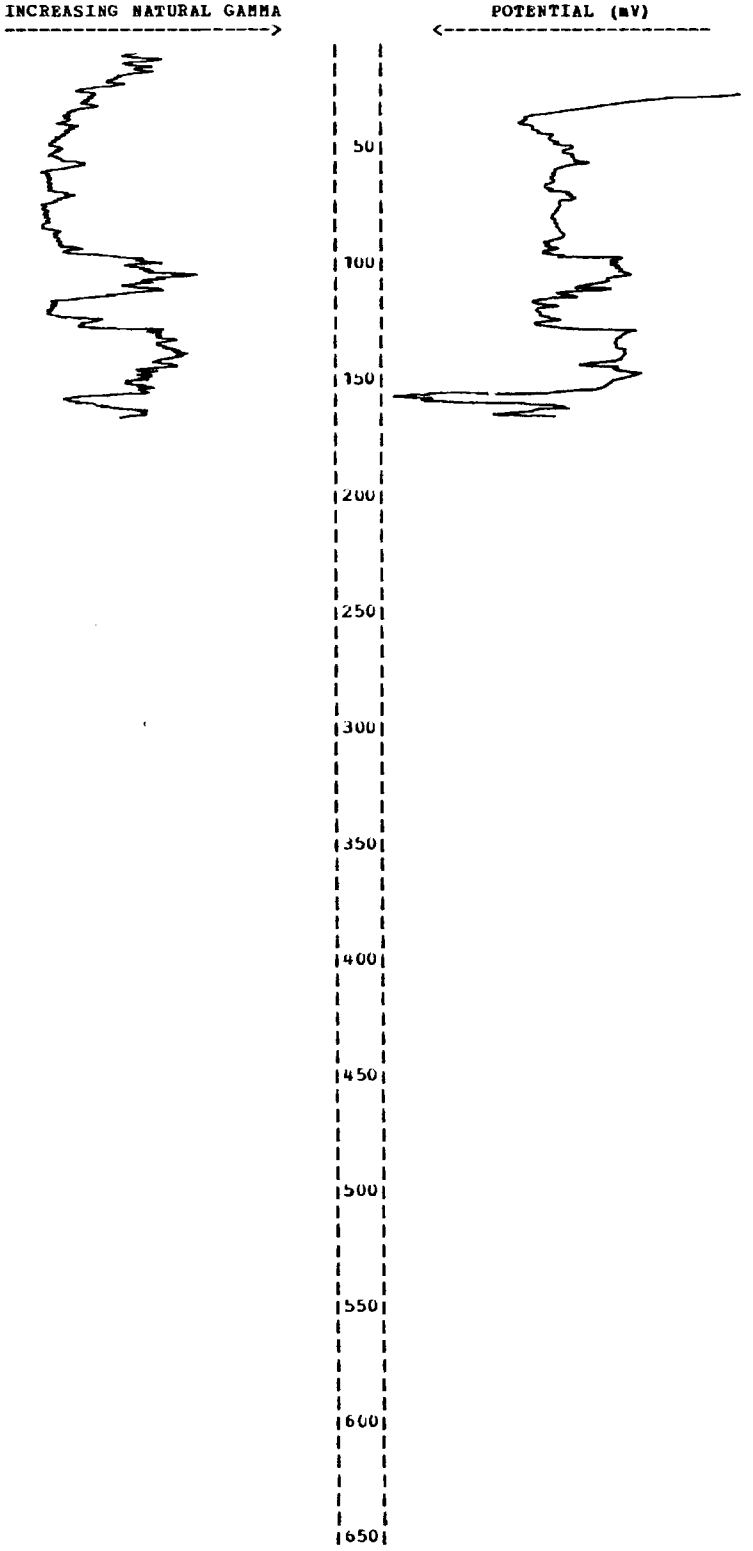


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Road bed; top soil
6-10	Clay, dark gray grading to gray
10-15	Clay, yellow-gray
15-18	Clay, silty, soft, yellow-gray, yellow-brown
18-21	Clay, silty, soft, yellow-gray grading to blue-gray
21-25	Sand, fine to coarse, gravel, fine, gray; clay layers
25-30	Sand and gravel, fine to coarse, gray
30-32	Gravel; boulders; till, blue-gray
32-41	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-36-36ADBB WC-73 STATION ID: 413054-0945553-01

ALTITUDE: 1200 FEET (NGVD 1929) DEPTH: 161 FEET DATE COMPLETED: June 24, 1982

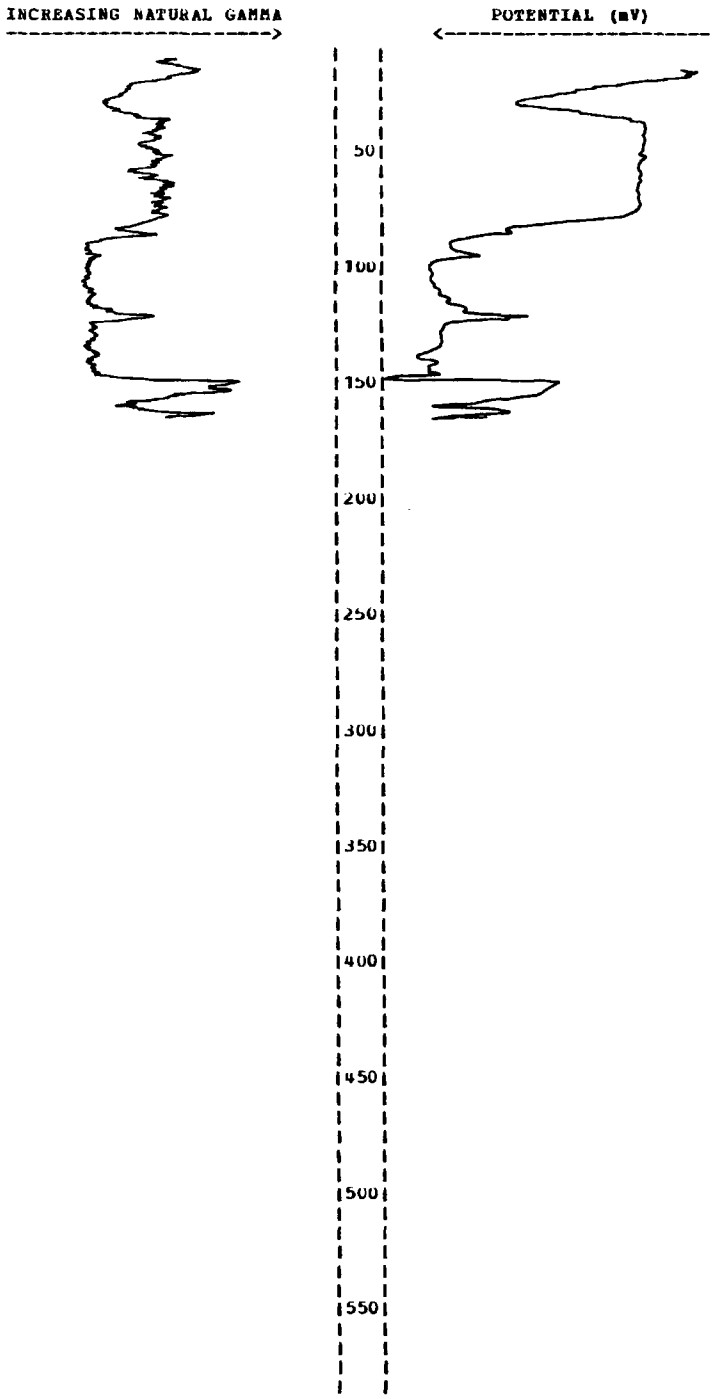


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed; top soil
4-8	Clay, dark-gray to gray
8-13	Clay, yellow-gray
13-16	Clay, silty, soft, yellow-brown
16-22	Sand, fine to coarse (fine gravel); clay layers
22-31	Sand, fine to coarse, gray; gravel; clay mixed
31-38	Sand and gravel, fine to medium, tan, yellow-brown
38-41	Sand and gravel, fine to coarse, oxidized, brown, yellow-brown
41-47	Sand and gravel, fine to medium, mostly quartz, some cemented, tan, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
47-50	Sandstone, medium to coarse, brown
50-52	Shale, silty, sandy, gravelly, oxidized, light gray, yellow-brown
52-60	Sandstone, fine to medium, tan, yellow-brown
60-70	Sandstone, fine to coarse, oxidized, brown, yellow-brown; shale, occasional streak
70-72	Sandstone, iron cemented; shale, gray, yellow, red trace
72-80	Sandstone, fine to medium, tan; shale streak trace
80-92	Sandstone, iron cemented, very oxidized, brown-orange; shale streaks
92-98	Shale, silty, gray, yellow-gray, oxidized layers of brown, yellow-brown
98-105	Shale, silty, blue-gray; lignite at 99 feet
105-106	Shale, silty, oxidized
106-107	Sandstone, fine, yellow-brown
107-110	Shale, silty, sandy, gray, yellow-brown
110-111	Conglomerate, hard, iron cemented
111-123	Sandstone, fine to medium, yellow-brown; shale, occasional streak
123-128	Shale, gray-tan, yellow-brown
	PENNSYLVANIAN
128-139	Shale, silty, blue-gray; pyrite
139-140	Shale, blue-gray; coal
140-144	Shale, silty, gray-brown; coal at 143; pyrite
144-147	Shale, blue-gray
147-151	Shale, light blue-gray
151-152	Dolomite, brown
152-156	Limestone, light colored; dolomite
156-161	Shale, gray-green; limestone near base, sandy

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-36-36CABA WC-70 STATION ID: 413043-0945621-01

ALTITUDE: 1190 FEET (NGVD 1929) DEPTH: 161 FEET DATE COMPLETED: June 22, 1982

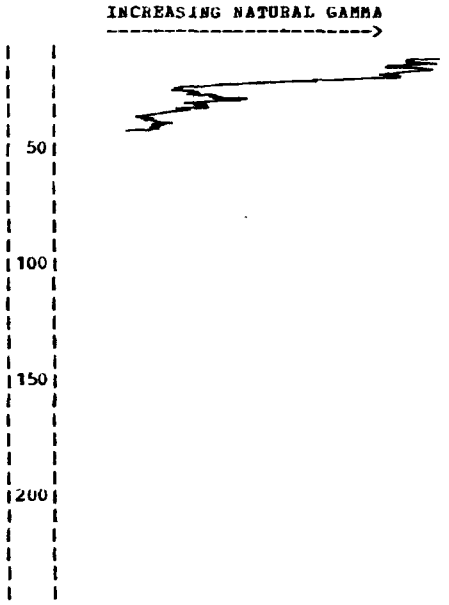


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed; top soil
4-12	Clay, silty, dark gray to gray
12-14	Clay, silty, yellow-gray
14-16	Clay, silty, blue-gray
16-17	Clay, silty, sandy, brown, gray; wood
17-21	Sand, fine to medium, gray; clay
21-26	Sand and gravel, fine, gray
26-28	Sand and gravel, fine to coarse, gray; clay trace
28-31	Sand and gravel, fine to coarse, yellow-gray; clay mixed
31-50	Till, blue-gray
50-60	Till, sandy layers, blue-gray
60-75	Clay or till, silty, dark gray; sand grains
	CRETACEOUS
	DAKOTA FORMATION
75-77	Sandstone, fine to medium, gray-tan
77-80	Sandstone, fine to coarse, iron cemented, oxidized layers, yellow-brown
80-84	Sandstone, medium to very coarse, oxidized, brown, yellow-brown
84-90	Sandstone, fine to medium, tan
90-91	Shale, light yellow-gray
91-115	Sandstone, fine to medium, coarse, tan
115-118	Shale, very sandy, gravelly, oxidized, yellow-brown, reddish-brown
118-130	Sandstone, fine to medium, very oxidized, yellow-brown, brown; shale
130-135	As above, grading to medium to very coarse
135-140	Sandstone, medium to coarse, yellow-tan
140-144	Sandstone, very coarse (pea gravel), yellow-brown
	PENNSYLVANIAN
144-148	Shale, blue-gray
148-153	Shale, silty, gray
153-155	Dolomite, sandy; limestone, light colored
155-157	Limestone, dolomitic, gray-green, light blue-gray
157-159	Shale, light blue-gray
159-161	Limestone, very sandy, shaly, light gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-36-36DABB WC-71 STATION ID: 413041-0945554-01

ALTITUDE: 1195 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 23, 1982



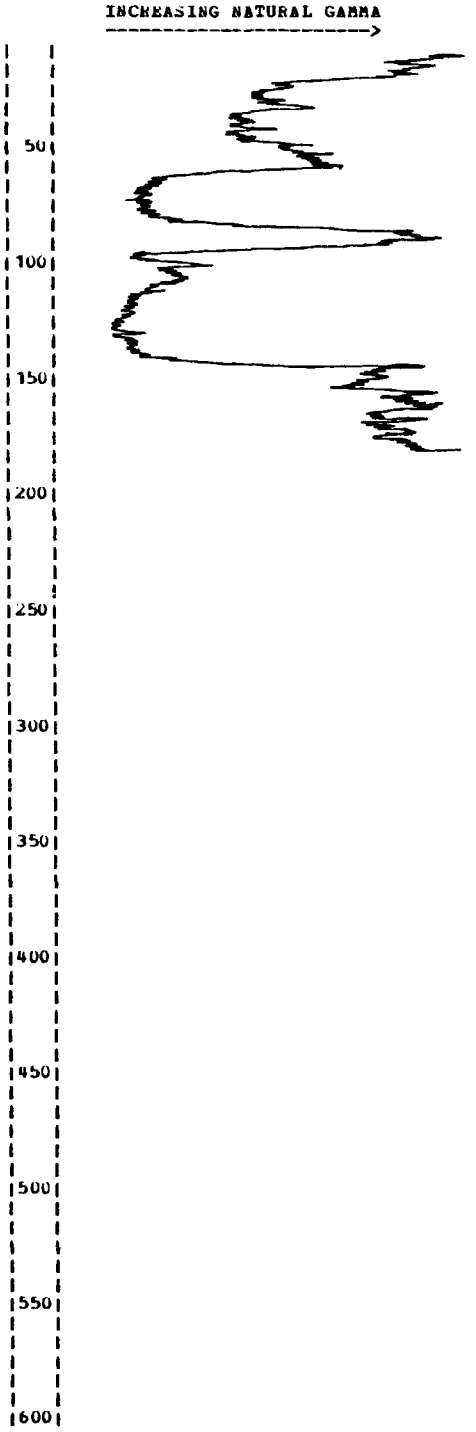
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil; clay, dark gray
5-14	Clay, yellow-gray
14-16	Clay, silty, sandy, soft, gray, yellow-brown
16-20	Sand, fine to coarse, gray-tan; gravel, fine
20-29	Sand and gravel, fine to coarse, gray
29-37	Sand and gravel, fine to very coarse, oxidized, brown, yellow-brown; clay at base, blue-gray
37-39	Sand and gravel, fine, some cementation
	CRETACEOUS
	DAKOTA FORMATION
39-41	Sandstone, hard, well cemented, oxidized, brown

Casing record: set 2 inch pipe to 39 feet slotted from 32 to 39 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-37-17DDDD WC-16 STATION ID: 413255-0950704-01

ALTITUDE: 1208 FEET (NGVD 1929) DEPTH: 181 FEET DATE COMPLETED: July 29, 1981



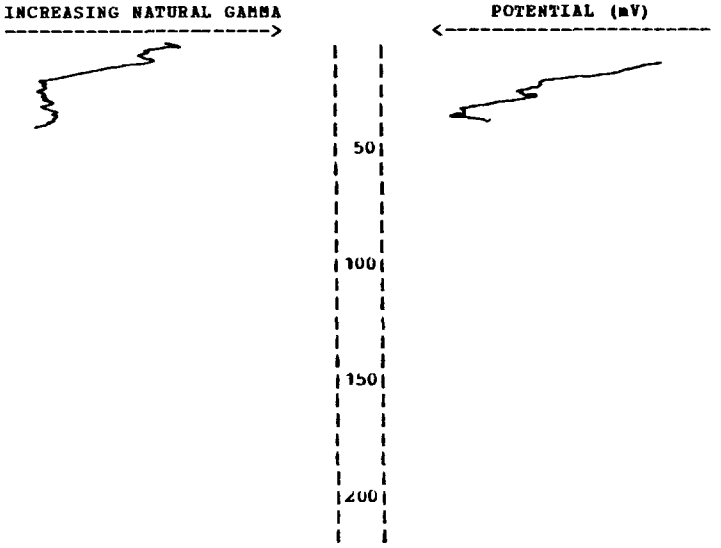
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Topsoil: loess, brown
5-13	Clay or loess, silty, yellow-tan
13-27	Sand, fine to coarse, yellow-tan
27-40	Sand and gravel, fine to medium, yellow-tan, yellow-brown
40-42	Sand and gravel, coarse
42-50	Till, blue-gray
50-55	Clay, silty, blue-gray
	CRETACEOUS
	DAKOTA FORMATION
55-76	Sandstone, fine to coarse, tan
76-78	Sandstone, very coarse, oxidized, some iron cementation; gravel, fine; clay
78-87	Shale, light gray, gray
87-88	Sandstone, conglomerate, hard, iron cemented
88-94	Sandstone, fine to coarse, yellow-brown; shale trace
94-95	Sandstone, coarse, hard, iron cementation (possible conglomerate)
95-99	Sandstone, fine to coarse, some oxidized, yellow-brown
99-100	Sandstone, coarse, iron cemented (possible conglomerate)
100-104	Sandstone, fine to very coarse, iron cemented; shale, red, green, brown
104-110	Sandstone, fine to medium, tan
110-130	Sandstone, fine to coarse, tan to yellow-brown
130-140	Sandstone, oxidized, brown
	PENNSYLVANIAN
140-141	Shale, silty, oxidized streaks, gray-green
141-146	Shale, silty, oxidized, brown, yellow-brown; siltstone streaks
146-158	Shale, silty, sandy, gray-green; siltstone streaks
158-170	Shale, reddish brown
170-175	Shale, varying colors of reddish brown, yellow-brown
175-177	Shale, yellow-gray, gray-green
177-179	Limestone, gray
179-181	Shale, dark gray, gray-green

Casing record: set 2 inch pipe to 181 feet, slotted from 121 to 139 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-39-03CDDD WC-201 STATION ID: 413443-0951905-01

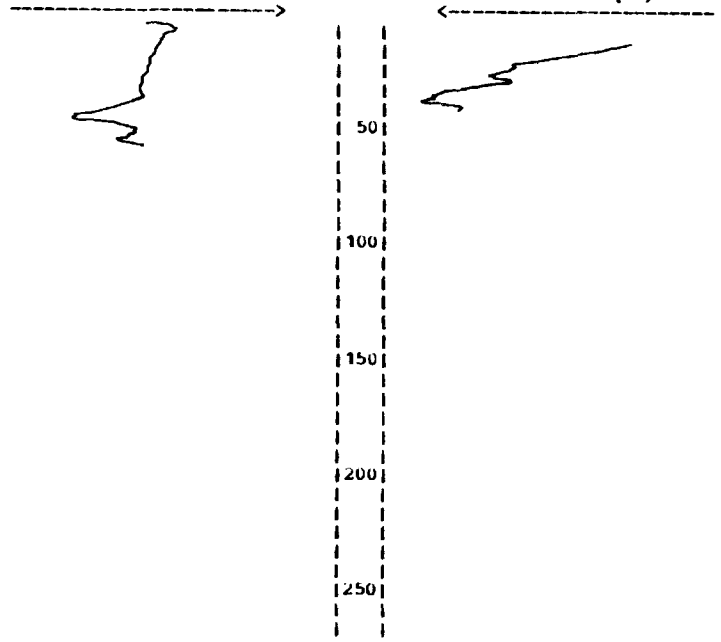
ALTITUDE: 1175 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 7, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-10	Clay, silty, yellow-gray, dark gray; fill
10-12	Clay, silty, gray
12-14	Clay, silty, yellow-gray
14-18	Clay, silty, sandy at base, yellow-brown
18-20	Sand, fine to coarse, brown
20-24	Clay, silty, gray, brown; sand layers; gravel, fine
24-30	Sand and gravel, fine to medium, gray
30-38	Sand and gravel, fine to medium, some coarse, oxidized, tan grading to brown
38-45	Sand and gravel, fine to medium, some coarse, yellow-brown, tan; boulders at base
45-61	Till, blue-gray

LOCATION: 078-39-04DCDD WC-202 STATION ID: 413443-0951957-01

ALTITUDE: 1194 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 8, 1983

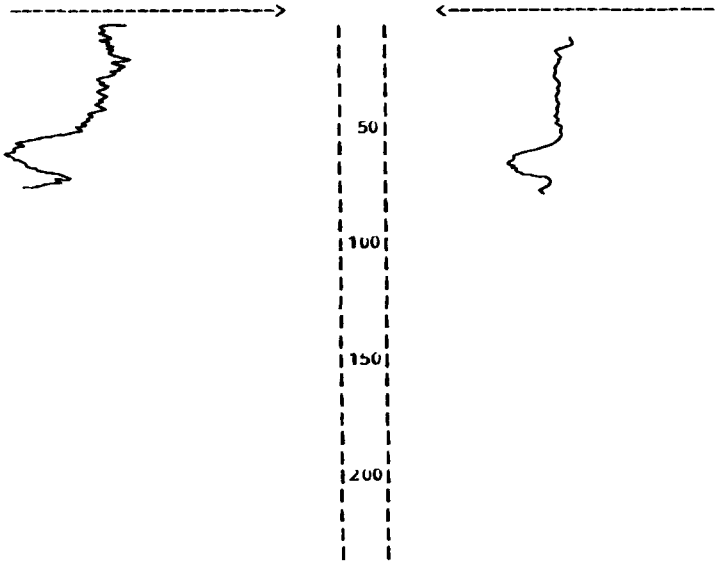


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-10	Clay, silty, yellow-brown; loess
10-17	Loess, yellow-brown, yellow-tan
17-21	Loess, gray grading to yellow-gray
21-24	Clay, silty, yellow-brown; loess
24-28	Clay, silty, gray-brown; loess
28-32	Clay or loess, silty, gray-green
32-34	Clay, silty, gray
34-38	Clay, silty, some sandy at base, yellow-gray
38-40	Clay, sandy, light blue-gray
40-41	Sand, fine to medium, gray
41-44	Sand, fine to coarse, gray-tan; clay layers
44-46	Sand and gravel, fine, tan
46-48	Sand and gravel, fine to coarse, gray
48-53	Till, blue-gray
53-55	Till, sandy, gravelly
55-56	Sand, fine to coarse, gray; wood
56-61	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-39-08AABA WC-203 STATION ID: 413442-0952057-01

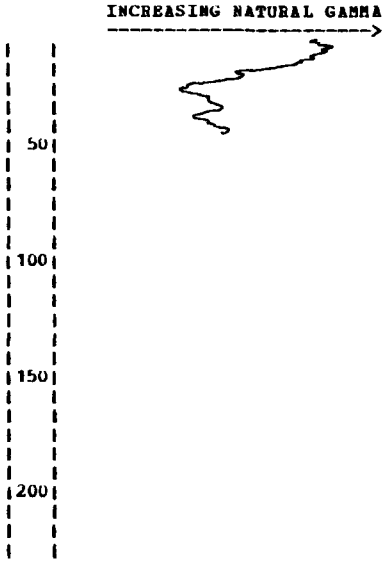
ALTITUDE: 1260 FEET (NGVD 1929) DEPTH: 101 FEET DATE COMPLETED: June 9, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-10	Loess, yellow-brown, brown
10-24	Loess, yellow-brown, yellow-gray
24-29	Clay, silty, tough, brown
29-45	As above, yellow-brown grading to yellow-tan
45-51	Clay, tough, gray; sand grains
51-55	Clay, tough, light gray, yellow-gray
55-60	Sand grading to sand and gravel, fine to coarse
60-69	Sand and gravel, fine to coarse, cemented at base, oxidized layers, yellow-brown, brown
69-72	Till, brown, olive, yellow-brown; boulder
72-75	Till, blue-gray
75-80	Sand, fine to coarse, gray
80-101	Till, very sandy, gravelly, blue-gray

LOCATION: 078-39-10BBBA WC-200 STATION ID: 413442-0951931-01

ALTITUDE: 1168 FEET (NGVD 1929) DEPTH: 46 FEET DATE COMPLETED: June 7, 1983



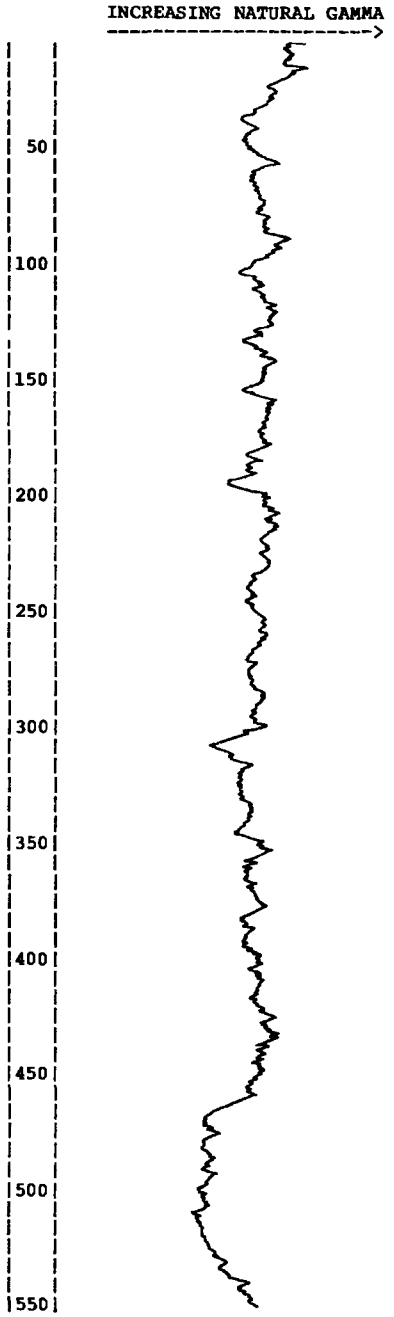
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-12	Road bed
12-18	Clay, silty, dark gray; possible fill
18-20	Wood; possible fill
20-22	Clay, silty, dark blue-gray
22-23	Clay, sandy, silty, yellow-gray
23-25	Sand, fine to coarse
25-33	Sand and gravel, fine to medium, olive, gray-tan
33-35	Clay, sandy, silty, gray; sand layers, very fine
35-41	Sand, fine to coarse, gray
41-44	Sand and gravel, fine to medium, some coarse, gray
44-46	Till, blue-gray

Casing record: set 2 inch pipe to 44 feet, slotted from 40 to 44 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-39-11CCBC WC-227 STATION ID: 413359-0951827-01

ALTITUDE: 1310 FEET (NGVD 1929) DEPTH: 541 FEET DATE COMPLETED: July 18, 1983



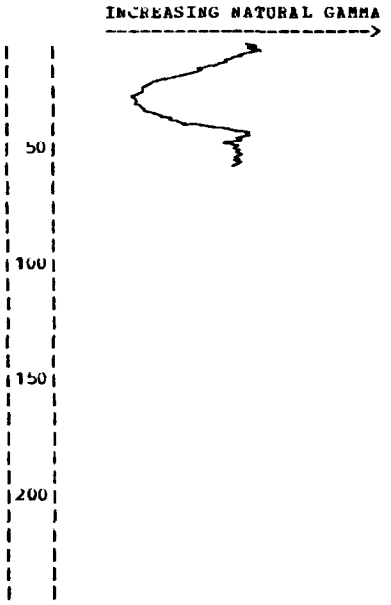
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-16	Loess, yellow-brown
16-18	Loess, yellow-gray
18-20	Clay, silty, gray
20-29	Clay, silty, yellow-gray
29-35	Clay, yellow-gray; sand grains
35-60	Till, yellow-brown
60-103	Till, yellow-tan
103-105	Sand and gravel, fine to coarse, yellow-brown
105-120	Till, olive, grading to blue-gray at base
120-130	Till, blue-gray
130-134	Sand and gravel
134-138	Sand, fine to coarse, gray; clay or till layers; wood
138-141	As above, tan
141-154	Till, sandy, blue-gray
154-158	Sand and gravel, fine, gray-tan
158-191	Till, sandy, gravelly, blue-gray
191-199	Sand and gravel, fine to coarse, gray-tan; wood; shale, reworked
199-221	Till, sandy, gravelly, blue-gray; shale, reworked
221-240	As above
240-401	Till, very sandy, gravelly, blue-gray; sand and gravel layers
401-430	As above, sand, occasional layer, cemented
430-450	Till; sand, cemented, fine to coarse
450-532	Sand and gravel, fine, coarser at base, cemented
532-537	As above; clay or shale, mixed
	PENNSYLVANIAN
537-541	Shale, hard, dark gray, brown

Casing record: set 2 inch pipe to 541 feet, slotted from 520 to 535 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-39-13BCCC WC-204 STATION ID: 413325-0951718-01

ALTITUDE: 1180 FEET (NGVD 1929) DEPTH: 37 FEET DATE COMPLETED: June 9, 1983

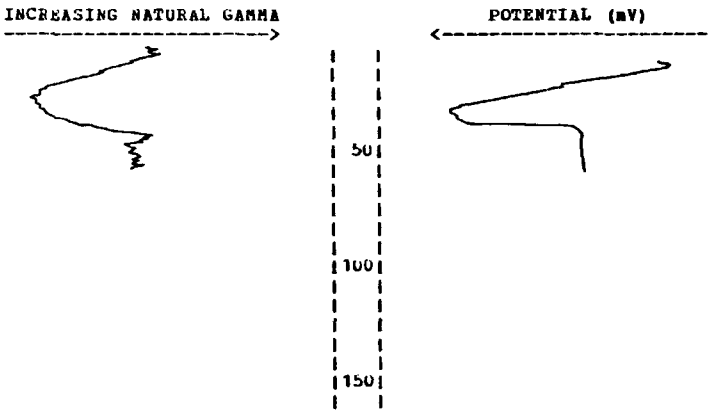


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Fill: top soil
5-10	Clay, silty, brown grading to yellow-brown
10-13	Clay, silty, yellow-brown
13-16	Clay, silty, gray
16-18	Clay, silty, gray, yellow-gray
18-21	Sand, oxidized at base, yellow-gray, yellow-brown
21-24	Sand, fine to coarse; clay, blue-gray
24-30	Sand and gravel, fine, tan; clay layers, blue-gray
30-35	Sand and gravel, fine to coarse, yellow-brown; boulder at base
35-36	As above, blue-gray; boulders
36-37	Till, blue-gray

Casing record: set 2 inch pipe to 36 feet, slotted from 32 to 36 feet, gravel packed

LOCATION: 078-39-13BDCC WC-205 STATION ID: 413324-0951657-01

ALTITUDE: 1170 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 9, 1983

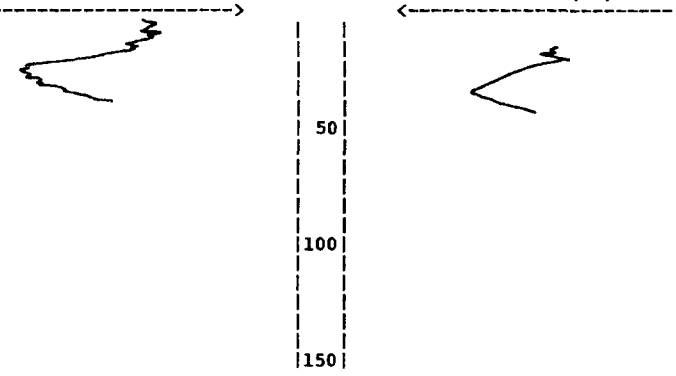


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Road bed; fill
10-17	Clay, silty, dark gray, brown
17-20	Clay, silty, gray; sand layers, oxidized streaks
20-23	Sand, fine to coarse, gray; clay, silty, gray; wood
23-25	Sand and gravel, fine, gray
25-38	Sand and gravel, fine to medium, some coarse, yellow-tan, yellow-brown
38-42	Sand and gravel, fine to coarse, yellow-gray
42-61	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-39-13DBBA WC-206 STATION ID: 413321-0951638-01

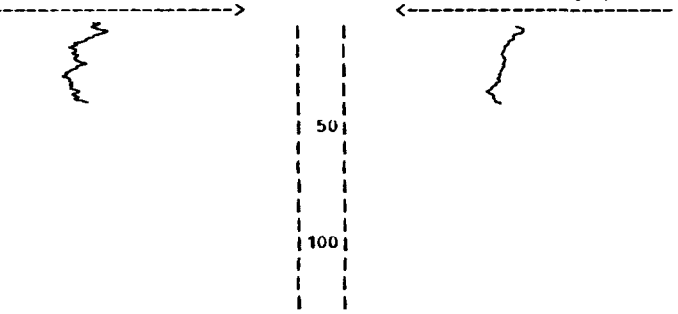
ALTITUDE: 1179 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 10, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Road bed; top soil
7-16	Clay, silty, dark gray, brown
16-20	Clay, silty, yellow-gray, yellow-brown
20-23	Clay, sandy, silty, gray, yellow-gray; sand layers
23-26	Sand, fine to coarse, yellow-brown
26-33	Sand and gravel, fine, some medium, olive
33-38	Sand and gravel, fine to medium, some coarse at base, gray
38-41	Till, blue-gray

LOCATION: 078-39-13DBDA WC-207 STATION ID: 413315-0951627-01

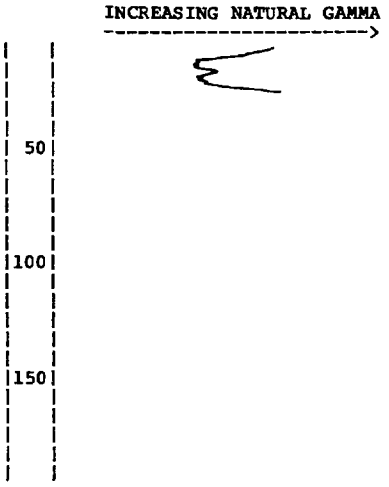
ALTITUDE: 1182 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 10 , 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Road bed; top soil
7-9	Clay, silty, very dark gray
9-16	Clay, silty, gray-brown
16-24	Clay, silty, yellow-gray, yellow-brown
24-28	Clay, silty, yellow-gray grading to gray-green
28-35	Clay, silty, gray-green
35-37	Clay or till, very sandy, gravelly
37-41	Till, blue-gray

LOCATION: 078-39-32DDAA WC-197 STATION ID: 413031-0952049-01

ALTITUDE: 1144 FEET (NGVD 1929) DEPTH: 27 FEET DATE COMPLETED: June 6, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-8	Clay, silty, gray, yellow-gray
8-12	Clay, sandy, silty, yellow-brown, yellow-gray
12-14	Sand, fine to coarse; clay, yellow-gray
14-17	Sand and gravel, fine, tan, brown at base
17-18	Clay, sandy, silty, blue-gray; sand streaks
18-24	Sand and gravel, fine to coarse, gray; boulders at base
24-27	Till, blue-gray

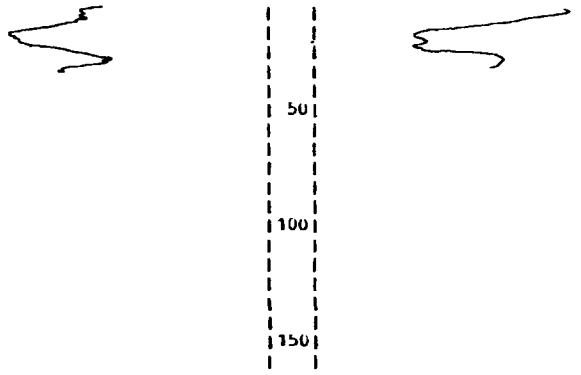
Casing record: set 2 inch pipe to 24 feet, slotted from 21 to 24 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-39-32DDBB WC-224 STATION ID: 413034-0952103-01

ALTITUDE: 1150 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: July 6, 1983

INCREASING NATURAL GAMMA ----------> POTENTIAL (mV) <----------

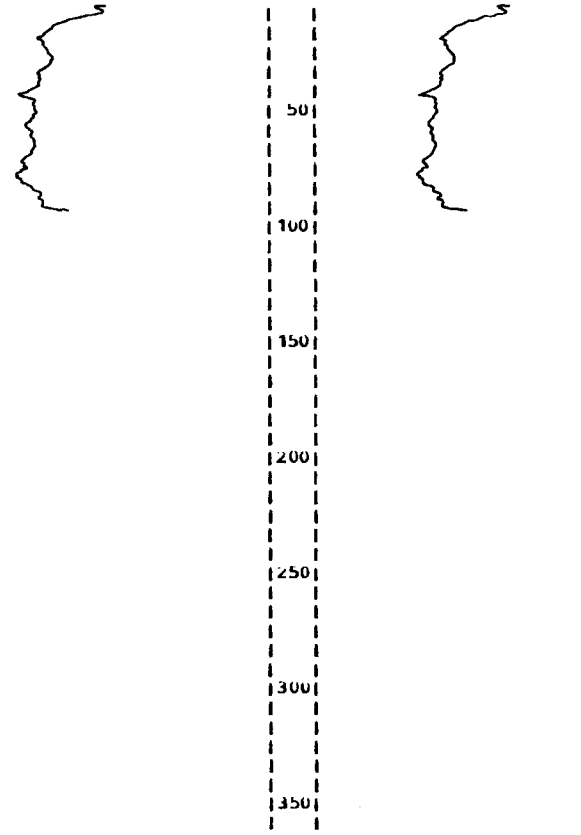


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-9	Clay, silty, brown; sand layers
9-11	Clay, silty, sandy, gray; sand layers
11-13	Clay, silty, sandy, yellow-brown; sand layers
13-16	Sand, fine to coarse, yellow-brown
16-22	Sand and gravel, fine, tan, brown
22-25	Sand and gravel, fine to medium, gray
25-31	Till, blue-gray
31-38	Sand and gravel, fine to medium, gray;
38-41	Till, blue-gray

LOCATION: 078-39-33AABA WC-199 STATION ID: 413113-0951947-01

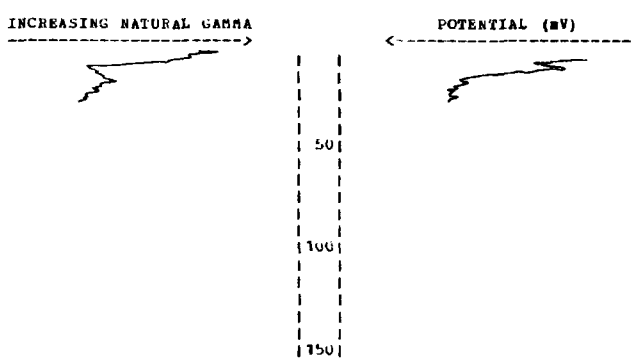
ALTITUDE: 1270 FEET (NGVD 1929) DEPTH: 108 FEET DATE COMPLETED: June 6, 1983

INCREASING NATURAL GAMMA ----------> POTENTIAL (mV) <----------



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed; top soil
3-8	Loess, silty, yelow-brown, yellow-gray
8-14	Loess, gray
14-20	Loess, yellow-gray, yellow-brown
20-25	Clay, silty, brown
25-28	Clay, silty, brown grading to yellow-brown; till
28-32	Till, yellow-brown
32-35	Till, yellow-gray
35-50	Till, very gravelly at 41-46 feet, lime concretions, yellow-brown, gray layer
50-53	Till, yellow-gray
53-56	Till, gray
56-58	Till, yellow-brown, yellow-gray
58-60	Till, blue-gray
60-63	Till, yellow-brown, gray grading to olive
63-75	Till, blue-gray; boulders, occasional
75-77	Gravel; till, gravelly
77-79	Till, gravelly, olive
79-82	Till, blue-gray, olive; gravel layers
82-85	Sand and gravel, fine to medium, olive; till, mixed at base
85-90	Sand, well cemented, olive; till, mixed
90-97	Till, sandy, blue-gray
97-102	Sand and gravel, fine, gray-tan
102-108	Till, very sandy, gravelly, blue-gray; sand, occasional layer

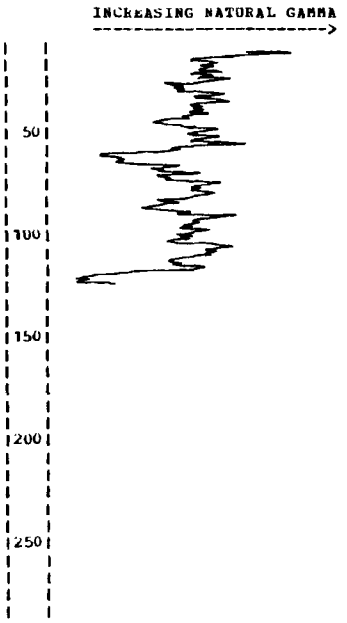
ALTITUDE: 1146 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 6, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Road bed; top soil
6-9	Clay, dark gray grading to gray
9-11	Clay, silty, gray to yellow-gray
11-12	Clay, silty, yellow-brown
12-15	Sand and gravel, fine, tan grading to yellow-brown
15-20	Sand and gravel, fine to medium, some coarse, yellow-brown
20-29	Sand and gravel, fine to coarse, yellow-tan, boulders at base
29-41	Till, blue-gray

LOCATION: 078-41-31DDDD WC-27 STATION ID: 413024-0953539-01

ALTITUDE: 1158 FEET (NGVD 1929) DEPTH: 129 FEET DATE COMPLETED: December 21, 1981



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Loess, brown
10-20	Loess, yellow-brown; small fossils
20-27	Loess, silty, very soft
27-35	Clay, yellow-brown
35-37	Clay, gray
37-52	Clay, yellow-brown, gray
52-55	Sand and gravel, fine, gray
55-59	Sand and gravel, coarse, yellow-brown
59-63	Clay, gray
63-80	Till, blue-gray
80-82	Till, gray
82-95	Till, blue-gray
95-103	Clay, dark gray
103-112	Clay or till, blue-gray
112-118	Sand, fine to coarse, gray-green, dark specks
	PENNSYLVANIAN
118-122	Shale, reddish-brown, gray, gray-green
122-123	Shale, yellow-brown
123-125	Limestone, silty, gray
125-129	Shale, silty, gray, gray-green; limestone

Casing record: set 2 inch pipe to 129 feet, slotted from 109 to 119 feet, gravel packed

LOCATION: 078-42-07CCCC WC-26 STATION ID: 413352-0954335-01

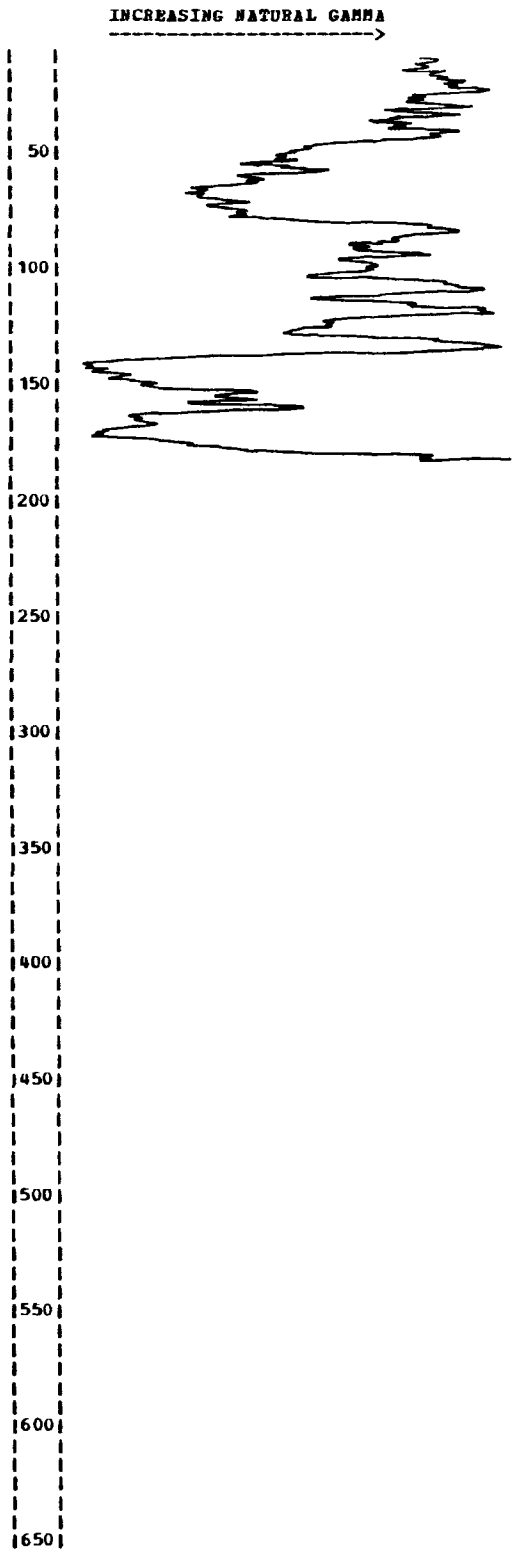
ALTITUDE: 1255 FEET (NGVD 1929) DEPTH: 228 FEET DATE COMPLETED: December 11, 1981

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-20	Loess, brown, yellow-brown
20-40	Till, yellow-brown
40-50	Till, yellow-gray, yellow-brown; lime fragments
50-58	Till, yellow-brown
58-63	Clay, gray (gumbo-type)
63-65	Clay or till, yellow-gray
65-75	Clay or till, dark gray
75-85	Till, olive
85-90	Clay or gumbo, dark gray
90-95	Till, light blue-gray; clay, gray
95-101	Clay or till, dark gray
101-110	Till, olive
110-116	Clay or till, silty, dark gray
116-130	Till, blue-gray
130-135	Clay or till, gray; sand grains
135-160	Clay, salmon color; sand grains mixed
160-165	As above, lighter color
165-180	Clay, silty, sandy, light salmon
180-200	Clay, silty, light gray-green; limestone conglomerates
200-216	Clay, light gray-green; sand layers, fine to medium, dark specks
	PENNSYLVANIAN
216-218	Limestone, shaly, oxidized, yellow-brown
218-224	Limestone, silty, shaly, gray to gray-green
224-226	Shale, gray
226-228	Limestone, shaly

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-43-05ACDD WC-33 STATION ID: 413523-0954831-01

ALTITUDE: 1080 FEET (NGVD 1929) DEPTH: 179 FEET DATE COMPLETED: May 11, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Loess or clay, silty, yellow-brown
10-25	Loess or clay, silty, yellow-brown, gray; snails
25-26	Clay, gray-brown
26-28	Clay, brown
28-31	Till, yellow-gray
31-38	Till, gray; clay mostly, lime concretions
38-40	Clay or till, lime concretions, yellow-tan
40-47	Clay, silty, grading very sandy at bottom, lime concretions, gray-green
47-55	Sand, fine, mixed with dark minerals, brown-tan
55-70	Sand, fine to coarse, brown-tan
70-74	Clay, yellow-tan; sand, fine to medium, tan-brown
	CRETACEOUS
	DAKOTA FORMATION
74-75	Sand and gravel or conglomerate, very hard, iron cemented
75-77	Shale, silty, yellow-brown, gray
77-91	Shale, very silty, blue-gray; lignite streak at 83 feet
91-92	Dolomite, silty, gray-brown
92-97	Shale, very silty, blue-gray
97-99	Dolomite, sandy, brown to gray-brown siderite
99-101	Shale, sandy, silty, blue-gray; coal trace; sandstone streaks, hard
101-106	Shale, silty, sandy, blue-gray
106-110	Sandstone, well cemented, hard; shale, silty, sandy, blue-gray; pyrite
110-121	Shale, silty, blue-gray; sandstone, occasional thin layer
121-127	Shale, silty, very sandy, blue-gray, gray; sandstone, occasional streak
127-133	Shale, silty, blue-gray
133-134	Sandstone, iron cemented, hard (conglomerate)
134-140	Sandstone, fine to medium, yellow-brown, tan
140-150	Sandstone, fine to coarse, iron cemented layer, yellow-brown
150-154	As above, very oxidized
154-156	Shale, very sandy, silty, oxidized zones, gray
156-169	Sandstone, fine to coarse, yellow-brown
169-175	Sandstone, fine to coarse, iron cemented, hard, orange

Table 2. Logs of wells and test holes--Continued.

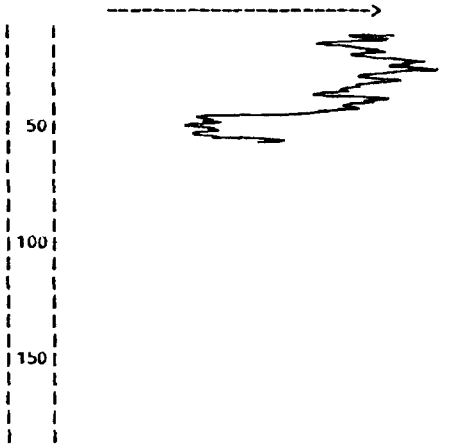
WC-33 Continued

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	PENNSYLVANIAN
175-177	Shale, slightly sandy, light blue-gray
177-177	Shale, slightly silty, light gray
177-179	Shale, slightly silty, darker blue-gray

Casing record: set 2 inch pipe to 179 feet, slotted from 168 to 175 feet, gravel packed

LOCATION: 078-43-05BCDD WC-32 STATION ID: 413524-0954906-01

ALTITUDE: 1010 FEET (NGVD 1929) DEPTH: 51 FEET DATE COMPLETED: May 10, 1982

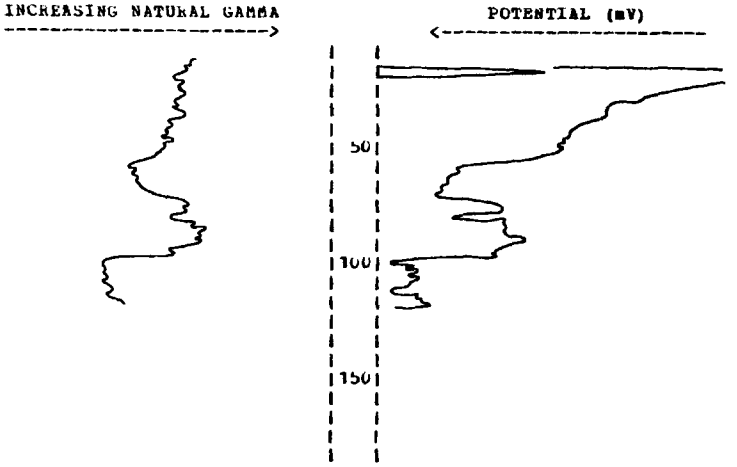


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Clay, silty, brown
5-10	Clay, silty, dark-gray
10-14	Clay, silty, blue-gray
14-18	Clay, silty, yellow-gray
18-20	Clay, silty, gray-green
20-27	Clay, silty, yellow-brown, yellow-gray
27-29	Clay, silty, yellow-brown, blue-gray
29-32	Clay, silty, blue-gray
32-45	Sand and gravel, fine to medium, tan
45-51	Sand and gravel, fine to coarse, gray

Casing record: set 2 inch pipe to 51 feet, slotted from 48 to 51 feet, gravel packed

LOCATION: 078-43-05DBBA WC-30 STATION ID: 413523-0954839-01

ALTITUDE: 1030 FEET (NGVD 1929) DEPTH: 116 FEET DATE COMPLETED: May 5, 1982

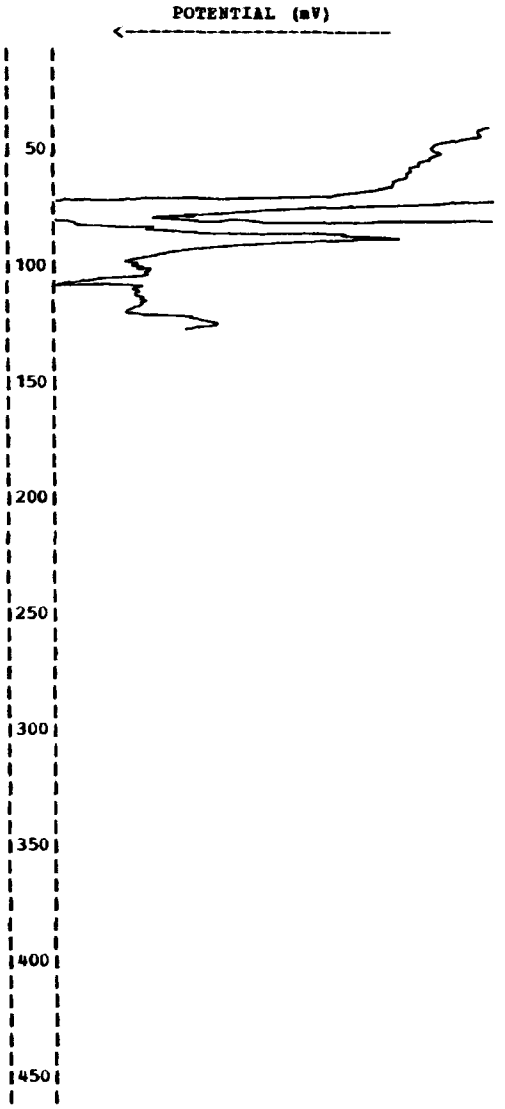


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Fill; road bed
10-14	Clay, silty, brown
14-48	Clay, silty, yellow-brown
48-51	Clay, silty, blue-gray
51-54	Sand and gravel, fine to coarse, oxidized, yellow-brown
54-68	Sand and gravel, fine to coarse, yellow-tan
	CRETACEOUS
	DAKOTA FORMATION
68-75	Shale, silty, gray
75-76	Dolomite, brown
76-91	Shale, silty, gray
91-96	Sandstone, fine to coarse, yellow-brown
96-116	Sandstone conglomerate, oxidized at bottom, yellow-brown

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-43-06BCAC WC-51 STATION ID: 413532-0955021-01

ALTITUDE: 1085 FEET (NGVD 1929) DEPTH: 135 FEET DATE COMPLETED: June 3, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Loess, brown
5-40	Loess, yellow-brown
40-50	Loess, yellow-brown, brown
50-60	Loess, yellow-gray, brown
60-62	Clay, silty, brown
62-66	Clay, silty, sandy, brown
66-76	Sand and gravel, fine to medium, yellow-brown, oxidized brown
76-78	Clay, sandy, yellow-tan
78-83	Sand and gravel, fine to coarse, tan
83-86	Clay, sandy, tan
86-89	Sand and gravel, fine to medium; clay trace
89-100	Sand and gravel, fine to coarse, yellow-brown, occasional boulder
100-102	Sand and gravel, fine to very coarse, oxidized, brown, yellow-brown, occasional boulder
	CRETACEOUS
	DAKOTA FORMATION
102-103	Gravel, cemented, oxidized, brown; boulders
103-115	Sandstone, fine to coarse, yellow-brown, tan
115-125	Sandstone, fine to very coarse, tan, yellow-brown; shale, thin streaks
125-128	Sandstone, coarse, oxidized, brown, yellow-brown
128-130	Shale, very sandy; sandstone, iron cemented, oxidized, brown
	PENNSYLVANIAN
130-131	Limestone, gray to gray-green; shale
131-135	Shale, gray-green, gray mottling

UNITED STATES DEPARTMENT OF THE INTERIOR

DONALD PAUL HODEL, *SECRETARY*

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Iowa City, Iowa 52244-1230

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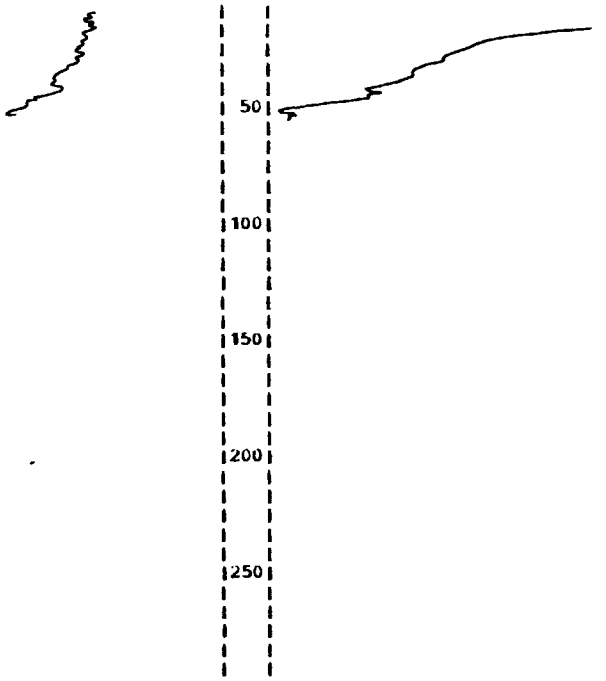
Open-File Services Section
U.S. Geological Survey
Box 25425, Federal Center
Denver, Colorado 80225

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-43-06BCDD WC-29 STATION ID: 413526-0955015-01

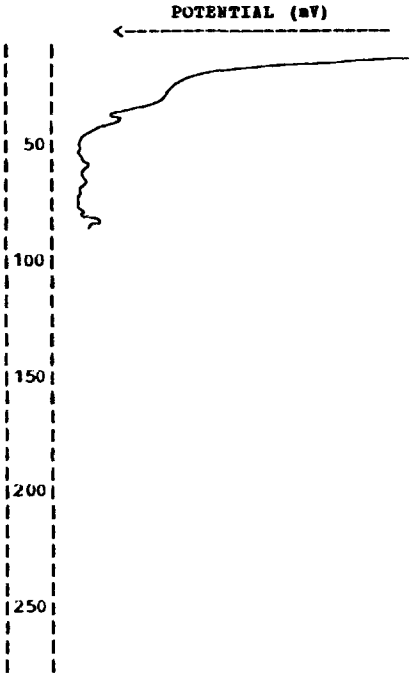
ALTITUDE: 1015 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: May 5, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil; clay, dark
5-10	Clay, dark gray
10-12	Clay, silty, blue-gray
12-16	Clay, silty, gray
16-20	Clay, silty, yellow-gray
20-25	Clay, silty, yellow-brown
25-27	Clay, silty, grading to blue-gray
27-33	Clay, silty, blue-gray
33-37	Clay, silty, sandy, blue-gray yellow-brown; fine sand layers
37-44	Sand and gravel, fine, yellow-brown; clay mixed
44-47	Sand and gravel, fine to coarse, oxidized, yellow-brown; boulders
	CRETACEOUS
	DAKOTA FORMATION
47-50	Sandstone, fine to coarse, tan
50-52	Sandstone, fine to coarse, yellow-brown
52-55	Sandstone, fine to medium, oxidized
	PENNSYLVANIAN
55-59	Limestone, gray, tan
59-61	Limestone, shaly, silty, gray-green

LOCATION: 078-43-06DABA WC-31 STATION ID: 413523-0954932-01

ALTITUDE: 1015 FEET (NGVD 1929) DEPTH: 91 FEET DATE COMPLETED: May 10, 1982

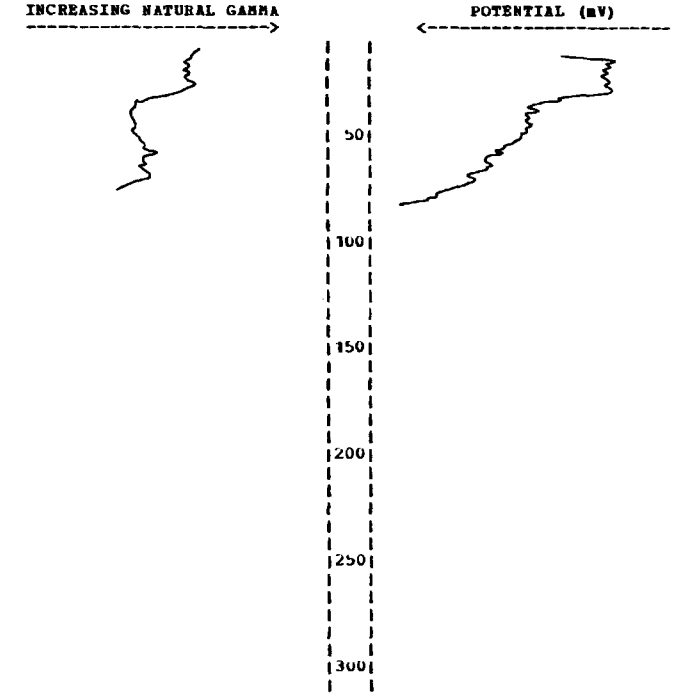


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-10	Clay, silty, dark gray
10-17	Clay, silty, dark blue-gray
17-28	Clay, silty, sandy, gray-green
28-32	Sand and gravel, fine to medium, yellow-brown
32-56	Sand and gavel, fine to very coarse, gray; occasional boulders
	CRETACEOUS
	DAKOTA FORMATION
56-73	Sandstone, fine to coarse, oxidized, yellow-brown
73-75	Conglomerate, hard iron concretion
75-78	Sandstone, fine to medium, tan
78-81	Shale, silty, gray-tan
81-82	Conglomerate, iron concretion
82-86	Sandstone, fine to medium, tan
	PENNSYLVANIAN
86-89	Shale, silty, gray-green
89-91	Siltstone, gray-green; shale; limestone

Table 2. Logs of wells and test holes--Continued.

LOCATION: 078-43-06DBAB | WC-28 | STATION ID: 413523-0954945-01

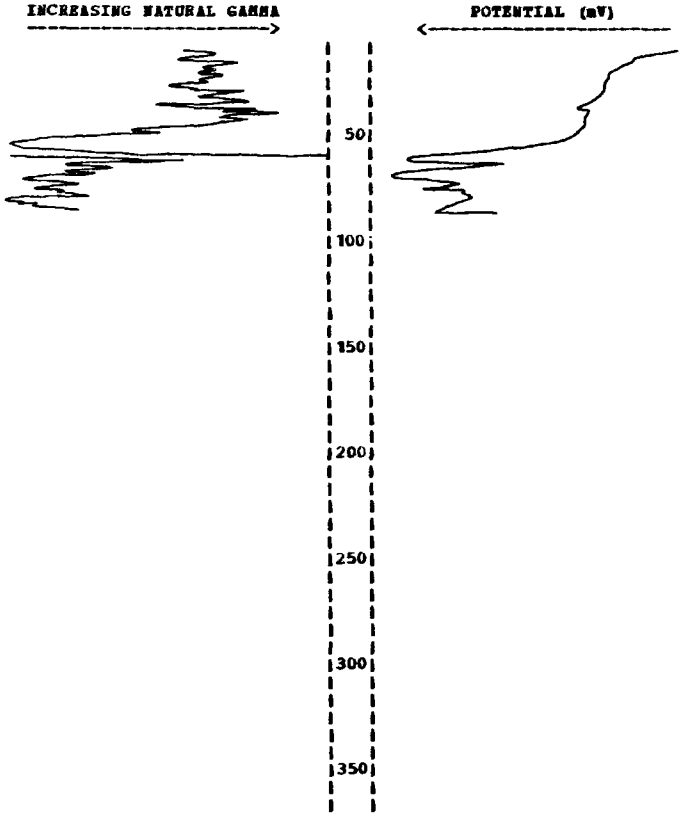
ALTITUDE: 1015 FEET (NGVD 1929) | DEPTH: 94 FEET | DATE COMPLETED: May 4, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-7	Clay, silty, blue-gray
7-9	Clay, silty, yellow-brown
9-15	Clay, silty, dark gray
15-18	Clay, silty, yellow-gray
18-26	Clay, silty, blue-gray
26-28	Clay, silty, gray-green
28-31	Sand, fine to coarse, gray
31-35	Sand and gravel, fine to medium, gray
35-38	Sand and gravel, fine to medium, yellow-gray
38-51	Sand and gravel, fine to medium, gray
51-67	Sand and gravel, oxidized, fine to coarse, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
67-80	Sandstone, oxidized, tan, reddish-brown, yellow-brown
80-82	Sandstone, brown; shale
82-86	Shale, sandy, silty, reddish-brown, gray
	PENNSYLVANIAN
86-91	Shale, silty, gray-green
91-92	Shale, reddish-brown
92-94	Limestone, gray, brown

LOCATION: 079-30-15CDCA | WC-113 | STATION ID: 413845-0941951-01

ALTITUDE: 1070 FEET (NGVD 1929) | DEPTH: 81 FEET | DATE COMPLETED: August 19, 1983

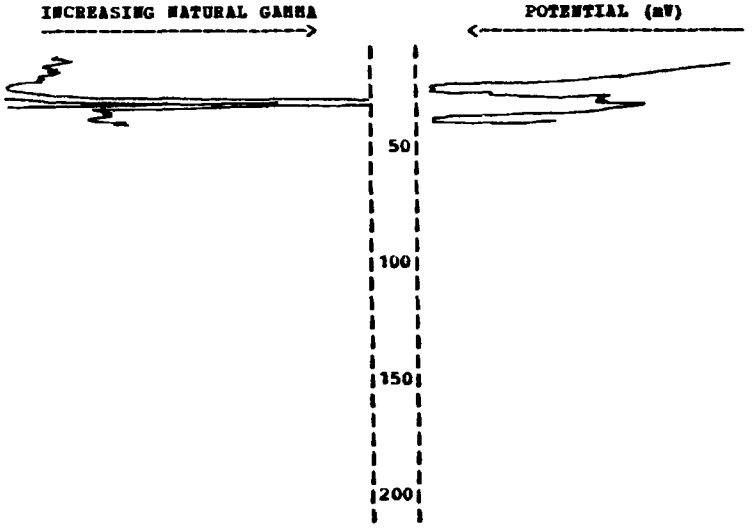


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed
3-10	Till, yellow-gray, yellow-brown
10-19	Till, yellow-gray
19-25	Clay, yellow-gray, gray, black trace at top; few sand grains
25-26	Limestone boulder, oxidized, brown
26-28	Till, gray, yellow-gray
28-30	Till, very sandy, gravelly, yellow-brown, gray
30-33	Clay, black, very dark gray; gumbo
33-38	Clay, dark gray to gray
38-43	Clay or till, gray, yellow-gray; sand grains
43-47	Clay or till, hard, yellow-brown, yellow-gray; sand
47-50	Clay, very sandy, gray-tan
	CRETACEOUS
	DAKOTA FORMATION
50-57	Sandstone, coarse (gravel), tan to yellow-brown
	PENNSYLVANIAN
57-57	Shale, yellow, gray-green
57-58	Coal, shale, black
58-59	Shale, very dark gray
59-67	Shale, silty, gray
67-71	Shale, gray, gray-green; limestone layer at 68 and 70 feet
71-81	Shale, blue-gray, gray gray, black trace at top; few sand grains

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-30-15DCBA | WC-111 | STATION ID: 413854-0941933-01

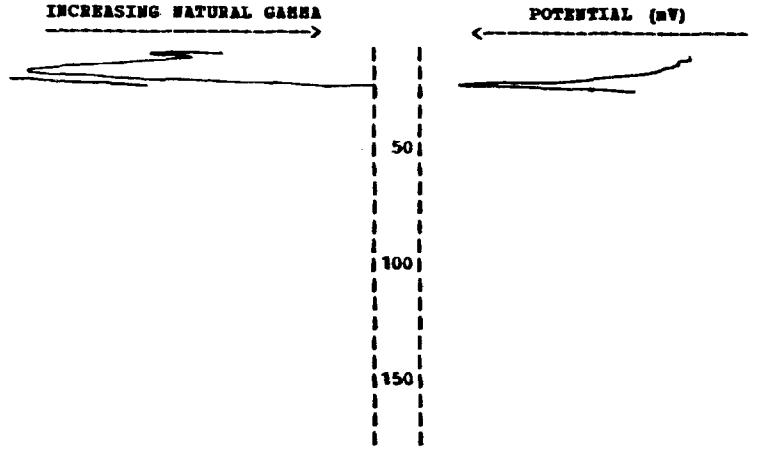
ALTITUDE: 990 FEET (NGVD 1929) | DEPTH: 41 FEET | DATE COMPLETED: August 18, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-8	Road bed
8-10	Clay, silty, very dark brown
10-17	Clay, silty, sandy, dark brown
17-21	Sand and gravel, fine, tan, yellow-brown
21-24	Sand and gravel, fine to coarse; boulder
	PENNSYLVANIAN
24-25	Shale, gray
25-26	Limestone, brown
26-27	Shale, black
27-30	Shale, gray-green, yellow-gray
30-36	Shale, silty, gray-green; siltstone layers
36-39	Shale, gray-green, reddish brown
39-41	Shale, reddish brown, trace yellow-brown

LOCATION: 079-30-15DCBB | WC-110 | STATION ID: 413852-0941937-01

ALTITUDE: 990 FEET (NGVD 1929) | DEPTH: 21 FEET | DATE COMPLETED: August 18, 1982

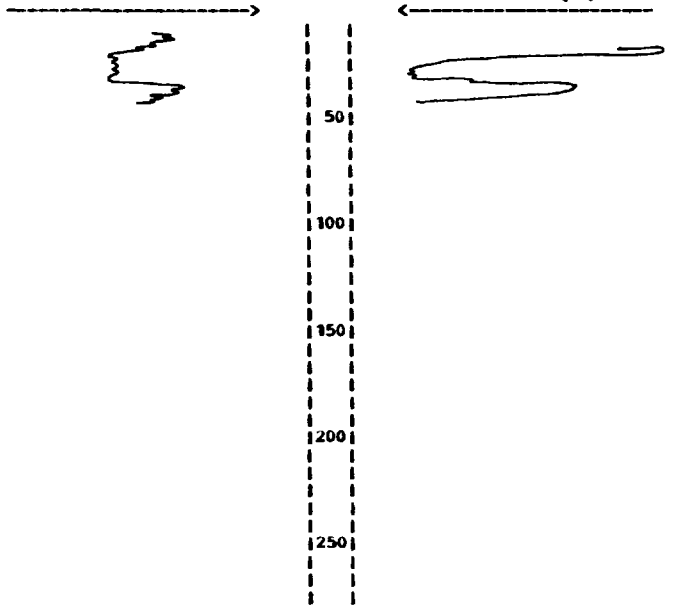


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Road bed
6-8	Clay, dark gray-brown
8-10	Clay, yellow-gray to yellow-brown
10-12	Clay, sandy, gravelly, oxidized, gray brown
12-14	Clay, very sandy, gravelly, gray-brown; sand layers
	PENNSYLVANIAN
14-17	Limestone, tan, brown
17-17	Shale, gray-green, brown
17-18	Shale, gray-green
18-19	Limestone, gray, brown
19-19	Shale, dark gray
19-20	Limestone, dark gray, blue-gray
20-21	Shale, dark gray-green

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-30-15DDAA NC-112 STATION ID: 413853-0941908-01

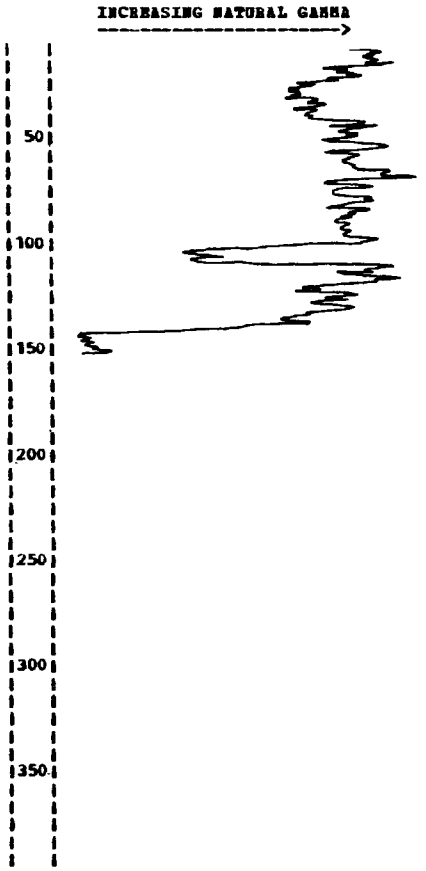
ALTITUDE: 1060 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: August 19, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-7	Till, sandy, brown
7-11	Till, light yellow-brown (possibly reworked)
11-15	Till, light brown (possibly reworked)
15-29	Sand and gravel, fine to coarse, tan yellow-brown
29-30	Sand and gravel, fine to very coarse, oxidized, brown; boulders
	CRETACEOUS
	DAKOTA FORMATION
30-33	Shale, silty, gray-green, yellow-brown
33-35	Shale, silty, gray-green
35-39	Shale, silty, oxidized zone at 37 feet, yellow-brown, yellow-gray; sandstone layers, silty
	PENNSYLVANIAN
39-40	Limestone, blue-gray
40-41	Shale, gray-green, yellow-gray

LOCATION: 079-30-22BAAC NC-109 STATION ID: 413837-0941946-01

ALTITUDE: 1140 FEET (NGVD 1929) DEPTH: 152 FEET DATE COMPLETED: August 19, 1982



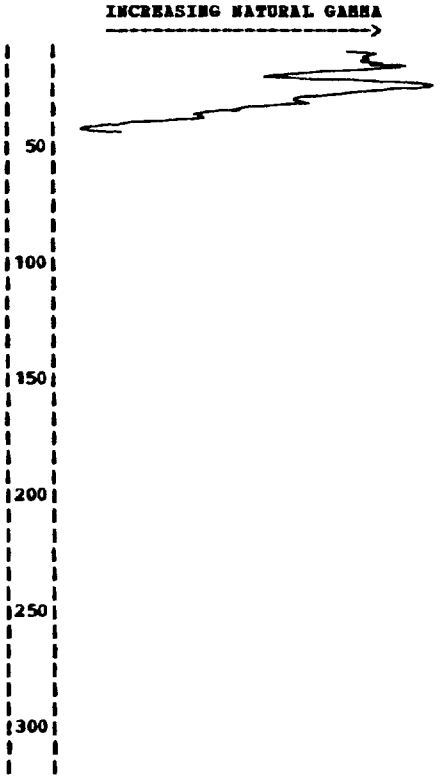
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Clay, silty, yellow-brown, yellow-tan
7-13	Clay, silty, yellow-tan
13-22	Clay or gumbo, gray; sand trace
22-35	Till, yellow-brown
35-36	Sand, fine to coarse, yellow-brown
36-39	Till, yellow-brown
39-45	Till, yellow-brown, some gray
45-60	Till, yellow-brown; boulder at 56 feet
60-65	Till, yellow-brown, gray
65-67	Till, blue-gray
67-71	Till, yellow-brown, some gray
71-98	Till, gravelly at top, blue-gray to gray
98-105	Sand and gravel, fine to medium
105-120	Till, blue-gray; shale, reworked
120-123	Clay, silty, black, very dark gray
123-131	Clay, gray; few sand grains
131-134	Clay, sandy, gray
134-137	Clay, sandy, gray-green
	CRETACEOUS
	DAKOTA FORMATION
137-149	Sandstone, very coarse (gravel), yellow-brown
	PENNSYLVANIAN
149-151	Shale, dark gray; coal; lignite
151-152	Shale, silty, gray

Casing record: set 2 inch pipe to 150 feet, slotted from 140 to 150 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-31-14CBCC WC-82 STATION ID: 414156-0942605-01

ALTITUDE: 1090 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: July 14, 1982

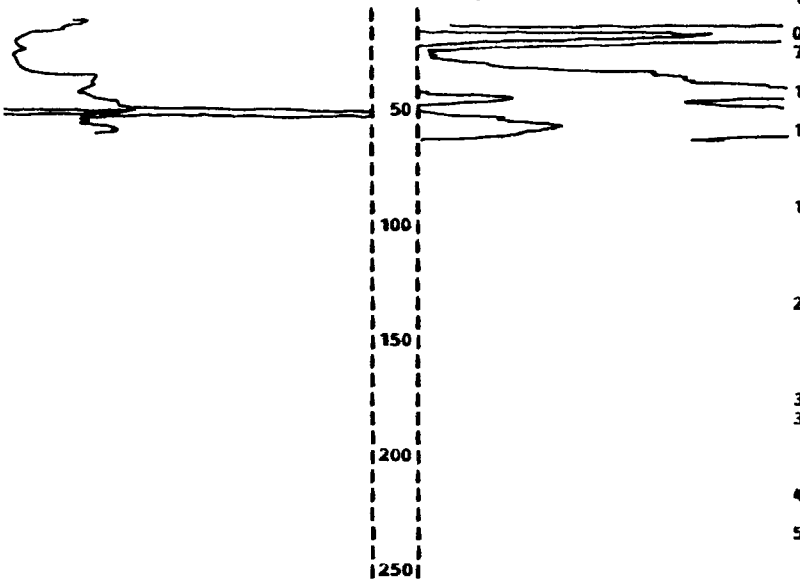


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-14	Loess, yellow-brown, yellow-tan
14-16	Sand, fine to medium, oxidized, tan, brown
16-18	Clay, gray; sand grains
18-19	Clay, yellow-gray
19-24	Clay, gray; sand grains
24-26	Clay, silty, oxidized, light gray, brown
26-27	Sand, fine, tan
27-34	Sand and gravel, fine to medium, brown, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
34-40	Sand and gravel, fine to coarse, yellow-brown
40-42	As above, hard, well cemented
42-46	Shale, silty, blue-gray
46-48	Sandstone, fine to medium, tan
	PENNSYLVANIAN
48-53	Shale, silty, gray
53-56	Shale, silty, light blue-gray
56-61	Shale, silty, hard streaks, gray

Casing record: set 2 inch pipe to 40 feet, slotted from 30 to 40 feet, gravel packed

LOCATION: 079-31-22ADAD WC-83 STATION ID: 413825-0942606-01

ALTITUDE: 1035 FEET (NGVD 1929) DEPTH: 56 FEET DATE COMPLETED: July 15, 1982

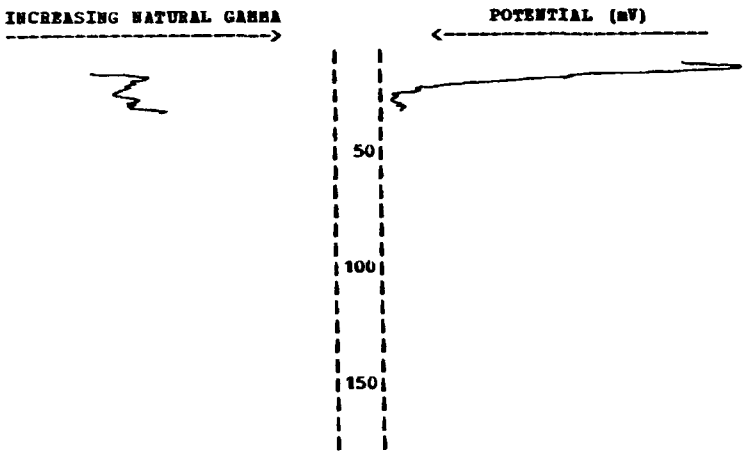


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Road bed, top soil
7-10	Clay, silty, yellow-gray
10-11	Clay, silty, sandy, yellow-brown
11-17	Sand and gravel, fine to medium, brown, yellow-brown; clay at top
17-28	Sand and gravel, fine to medium, yellow-tan
	CRETACEOUS
	DAKOTA FORMATION
28-35	Shale, silty, gray; conglomerate layer at 33 feet
	PENNSYLVANIAN
35-37	Shale, light blue-gray
37-42	Shale, silty, gray-green; silty limestone or siltstone layer at top
42-50	Shale, light blue-gray, maroon, reddish-brown
50-56	Shale, yellow-brown, gray, brown, reddish-brown

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-31-22DAAA WC-84 STATION ID: 413816-0942606-01

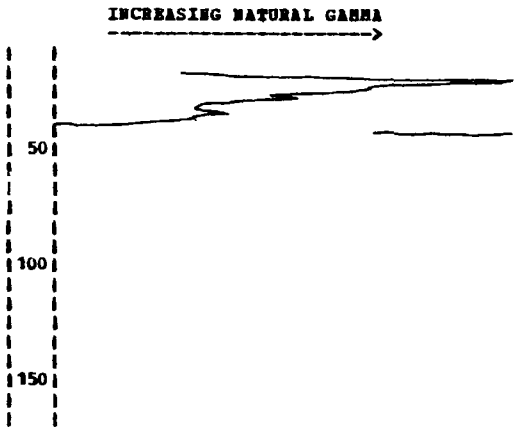
ALTITUDE: 1046 FEET (NGVD 1929) DEPTH: 21 FEET DATE COMPLETED: July 15, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil, silty
2-3	Sand and gravel
	CRETACEOUS
	DAKOTA FORMATION
3-4	Shale, oxidized, weathered, brown, yellow-brown
4-5	Sandstone, fine, hard, brown
	PENNSYLVANIAN
5-6	Shale, reddish-brown
6-8	Shale, silty, yellow-tan, brown; siltstone
8-9	Shale, very dark; iron concretions
9-21	Shale, silty, light blue-gray siltstone

LOCATION: 079-31-23BBBB WC-85 STATION ID: 414110-0942605-01

ALTITUDE: 1037 FEET (NGVD 1929) DEPTH: 30 FEET DATE COMPLETED: July 15, 1982



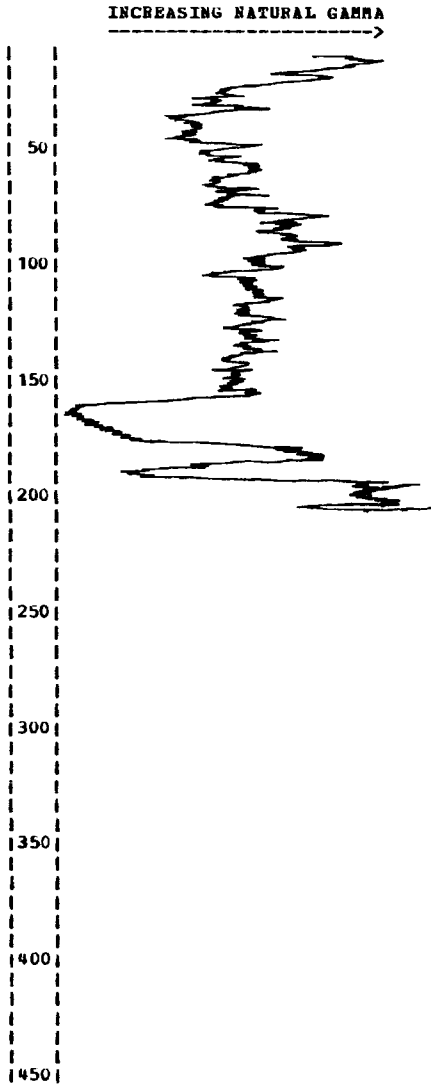
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Fill; top soil
5-8	Clay, silty, gray
8-11	Clay, very sandy, brown
11-13	Clay, sandy, blue-gray; sand layers
13-17	Sand and gravel, fine to medium, gray
17-27	Sand and gravel, fine to medium, some coarse, tan
	PENNSYLVANIAN
27-30	Shale, silty, light blue-gray

Casing record: set 2 inch pipe to 27 feet, slotted from 21 to 27 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-35-10CABB WC-17 STATION ID: 413958-0945445-01

ALTITUDE: 1280 FEET (NGVD 1929) DEPTH: 221 FEET DATE COMPLETED: August 14, 1981



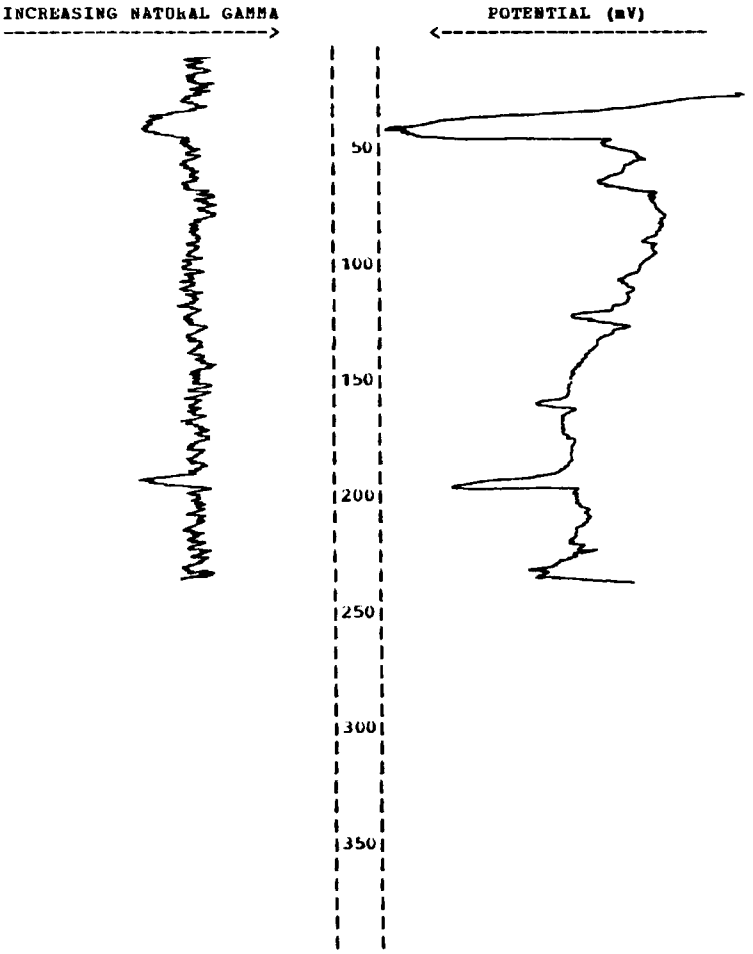
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Top soil; clay, yellow-tan
7-14	Till, yellow-brown
14-17	Clay, dark gray
17-30	Till, blue-gray to light blue-gray
30-35	Till, yellow-gray
35-44	Till, gray; occasional boulders
44-50	Till, yellow, yellow-gray; occasional boulders
50-74	Till, yellow-brown
74-97	Till, blue-gray
97-100	Sand and gravel, fine to coarse, gray
100-120	Till, sandy, gravelly, blue-gray; occasional boulders
120-150	As above
	CRETACEOUS
	DAKOTA FORMATION
150-160	Sand or sandstone, fine to coarse, cemented, brown
160-171	Sand and gravel, fine, oxidized, cemented, brown
171-180	Shale, silty, oxidized zones, tan, gray-brown; sandstone, fine, oxidized streaks, iron cementation
180-186	Sandstone, coarse, yellow-brown, tan
	PENNSYLVANIAN
186-202	Shale, silty, gray; limestone streaks
202-206	Shale, slate-like, dark gray, brown; coal
206-209	Shale, silty, gray
209-211	Limestone; pyrite
211-216	Shale, light gray
216-221	Shale, silty, gray-green; siltstone, occasional layers

Casing record: set 2 inch pipe to 210 feet, slotted from 168 to 188 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-35-15DCCD WC-76 STATION ID: 413842-0945425-01

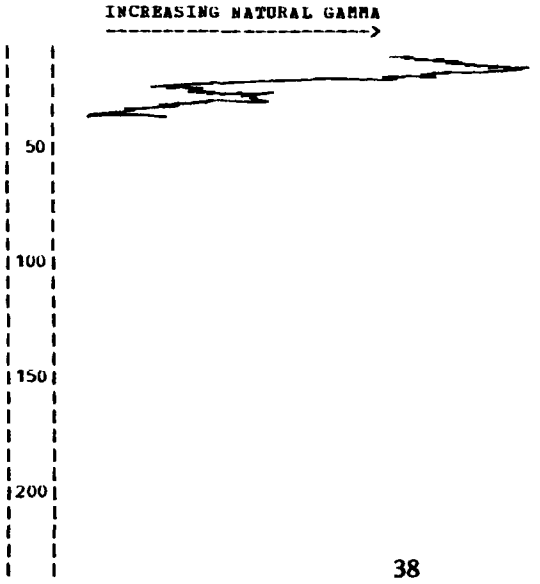
ALTITUDE: 1260 FEET (NGVD 1929) DEPTH: 276 FEET DATE COMPLETED: June 29, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Road bed; top soil
6-12	Clay, silty, brown to light brown
12-16	Clay, silty, soft, yellow-gray
16-21	Clay, silty, some sandy, yellow-gray
21-24	Clay, silty, sandy, soft, yellow-brown
24-26	Clay, silty, sandy, soft, gray
26-30	Clay, silty, very sandy, soft, blue-gray
30-38	Sand, fine grading to sand and gravel, fine to medium, gray
38-38	Clay; gravel
38-41	Sand and gravel, fine to medium, gray
41-50	Till, yellow-brown, yellow-gray
50-60	Till, yellow-brown, gray trace
60-70	Till, sandy, yellow-gray grading to blue-gray
70-101	Till, blue-gray
101-103	Sand and gravel, fine to coarse, gray
103-116	Till, blue-gray; occasional boulders
116-120	Till, very silty, sandy, blue-gray; sand, layer at 119 feet
120-150	Till, blue-gray; occasional boulders
150-187	As above, gravelly
187-192	Sand and gravel, fine to coarse, gray-tan; pyrite
192-247	Till, very sandy, gravelly at base, blue-gray
247-276	Sand or sandstone, fine to coarse, cemented, brown, tan

LOCATION: 079-35-15DCDD WC-75 STATION ID: 413843-0945417-01

ALTITUDE: 1245 FEET (NGVD 1929) DEPTH: 32 FEET DATE COMPLETED: June 25, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Top soil; clay, silty, dark
4-12	Clay, gray
12-14	Clay, silty, sandy, soft, yellow-gray
14-15	Clay, silty, sandy, soft, yellow-brown
15-16	Clay, silty, sandy, blue-gray
16-17	Sand, fine to coarse, gray; wood; clay
17-19	Sand and gravel, yellow-brown
19-21	Sand and gravel, fine to coarse, gray; clay trace
21-27	Sand and gravel, fine to coarse, gray-tan
27-30	Sand and gravel, fine to coarse, oxidized, brown
30-32	Till, yellow-gray

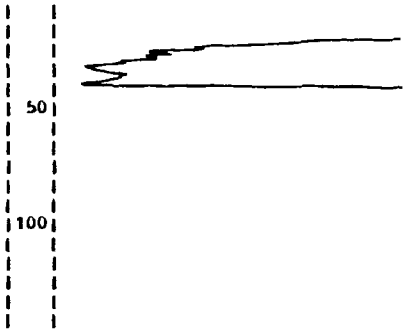
Casing record: set 2 inch pipe to 30 feet slotted from 25 to 30 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-35-15DDCD WC-74 STATION ID: 413842-0945406-01

ALTITUDE: 1245 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 24, 1982

INCREASING NATURAL GAMMA ----------> POTENTIAL (mV) <----------



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-11	Clay, silty, soft, dark
11-15	Clay, silty, brown
15-19	Clay, sandy, silty, gray; sand layers, brown
19-22	Sand and gravel, fine, gray; clay
22-27	Sand and gravel, fine to medium, gray
27-35	Sand and gravel, fine to coarse, yellow-brown
35-36	Gravel, oxidized; boulders; till mixed
36-38	Till, yellow-tan
38-41	Till, yellow-gray

LOCATION: 079-35-15DDDD WC-77 STATION ID: 413843-0945357-01

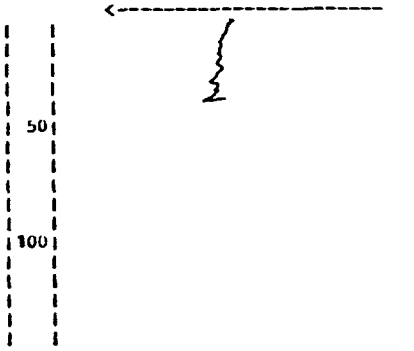
ALTITUDE: 1280 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 30, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Clay, silty, brown to yellow-brown
5-14	Clay, silty, very sandy, soft, tan
14-19	Clay, silty, sandy, soft, gray, brown
19-35	Clay, sandy, yellow-brown; few pebbles
35-37	Clay, silty, yellow-gray
37-39	Clay, silty, gray-brown
39-46	Sand, fine to coarse, tan
46-47	Clay, silty, dark gray
47-54	Till, yellow-gray
54-55	Sand and gravel, fine to medium, gray
55-57	Till, sandy, gravelly, light blue-gray
57-61	Till, yellow-gray

LOCATION: 079-38-23CDCC WC-209 STATION ID: 413752-0951431-01

ALTITUDE: 1212 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 13, 1983

INCREASING NATURAL GAMMA ----------> POTENTIAL (mV) <----------

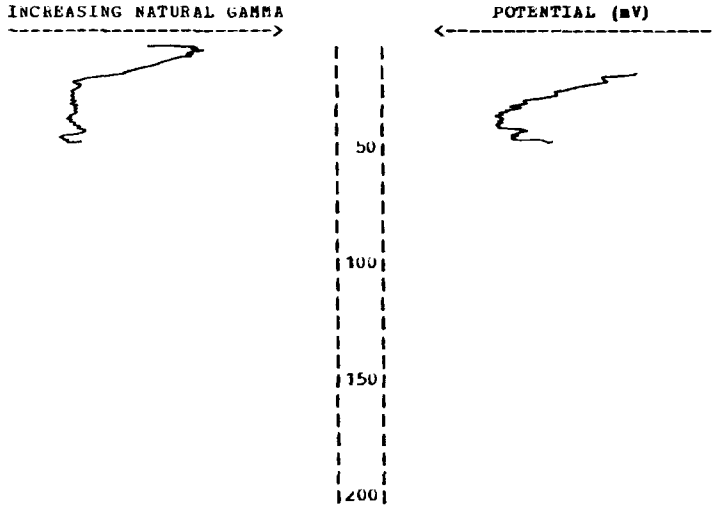


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-7	Clay, dark gray-brown
7-8	Clay, silty, yellow-brown
8-15	Clay, silty, gray-green
15-20	Clay, silty, yellow-gray, gray; shells
20-25	Clay, silty, gray-green
25-26	Clay, silty, yellow-brown
26-30	Clay, silty, gray-green
30-34	Clay, silty, gray-brown
34-35	Clay or till, very sandy, gray; wood
35-41	Till, blue-gray, gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-38-23CDDC WC-210 STATION ID: 413752-0951423-01

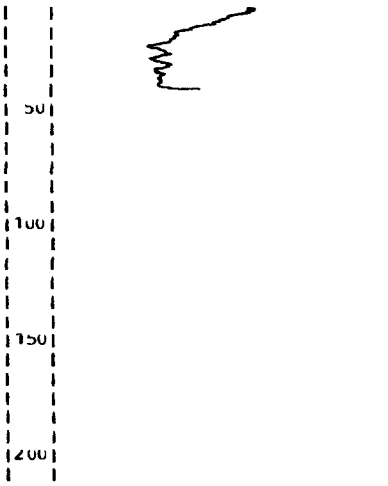
ALTITUDE: 1205 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 13, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-8	Clay, silty, very dark gray-brown
8-10	Clay, silty, yellow-gray
10-16	Clay, silty, yellow-brown
16-19	Clay, silty, oxidized, yellow-gray, brown; sand
19-21	Sand and gravel, fine, oxidized, gray, brown
21-24	Sand and gravel, fine; wood; clay, silty
24-30	Sand and gravel, fine to medium, gray, tan
30-40	Sand and gravel, fine to coarse, olive, yellow-brown
40-47	Sand and gravel (mostly sand), fine, some coarse at base, gray
47-61	Till, blue-gray

LOCATION: 079-38-23DCCC WC-208 STATION ID: 413752-0951414-01

ALTITUDE: 1202 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 13, 1983



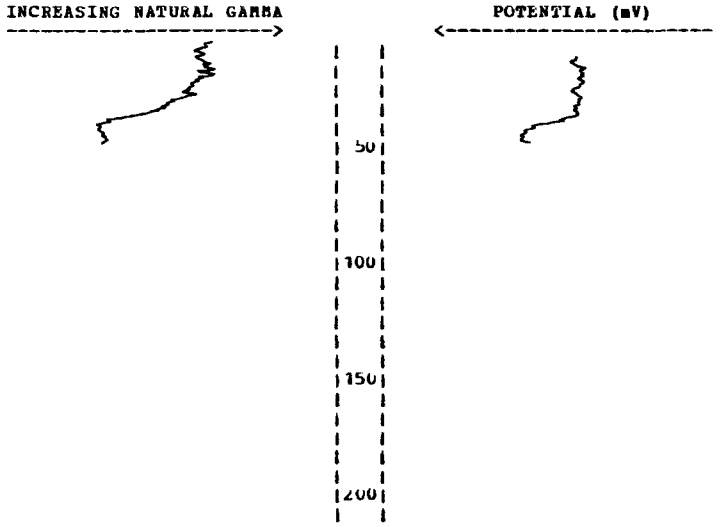
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Road bed; fill
10-13	Clay, silty, brown
13-15	Sand, fine to coarse, brown; clay layers
15-17	Clay, sandy, silty, yellow-brown; sand layers
17-19	Sand, fine to coarse; clay layers, tan, yellow-brown
19-21	As above, brown
21-24	Sand and gravel, fine, gray; clay layers
24-30	Sand and gravel, fine to medium, some coarse, gray, tan
30-40	As above, coarse at base, yellow-tan, tan
40-41	Till, blue-gray

Casing record: set 2 inch pipe to 39 feet, slotted from 34 to 39 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-38-23DDDD WC-211 STATION ID: 413752-0951341-01

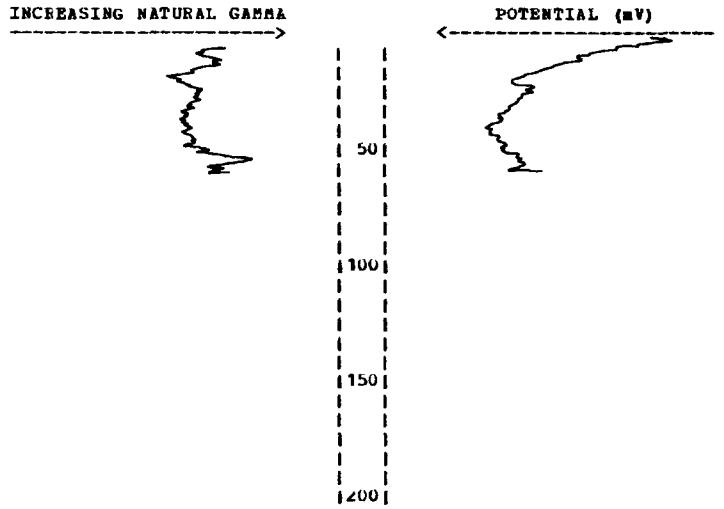
ALTITUDE: 1210 FEET (NGVD 1929) DEPTH: 60 FEET DATE COMPLETED: June 14, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-8	Clay, silty, dark brown
8-15	Clay, silty, gray-brown grading to yellow-brown
15-20	Clay, silty, yellow-gray, yellow-brown
20-26	Clay, silty, olive grading to gray-green
26-29	Clay, silty, dark blue-gray
29-31	Clay, silty, gray
31-34	Clay, silty, yellow-gray
34-35	Clay, silty, brown
35-38	Clay, sandy, silty, gray
38-40	Sand, fine to coarse, gray; gravel; clay
40-49	Sand and gravel, fine to medium, coarse at base; boulders at base
49-60	Till, blue-gray: boulder at 59 feet

LOCATION: 079-38-25BABB WC-213 STATION ID: 413751-0951322-01

ALTITUDE: 1260 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 14, 1983

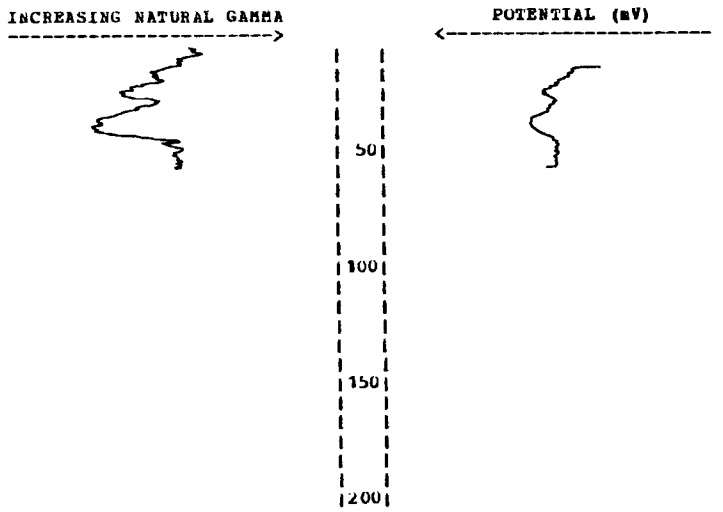


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-8	Clay, silty, yellow-gray, brown; loess
8-10	Clay or till, sandy, gravelly, yellow-brown
10-18	Clay, silty, gray
18-19	Clay or till, sandy, gravelly, gray, yellow-brown
19-21	Clay or till, sandy, gravelly, yellow-brown
21-25	Till, yellow-tan, yellow-brown, gray
25-45	Till, yellow-brown, gray mottling
45-47	Till, yellow-gray
47-49	Till, blue-gray
49-54	Till, yellow-gray, olive, gray
54-57	Till, blue-gray
57-58	Till, olive
58-61	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-38-26ABAA WC-212 STATION ID: 413750-0951358-01

ALTITUDE: 1200 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 14, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Road bed; top soil
6-8	Clay, dark gray grading to gray
8-12	Clay, silty, yellow-gray
12-17	Clay, silty, yellow-brown
17-18	Clay, silty, oxidized, brown
18-22	Clay, sandy, silty, gray-green; wood at base
22-28	Sand and gravel, fine to coarse; clay layers
28-32	Clay, silty, gray-green
32-36	Sand, fine to coarse; clay, sandy
36-40	Sand and gravel, fine to coarse, gray
40-44	Sand, fine to coarse, gray
44-61	Till, blue-gray; sand layer at 60 feet, fine,

LOCATION: 079-39-36CAAA WC-21 STATION ID: 413632-0952006-01

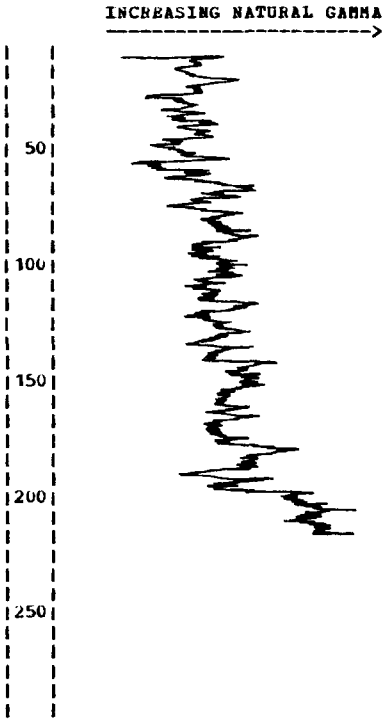
ALTITUDE: 1200 FEET (NGVD 1929) DEPTH: 321 FEET DATE COMPLETED: September 9, 1981

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Clay, silty, tan, yellow-brown
10-32	Clay, silty, sandy, soft, blue-gray
32-40	Sand and gravel, fine to medium
40-42	Sand and gravel; boulder; clay
42-50	Clay, silty, sandy, gray
50-130	Till, blue-gray
130-134	Till or clay, very sandy
134-140	Sand, fine to medium, gray
140-141	Till, gray
141-143	Sand and gravel, fine, yellow-gray
143-147	Till, sandy, gravelly, blue-gray
147-155	Sand and gravel, fine, gray
155-180	Till, sandy, gravelly, blue-gray
180-220	Till, sandy, gravelly, blue-gray; boulder at 217 feet
220-250	Till, blue-gray; reworked shales
250-267	Clay or till, silty, sandy, light blue-gray
267-272	Sand, fine to medium, cemented
272-281	Sand, very fine to medium, silty; clay
281-284	Clay, silty, sandy, gray-green
284-292	Clay, very sandy, silty, soft as above
292-301	Clay, silty, sandy, tough, gray to gray-green
301-305	Sand and gravel, fine, well cemented
305-307	Clay, silty, sandy, hard, gray to gray-green
307-310	Sand and gravel, fine, well cemented
	PENNSYLVANIAN
310-312	Siltstone or limestone, silty, gray-green
312-320	Shale, silty, gray-green
320-321	Shale, reddish brown

Table 2. Logs of wells and test holes--Continued.

OCATION: 079-40-09DBCA WC-15 STATION ID: 413953-0953026-01

LTITUDE: 1205 FEET (NGVD 1929) DEPTH: 210 FEET DATE COMPLETED: July 21, 1981



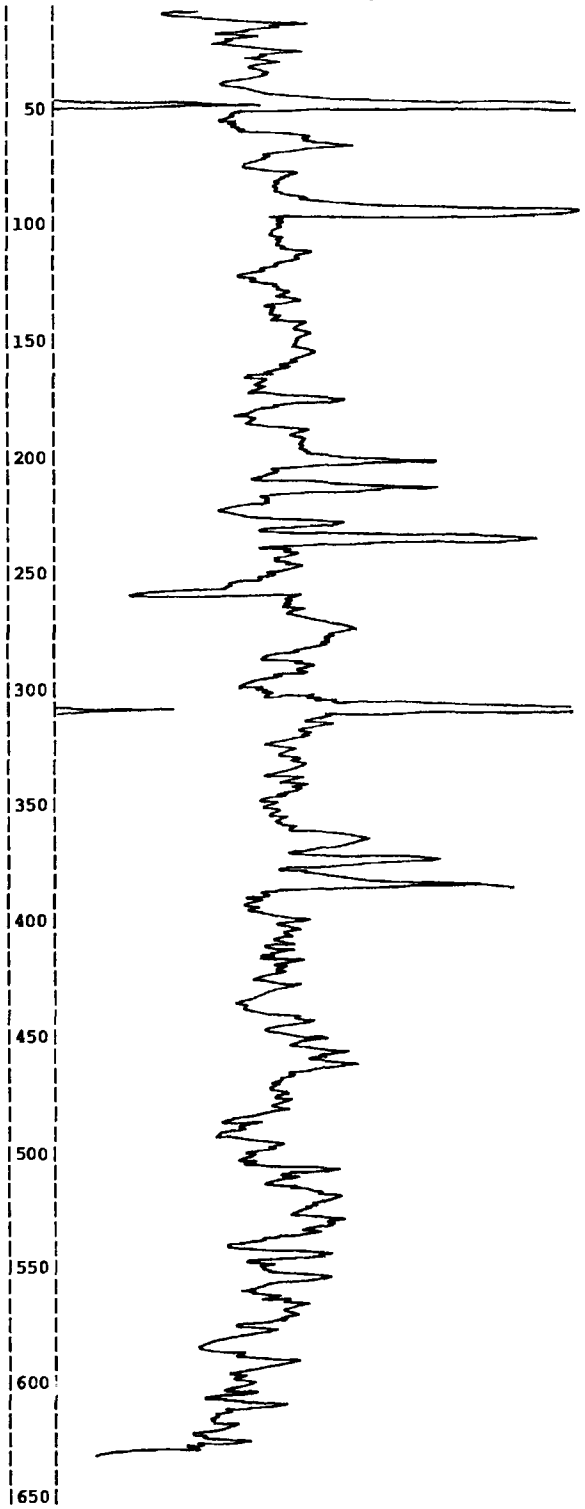
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-14	Clay, silty, brown, yellow-tan
14-17	Clay, silty, soft, yellow-tan
17-20	Clay, silty, soft, gray-green
20-26	Clay, silty, soft, blue-gray
26-34	Clay, silty, soft, gray
34-40	Clay, silty, sandy, gray, blue-gray; wood
40-45	Sand and gravel; boulders; clay mixed, gray
45-60	Till, blue-gray
60-127	Till, blue-gray; occasional boulders
127-129	Sand and gravel, fine to coarse, gray
129-166	Till, gravelly, sandy, blue-gray
166-180	Clay or till, silty, gray-brown
180-182	Sand and gravel, fine to coarse; boulders
	PENNSYLVANIAN
182-210	Shale, yellow grading to reddish brown

Casing record: set 2 inch pipe to 200 feet, slotted from 160 to 175 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-42-19AADB WC-22 STATION ID: 413838-0954620-01

ALTITUDE: 1045 FEET (NGVD 1929) DEPTH: 628 FEET DATE COMPLETED: October 30, 1981



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-23	Fill; sand and gravel; clay, silty
22-23	Sand and gravel, iron cemented, brown
23-25	Sand and gravel
25-28	Clay, silty, gray-green
28-34	Sand and gravel, fine to coarse
	PENNSYLVANIAN
34-38	Limestone, broken, weathered
38-41	Limestone, gray
41-42	Shale, gray
42-43	Shale, fissle, black
43-45	Shale, fissle, black, dark gray
45-46	Shale, gray; limestone
46-47	Limestone, blue-gray
47-48	Shale, gray to gray-green; limestone layer
48-53	Limestone, gray
53-60	Limestone, light color; shale layer, gray-green
60-63	Shale, black streak at 52 feet, gray-green; limestone
63-68	Shale, gray-green
68-72	Limestone, light color; shale
72-73	Shale, reddish-brown, gray-green and yellow-green mottling
73-75	Shale, reddish-brown; limestone
75-81	Shale, very silty, gray-green, reddish-brown mottling
81-83	Shale, silty, gray-green, reddish-brown
83-84	Shale, reddish brown, gray-green
84-85	Shale, silty, gray-green; limestone trace
85-89	Limestone, light colored; shale, occasional thin streak
89-91	Shale, gray-green, black
91-93	Shale, silty, gray-green, reddish-brown
93-98	Shale, small lime concretions, gray, yellow mottling
98-101	Shale, gray, reddish-brown
101-103	Shale, very hard at bottom, reddish-brown
103-105	Shale, silty, reddish-brown
105-113	Shale, reddish-brown
113-123	Shale, reddish-brown, gray-green; limestone
123-125	Shale, silty, gray, gray-green
125-131	Shale, silty, gray-green, reddish-brown trace; limestone streak
131-133	Shale, silty, gray-green, reddish-brown
133-143	Shale, reddish-brown

Table 2. Logs of wells and test holes--Continued.

WC-22 Continued

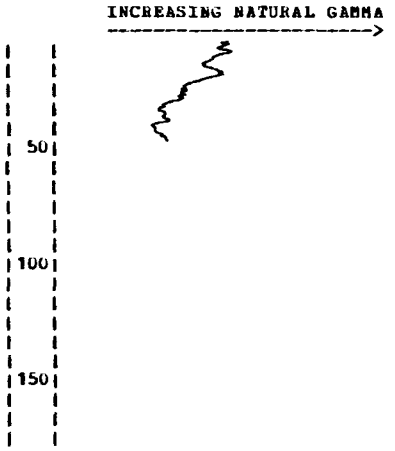
DEPTH (FEET)	DESCRIPTION OF MATERIALS
143-151	Shale, reddish-brown, yellow streaks
151-153	Shale, blue-gray
153-153	Shale, blue-gray
153-154	Shale, reddish-brown, yellow
154-155	Shale, gray to dark gray
155-155	Shale, dark gray to black
155-160	Shale, gray; limestone at bottom
160-162	Shale, reddish-brown; limestone
162-163	Shale, reddish-brown to gray
163-164	Shale, reddish-brown
164-166	Shale, gray; limestone
166-169	Limestone, light colored
169-170	Shale, gray-tan; limestone
170-172	Shale, blue-gray to dark-gray
172-172	Shale, black; coal
172-173	Sandstone, fine, silty, gray
173-182	Sandstone, very fine to medium, silty, gray
182-183	Shale, sandy, silty, gray
183-193	Shale, gray; sandstone, thin layers; siltstone, thin layers
193-195	Limestone, shaly at top
195-202	Shale, gray to dark gray; siltstone, occasional layer
202-203	Limestone, shaly at top
203-209	Limestone; shale, green-gray
209-211	Shale, dark gray; limestone
211-213	Shale, gray; limestone
213-217	Shale, gray, reddish-brown
217-221	Limestone, light colored
221-223	Shale, silty, gray-green; siltstone
223-224	Shale, gray-green
224-226	Shale, dark-gray
226-229	Limestone, gray; shale
229-232	Shale, black, dark-gray
232-233	Coal
233-243	Shale, gray-green; limestone; pyrite
243-253	Shale, sandy, silty, reddish-brown, gray-green
253-263	Shale, silty, reddish-brown, yellow, brown, gray-brown
263-267	Shale, gray-brown, yellow, some reddish-brown
267-273	Shale, dark blue-gray
273-279	Shale, dark gray; limestone layer at bottom
279-281	Shale, gray-green
281-283	Shale, reddish-brown; limestone, silty
283-287	Shale, reddish-brown, some gray
287-293	Shale, gray to dark gray
293-303	Shale, oxidized streaks at bottom, dark gray; limestone layers
303-305	Shale, black; limestone
305-310	Shale, yellow-gray, crumbly
310-313	Shale, reddish-brown
313-315	Shale, reddish-brown, yellow-brown, some gray-green
315-323	Siltstone, gray-green; limestone, some shaly
323-326	Siltstone; sand
326-333	Shale, gray, reddish-brown
333-356	Shale, gray, yellow, brown, reddish-brown
356-359	Shale, gray, yellow-brown
359-365	Shale, black, dark gray
365-365	Shale, dark gray
365-366	Limestone, dark
366-369	Shale, dark gray, black
369-369	Coal
369-373	Shale, gray-green; limestone
373-383	Shale, gray-green, gray to dark gray, yellow; limestone layer at 378 feet
383-385	Shale, gray-green, yellow; limestone at bottom
385-389	Shale, gray-green, maroon, yellow
389-392	Shale, gray, maroon
392-393	Limestone
393-401	Limestone, yellow-gray, some reddish-brown
401-405	Shale, crumbly, gray
405-411	Siltstone, gray-green; limestone at top
411-416	Cored -no drillers description recorded
416-419	Shale, gray; pyrite
419-420	Coal
420-426	Shale, sandy at bottom, gray-green, olive; pyrite
426-436	Siltstone, shaly, gray-green; limestone
436-442	Siltstone, shaly, gray, gray-green; shale, dark gray
442-446	Dolomite, sandy, shaly, gray-tan; shale at bottom, sandy, black
446-448	Shale, sandy, black; conglomerate layer; pyrite
448-451	Limestone, sandy, gray; siltstone streak; pyrite
451-454	Shale, gray grading to dark gray
454-455	Dolomite, sandy, brown; shale
455-456	Limestone, some shaly
456-458	Shale, dark gray
458-460	Shale, hard, tan-gray
460-461	Limestone
461-466	Shale, silty; siltstone, sandy, shaly
466-476	Sandstone, very fine, silty, some shaly
476-479	Sandstone, very fine, silty, shaly
479-486	Sandstone, fine grading to medium
486-492	Sandstone, fine to medium
492-493	Shale, dark gray; sandstone
493-496	Sandstone, mostly fine to medium; shale, dark gray
496-502	Sandstone, fine grading to coarse
502-504	Shale, dark gray
504-506	Shale, dolomitic, gray-tan
506-507	Shale, gray
507-508	Coal; pyrite
508-510	Shale, silty, dark gray
510-512	Sandstone, fine; shale, silty, dark
512-515	Shale, dark gray
515-516	Shale, gray-tan to dark gray
516-526	Shale, black; pyrite
526-526	As above
526-530	Shale, sandy, silty, gray-tan
530-531	Sandstone, very fine
531-534	Shale, tan, gray
534-535	Sandstone, fine; shale, dark gray
535-538	Sandstone, medium
538-541	Shale, black
541-543	Coal; pyrite
543-545	Shale; gray-brown; pyrite
545-547	Shale, gray-brown
547-549	Coal; pyrite
549-553	Shale, dark gray
553-555	Shale, silty, dark gray; sandstone, thin layers
555-560	Shale, sandy, silty, dark gray; sandstone layers; pyrite
560-563	Shale, very dark gray
563-568	Shale, dark gray
568-573	Sandstone; dolomite, sandy, shaly, silty, brown
573-578	Sandstone, very fine, shaly; siltstone; dolomite
578-581	Dolomite, sandy; conglomerate
	MISSISSIPPIAN
581-583	Dolomite layers; shale layers; chert at bottom
583-593	Dolomite, brown; shale
593-603	As above
603-613	Dolomite, vuggy, brown, light gray; shale layers; quartzite
613-623	As above
623-628	Dolomite, brown, gray; shale layers

Casing record: set 2 inch pipe to 628 feet, slotted from 588 to 628 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 079-42-19BADC WC-196 STATION ID: 413836-0954655-02

ALTITUDE: 1030 FEET (NGVD 1929) DEPTH: 49 FEET DATE COMPLETED: June 2, 1983

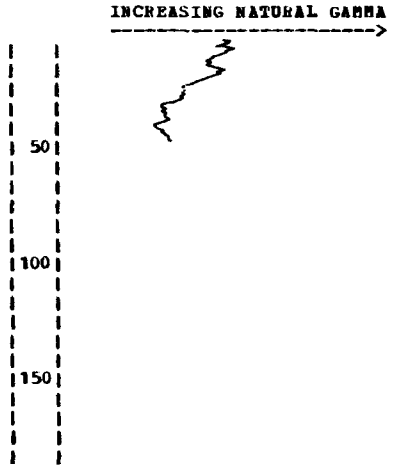


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil; clay, silty, dark
5-9	Clay, silty, gray
9-16	Clay, silty, some oxidized, brown, yellow-gray
16-23	Clay, silty, blue-gray
23-31	Sand, fine to coarse; gravel, fine; clay, blue-gray
31-40	Sand and gravel, fine to medium, gray
40-49	Sand and gravel, fine to very coarse, yellow-brown

Casing record: set 5 inch pipe to 49 feet, slotted from 31 to 49 feet, gravel packed

LOCATION: 079-42-19BADC WC-195 STATION ID: 413836-0954655-01

ALTITUDE: 1030 FEET (NGVD 1929) DEPTH: 55 FEET DATE COMPLETED: June 2, 1983

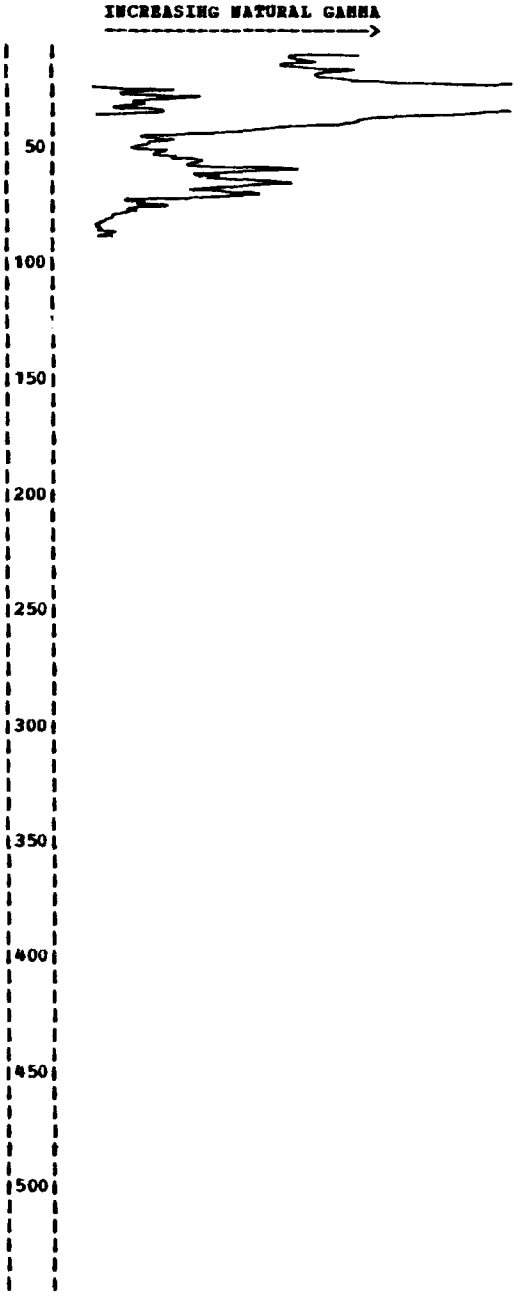


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil; clay, silty, dark
5-9	Clay, silty, gray
9-16	Clay, silty, some oxidized, brown, yellow-gray
16-23	Clay, silty, blue-gray
23-31	Sand, fine to coarse; gravel, fine; clay, blue-gray
31-40	Sand and gravel, fine to medium, gray
40-50	Sand and gravel, fine to very coarse, yellow-brown
50-53	As above, very coarse; boulders
	PENNSYLVANIAN
53-55	Limestone, light colored

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-31-06AAAD WC-114 STATION ID: 414631-0942935-01

ALTITUDE: 1150 FEET (NGVD 1929) DEPTH: 100 FEET DATE COMPLETED: August 20, 1982



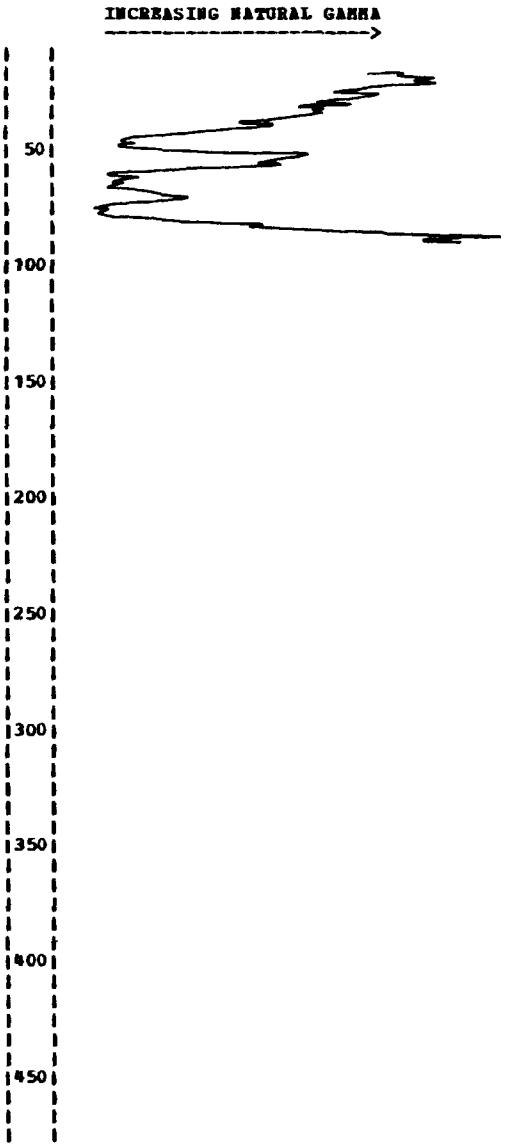
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Fill; top soil
4-6	Clay, yellow-gray
6-8	Till, yellow-gray
8-17	Till, yellow-brown, brown
	CRETACEOUS
	DAKOTA FORMATION
17-18	Sandstone, fine to coarse, yellow-brown, tan
18-26	Shale, silty, gray
26-29	Shale, silty, oxidized layers, yellow-gray to yellow-brown
29-31	Shale, yellow-brown; ironstone layer at top; sandstone; gravel
31-32	Shale, silty, sandy, light gray, yellow-brown
32-38	Sandstone, fine to coarse, iron cemented, oxidized; ironstone layer
38-54	Sandstone, fine to medium, yellow-brown
54-54	Ironstone
54-60	Sandstone, fine to very coarse, oxidized, brown, yellow-brown; gravel at base
60-61	Ironstone conglomerate
61-65	Sandstone, fine to very coarse, yellow-brown, brown
65-70	Sandstone, fine to very coarse (gravel)
70-71	Shale, gray-yellow
71-76	Sandstone, fine to very coarse (gravel)
76-80	Sandstone, fine to coarse grading to very coarse, yellow-brown, tan
80-90	Sandstone, very coarse (gravel), tan, yellow-brown
90-91	Ironstone; sandstone, hard
91-93	Shale, silty, yellow-brown
	PENNSYLVANIAN
93-95	Shale, silty, gray-green
95-100	Shale, silty, gray-green, gray; siltstone

Casing record: set 2 inch pipe to 91 feet, slotted from 80 to 91 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-33-12ACCC WC-90 STATION ID: 414514-0943816-01

ALTITUDE: 1170 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: July 21, 1982

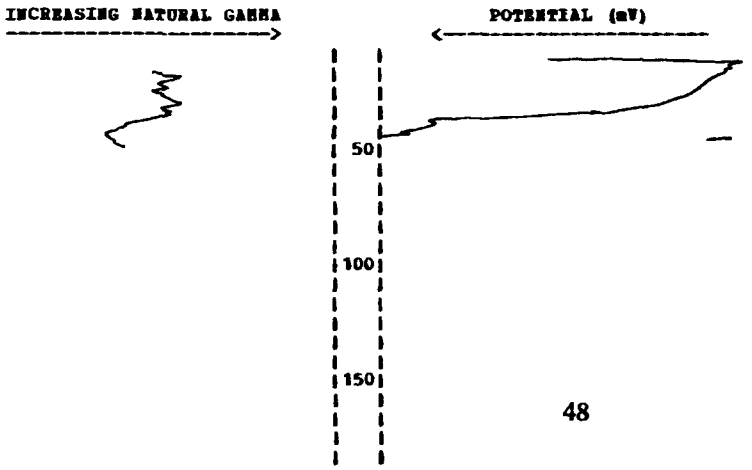


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed
3-9	Clay, dark brown
9-12	Clay, silty, yellow-brown, brown
12-15	Clay, silty, soft, gray
15-17	Clay, sandy, yellow-brown
17-21	Clay, silty, yellow-gray, brown; sand trace
21-24	Clay, silty, soft, blue-gray
24-27	Sand, fine to coarse, gray; clay
	CRETACEOUS DAKOTA FORMATION
27-30	Sandstone, fine to coarse, very oxidized, brown
30-38	Sandstone, fine to coarse, yellow-brown
38-40	Sand and gravel, fine to coarse, well cemented, oxidized, yellow-brown, brown; ironstone layers; shell layers
40-50	Sandstone, fine to very coarse (gravel), brown to yellow-brown; ironstone layers, oxidized, brown, yellow-brown; shale trace
50-60	Sandstone, fine to very coarse, (gravel), yellow-brown; shale trace
60-69	Sandstone, fine to coarse, iron cementation trace, yellow-tan; shale trace
69-71	Shale, silty, sandy, yellow-brown, gray
71-78	Shale, reddish-brown, yellow-tan
78-81	Shale, reddish-brown, light blue-gray, yellow

Casing record: set 2 inch pipe to 81 feet, slotted from 60 to 66 feet, gravel packed

LOCATION: 080-33-12CAAA WC-91 STATION ID: 414509-0943817-01

ALTITUDE: 1171 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: July 22, 1982

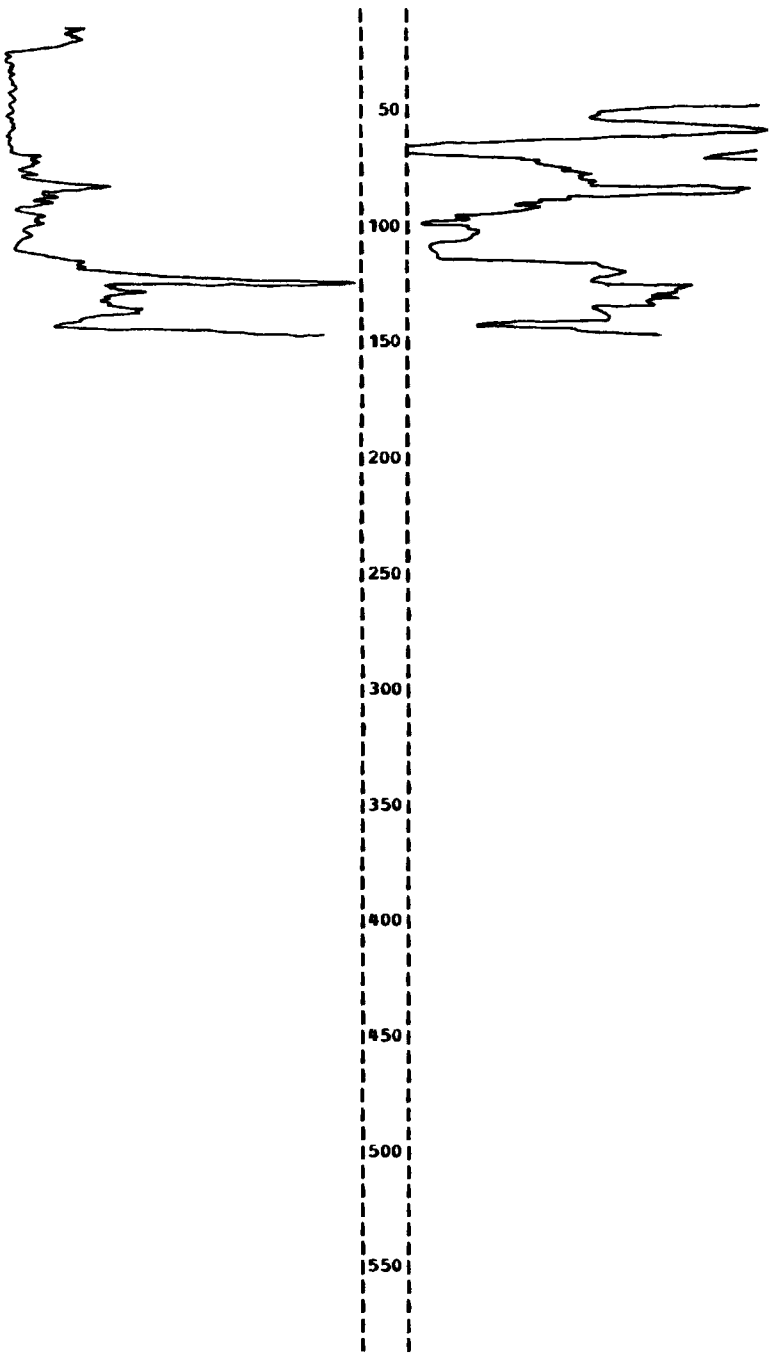


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-7	Clay, silty, very dark
7-12	Clay, silty, gray
12-15	Clay, silty, sandy, yellow-gray
15-18	Clay, silty, sandy, gray-green
18-26	Clay, silty, blue-gray
26-30	Sand and gravel, fine to medium, tan, yellow-brown
	CRETACEOUS DAKOTA FORMATION
30-35	Sandstone or sand and gravel, fine, oxidized, brown,
35-41	Sandstone, very coarse, oxidized, brown, yellow-brown; ironstone layers

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-33-12CDAD WC-92 STATION ID: 414454-0943817-01

ALTITUDE: 1230 FEET (NGVD 1929) DEPTH: 138 FEET DATE COMPLETED: July 22,1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed
3-5	Clay, silty, yellow-tan; sand layer at base
5-7	Clay or till, brown, gray
7-10	Till, yellow-gray
10-12	Till, brown
12-14	Till, yellow-gray
14-15	Till, oxidized, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
15-16	Sandstone, hard, tan
16-40	Sandstone, fine to medium, tan
40-50	As above, coarser
50-51	Shale, oxidized, brown
51-60	Sandstone, fine to coarse, yellow-brown
60-65	Sandstone, coarse, tan, yellow-brown; shale layers
65-71	Sandstone, fine to coarse, oxidized, brown; shale streaks
71-73	Ironstone, dark brown; conglomerate
73-76	Shale, gray
76-80	Sandstone, very coarse (gravel), oxidized, brown, yellow-brown; ironstone layer
80-95	Sandstone, coarse grading to very coarse, oxidized, yellow-brown; ironstone layers; shale, sandy
95-105	Sandstone, fine to medium, oxidized zones, tan, yellow-brown
	PENNSYLVANIAN
105-110	Shale, silty, yellow-gray, brown
110-114	Shale, silty, blue-gray
114-117	Shale, black: coal mostly
117-119	Shale, gray
119-120	Coal; shale layers, gray
120-123	Shale, light blue-gray
123-124	Shale, silty, gray; coal streaks
124-130	Shale, silty, light gray-green; siltstone layers
130-131	Limestone, brown, tan
131-132	Limestone, very sandy, shaly, gray
132-134	Limestone, tan, light gray
134-135	Limestone, tan, gray-green
135-137	Shale, gray-green
137-138	Shale, gray, gray-green, darker than above

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-34-06BBBC WC-78 STATION ID: 414630-0945136-01

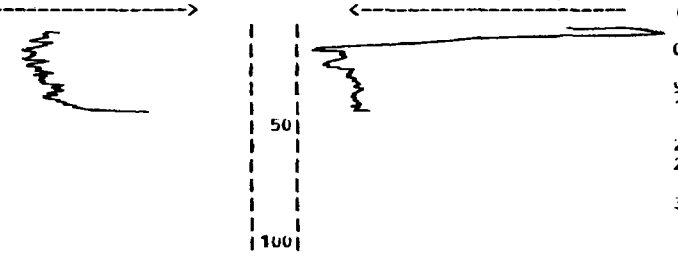
ALTITUDE: 1325 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 30, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed; top soil
3-7	Clay, yellow-tan; sand grains
7-12	Clay, sandy, yellow-tan
12-15	Clay, silty, very sandy, yellow-gray; sand layers, fine to coarse
15-17	Clay, silty, yellow-brown, yellow-gray
17-19	Clay, very sandy, soft, gray
19-21	Sand and gravel, fine, yellow-brown, tan
21-22	Sand and gravel, fine to very coarse, oxidized, brown; boulders
22-23	Till, oxidized, blue-gray to yellow-brown
23-28	Till, blue-gray
28-31	Till, olive
31-41	Till, olive, blue-gray

LOCATION: 080-34-06CCBC WC-81 STATION ID: 414552-0945136-01

ALTITUDE: 1340 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: July 13, 1982

INCREASING NATURAL GAMMA ----------> POTENTIAL (mV) <----------



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-9	Clay or loess, silty, yellow-brown
9-15	Till, yellow-brown
15-28	Till, yellow-brown, yellow-gray
28-29	Till, blue-gray
29-35	Till, yellow-gray, yellow-brown
35-41	Till, blue-gray, olive, mostly light blue-gray at base

CONTENTS

	Page
Introduction	1
Scope and Purpose	1
Acknowledgments	1
Location-Numbering System	1
Explanation of Tables and Methods of Data Collection	1
Records of Wells and Test Holes	4
Water Levels in Selected Wells	4
Water Quality	4
pH	4
Temperature	4
Specific Conductance	4
Dissolved Solids	4
Alkalinity	5
Hardness	5
Iron	5
Silica	5
Sodium-Adsorption Ration (SAR)	5
Potassium and Sodium	8
Calcium and Magnesium	8
Manganese	8
Nitrate	8
Fluoride	8
Chloride	8
Sulfate	8
Radionuclides	8
References	8

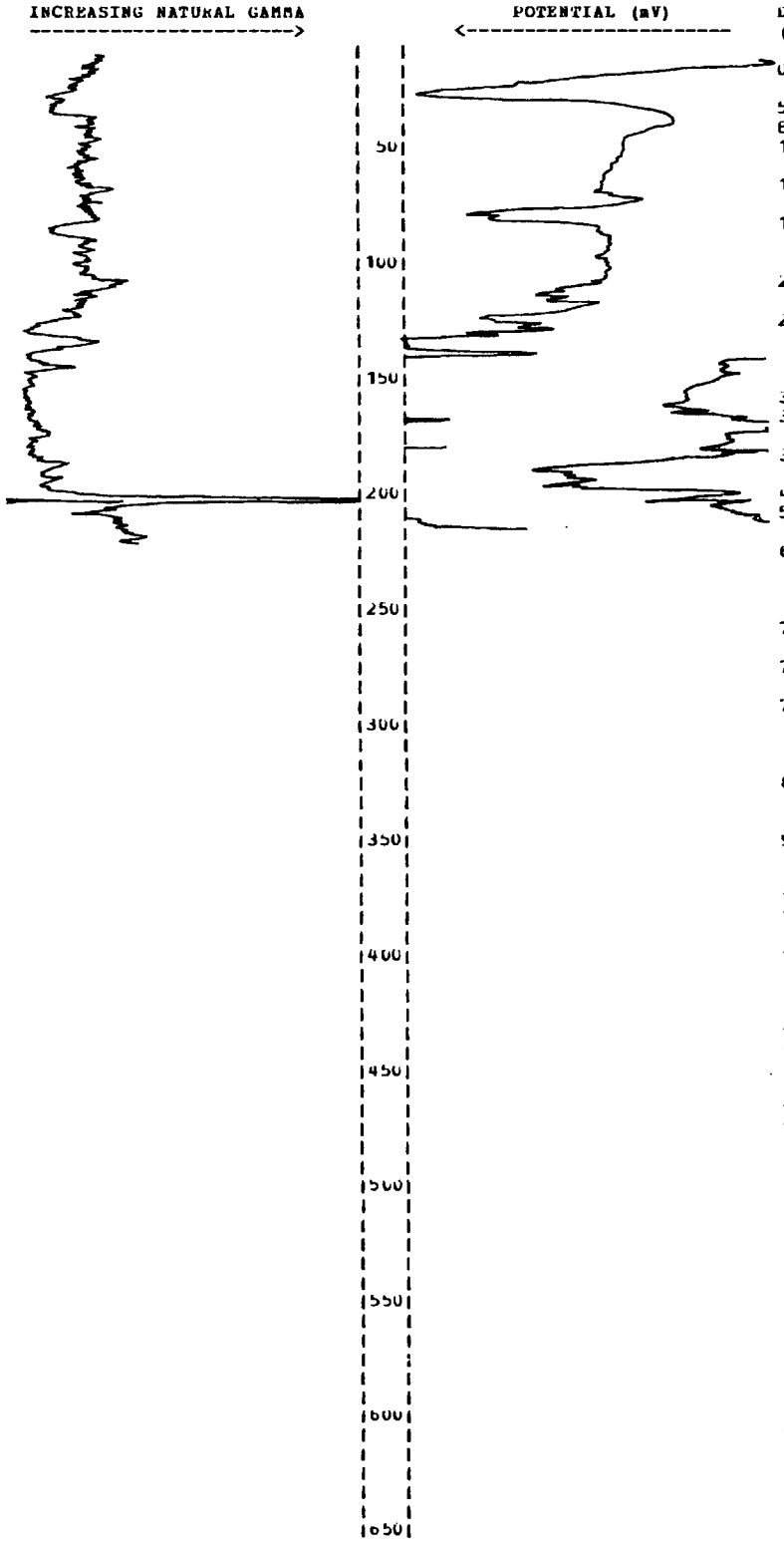
TABLES

		Page
Table	1. Drinking Water Standards for Community Water Systems	6
	2. Logs of wells and test holes	9
	3. Water levels in selected wells	140
	4. Chemical analyses of ground-water in observation wells and selected municipalities	156

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-35-01ADAD WC-79 STATION ID: 414617-0945136-01

ALTITUDE: 1290 FEET (NGVD 1929) DEPTH: 218 FEET DATE COMPLETED: July 12, 1982

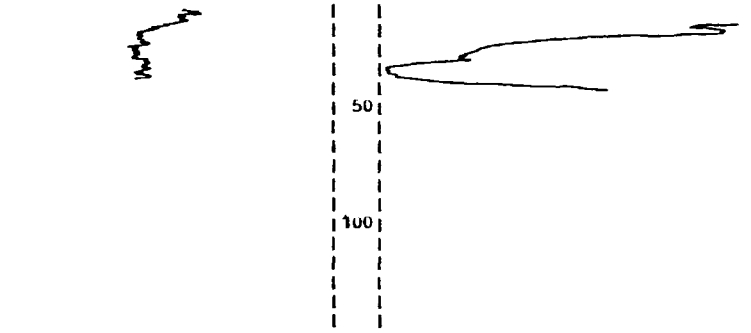


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; clay, silty, dark
5-8	Clay, silty, dark gray
8-10	Clay, silty, light gray
10-14	Clay, silty, sandy, gray-brown
14-18	Clay, silty, sandy, gray-green
18-24	Sand, fine, gray; clay, silty; gravel at base
24-27	Sand and gravel, fine to medium, gray
27-31	Sand and gravel, fine to coarse, yellow-brown; boulders at base
31-37	Till, blue-gray
37-39	Clay, silty, hard, dark brown
39-43	Clay, silty, hard, blue-gray
43-52	Till, light blue-gray
52-62	Till, light yellow-brown
62-73	Till, yellow-gray, gray, light yellow-brown; occasional boulders
73-77	Till, blue-gray, yellow-gray
77-79	Till, sandy, yellow-brown
79-84	Sand and gravel, fine to medium, yellow-brown; clay; boulder at 82 feet
84-90	Till, gravelly, yellow-brown; clay, light gray
90-102	Till, gravelly, yellow-brown, yellow-gray
102-108	Till, blue-gray
108-109	Sand, fine to coarse; lignite
109-115	Till, blue-gray
	CRETACEOUS
	DAKOTA FORMATION
115-116	Sandstone, coarse, tan
116-123	Shale, sandy, hard, gray-tan; possible shale
123-128	Sandstone, coarse, tan
128-133	Shale, silty, very sandy at base, oxidized, light gray, yellow-brown
133-140	Sandstone, coarse, tan, yellow-brown
140-141	Shale, light yellow-gray
141-164	Sandstone, coarse grading to very coarse, tan, yellow-brown; shale
164-188	Sandstone, fine (gravel), iron cemented at base, hard, brown, yellow-brown
188-197	Sandstone, coarse, iron cemented layers, hard, brown
	PENNSYLVANIAN
197-202	Shale, silty, organic, very dark brown
202-204	Shale, black, dark gray; coal
204-210	Shale, light blue-gray
210-218	Shale, silty, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-35-01ADDD WC-80 STATION ID: 414610-0945136-01

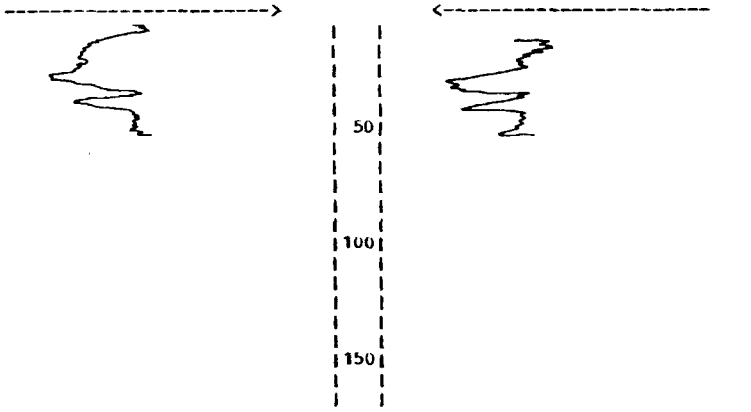
ALTITUDE: 1290 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: July 13, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed; top soil
4-11	Clay, silty, dark gray
11-14	Clay, silty, sandy, gravelly, gray, brown
14-16	Clay, silty, sandy, blue-gray; sand layers
16-27	Sand and gravel, fine to medium, yellow-tan
27-29	Sand, fine to coarse, tan; gravel
29-35	Sand and gravel, fine to coarse, yellow-brown; boulders at base
35-41	Clay or till, blue-gray; sand

LOCATION: 080-38-27CCCC WC-215 STATION ID: 414212-0951558-01

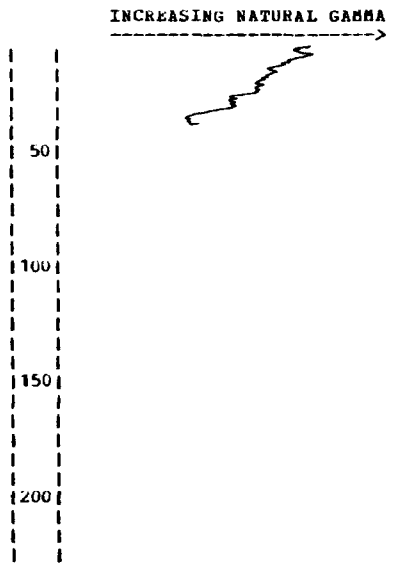
ALTITUDE: 1222 FEET (NGVD 1929) DEPTH: 55 FEET DATE COMPLETED: June 15, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Road bed; top soil
7-13	Clay, silty, dark gray
13-16	Clay, silty, dark blue-gray
16-24	Clay, sandy, silty, oxidized layer at 19 feet, blue-gray; sand, thin layers
24-26	Sand, fine to medium, gray; clay
26-34	Sand and gravel, fine to coarse, yellow-gray
34-38	Clay, light blue-gray
38-40	Sand and gravel, fine, gray-tan; clay
40-42	Sand and gravel, fine to very coarse, gray-tan; boulders
42-55	Till, blue-gray

LOCATION: 080-38-30ACCC WC-221 STATION ID: 414238-0951851-01

ALTITUDE: 1220 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 16, 1983



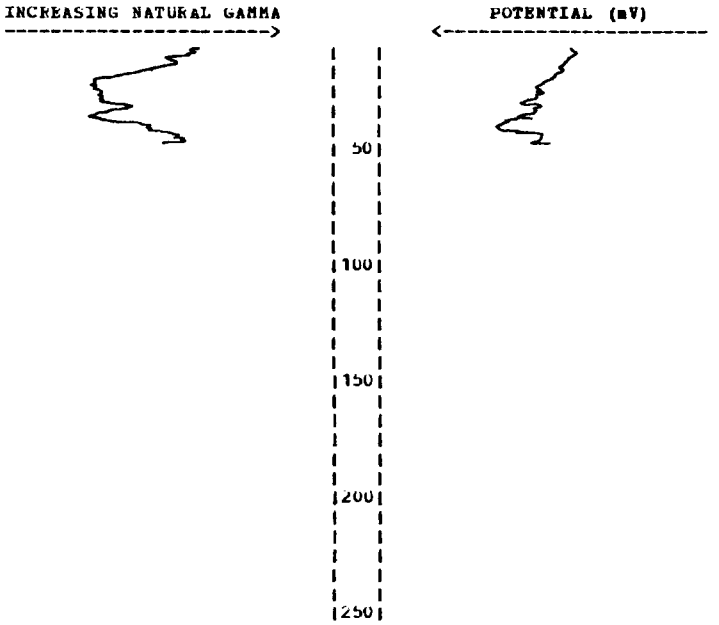
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Road bed; top soil
7-11	Clay, silty, dark gray, yellow-brown; fill (possible)
11-13	Clay, silty, very dark gray
13-20	Clay, silty, yellow-brown, yellow-gray
20-22	Clay, silty, yellow-gray grading to gray-green
22-27	Clay, silty, gray-green
27-31	Clay, silty, blue-gray
31-36	Sand and gravel, fine to coarse, gray; boulder, occasional
36-40	Till, very sandy, gravelly, blue-gray
40-41	Till, blue-gray; boulder

Casing record: set 2 inch pipe to 38 feet, slotted from 33 to 38 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-38-30ACDC WC-219 STATION ID: 414238-0951841-01

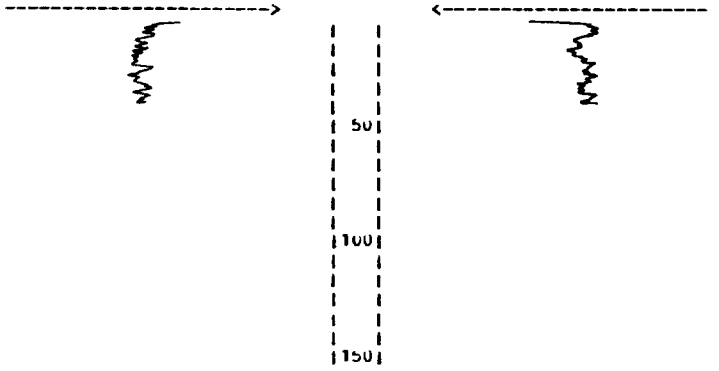
ALTITUDE: 1212 FEET (NGVD 1929) DEPTH: 50 FEET DATE COMPLETED: June 16, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-7	Road bed; top soil
7-9	Clay, silty, dark gray-brown
9-10	Clay, silty, yellow-gray
10-14	Clay, silty, yellow-brown
14-17	Clay, silty, oxidized, yellow-brown, brown
17-19	Clay, sandy, silty, yellow-brown, yellow-gray; sand layer
19-20	Wood; sand; clay
20-22	Sand, fine to coarse, tan; gravel, fine
22-25	Sand and gravel, fine; clay, silty; wood
25-31	Sand and gravel, fine, gray, tan
31-35	Wood; organics, silty, some sandy
35-40	Sand and gravel, fine to coarse, tan, yellow-brown
40-43	Sand and gravel, fine to very coarse, olive; boulders
43-50	Till, blue-gray

LOCATION: 080-38-30ADDD WC-218 STATION ID: 414238-0951820-01

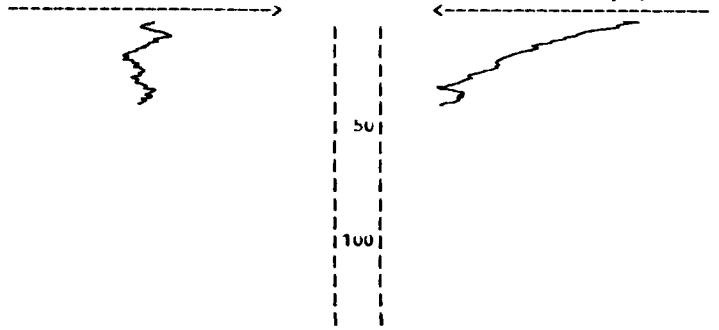
ALTITUDE: 1238 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 16, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed; top soil
4-7	Clay, silty, very dark gray
7-11	Clay, silty, gray-brown
11-14	Clay, silty, yellow-gray
14-24	Clay, silty, gray-green
24-27	Clay, tough, light gray-green
27-29	Clay, sandy, gravelly; gravel
29-30	Till, olive
30-32	Till, very gravelly, olive
32-35	Till, gray, yellow-gray
35-36	Till, gravelly, olive
36-41	Till, blue-gray

LOCATION: 080-38-30BDDC WC-220 STATION ID: 414238-0951900-01

ALTITUDE: 1223 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: June 16, 1983

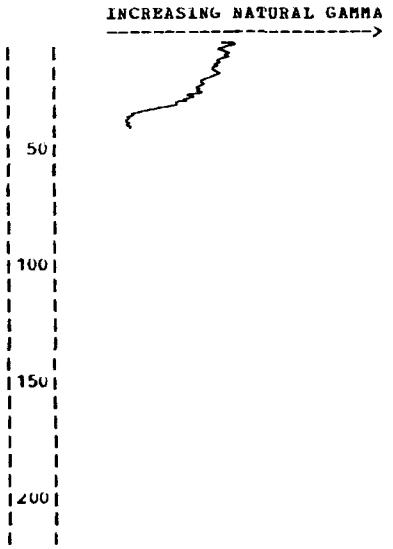


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Fill; top soil
3-6	Clay, gray
6-9	Clay, yellow-gray
9-15	Clay, silty, oxidized, yellow-brown, brown
15-18	Clay, silty, gray, green; shells
18-25	Clay, silty, gray; wood; organics
25-33	Clay, silty, gray, gray-green; wood; organics
33-34	Clay, sandy, silty, gravelly, gray
34-41	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-38-33AABB WC-216 STATION ID: 414211-0951617-01

ALTITUDE: 1225 FEET (NGVD 1929) DEPTH: 43 FEET DATE COMPLETED: June 15, 1983

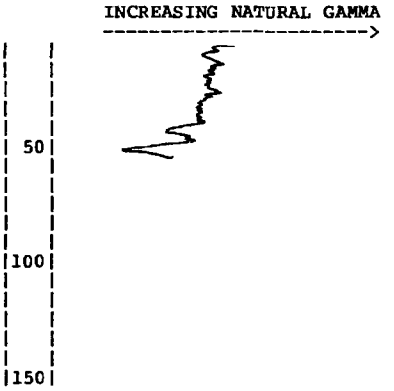


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil
2-4	Clay, silty, yellow-brown, brown
4-7	Clay, silty, yellow-brown
7-20	Clay, silty, yellow-brown, yellow-gray
20-25	Clay, silty, gray
25-28	Clay, silty, gray-green
28-30	Clay, silty, gray
30-32	Clay, blue-gray
32-36	Sand, very fine to medium; clay, silty, gray
36-41	Sand and gravel, fine to coarse, yellow-brown, brown
41-43	Till, blue-gray, brown at top

Casing record: set 2 inch pipe to 41 feet, slotted from 36 to 41 feet, gravel packed

LOCATION: 080-38-33ABAB WC-217 STATION ID: 414212-0951625-01

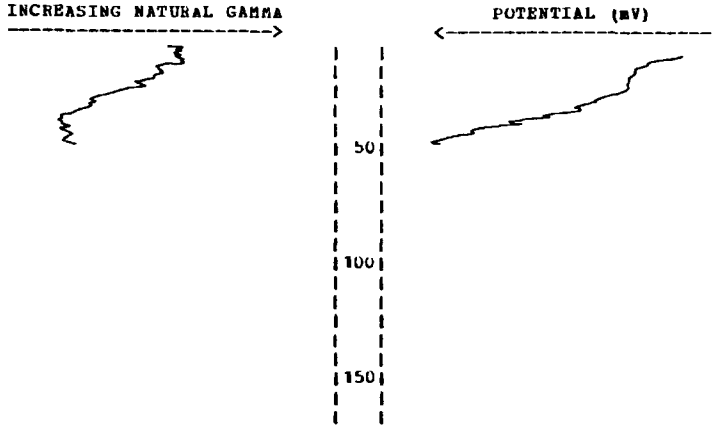
ALTITUDE: 1250 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 15, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed; top soil
3-14	Clay, silty, yellow-brown; loess
14-16	Clay, silty, brown; loess
16-19	As above, tough
19-30	Clay, tough, gray-tan
30-40	Clay, silty, yellow-gray
40-47	Clay, very silty, sandy, yellow-gray
47-49	Clay, silty, gray
49-55	Sand and gravel, fine to medium, coarse at base, oxidized at base, gray-tan, brown at base
55-61	Till, blue-gray, brown at top

LOCATION: 080-38-34BAAB WC-214 STATION ID: 414212-0951534-01

ALTITUDE: 1227 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: June 15, 1983

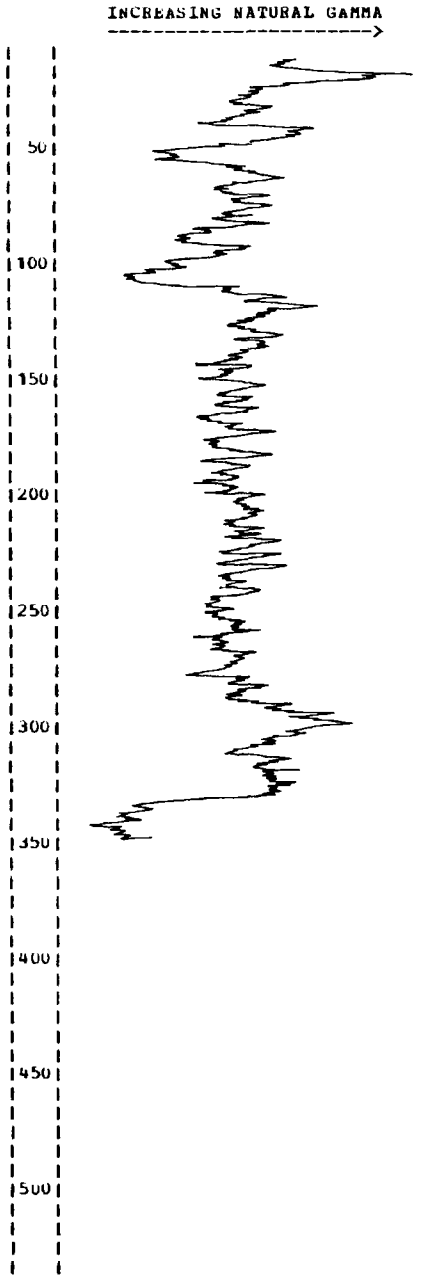


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Road bed; top soil
6-8	Clay, silty, brown
8-15	Clay, silty, yellow-brown
15-25	Clay, silty, yellow-brown, yellow-gray
25-28	Clay, silty, gray
28-30	Clay, silty, sandy, gray-green; sand layers
30-36	Sand, very fine to medium, gray-tan; clay layers
36-40	Sand and gravel, fine, gray-tan
40-52	Sand and gravel, fine to coarse, gray-tan
52-61	Till, blue-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-39-06AADC WC-10 STATION ID: 414624-0952523-01

ALTITUDE: 1305 FEET (NGVD 1929) DEPTH: 370 FEET DATE COMPLETED: June 10, 1981



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Top soil, silty, tan
3-10	Clay, silty, very dark
10-15	Clay, silty, gray, yellow-gray at bottom
15-25	Clay, silty, soft, blue-gray
25-30	Clay, silty, gray-green
30-31	As above, oxidized zone
31-40	Clay, silty, sandy, gray
40-42	As above, wood
42-43	Sand, fine to coarse
43-44	Clay, gravel
44-47	Sand and gravel, fine to coarse, gray
47-50	As above, yellow-brown
50-70	Till, yellow-brown grading to yellow-gray
70-75	Till, yellow-brown; blue-gray at bottom,
75-78	Sand and gravel; till mixed, gray, yellow
78-81	Sand, fine to coarse; till, yellow-brown
81-84	Sand and gravel; boulders; till mixed
84-89	Till, gravelly, blue-gray, yellow
89-101	Sand and gravel, fine to coarse, yellow-brown; boulders
101-228	Till, gravelly, sandy, blue-gray
228-229	Sand, gray
229-245	Till, sandy, gravelly, blue-gray
245-260	Clay or till, gray-tan
260-270	Clay, sandy, gray-tan; sand, thin layer, fine, gray
270-297	Clay, very sandy, silty
297-320	Sand, fine to medium, silty, some cementation, dark specks, tan
	CRETACEOUS
	DAKOTA FORMATION
320-347	Sand or sandstone, fine to coarse, some cementation, tan, brown
	PENNSYLVANIAN
347-360	Shale, silty, gray-green; siltstone
360-370	Shale, reddish-brown; limestone, occasional streak

Casing record: set 2 inch pipe to 370 feet slotted from 332 to 347 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-41-19AAAA WC-25 STATION ID: 414357-0953916-01

ALTITUDE: 1275 FEET (NGVD 1929) DEPTH: 280 FEET DATE COMPLETED: December 7, 1981

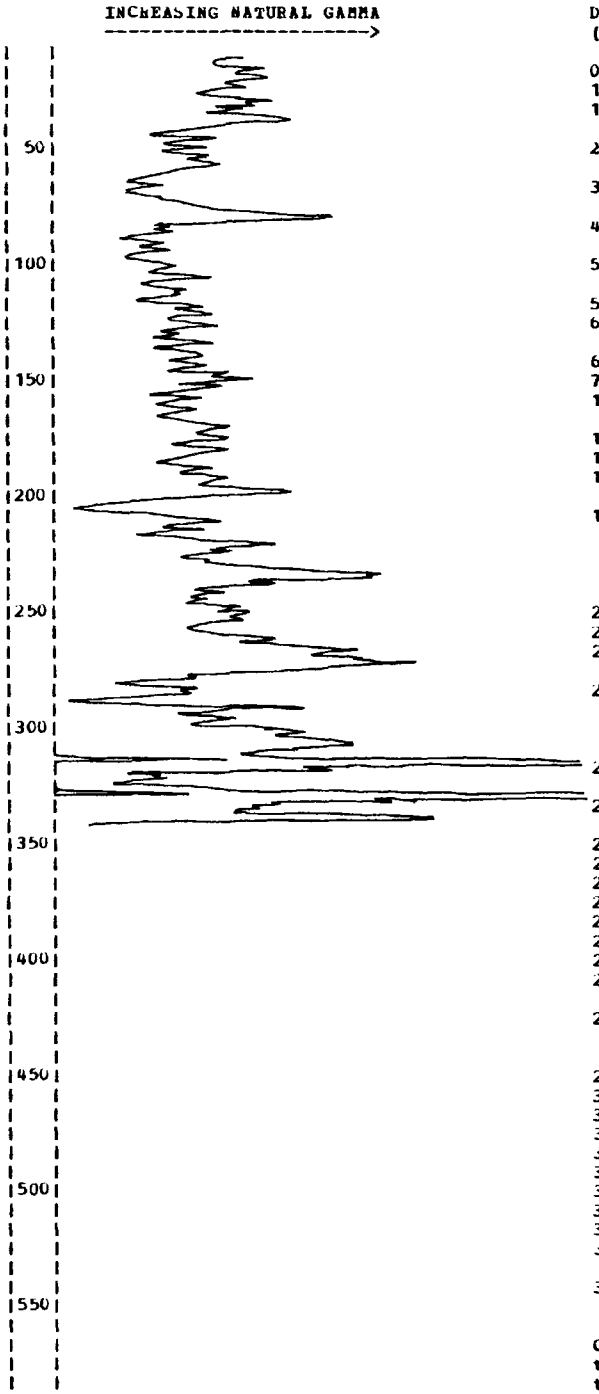
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-48	Loess, yellow-brown, tan
48-51	Clay, brown
51-54	Till, brown
54-60	Till, yellow-brown
60-65	Till, very sandy, yellow-brown
65-68	Sand and gravel, fine to coarse, yellow-brown
68-75	Till, yellow-brown, gray; sand streaks at bottom
75-80	Till, blue-gray, yellow-gray
80-81	Till, light blue-gray
81-82	Sand and gravel, fine
82-110	Till, blue-gray; sand, thin layers
110-111	Limestone boulder
111-122	Till, blue-gray
122-130	Clay, gray-tan
130-145	Clay or till, yellow-tan; few sand specks mixed
145-190	Clay, salmon color
190-201	Clay, very sandy, salmon color, colored with dark specks
	CRETACEOUS
	DAKOTA FORMATION
201-206	Sand, fine to coarse, cemented, oxidized, brown, orange
	PENNSYLVANIAN
206-230	Shale, reddish brown, yellow-brown, light gray
230-245	Shale, silty, sandy, light gray, red trace
245-260	Shale, silty, brown, reddish-brown
260-265	Shale, silty, reddish-brown; limestone; siltstone, gray-green
265-280	Shale, silty, gray-green; limestone; siltstone; possible sandstone streaks at bottom

Casing record: set 2 inch pipe to 215 feet, slotted from 125 to 145 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-42-08ACCC WC-3 STATION ID: 414517-0954534-01

ALTITUDE: 1220 FEET (NGVD 1929) DEPTH: 336 FEET DATE COMPLETED: April 23, 1981



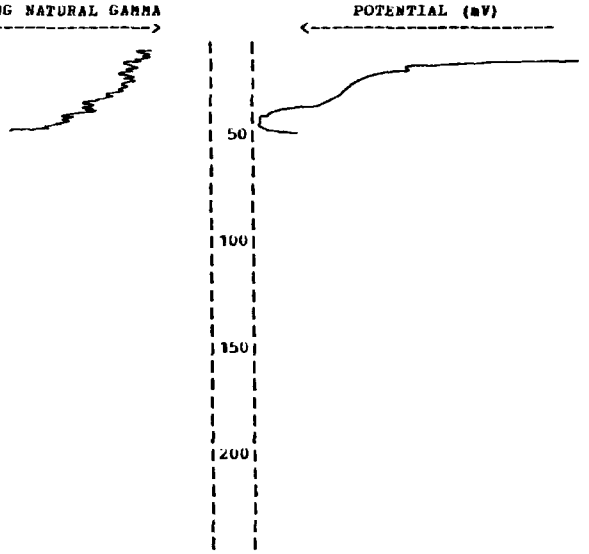
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Loess, yellow-brown
10-15	Loess, yellow-tan
15-24	Clay or loess, silty, tough, brown
24-38	Loess, yellow-tan, yellow-brown
38-45	Clay or loess, silty, tough, brown
45-50	Clay or loess, silty, tough, gray
50-58	Clay, silty, soft, yellow-tan
58-61	Till, yellow-gray
61-66	Sand and gravel, fine to coarse, brown
66-75	Clay, very sandy, olive
75-165	Till, blue-gray
165-169	Till, blue-gray, gray; limestone fragments
169-174	Till or gumbo, gray
174-180	Clay, tough, gray-green
180-190	Clay, silty, sandy, gray-green
190-204	Sand, very fine to coarse, gray-green, dark specks
	PENNSYLVANIAN
204-210	Shale, reddish-brown
210-221	Shale, light gray
221-235	Shale, reddish-brown, light gray, yellow
235-240	Shale, silty, gray-green, trace of red; siltstone, occasional layers
240-251	Shale, gray-green, reddish-brown
251-260	Shale, yellow, reddish-brown, gray
260-265	Shale, silty, gray
265-265	Limestone, hard, dark
265-272	Shale, light blue-gray
272-275	Limestone, shaly, brown
275-280	Shale, gray, brown
280-283	Limestone, gray
283-287	Shale, gray; some lime
287-288	Coal (less than 1 foot); shale, black
288-295	Shale, gray; siltstone, thin layers, hard; pyrite
295-303	Shale, gray; pyrite
303-306	Limestone, gray
306-310	Shale, gray
310-312	Limestone, gray
312-315	Shale, gray; some lime
315-318	Limestone, gray-tan
318-321	Shale, gray
321-324	Limestone, gray
324-326	Shale, gray
326-335	Limestone, tan; shale, layers, gray
335-336	Shale, black

Casing record: set 2 inch pipe to 336 feet, slotted from 311 to 336 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-42-27CCBA WC-35 STATION ID: 414226-0954350-01

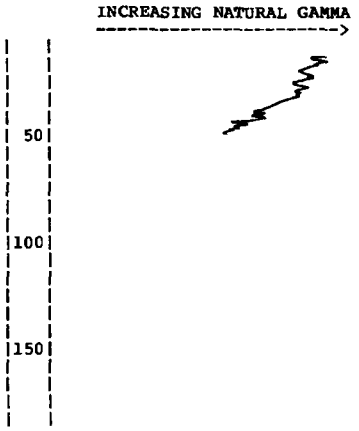
ALTITUDE: 1050 FEET (NGVD 1929) DEPTH: 60 FEET DATE COMPLETED: May 12, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Sample gap
5-7	Clay, silty, dark brown
7-10	Clay, silty, brown
10-15	Clay, silty, soft, gray-brown
15-20	Clay, silty, soft, oxidized brown zones, gray
20-30	Clay, silty, very soft, blue-gray; snails
30-37	Sand and gravel, fine to coarse, gray
37-40	Sand and gravel, fine to coarse, tan
40-45	Sand and gravel, fine to medium, tan
	PENNSYLVANIAN
45-46	Shale, reddish-gray; boulders
46-48	Shale, silty, gray
48-49	Shale, gray-green
49-53	Shale, reddish-brown, gray
53-57	Shale, gray, gray-green trace, yellow-gray
57-60	Shale, yellow, reddish-brown, gray

LOCATION: 080-42-27CCBA WC-192 STATION ID: 414226-0954350-02

ALTITUDE: 1050 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: May 12, 1983

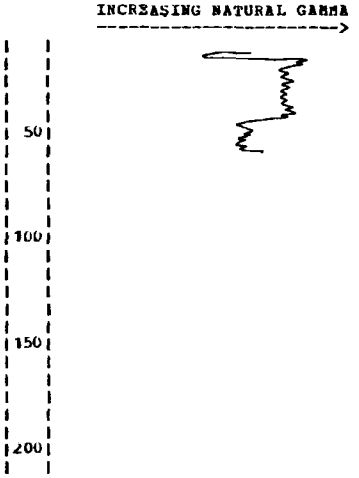


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Sample gap
5-7	Clay, silty, dark brown
7-10	Clay, silty, brown
10-15	Clay, silty, soft, gray-brown
15-20	Clay, silty, soft, oxidized brown zones, gray
20-30	Clay, silty, very soft, blue-gray; snails
30-37	Sand and gravel, fine to coarse, gray
37-40	Sand and gravel, fine to coarse, tan
40-41	Sand and gravel, fine to medium, tan

Casing record: set 2 inch pipe to 40 feet, slotted from 35 to 40 feet, gravel packed

LOCATION: 080-42-28DBCD WC-37 STATION ID: 414228-0954423-01

ALTITUDE: 1060 FEET (NGVD 1929) DEPTH: 53 FEET DATE COMPLETED: May 18, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Top soil, silty, dark; till
6-10	Clay, silty, brown
10-30	Clay, silty, yellow-brown
30-34	Clay, silty, soft, yellow-gray
34-36	Clay, silty, soft, blue-gray
36-42	Sand and gravel, fine, yellow-brown
42-51	Sand and gravel, fine to coarse, yellow-brown, tan
	PENNSYLVANIAN
51-52	Shale, gray, maroon
52-53	Shale, silty, gray-green

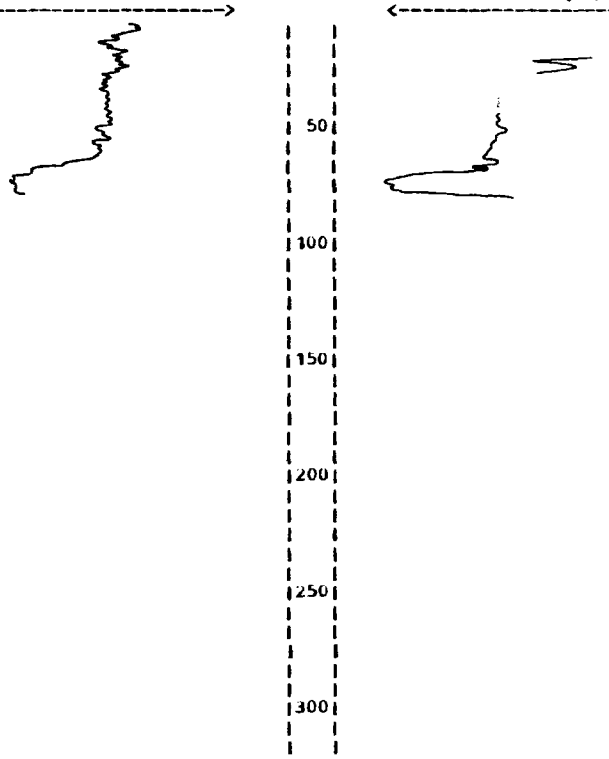
Casing record: set 2 inch pipe to 52 feet, slotted from 46 to 52 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-42-33AAAA | WC-194 | STATION ID: 414213-0954355-01

ALTITUDE: 1100 FEET (NGVD 1929) | DEPTH: 81 FEET | DATE COMPLETED: June 1, 1983

INCREASING NATURAL GAMMA ----------> | POTENTIAL (mV) <----------

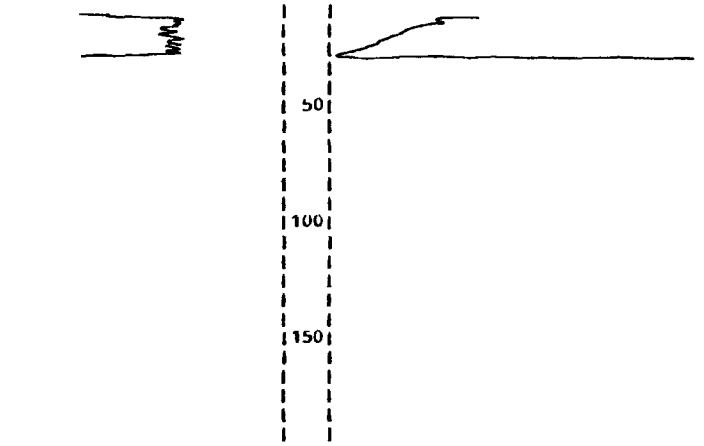


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Top soil; clay, silty, very dark
4-6	Loess, yellow-brown, yellow-tan
6-9	Clay, silty, brown; loess, hard
9-21	Clay, silty, yellow-tan; loess, soft
21-30	Clay, silty, brown; loess, hard
30-47	As above, grading to yellow-tan, softer
47-55	Loess, iron concretions, brown, yellow-tan, yellow-brown
55-62	Clay, silty, yellow-gray, brown; loess
62-65	Clay, gray; sand grains
65-69	Clay or till, sandy, yellow-gray; sand layers, fine to coarse
69-76	Sand, fine to coarse, gray-tan, dark grains
76-77	Sand and gravel, fine, yellow-brown
	PENNSYLVANIAN
77-78	Limestone, shaly, yellow-brown, gray-green
78-79	Shale, gray-green
79-81	Shale, reddish-brown, yellow-brown

LOCATION: 080-42-34ABBB | WC-34 | STATION ID: 414213-0954316-01

ALTITUDE: 1045 FEET (NGVD 1929) | DEPTH: 43 FEET | DATE COMPLETED: May 12, 1982

INCREASING NATURAL GAMMA ----------> | POTENTIAL (mV) <----------

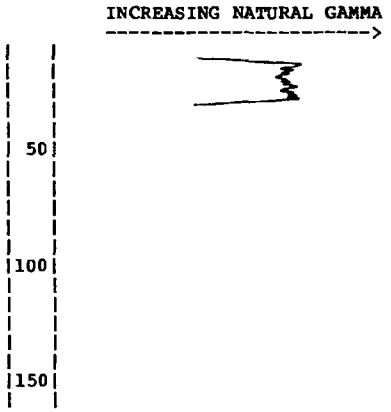


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Clay, dark; road bed
6-9	Clay, silty, dark gray
9-16	Clay, silty, dark gray-green
16-20	Clay, silty, sandy, soft, gray-green
20-23	Clay, silty, blue-gray
23-24	Clay, silty, sandy, very soft, gray; wood
24-26	Sand, fine to coarse, gray-tan
26-37	Sand and gravel, fine to coarse, yellow-brown
37-39	Sand and gravel; boulders
	PENNSYLVANIAN
39-41	Shale, silty, gray-green; limestone, silty
41-43	Limestone, light-colored

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-42-34ABBB WC-191 STATION ID: 414213-0954316-02

ALTITUDE: 1045 FEET (NGVD 1929) DEPTH: 37 FEET DATE COMPLETED: May 12, 1983

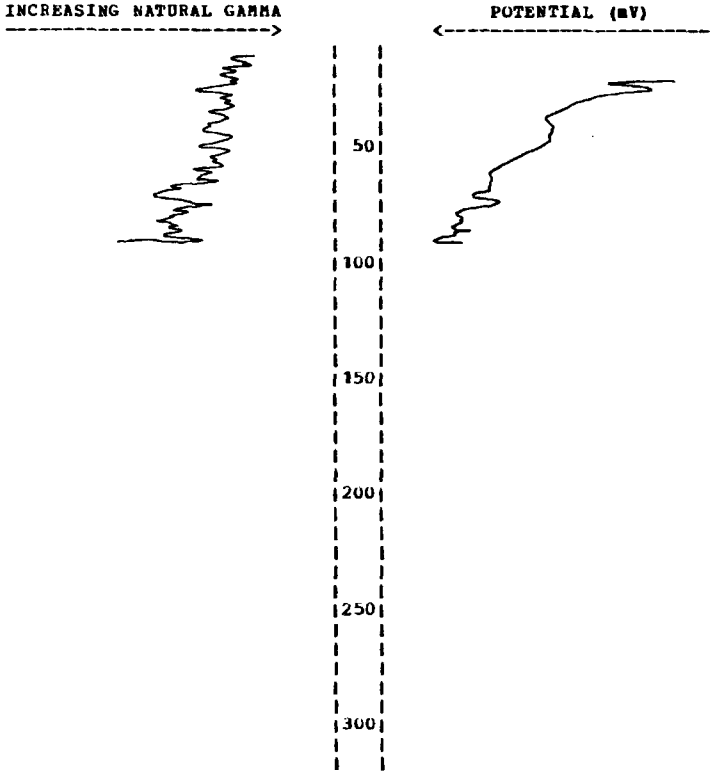


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Clay, dark; road bed
6-9	Clay, silty, dark gray
9-16	Clay, silty, dark gray-green
16-20	Clay, silty, sandy, soft, gray-green
20-23	Clay, silty, blue-gray
23-24	Clay, silty, sandy, very soft, gray; wood
24-26	Sand, fine to coarse, gray-tan
26-37	Sand and gravel, fine to coarse, yellow-brown

Casing record: set 2 inch pipe to 37 feet, slotted from 32 to 37 feet, gravel packed

LOCATION: 080-42-34DCCB WC-36 STATION ID: 414128-0954320-01

ALTITUDE: 1095 FEET (NGVD 1929) DEPTH: 91 FEET DATE COMPLETED: May 17, 1982

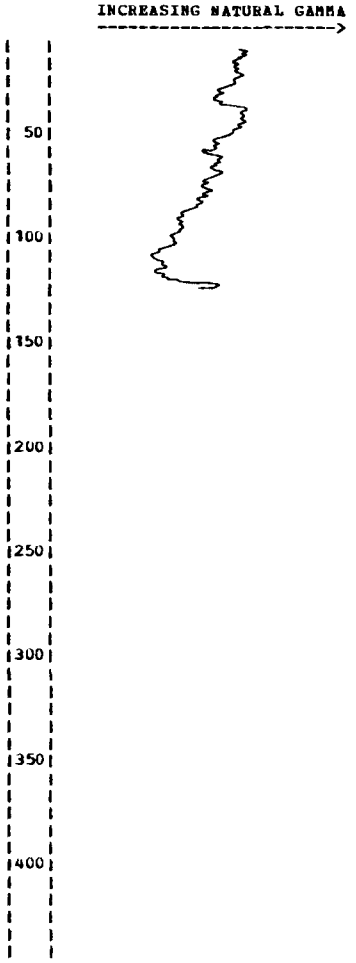


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-9	Clay, silty, very dark
9-30	Clay or loess, silty, soft, yellow-brown, brown
30-38	Clay, silty, yellow-brown, blue-gray
38-47	Clay or loess, silty, gray
47-60	Clay, silty, soft, blue-gray
60-64	Clay, silty, hard, dark brown
64-69	Sand and gravel, fine, gray
69-71	Clay, gray-green; sand layers
71-74	Sand and gravel, fine to coarse, oxidized, yellow-brown
74-75	Boulders
75-85	Sand and gravel, fine to very coarse, yellow-tan; boulders; clay layers, yellow-brown
85-87	Sand and gravel, fine to very coarse, oxidized, yellow-brown; clay
87-88	Clay, yellow-brown; limestone, weathered
	PENNSYLVANIAN
88-90	Shale, light yellow-tan; limestone
90-91	Limestone, gray, tan

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-42-35BDCC WC-193 STATION ID: 414149-0954224-01

ALTITUDE: 1140 FEET (NGVD 1929) DEPTH: 120 FEET DATE COMPLETED: May 31, 1983

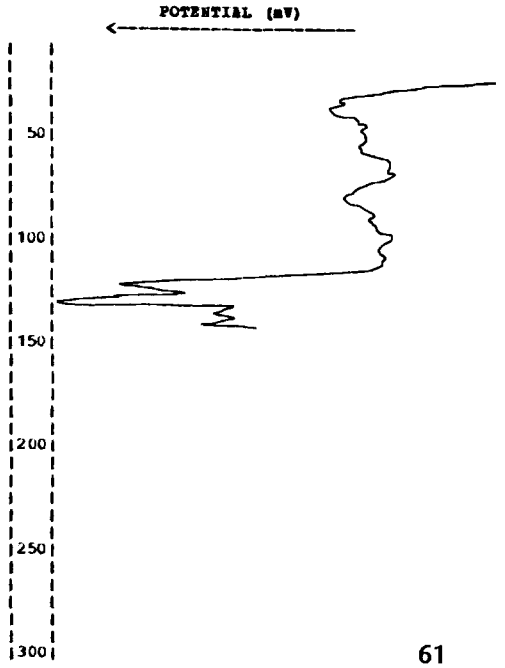


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil; fill
5-10	Loess, brown, tan; snails
10-20	Loess, iron concretions, yellow-tan, yellow-gray
20-25	Loess, yellow-tan
25-27	Loess, oxidized, brown
27-35	Loess, yellow-gray
35-40	Clay or loess, silty, gray-brown to gray
40-43	Clay, silty, tough, gray-brown
43-46	Clay, silty, yellow-tan
46-49	Clay, silty, yellow-brown, yellow-tan
49-54	Till, yellow-brown; gravel layer at 52 feet
54-57	Till, harder than above, yellow brown
57-70	Till or clay, gray; sand grains
70-75	Clay, gray; sand grains
75-85	As above, gray grading to tan; lime nodules
85-90	Clay, silty, sandy at base, softer than above, tan; lime nodules, more than above
90-97	Sand, fine to coarse, tan, dark grains
97-100	Sand layers, very fine to medium; clay, sandy
100-112	As above, very fine grading to fine to coarse; clay layers
	PENNSYLVANIAN
112-114	Clay or shale, sandy, oxidized, brown; sand at base
114-120	Shale, sandy, silty, oxidized, yellow-brown, yellow-gray

Casing record: set 2 inch pipe to 118 feet, slotted from 103 to 105 feet, gravel packed

LOCATION: 080-42-35CBAC WC-50 STATION ID: 414141-0954234-01

ALTITUDE: 1165 FEET (NGVD 1929) DEPTH: 140 FEET DATE COMPLETED: June 2, 1982

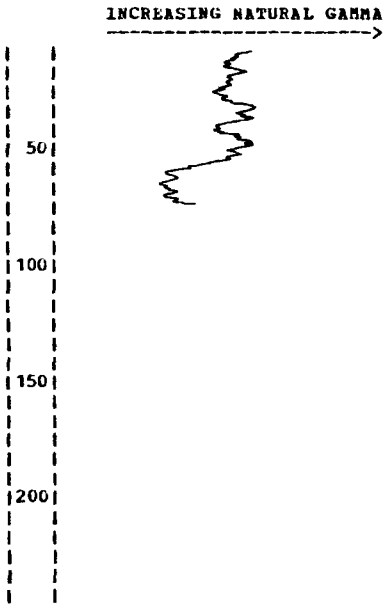


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-25	Loess, brown, yellow-brown
25-50	Loess, very soft, light yellow-brown
50-54	Loess, very soft, yellow-brown
54-69	Clay, silty, brown
69-84	Clay or loess, silty, soft, yellow-tan
84-95	Clay or till, silty, sandy, yellow-tan; few pebbles
95-100	Clay, silty, soft, gray-brown
100-108	Clay, silty, gray-green; shell fragments
108-110	Sand, very fine, tan grading to brown
110-113	Sand, fine to coarse, tan, brown
113-126	Sand and gravel, fine to very coarse, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
126-133	Shale, silty, oxidized, yellow-brown
133-137	Shale, silty, gray; dolomite at base, brown
137-138	Shale, sitly, gray
	PENNSYLVANIAN
138-140	Limestone, brown, tan

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-44-04BBDA WC-184 STATION ID: 414627-0955841-01

ALTITUDE: 1039 FEET (NGVD 1929) DEPTH: 75 FEET DATE COMPLETED: May 24, 1983

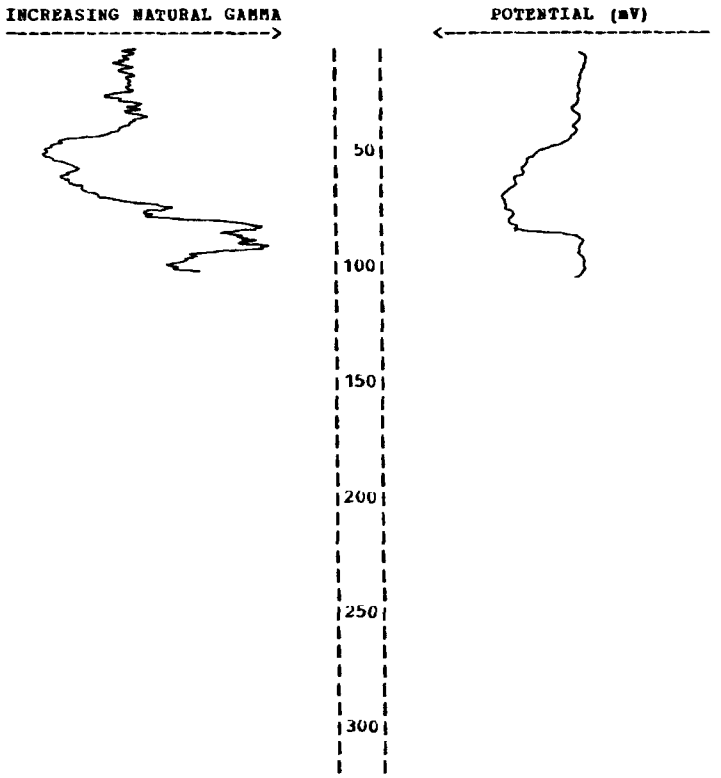


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Road bed; top soil
6-17	Clay, silty, dark gray
17-20	Clay, silty, gray-green
20-30	Clay, silty, gray; snail shells
30-33	Clay, silty, yellow-gray
33-38	Clay, blue-gray; snail shells
38-54	Clay, silty, gray-green, yellow-gray
54-60	Sand and gravel (mostly sand), fine to medium; clay, occasional layer, gray
60-72	Sand and gravel, fine to coarse, gray, yellow-gray at base
	CRETACEOUS
	DAKOTA FORMATION
72-75	Shale, silty, gray-brown

Casing record: set 2 inch pipe to 73 feet, slotted from 63 to 71 feet, gravel packed

LOCATION: 080-44-04BDBA WC-185 STATION ID: 414622-0955831-01

ALTITUDE: 1037 FEET (NGVD 1929) DEPTH: 101 FEET DATE COMPLETED: May 24, 1983

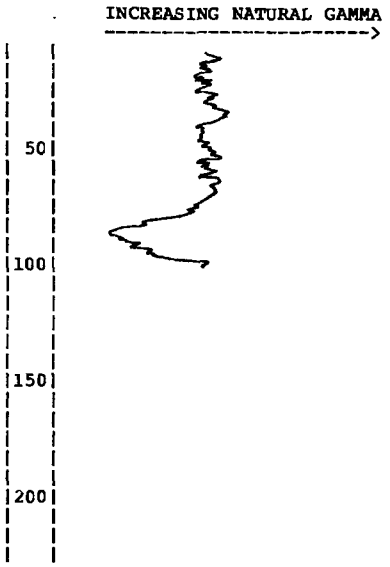


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-1	Top soil
1-10	Clay, silty, brown
10-13	Clay, silty, gray-brown
13-32	Clay, silty, blue-gray; snails; wood at base
32-42	Clay, silty, gray-green, yellow-gray
42-47	Sand and gravel, fine, yellow-brown
47-60	Sand and gravel, fine to coarse, gray at base
60-70	As above, gray
	CRETACEOUS
	DAKOTA FORMATION
70-77	Shale, silty, some sandy, gray-brown, tan
77-83	Shale, silty, hard, gray
	PENNSYLVANIAN
83-88	Shale, silty, reddish-brown, gray-brown
88-91	Shale, silty, gray, yellow-brown
91-93	Shale, reddish-brown, gray, yellow
93-95	Shale, reddish-brown, gray-green
95-97	Shale, gray-green
97-98	Shale, reddish-brown
98-100	Shale, reddish-brown, gray-green
100-101	Limestone, shaly, gray-tan

Table 2. Logs of wells and test holes--Continued.

LOCATION: 080-44-09ABBB WC-183 STATION ID: 414538-0955819-01

ALTITUDE: 1070 FEET (NGVD 1929) DEPTH: 96 FEET DATE COMPLETED: May 23, 1983



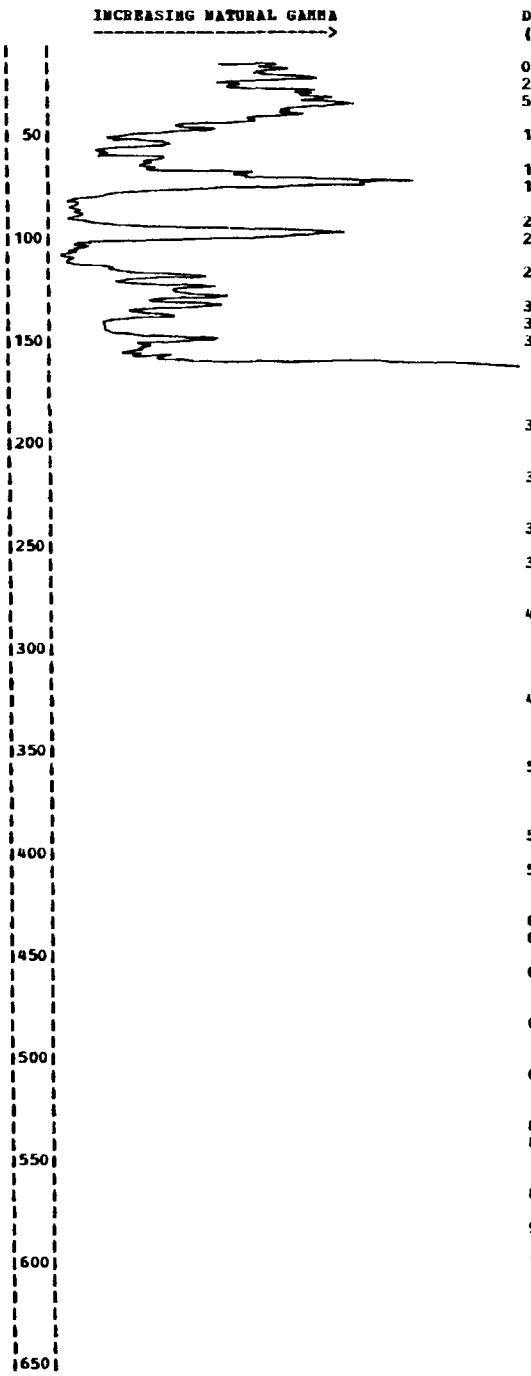
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-13	Clay, silty, yellow-tan, yellow-gray; loess
13-30	Loess, yellow-brown grading to gray
30-40	Loess, oxidized, yellow-gray, brown streaks
40-50	Clay, silty, gray; shells; loess
50-55	Clay, silty, brown; loess
55-60	Clay, silty, gray; loess
60-70	Clay, silty, oxidized layers, gray, brown
70-76	Clay, silty, gray
76-93	Sand, fine, grading to sand and gravel (mostly sand), fine to medium
93-96	Till, blue-gray

Casing record: set 2 inch pipe to 96 feet, slotted from 89 to 95 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-31-22CCCC WC-105 STATION ID: 414821-0942713-01

ALTITUDE: 1190 FEET (NGVD 1929) DEPTH: 153 FEET DATE COMPLETED: August 11, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Top soil
2-5	Till, yellow-tan
5-15	Till, light yellow-brown, gray
15-17	Sand and gravel, fine to coarse; till
17-19	Till, olive
19-23	Clay, silty, blue-gray grading to olive
23-27	Clay, silty, blue-gray
27-29	Clay or till, hard, blue-gray
29-31	Till, hard, light yellow-brown
31-33	Till, dark yellow-brown
33-34	Boulder, weathered
34-34	Till or clay, dark brown, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
34-35	Sandstone, fine to coarse, yellow-brown; shale
35-36	Sandstone, iron cemented, oxidized, brown; gravel
36-38	Sandstone, fine to very coarse, oxidized, brown
38-41	Sandstone, very coarse (gravel), tan, yellow-brown
41-45	Sandstone, fine to coarse, brown, yellow-brown; gravel at base; shale, thin streaks
45-50	Sandstone, fine to coarse, tan, yellow-brown; shale trace
50-57	Sandstone, fine to very coarse (gravel at base), yellow-brown; shale, thin layer
57-58	Shale, very sandy, light gray
58-61	Sandstone, fine to coarse, brown, yellow-brown
61-61	Conglomerate, ironstone
61-62	Shale, silty, yellow-brown
62-64	Sandstone, fine to coarse, brown, yellow-brown
64-65	Conglomerate, ironstone; sandstone, iron cemented
65-80	Sandstone, fine to coarse, oxidized, brown, yellow-brown
80-85	As above, iron cemented
85-88	Shale, green-brown; sandstone layer; ironstone streak at top
88-90	Sandstone, creviced, brown
90-105	Sandstone, fine to coarse, yellow-brown
105-110	Sandstone, oxidized, brown, yellow-brown; shale layer
110-115	Sandstone, fine to coarse, iron cemented, oxidized, brown
115-120	Sandstone, fine to coarse, hard, iron cemented, oxidized, brown; shale layer
120-128	Sandstone, fine to coarse (gravel), yellow-brown to brown; shale at base
128-137	Sandstone, fine to coarse, yellow-brown, tan; shale trace
137-145	Sandstone, fine to very coarse (gravel), iron cemented; shale
145-149	Sandstone, very coarse (gravel), tan, yellow-brown
	PENNSYLVANIAN
149-153	Shale, silty, blue-gray, light gray

Casing record: set 2 inch pipe to 153 feet, slotted from 143 to 153 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-31-28AAAA WC-153 STATION ID: 414820-0942718-01

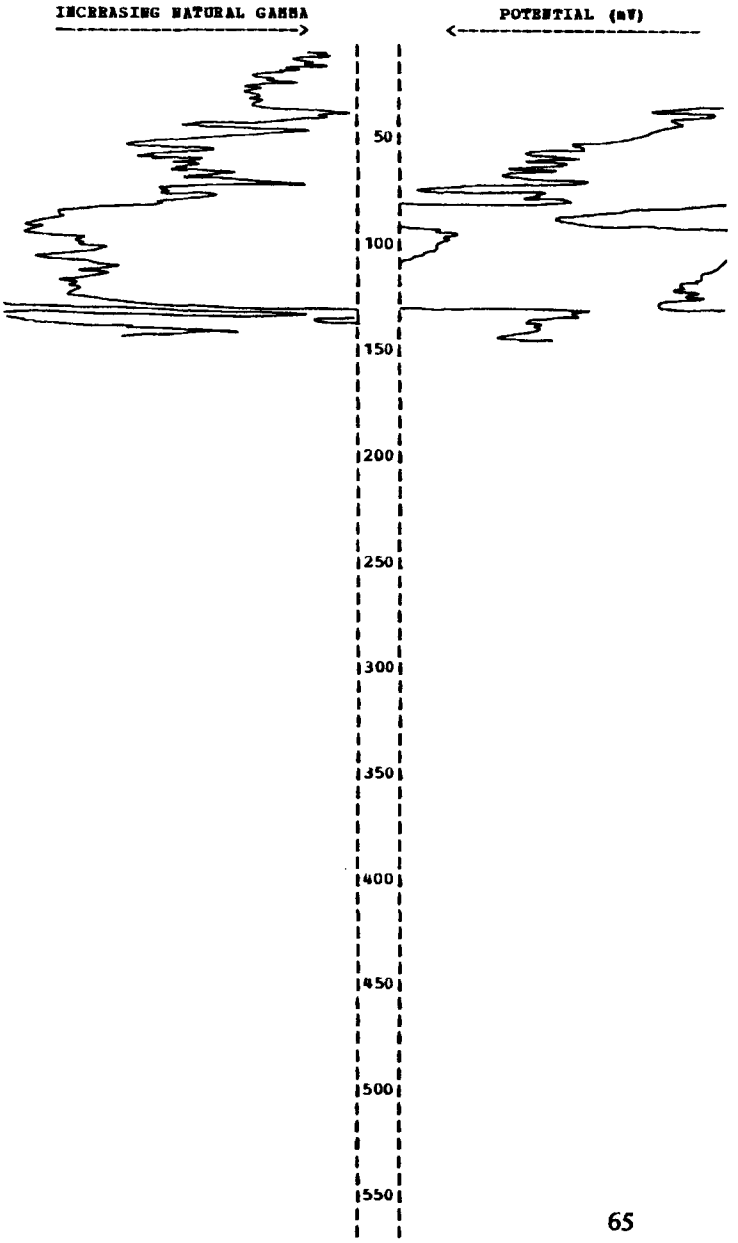
ALTITUDE: 1193 FEET (NGVD 1929) DEPTH: 170 FEET DATE COMPLETED: October 12,1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil; clay, gray
5-9	Till, yellow-gray to yellow-brown
9-13	Till, yellow-brown
13-43	Till, blue-gray
	CRETACEOUS
	DAKOTA FORMATION
43-46	Sandstone
46-62	Cored - no drillers description
62-82	Sandstone; gravel
82-170	Cored - no drillers description

WC-153 is located near WC-105. For a detailed description of cored intervals see WC-105. Cored material from 0 to 170 feet.

LOCATION: 081-31-32BCCB WC-108 STATION ID: 414707-0942933-01

ALTITUDE: 1177 FEET (NGVD 1929) DEPTH: 141 FEET DATE COMPLETED: August 16, 1983

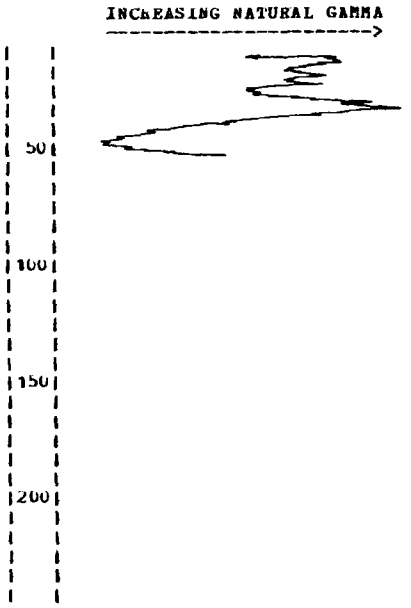


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Fill; road bed
10-13	Till, olive
13-26	Till, yellow-brown
26-34	Till, yellow-brown, yellow-gray
34-38	Till, gray-brown
38-39	Till, brown
39-40	Clay or shale, sandy, brown
	CRETACEOUS
	DAKOTA FORMATION
40-45	Shale, very sandy, oxidized, brown; sandstone, fine
45-66	Sandstone, very fine to fine, yellow-brown, tan; shale, silty, sandy; ironstone, thin layer at 46 and 56 feet
66-68	Shale, silty, sandy, gray, yellow-tan
68-70	Sandstone, fine to medium, yellow-brown, brown; ironstone layer at 66 and 68 feet
70-76	Sandstone, fine; shale, silty, yellow-brown, tan
76-80	Sandstone, fine to medium, yellow-brown, tan; gravel layer at 76 feet and at base
80-88	Sandstone, very coarse (gravel), tan yellow-brown
88-96	As above, yellow-brown, brown; shale, thin layers
96-103	Sandstone, fine to medium, some coarse, yellow-brown, brown at base
103-110	Sandstone, fine to medium, hard at base, iron cemented, brown
110-112	Sandstone, fine to coarse, iron cemented, brown
112-120	Sandstone, medium to very coarse (gravel), tan, yellow-brown
120-126	Sandstone, coarse to very coarse (gravel), tan, yellow-brown
126-127	Shale, yellow-gray
	PENNSYLVANIAN
127-131	Shale, silty, gray; siltstone, thin layer at 129-130 feet
131-133	Shale, silty, gray; sandstone, silty, gray
133-136	Shale, silty, gray; siltstone, occasional streak
136-141	Shale, dark gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-31-32CBCC WC-106 STATION ID: 414652-0942933-01

ALTITUDE: 1090 FEET (NGVD 1929) DEPTH: 52 FEET DATE COMPLETED: August 12, 1982

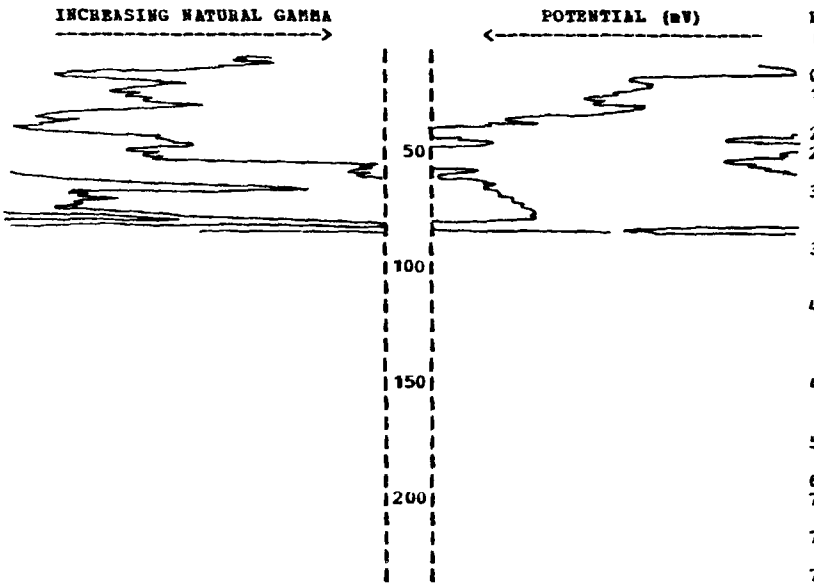


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Sand and gravel
3-20	Clay or reworked till, sandy, gravelly, yellow-tan
20-24	Sand and gravel, fine, tan
24-26	Sand and gravel, fine to coarse, yellow-brown; clay mixed
26-29	Clay, silty, soft, yellow-tan
29-36	Clay, silty, soft, blue-gray
36-40	Sand, fine to coarse, brown, tan
40-49	Sand, fine to coarse, tan
	PENNSYLVANIAN
49-52	Shale, silty, gray-green; siltstone trace

Casing record: set 2 inch pipe to 51 feet, slotted from 40 to 51 feet, gravel packed

LOCATION: 081-31-32CCCB WC-107 STATION ID: 414642-0942933-01

ALTITUDE: 1075 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: August 13, 1982

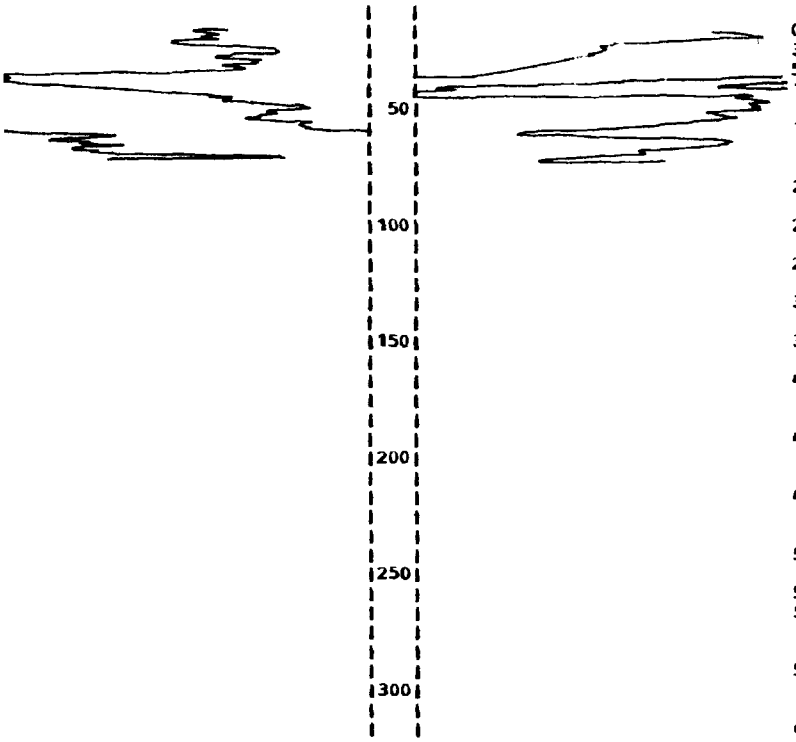


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-15	Fill; road bed
15-25	Clay, sandy, very dark gray
25-29	Clay, silty, dark gray
29-31	Clay, silty, sandy, brown
31-34	Sand and gravel, fine to medium, oxidized, brown
34-40	Sand and gravel, fine to coarse, tan, yellow-brown
40-49	Sand, fine to coarse, yellow-brown
	PENNSYLVANIAN
49-52	Siltstone, shaly, sandy, gray-green, light blue-gray
52-60	Shale, silty, light blue-gray
60-76	Shale, dark gray
76-78	Shale, hard like slate, very dark
78-79	Shale, fissile, black; coal
79-81	Shale, gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-32-20CDDC WC-100 STATION ID: 414820-0943607-01

ALTITUDE: 1110 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: July 29, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed
3-5	Clay, very dark gray
5-12	Clay, silty, dark gray
12-17	Clay, silty, sandy, gray to yellow-gray
17-20	Clay, silty, sandy, gray grading to blue-gray
20-25	Clay, silty, sandy, blue-gray
25-27	Sand and gravel, fine, brown, yellow-brown
27-32	Sand and gravel, fine to coarse, gray
32-37	Clay, silty, gray, blue-gray; wood at top
37-42	Clay, silty, blue-gray, gray-green
42-47	Clay, silty, gray-green to gray; organic traces; wood
47-49	Sand and gravel
	PENNSYLVANIAN
49-50	Shale, silty, gray-green, reddish brown
50-52	Shale, yellow-brown, gray, reddish brown
52-54	Shale, purple
54-58	Shale, blue-gray, yellow-brown, maroon, gray
58-60	Shale, gray-green, yellow-brown; limestone layers
60-61	Shale, silty, gray

LOCATION: 081-32-21CBBC WC-102 STATION ID: 414839-0943523-01

ALTITUDE: 1195 FEET (NGVD 1929) DEPTH: 56 FEET DATE COMPLETED: August 9, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed
3-13	Clay or loess, silty, yellow-brown
13-15	Clay or till, sandy, brown to yellow-brown
15-17	Clay or till, sandy, oxidized, brown to reddish-brown
	CRETACEOUS
	DAKOTA FORMATION
17-18	Shale, very sandy, hard, gray; gravel
18-18	Ironstone, brown
18-23	Sandstone, fine to medium, iron, cemented, oxidized, brown; shale, sandy
23-23	Conglomerate, ironstone
23-27	Sandstone, fine to coarse, iron cemented, oxidized, brown
27-30	As above; gravel; shale
30-35	Sandstone, fine to coarse, creviced, oxidized, brown
35-40	Sandstone, fine to coarse, yellow-brown
40-43	Sandstone, coarse (gravel), shaly, yellow-tan
43-43	Conglomerate, ironstone
43-48	Sandstone, fine to coarse, iron cemented
48-50	Shale, yellow-brown
50-53	Shale, reddish-brown, yellow-brown
53-56	Shale, silty, gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-32-21CCCC WC-101 STATION ID: 414821-0943523-01

ALTITUDE: 1145 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: August 9, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-3	Road bed
3-5	Clay, sandy, dark brown
5-35	Sand and gravel, fine to medium, some coarse, mostly sand, yellow-tan; lignite trace
35-48	Sand and gravel, iron cemented, oxidized, yellow-brown, brown
48-54	Clay, silty, sandy, gray; wood; lignite; sand layers
54-60	Clay, silty, gray, blue-gray; wood; lignite trace
60-63	Clay, silty, gray, yellow-gray
	PENNSYLVANIAN
63-68	Shale, silty, gray, yellow-gray; limestone layer at 64 feet
68-74	Shale, silty, gray to blue-gray
74-75	Shale, light gray
75-76	Limestone, gray, gray-green
76-78	Limestone, shaly, yellow-brown, gray-brown
78-81	Shale, gray-green, yellow-brown

LOCATION: 081-32-29ABAA WC-154 STATION ID: 414819-0943542-02

ALTITUDE: 1153 FEET (NGVD 1929) DEPTH: 51 FEET DATE COMPLETED: October 13, 1982

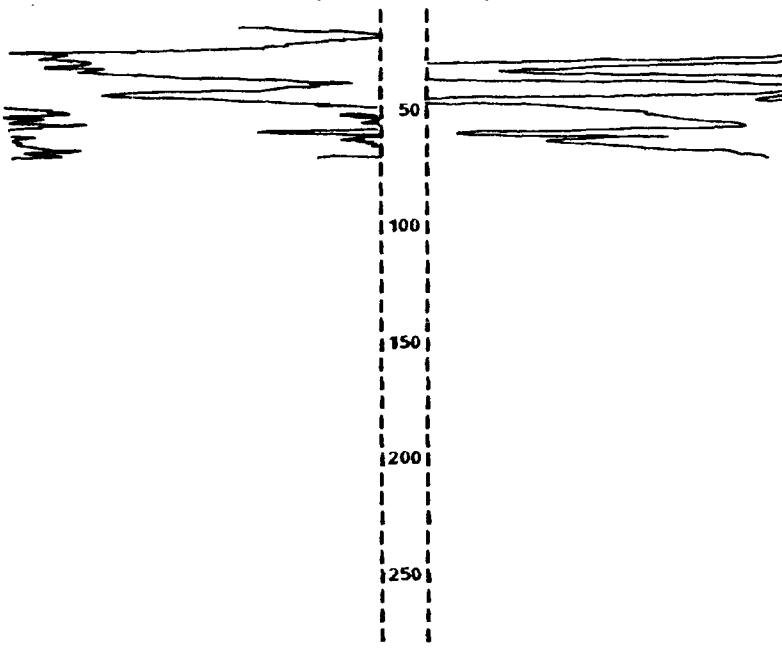
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-15	Clay, silty, soft, yellow-brown, brown
15-26	Sand and gravel
26-28	Clay, silty, soft, yellow-brown, tan
28-30	Clay, silty, soft, blue-gray
30-32	Clay or shale, sandy, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
32-37	Sandstone at top, fine to coarse (gravel), oxidized, brown; shale at base, sandy, reddish-brown
	PENNSYLVANIAN
37-39	Shale, silty, yellow-brown, yellow-gray
39-46	Shale, silty, blue-gray
46-47	As above
47-48	Shale, black; coal
48-51	Shale, silty, gray

WC-154 is located near WC-104. For a detailed description of cored intervals, 46 to 51 feet, see WC-104.

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-32-29ABAA WC-104 STATION ID: 414820-0943541-01

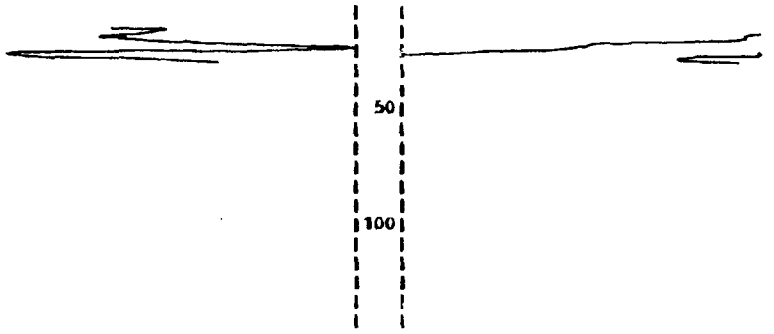
ALTITUDE: 1153 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: August 10, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed
4-11	Clay, silty, yellow-brown
11-15	Clay, silty, very soft, yellow-brown
15-21	Sand and gravel, fine to medium, some coarse
21-26	Sand, fine to coarse, tan
26-28	Clay, silty, yellow-brown, tan
28-31	Clay, silty, blue-gray
31-32	Clay or shale, very sandy, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
32-37	Sandstone, fine to coarse (gravel), iron cemented, oxidized, brown; shale
	PENNSYLVANIAN
37-39	Shale, silty, sandy, yellow-brown reddish-brown at top
39-48	Shale, silty, blue-gray
48-49.5	Shale, black; coal, mostly coal
49.5-58	Shale, blue-gray
58-61	Shale, hard, gray, dark gray-green

LOCATION: 081-32-29BABA WC-99 STATION ID: 414817-0943612-01

ALTITUDE: 1115 FEET (NGVD 1929) DEPTH: 21 FEET DATE COMPLETED: July 29, 1982

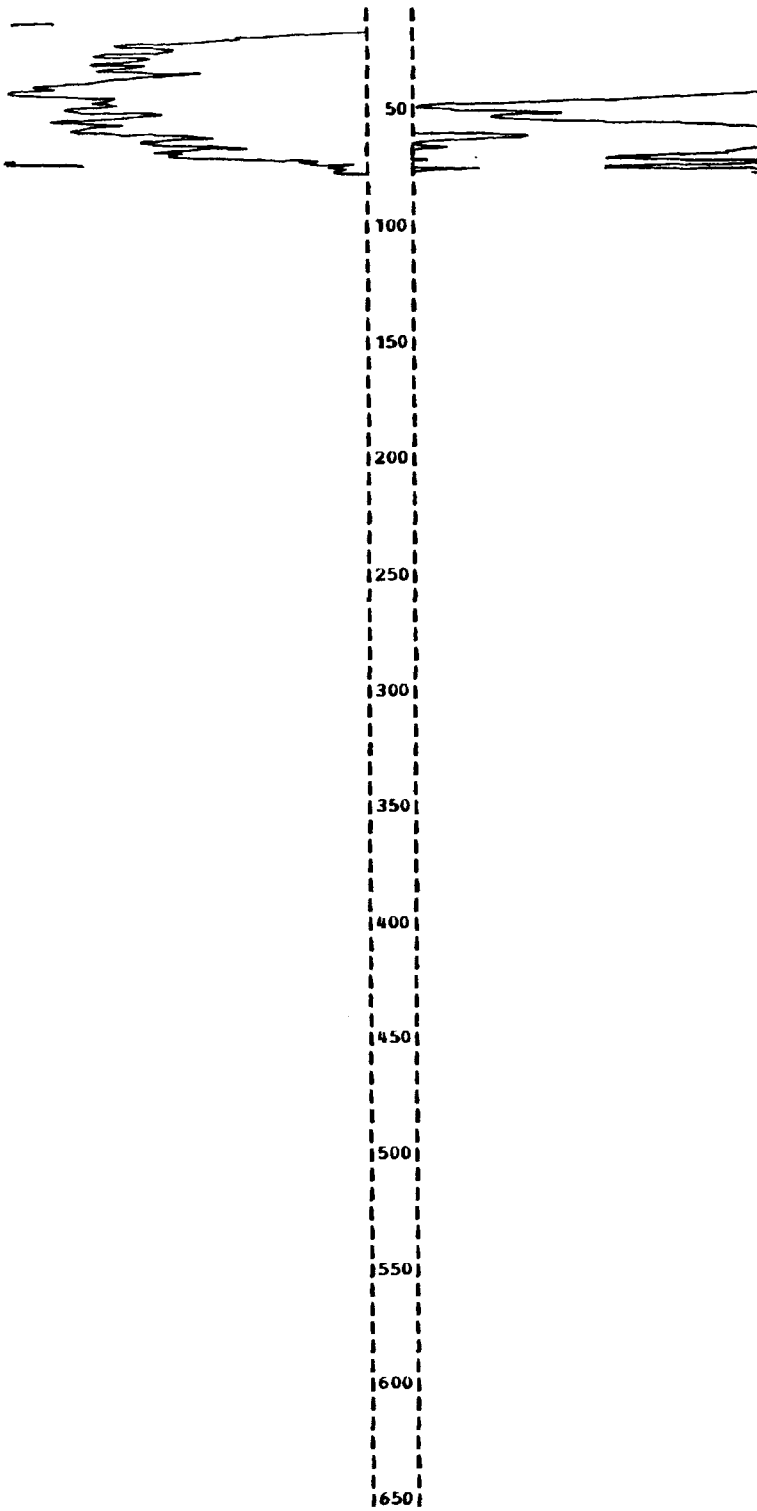


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-8	Clay, yellow-brown, gray
	PENNSYLVANIAN
8-13	Shale, reworked, yellow-gray; clay
13-15	Shale, gray
15-16	Limestone; dolomite; shale, gray, yellow-gray
16-19	Shale, gray-green, yellow-brown; limestone layer at 19 feet
19-21	Shale, black, very dark gray brown

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-32-29CBBC | WC-103 | STATION ID: 434748-0943632-01

ALTITUDE: 1230 FEET (NGVD 1929) | DEPTH: 141 FEET | DATE COMPLETED: August 10, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-4	Road bed
4-8	Clay, silty, tan
8-9	Clay, silty, brown
9-11	Clay, sandy, brown
	CRETACEOUS
	DAKOTA FORMATION
11-15	Sandstone, fine to medium, some coarse, well cemented, brown
15-20	Sandstone, well cemented, light brown, tan
20-30	Sandstone, fine to medium, yellow-brown, tan
30-40	As above, fine to coarse
40-43	Sandstone, very coarse, yellow-brown, tan; shale
43-48	Sandstone, fine to coarse, tan
48-52	Sandstone, fine to very coarse, brown, yellow-brown
52-53	Shale, light gray
53-56	Sandstone, coarse, brown
56-60	Sandstone, very coarse (gravel), oxidized, brown; ironstone, thin layers
60-63	Sandstone, very coarse, iron cemented; conglomerate, ironstone
63-65	Sandstone, fine to very coarse, brown, yellow-brown; shale, ironstone concretion layers, reddish brown
65-66	Conglomerate, ironstone, hard
66-72	Sandstone, fine to very coarse, shaly, iron cemented, oxidized, brown, yellow-brown
	PENNSYLVANIAN
72-72	Shale, yellow-brown
72-75	Shale, maroon
75-78	Shale, light yellow-gray, maroon
78-101	Shale, gray, maroon, light gray, reddish-brown
101-108	Shale, sandy, light gray
108-110	Shale, sandy, reddish-brown
110-113	Shale, sandy, reddish-brown, light gray
113-115	Shale, sandy, light gray
115-119	Shale, very sandy, light gray-green; sandstone, fine layers, darker at base
119-129	Shale, dark gray-green grading to gray-green
129-131	Limestone, dolomitic, gray-green, brown; shale at base
131-134	Shale, gray-green, yellow-brown
134-135	Limestone, brown
135-136	Shale, black
136-138	Shale, gray, reddish-brown
138-139	Shale, reddish-brown
139-141	Shale, reddish-brown, green-gray

ILLUSTRATIONS

		Page
Plate	1. Map showing locations of test holes, wells, and water quality from selected municipalities	in pocket
Figure	1. Map showing location of study area	2
	2. Diagram showing federal system of land subdivision in Iowa	3
	3. Chart showing geologic units used in this report	5

SELECTED FACTORS FOR CONVERTING INCH-POUND UNITS TO THE INTERNATIONAL SYSTEM

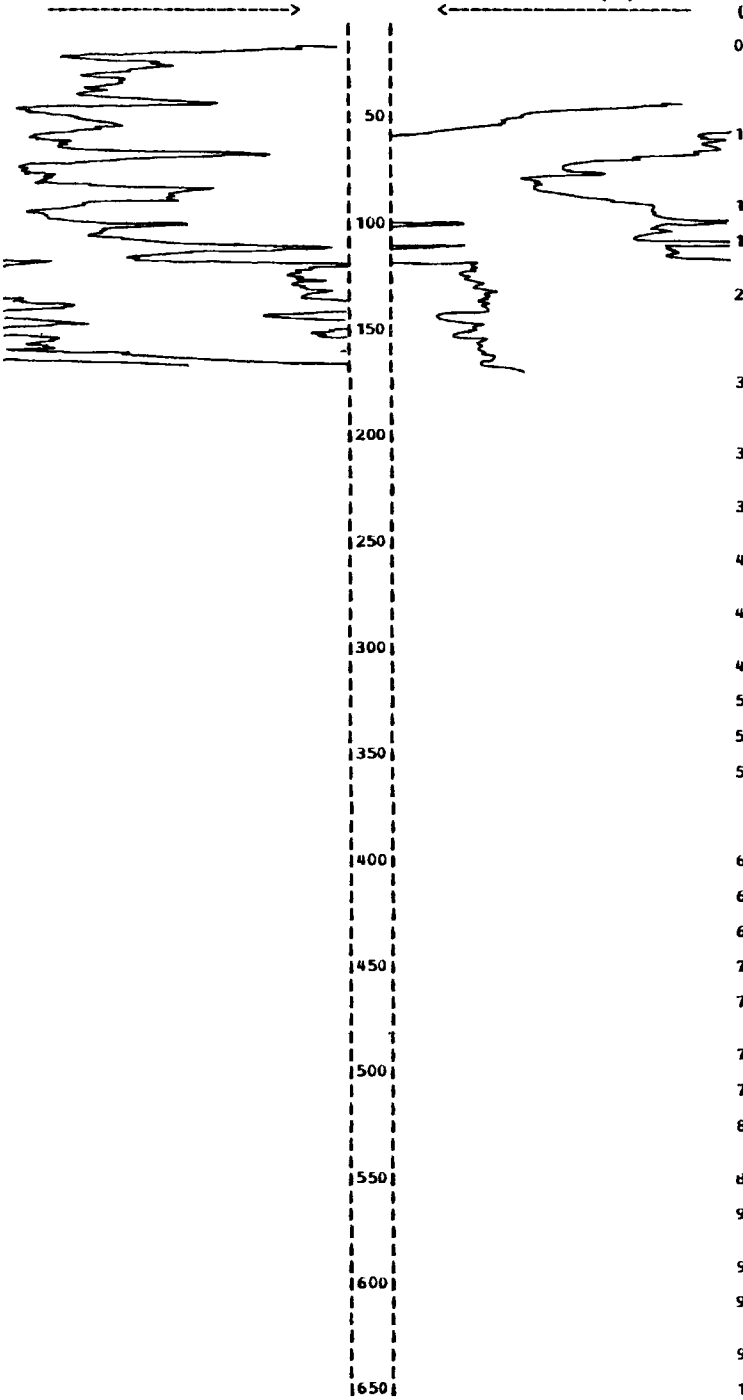
The following factors may be used to convert the inch-pound units used herein to the International System of Units (SI)

Multiply inch-pound unit	By	To obtain SI unit
foot	0.348	meter
inch	25.4	millimeter
gallon	3.785	liter

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-33-23DAAA WC-97 STATION ID: 414844-0943851-01

ALTITUDE: 1210 FEET (NGVD 1929) DEPTH: 161 FEET DATE COMPLETED: July 28, 1982

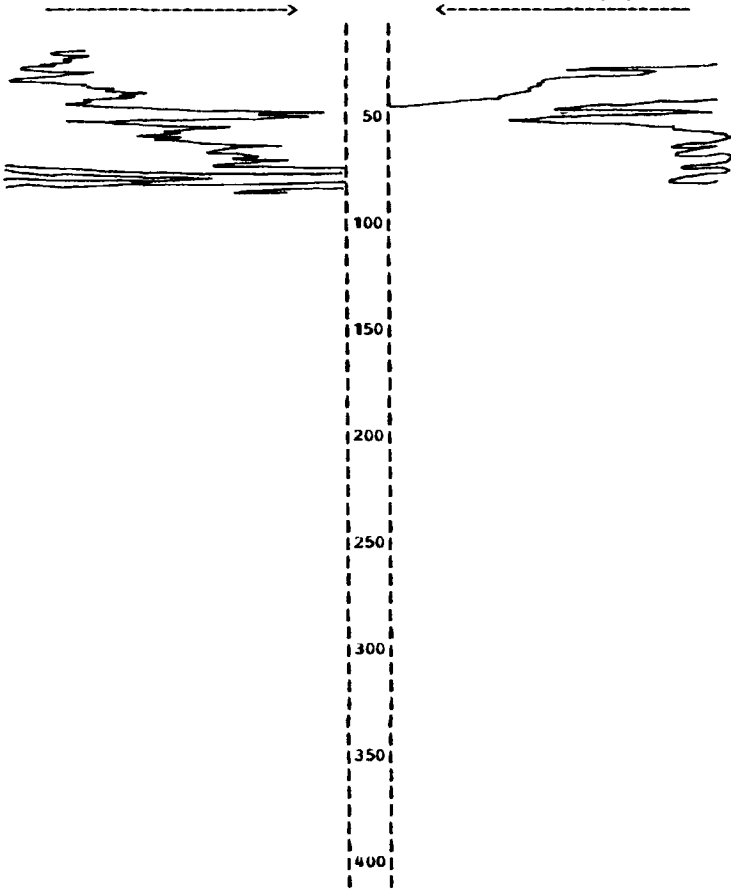


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Clay, silty, yellow-tan, brown
	CRETACEOUS
	DAKOTA FORMATION
10-13	Sandstone, fine to medium, oxidized, yellow-brown, brown; shale trace
13-18	Sandstone, very fine to fine, hard, yellow-tan
18-21	Sandstone, some coarser than above, yellow-brown
21-30	Sandstone, very fine to fine grading to very fine to medium, yellow-tan, yellow-brown
30-36	Shale, silty, sandy, tan, gray, brown; sandstone layers, oxidized
36-39	Sandstone, fine to coarse, tan to yellow-brown
39-41	Sandstone, oxidized, brown; shale; ironstone
41-45	Sandstone, fine to coarse, oxidized, brown; shale
45-47	Sandstone, fine to coarse (gravel), iron cemented, oxidized
47-52	Sandstone, coarse, yellow-brown, brown
52-53	Sandstone, fine to coarse, iron cemented
53-56	Sandstone, coarse, brown, yellow-brown
56-60	Sandstone, fine to very coarse (gravel), iron cemented layer-possible conglomerate, oxidized; shale, layer at top
60-65	Sandstone, fine to very coarse, oxidized, brown
65-69	Sandstone, fine to very coarse, tan
69-72	Sandstone, coarse, brown
72-73	Ironstone; sandstone, coarse, brown
73-76	Sandstone, coarse, some iron cemented, oxidized, brown
76-76.5	Ironstone or conglomerate
76.5-80	Sandstone, fine to very coarse, yellow-brown
80-89	Sandstone, fine to medium, some coarse, yellow-brown
89-90	Shale, silty, sandy, gray
90-92	Sandstone, fine to medium, oxidized, brown, yellow-brown
92-97	Sandstone, very coarse, yellow-brown
97-99	Ironstone or conglomerate; sandstone, very coarse
99-100	Shale, gray; some dolomite
100-104	Shale, gray, reddish brown; possible sandstone layers, coarse; lignite trace; gravel trace
104-107	Sandstone, fine to coarse, oxidized, brown, tan; ironstone, thin layer
	PENNSYLVANIAN
107-132	Shale, silty, sandy, gray; sandstone, thin layers, very fine, gray
132-133	Dolomite, brown
133-146	Shale, silty, sandy, gray
146-156	As above, less sandy
156-157	Shale, dark gray
157-159	Dolomite; shale, gray-green
159-161	Shale, black, gray at

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-33-24BBCB | WC-98 | STATION ID: 414902-0943848-01

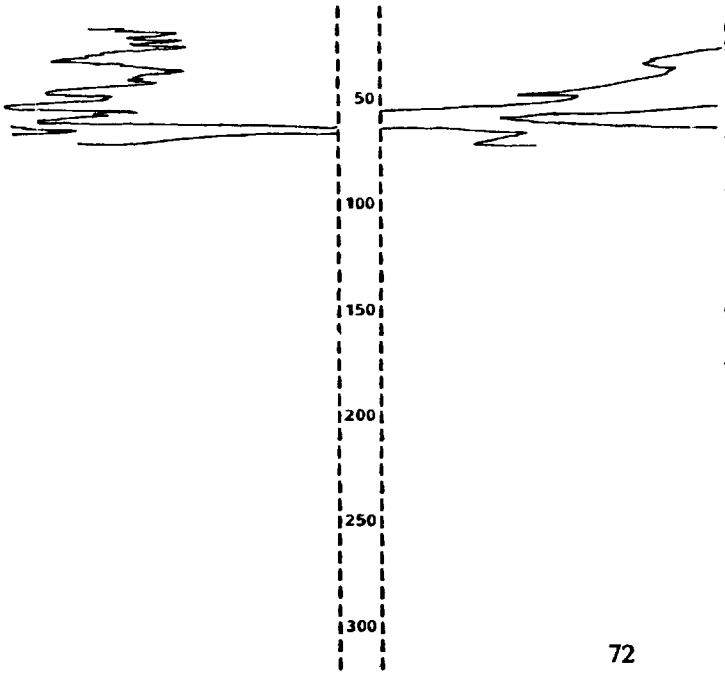
ALTITUDE: 1120 FEET (NGVD 1929) | DEPTH: 76 FEET | DATE COMPLETED: July 28, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Fill; road bed
10-12	Clay, gravelly, gray, brown
12-15	Sand, fine to coarse, tan, brown
15-17	Clay, sandy, gravelly, gray, brown
17-19	Sand, fine to coarse, tan, yellow-brown
19-23	Clay, gravelly, gray, brown; sand layers, gray
23-25	Clay, silty, some sandy, soft, blue-gray
25-30	Sand layers, gray; clay, silty, soft, blue-gray
30-34	Sand and gravel, fine to coarse, yellow-brown
	PENNSYLVANIAN
34-35	Sandstone; lignite; shale
35-45	Shale, silty, sandy, gray; sandstone, fine, gray-tan
45-52	Shale, sandy, silty, gray, gray-brown; lignite trace
52-55	Shale, blue-gray
55-58	Shale, gray-green; limestone
58-59	Limestone, dolomitic, gray-brown
59-62	Shale, dark gray, gray, yellow-brown
62-65	Shale, very dark gray, gray, maroon, yellow-brown
65-65.5	Dolomite, brown
65.5-69	Shale, black; coal trace
69-71	Shale, gray-green
71-73	Shale, yellow-brown, some gray
73-74	Shale, gray-green
74-76	Shale, yellow-brown, reddish brown

LOCATION: 081-33-26CCDD | WC-96 | STATION ID: 414728-0943943-01

ALTITUDE: 1160 FEET (NGVD 1929) | DEPTH: 61 FEET | DATE COMPLETED: July 27, 1982

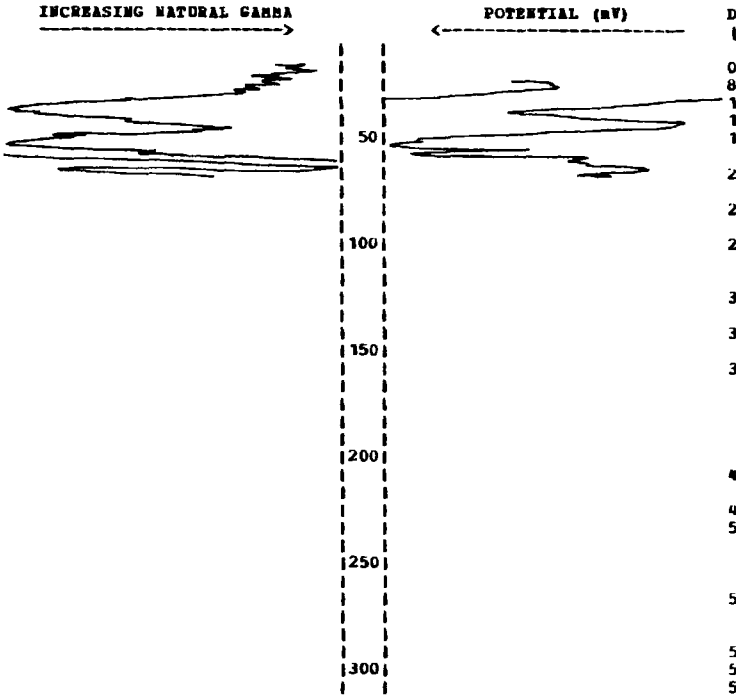


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-9	Road bed; top soil
9-11	Clay, dark gray
11-14	Clay, yellow-gray
14-16	Clay, gray-brown
16-23	Clay, silty, sandy, yellow-brown
23-26	Clay, silty, some sandy, soft, gray, yellow-brown
26-35	Clay, silty, sandy, soft, gray-green
35-37	Sand and gravel, fine to medium, gray
37-39	Clay, silty, gray
39-41	Clay, silty, sandy, gray
41-44	Sand and gravel, fine to coarse, oxidized, yellow-brown
44-49	Sand and gravel, fine to coarse, tan, brown
	CRETACEOUS
	DAKOTA FORMATION
49-51	Sandstone, fine to medium, oxidized, brown
51-53	Shale, silty, sandy, yellow-brown
	PENNSYLVANIAN
53-58	Shale, silty, light blue-gray
58-59	Shale, dark blue-gray; dolomite trace
59-59	Dolomite, gray
59-61	Shale, blue-gray, yellow-gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-33-26DCDC WC-95 STATION ID: 414725-0943913-01

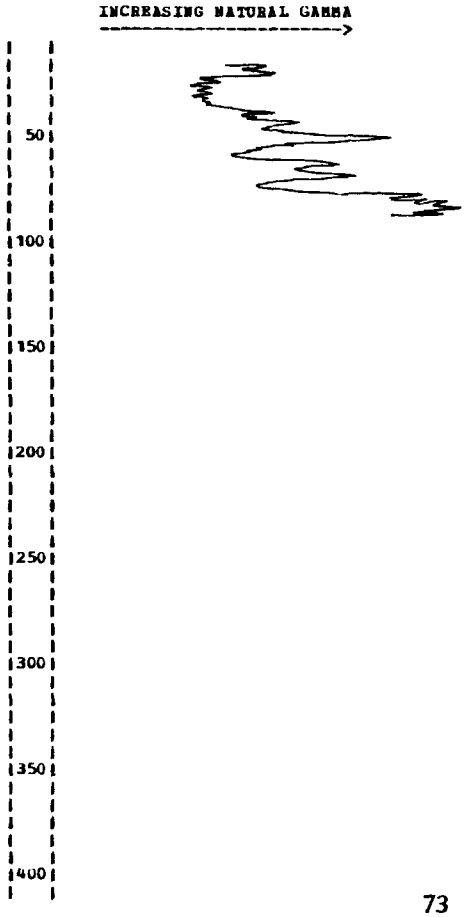
ALTITUDE: 1150 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: July 27, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-8	Road bed
8-13	Clay, very dark
13-17	Clay, tough, dark gray
17-19	Clay, gray-brown
19-21	Clay, silty, sandy, yellow-gray
21-23	Clay, sandy, light blue-gray; sand layers
23-25	Sand, fine to coarse, gray
25-30	Sand and gravel, fine to coarse, brown, yellow-brown
30-33	Sand and gravel, fine to medium, tan
33-37	Clay, sandy, silty, blue-gray
37-42	Sand and gravel, fine, yellow-brown, yellow-tan
	CRETACEOUS
	DAKOTA FORMATION
42-49	Sandstone, fine to medium, oxidized, brown
49-50	Shale, silty, gray-tan
50-51	Sandstone, fine, gray-tan
	PENNSYLVANIAN
51-56	Shale, blue-gray; limestone layer at bottom
56-57	Shale, silty, black
57-58	Coal; pyrite
58-61	Shale, light blue-gray

LOCATION: 081-33-26DDDD WC-93 STATION ID: 414728-0943853-01

ALTITUDE: 1205 FEET (NGVD 1929) DEPTH: 80 FEET DATE COMPLETED: July 23, 1982



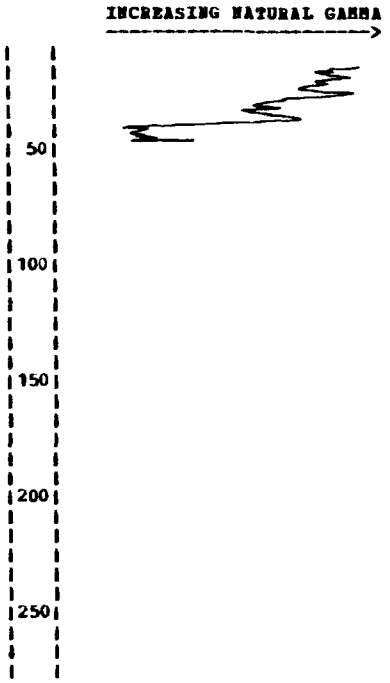
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	CRETACEOUS
	DAKOTA FORMATION
0-2	Shale, silty, yellow-brown, gray
2-5	Sandstone, very coarse, oxidized, brown
5-12	Sandstone, fine to very coarse (gravel), oxidized, brown, yellow-brown; shale, thin layers
12-24	Sandstone, fine to very coarse (gravel), yellow-brown; shale trace
24-28	Sandstone, very coarse (gravel), oxidized, brown
28-33	Sandstone, fine to very coarse, yellow-brown, yellow-tan; ironstone layer at top
33-37	Sandstone, fine to very coarse, oxidized, brown; ironstone conglomerate
37-39	Sandstone, fine to coarse, brown, yellow-brown
39-41	Ironstone; shale, gray
41-53	Ironstone layers; sandstone, very coarse, well cemented, oxidized, brown
53-64	Sandstone, fine to very coarse (gravel), iron cemented layers, yellow-brown
64-67	Shale, silty, yellow-gray
	PENNSYLVANIAN
67-78	Shale, silty, blue-gray
78-80	Shale, hard, gray-green

Casing record: set 2 inch pipe to 75 feet, slotted from 60 to 65 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-33-35ABBC WC-94 STATION ID: 414728-0943924-01

ALTITUDE: 1150 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: July 26, 1982

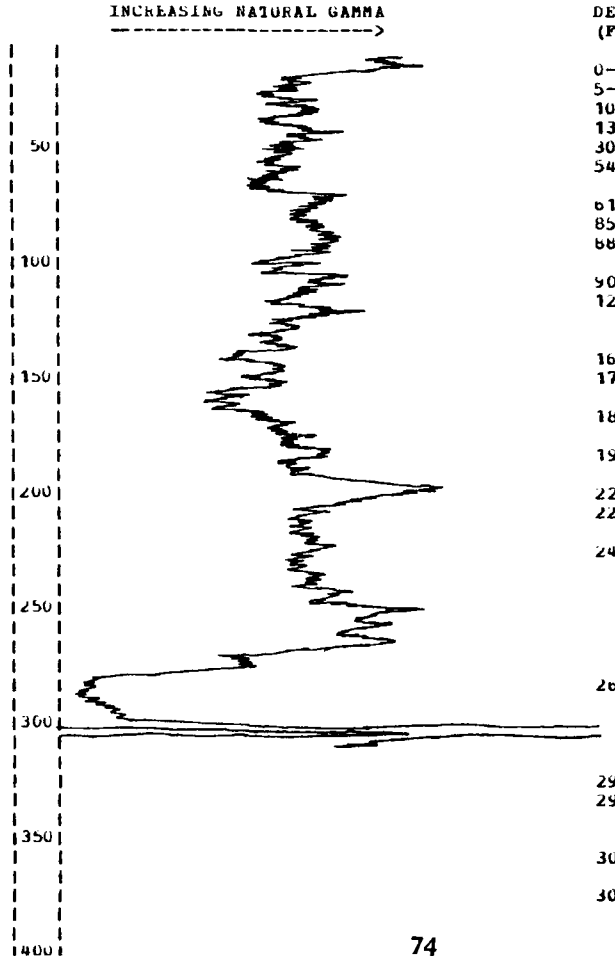


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-8	Road bed
8-15	Clay, very dark gray
15-22	Clay, silty grading to very silty, dark gray grading to very dark
22-24	Clay, silty, blue-gray; sand layers
24-25	Clay, sandy, gray-green
25-27	Clay, silty, sandy, gray
27-28	Sand, fine to coarse; clay layers, gray
28-30	Sand and gravel, fine, yellow-brown
30-35	Sand and gravel, fine to coarse, brown, yellow-brown
35-38	Sand and gravel, fine to coarse, yellow-tan
	CRETACEOUS
	DAKOTA FORMATION
38-39	Ironstone conglomerate
39-41	Sandstone, fine to coarse, brown
41-41	Shale, sandy, oxidized, gray, brown

Casing record: set 2 inch pipe to 35 feet, slotted from 26 to 35 feet, gravel packed

LOCATION: 081-36-12CBCA WC-18 STATION ID: 415023-0945938-01

ALTITUDE: 1393 FEET (NGVD 1929) DEPTH: 315 FEET DATE COMPLETED: August 18, 1981

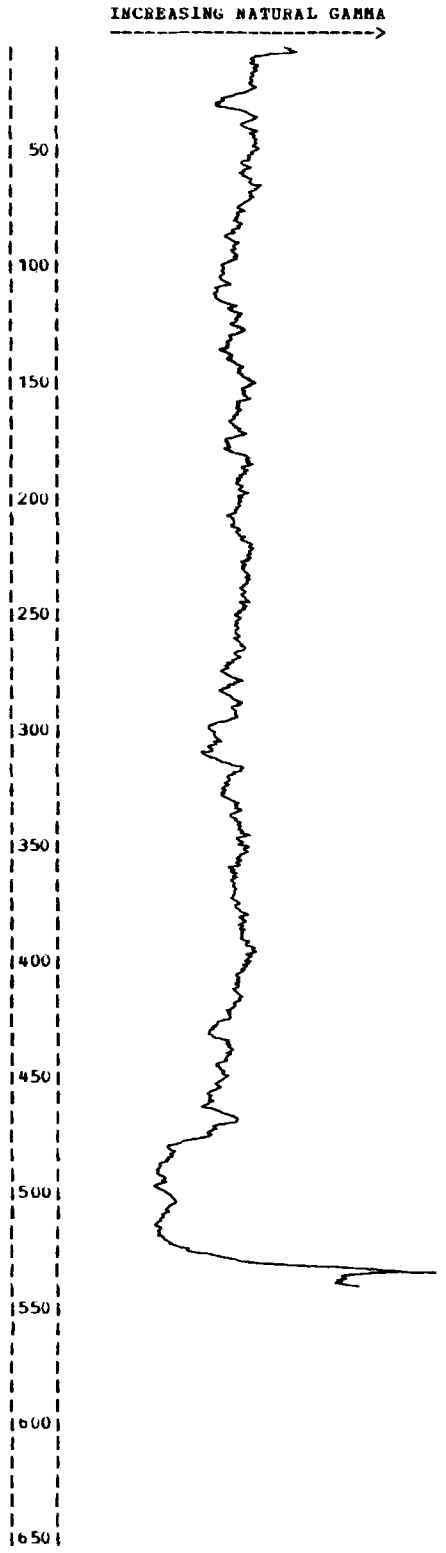


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Topsoil; clay, tan
5-10	Clay, tan, brown
10-13	Till, gray
13-30	Till, yellow-brown
30-54	Till, yellow-gray
54-61	Till, yellow-gray, blue-gray
61-85	Till, blue-gray
85-88	Clay, silty, blue-gray
88-90	Peat, silty, organic, oxidized, brown
90-121	Till, blue-gray
121-161	Till, tough, light yellow-brown; occasional boulders
161-179	Till, yellow-brown
179-180	Sand and gravel, fine to coarse
180-190	Till, gravelly, yellow-brown
190-222	Till, blue-gray; boulder at 115 feet
222-227	Sand, fine to coarse
227-240	Clay or till, silty, sandy, hard, gray
240-265	Clay, silty, sandy, gray, gray-green; sand layers, dark sand grains
	CRETACEOUS
	DAKOTA FORMATION
265-295	Sandstone, coarse, tan; shale, occasional streak
	PENNSYLVANIAN
295-297	Shale, gray-green
297-300	Shale, dark gray, black; coal, thin layers
300-304	Shale, dark gray grading to gray-green
304-315	Shale, light gray, gray-green; limestone layers

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-38-21ADAD WC-222 STATION ID: 414856-0951601-01

ALTITUDE: 1370 FEET (NGVD 1929) DEPTH: 535 FEET DATE COMPLETED: June 28, 1983



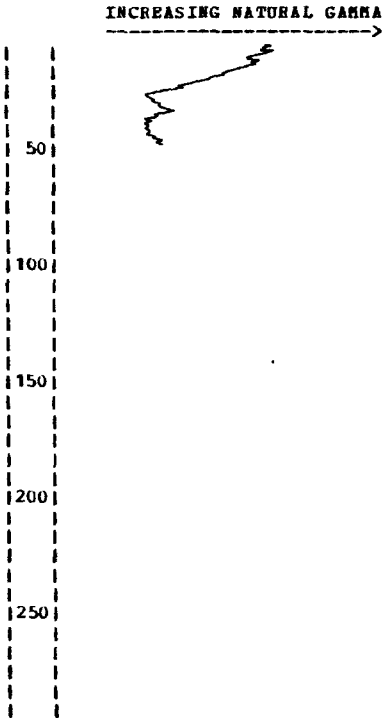
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil; fill
5-10	Clay, silty, dark brown, gray
10-20	Loess, yellow-tan, yellow-brown
20-28	Clay, silty, oxidized layer, brown, yellow-gray
28-29	Clay, silty, sandy, yellow-brown
29-33	Sand and gravel, fine to coarse, yellow-brown
33-34	Till, olive
34-60	Till, blue-gray
60-61	Sand and gravel, fine, gray
61-68	Till, blue-gray
68-70	Sand and gravel, fine, gray
70-86	Till, some sandy and gravelly, blue-gray; gravel, layer at bottom
86-91	Clay, silty, brown; wood
91-96	Clay, silty, sandy, light blue-gray; till (possible)
96-98	Till, light blue-gray, yellow-gray
98-100	Till, olive grading to yellow-brown
100-110	Till, yellow-brown
110-112	Sand and gravel, fine to medium, yellow-brown
112-141	Till, sandy, gravelly, yellow-brown
141-145	Till, sandy, gravelly, yellow-gray grading to blue-gray
145-174	Till, sandy, gravelly, blue-gray; boulder, occasional
174-177	Sand and gravel, fine to medium; till, mixed
177-201	Till, sandy, gravelly, blue-gray; boulder, occasional
201-390	Till, sandy, gravelly, blue-gray; gravel, occasional layer; boulder
390-426	Till, sandy, gravelly, blue-gray; sand layers, cemented
426-432	Sand, fine to coarse, cemented, tan, brown
432-461	Till, gravelly, sandy, blue-gray; sand at base
461-464	Sand, cemented; till, mixed
464-475	Till, sandy, gravelly, blue-gray; sand, occasional layer, cemented
475-530	Sand, fine to coarse, grading to very coarse at bottom, cemented, gray-tan
	PENNSYLVANIAN
530-532	Shale, black; coal
532-535	Shale, silty, gray-tan, gray

Casing record: set 2 inch pipe to 535 feet, slotted from 525 to 535 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-41-03ACCC WC-189 STATION ID: 415124-0953615-01

ALTITUDE: 1095 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: May 26, 1983

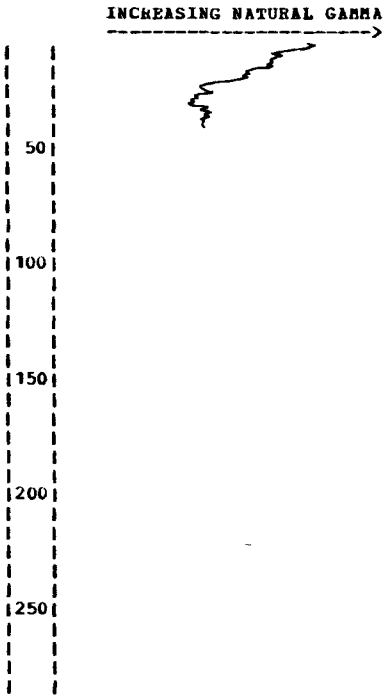


DEPTH (FEET)	DESCRIPTION OF MATERIAL
	QUATERNARY
0-5	Top soil; fill
5-9	Clay, dark gray
9-12	Clay, silty, gray
12-15	Clay, yellow-gray
15-16	Clay, gray-brown
16-20	Clay, silty, yellow-brown, yellow-gray
20-23	Clay, sandy, silty, gray-green; wood
23-25	Sand and gravel, fine, gray; clay; wood
25-30	Sand and gravel, fine to medium, gray; wood
30-46	Sand and gravel, fine to coarse, cemented at bottom 2 feet, yellow-brown
	CRETACEOUS DAKOTA FORMATION
46-50	Sand or sandstone, fine to coarse, brown, tan;
	PENNSYLVANIAN
50-61	Shale, sandy, reddish-brown, gray; sandstone, hard layers; lignite

Casing record: set 2 inch pipe to 46 feet, slotted from 40 to 46 feet, gravel packed

LOCATION: 081-41-03CDBB WC-190 STATION ID: 415109-0953632-01

ALTITUDE: 1090 FEET (NGVD 1929) DEPTH: 50 FEET DATE COMPLETED: May 26, 1983



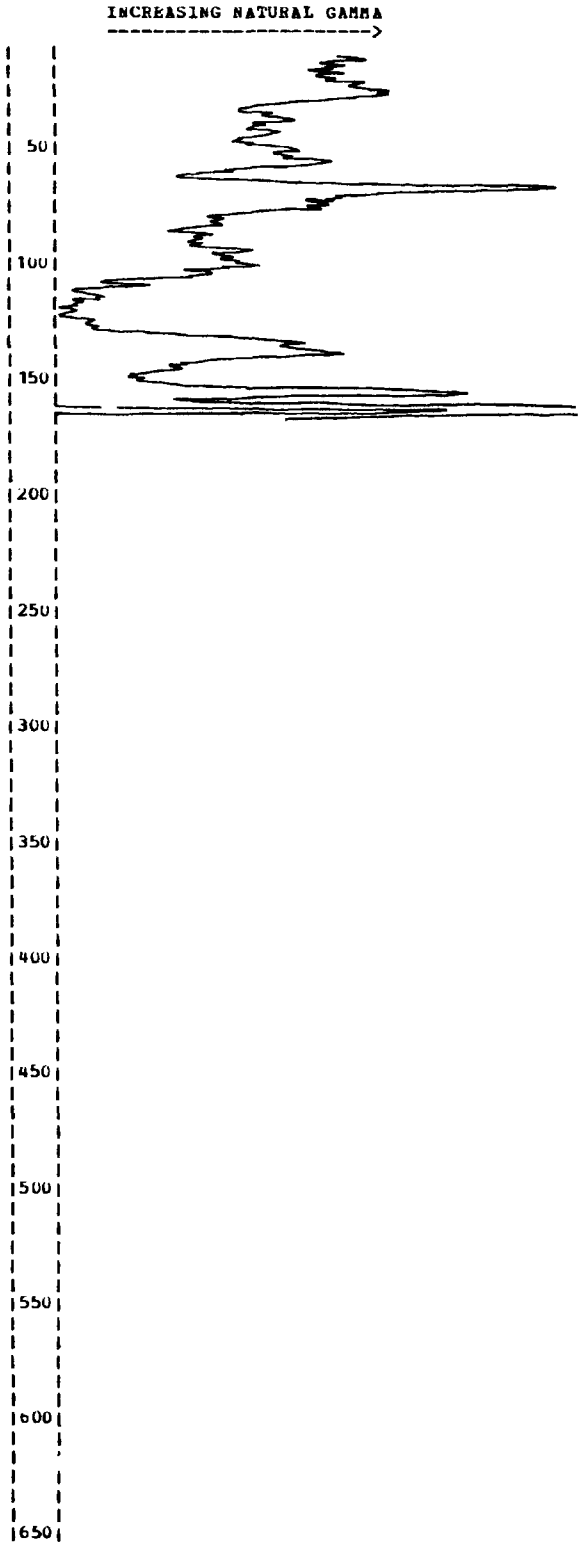
DEPTH (FEET)	DESCRIPTION OF MATERIAL
	QUATERNARY
0-4	Top soil
4-8	Clay, dark gray to gray
8-12	Clay, yellow-gray grading to gray-brown
12-17	Clay, silty, blue-gray
17-21	Clay, silty, gray-green
21-24	Sand, fine, grading to sand and gravel, fine, gray; wood
24-26	Sand and gravel, fine to coarse, gray
26-30	Sand and gravel, fine to coarse, brown, yellow-brown
30-40	Sand and gravel, yellow-tan, yellow-brown
	CRETACEOUS DAKOTA FORMATION
40-43	Sand and gravel or sandstone, fine to medium, cemented, oxidized, brown, yellow-brown; clay or shale
43-50	Sandstone, tan, yellow-brown

Casing record: set 2 inch pipe to 40 feet, slotted from 35 to 40 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-41-17ABAA WC-11 STATION ID: 415003-0953823-01

ALTITUDE: 1135 FEET (NGVD 1929) DEPTH: 166 FEET DATE COMPLETED: June 17, 1981



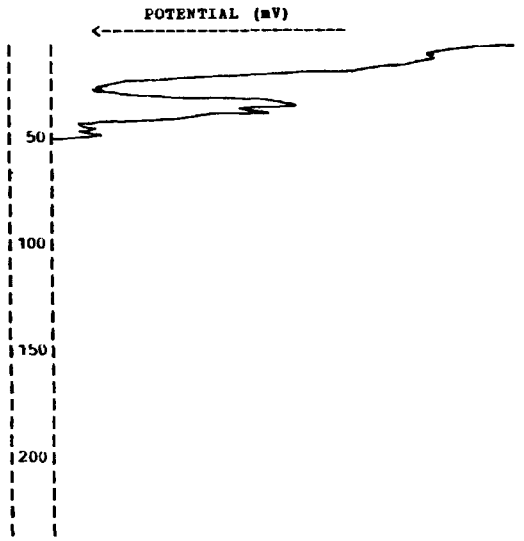
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Loess, brown, tan
10-23	Loess, sandy, very sandy at bottom, gray, yellow-brown streaks
23-30	Loess, sandy, soft, oxidized, yellow-brown
30-36	Loess, soft, yellow-gray, tan
36-43	Loess, blue-gray
43-46	Clay, sandy, yellow-brown
46-54	Clay, sandy, blue-gray
54-55	Clay, sandy, oxidized, organic zone
55-57	Sand, coarse, tan; some clay
57-60	Sand and gravel, oxidized, brown, yellow-brown; clay layer
60-62	Clay, sandy, yellow-gray
62-64	Clay, sandy, gray; dark grains
64-70	Clay, sandy, silty, blue-gray; limestone fragments; dark grains
70-72	Clay, sandy, tough, blue-gray
72-75	Clay, silty, gray-green; sand grains
75-81	Sand, very fine, silty, gray
81-92	Sand, very fine, silty, gray
	CRETACEOUS
	DAKOTA FORMATION
92-95	Sandstone, yellow-brown, oxidized zone; shale
95-98	Sandstone, yellow-tan; shale layers
98-103	Shale, silty, sandy, occasional oxidized zones, tan, gray
103-115	Sandstone, fine to medium, tan
115-126	As above, oxidized and yellow-brown
126-128	Shale, silty, sandy, oxidized
128-132	Shale, silty, light gray, trace of reddish-brown
132-137	Shale, some sandy, reddish-brown, gray
137-140	Sandstone, fine, some cementation, gray-tan; trace of shale
140-149	Sandstone, fine to medium, tan
149-152	Shale, silty, sandy, blue-gray
152-158	Sandstone, fine to medium, gray-tan
	PENNSYLVANIAN
158-160	Shale, slate-like streaks, very dark
160-163	Shale, gray
163-165	Shale, gray-green
165-166	Siltstone, gray-green

Casing record: set 2 inch pipe to 166 feet, slotted from 149 to 166 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-41-31ADCC WC-40 STATION ID: 414702-0953928-01

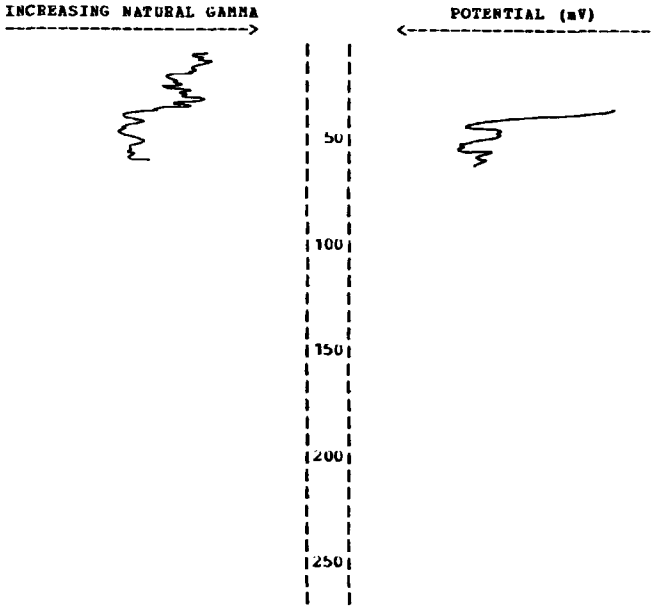
ALTITUDE: 1065 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: May 21, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil; road bed
5-12	Clay, silty, very dark gray
12-14	Clay, silty, gray
14-15	Clay, silty, soft, yellow-gray,
15-18	Clay, silty, sandy, soft, yellow-brown
18-21	Sand and gravel, fine to coarse, tan
21-25	Sand and gravel, fine to coarse, yellow-brown
25-31	Sand and gravel, very coarse, yellow-brown
31-35	Clay, silty, gray-brown; gravel
35-38	Sand and gravel, coarse, gray; clay trace
	CRETACEOUS
	DAKOTA FORMATION
38-50	Sandstone, fine to medium, tan
50-58	Sandstone, fine to coarse, yellow-brown
58-61	Shale, reddish-brown

LOCATION: 081-41-31BCDD WC-43 STATION ID: 414705-0954007-01

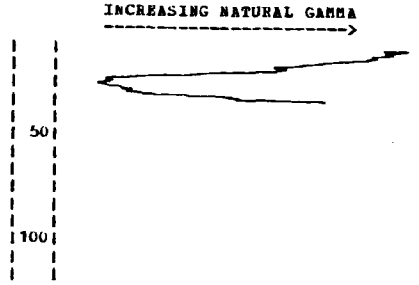
ALTITUDE: 1075 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: May 25, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
QUATERNARY	
0-5	Road bed
5-11	Clay, silty, dark brown
11-16	Clay, silty, dark brown grading to yellow-brown
16-25	Clay, silty, soft, brown,
25-30	Clay, very soft, yellow-brown,
30-36	Clay, silty, sandy, very sandy at base, yellow-gray
36-45	Sand and gravel, fine to very coarse, yellow-brown
45-47	As above with clay layers
47-60	Sand and gravel, fine to medium, yellow-brown
60-72	Sand and gravel, fine, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
72-76	Sandstone, fine to coarse
	PENNSYLVANIAN
76-78	Shale, silty, light gray
78-81	Shale, silty, gray-green; siltstone

LOCATION: 081-41-31BDDD WC-53 STATION ID: 414702-0953951-01

ALTITUDE: 1065 FEET (NGVD 1929) DEPTH: 30 FEET DATE COMPLETED: June 4, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Top soil; clay, silty, very dark
5-9	Clay, silty, gray
9-16	Clay, silty, soft, yellow-brown, yellow-gray
16-30	Sand and gravel, fine to medium, yellow-brown

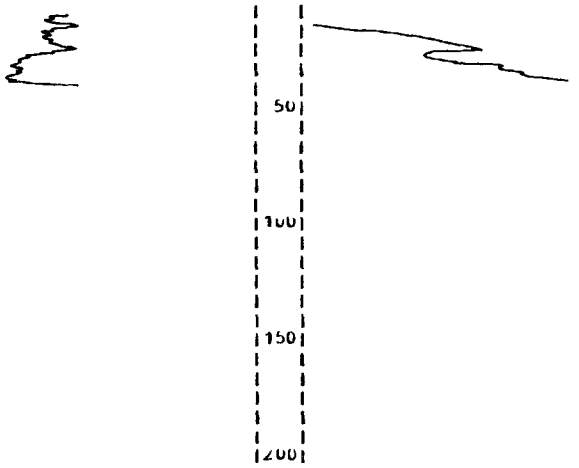
Casing record: set 2 inch pipe to 30 feet, slotted from 24 to 30 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-41-32BCCC WC-42 STATION ID: 414702-0953913-01

ALTITUDE: 1065 FEET (NGVD 1929) DEPTH: 41 FEET DATE COMPLETED: May 24, 1982

INCREASING NATURAL GAMMA ----------> POTENTIAL (mV) <----------

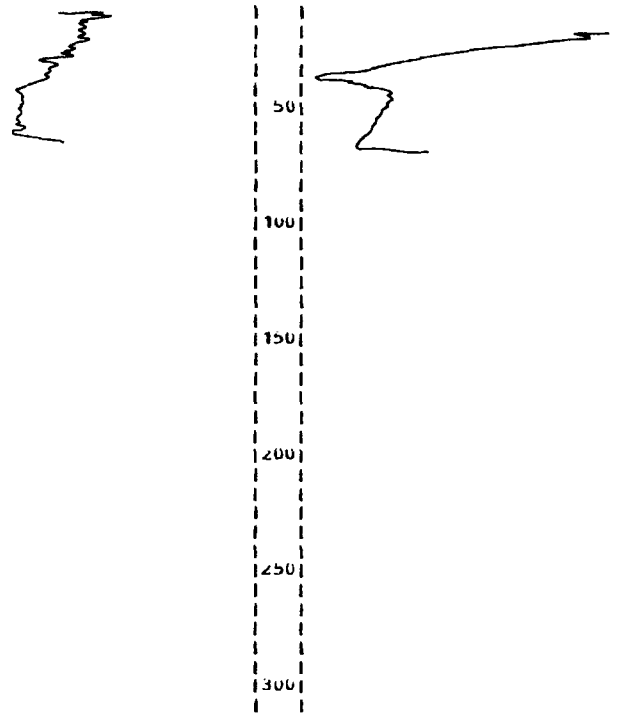


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-12	Clay, silty, gray-brown
12-18	Clay, very silty, soft, gray-brown
18-23	Clay, silty, sandy, blue-gray; wood
23-26	Sand and gravel, fine to coarse, yellow-brown
26-29	Sand and gravel, fine to coarse, tan
29-30	Gravel; clay, yellow-tan
30-34	Sand and gravel, fine to coarse, yellow-brown; clay
	CRETACEOUS
	DAKOTA FORMATION
34-36	Sandstone, iron cemented, brown; shale
36-39	Sandstone, tan
39-41	Shale, silty, yellow, gray-brown

LOCATION: 081-41-32BDCC WC-38 STATION ID: 414702-0953856-01

ALTITUDE: 1065 FEET (NGVD 1929) DEPTH: 72 FEET DATE COMPLETED: May 18, 1982

INCREASING NATURAL GAMMA ----------> POTENTIAL (mV) <----------

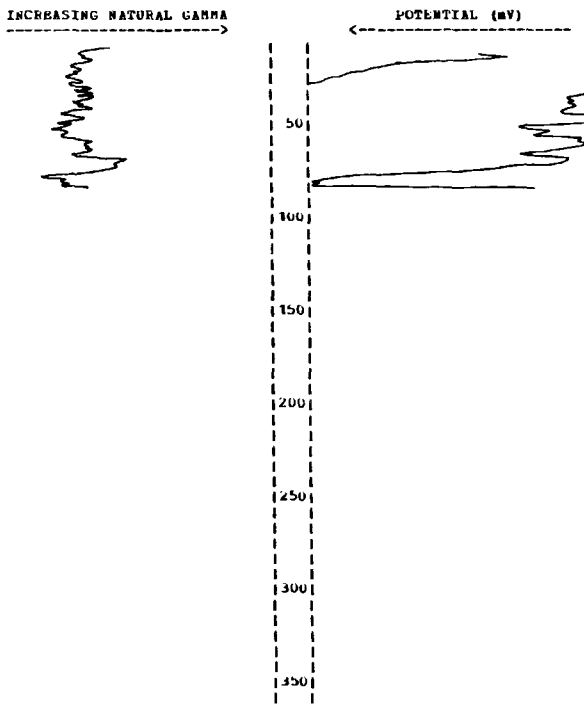


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil, dark
5-10	Clay, gray-tan
10-14	Clay, silty, soft, oxidized zones, gray-tan; wood
14-17	Clay, silty, soft, gray
17-19	Clay, silty, soft, blue-gray
19-20	Clay, silty, blue-gray; sand and gravel layers
20-25	Sand and gravel, fine to coarse, blue-gray; clay, silty; wood at base
25-29	Sand and gravel, fine to coarse, gray
29-33	Sand and gravel, yellow-brown
33-36	Sand and gravel, fine to medium, yellow-tan, some cementation
	CRETACEOUS
	DAKOTA FORMATION
36-55	Sandstone, fine to medium, tan
55-60	Sandstone, fine to medium, yellow-brown
	PENNSYLVANIAN
60-62	Shale, oxidized, yellow-brown
62-69	Shale, gray-green
69-72	Shale, gray-green, reddish brown

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-41-32DBAB WC-41 STATION ID: 414700-0953829-01

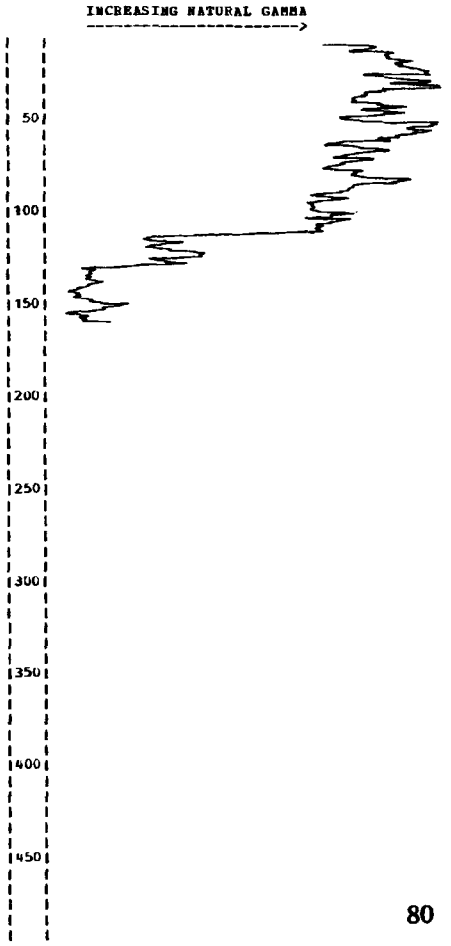
ALTITUDE: 1085 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: May 24, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-9	Clay, silty, brown
9-13	Clay, silty, soft, yellow-brown,
13-20	Clay, silty, soft, gray-green,
20-40	Clay, silty, soft, blue-gray
40-41	Sand, fine to coarse, gray; gravel, fine
41-44	Clay, gray-tan; sand grains
44-46	Clay, gray-green; sand
46-48	Sand and gravel, fine, gray-green
48-50	Clay, silty, yellow-brown
50-52	Clay, silty, sandy, gray-green
	PENNSYLVANIAN
52-55	Shale, reddish-brown, light gray
55-60	As above
60-63	Shale, silty, sandy, yellow-brown, reddish-brown
63-65	Shale, silty, light blue-gray, gray, yellow, reddish-brown
65-67	Shale, silty, yellow-gray
67-69	Shale, silty, sandy, blue-gray
69-73	Shale, silty, sandy, reddish-brown, gray
73-79	Shale, sandy, reddish-gray, gray-tan; limestone fragments, yellow-brown
79-81	Shale, green, gray-green

LOCATION: 081-41-33CAAA WC-52 STATION ID: 414700-0953730-01

ALTITUDE: 1182 FEET (NGVD 1929) DEPTH: 169 FEET DATE COMPLETED: June 3, 1982



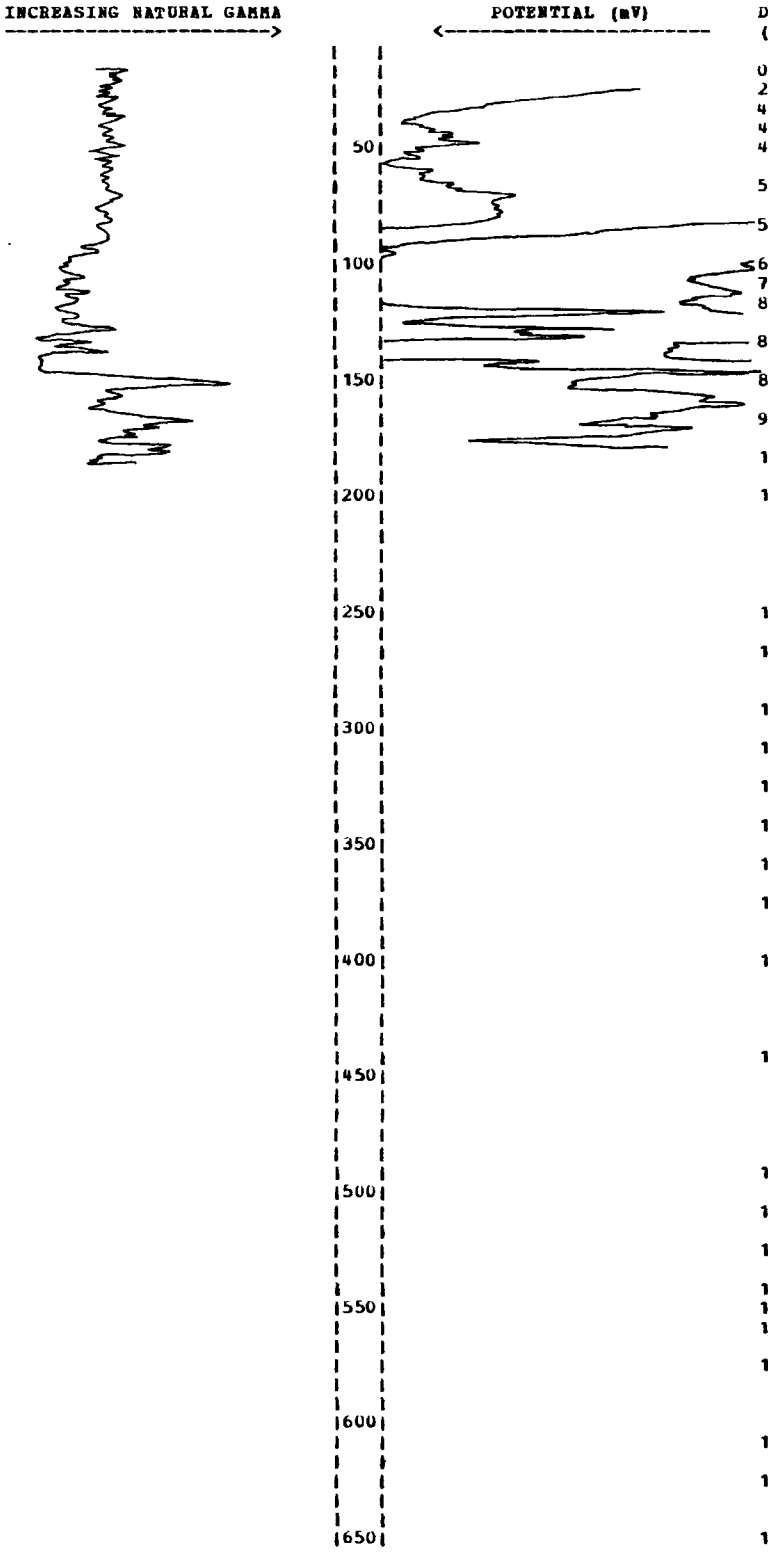
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-30	Loess, yellow-brown, brown
30-40	Loess, yellow-gray, brown
40-47	Clay, silty, tan; loess
47-54	Clay, silty, hard, gray-brown
54-58	Clay, silty, yellow-tan
58-61	Clay, silty, sandy, yellow-tan
61-64	Clay, silty, hard, gray-brown
64-67	Clay, silty, sandy, yellow-tan
67-78	Clay, silty, yellow-tan
78-81	Clay, silty, sandy, very soft, yellow-tan
81-95	As above, softer
95-102	Clay, silty, gray-tan
102-107	Clay, silty, yellow-tan
107-109	Clay, silty, yellow-gray, brown
109-115	Sand and gravel, fine, tan, yellow-brown
115-123	Sand and gravel, fine to coarse, possibly cemented, brown, yellow-brown
	CRETACEOUS
	DAKOTA FORMATION
123-126	Sandstone, fine to medium, tan
126-128	Sandstone, fine to coarse, oxidized, yellow-brown
128-145	Sandstone, fine to medium, coarser near bottom, tan
145-157	Sandstone, fine to very coarse, tan; shale, thin layers, yellow-gray
157-158	Shale, yellow-brown, yellow-gray
158-161	Sandstone, fine to coarse, tan
161-162	Shale, yellow-gray
162-165	Shale, reddish-brown
165-167	Shale, brown
167-169	Shale, gray, reddish-brown

Casing record: set 2 inch pipe to 155 feet, slotted from 145 to 154 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-41-33DDCD WC-39 STATION ID: 414635-0953707-01

ALTITUDE: 1185 FEET (NGVD 1929) DEPTH: 181 FEET DATE COMPLETED: May 19, 1982

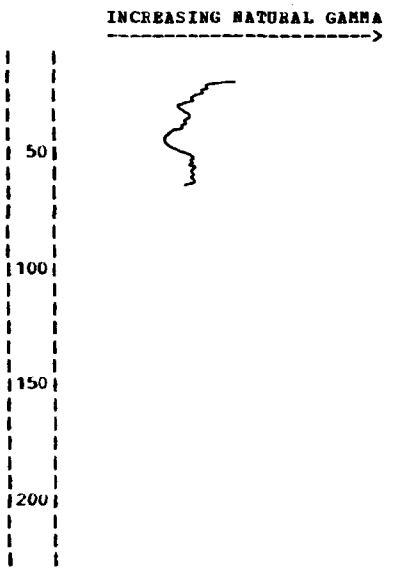


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-2	Road bed
2-41	Loess, yellow-brown
41-44	Loess, yellow-gray
44-47	Clay, silty and sandy
47-51	Till, silty, sandy, brown, yellow-brown
51-58	Till, silty, yellow-brown
58-69	Clay or till, silty, sandy, yellow-tan
69-77	Clay, gray
77-80	Clay, gray-green
80-86	As above grading very
86-88	Clay, silty, sandy, gray-tan
88-95	Sand, silty, very fine, brown-tan,
95-100	Sand, silty, very fine, gray-brown
100-110	Sand, very fine to fine, brown, gray-brown
110-122	Sand, very fine to coarse, yellow-brown; gravel trace
	CRETACEOUS
	DAKOTA FORMATION
122-123	Shale, oxidized, yellow-brown
123-125	Conglomerate, brown to yellow-brown; shale trace
125-126	Shale, gravelly, sandy, oxidized
126-129	Sandstone, fine to very coarse, tan
129-132	Shale, silty, yellow-gray to gray
132-133	Sandstone, oxidized, shaly, yellow-brown
133-143	Sandstone, fine to medium, tan
143-145	Shale, oxidized, yellow-brown, brown, reddish-brown
145-146	As above, layered; sand, very coarse, iron cemented; possible conglomerate, rust colored
146-148	Shale, yellow-brown, reddish brown, brown; sandstone, very coarse, iron cemented
	PENNSYLVANIAN
148-149	Shale, silty, light gray to gray
149-150	Shale, sandy, maroon-brown
150-151	Shale, sandy, gray, maroon
151-152	Shale, sandy, brown
152-154	Shale, sandy, maroon
154-155	Shale, sandy, gray, maroon
155-158	Shale, very sandy, light blue-gray; sandstone, some fine, very thin layer
158-161	Shale, blue-gray, yellow-brown trace
161-167	Shale, blue-gray grading to gray, maroon trace
167-170	Shale, yellow-brown, gray mixed
170-172	Shale, gray; sandstone trace, fine layers
172-178	Shale, blue-gray
178-181	Shale, very silty, gray-green; dolomite, occasional streak; pyrite

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-44-01ABAB WC-177 STATION ID: 415148-0955450-01

ALTITUDE: 1065 FEET (NGVD 1929) DEPTH: 61 FEET DATE COMPLETED: May 18, 1983

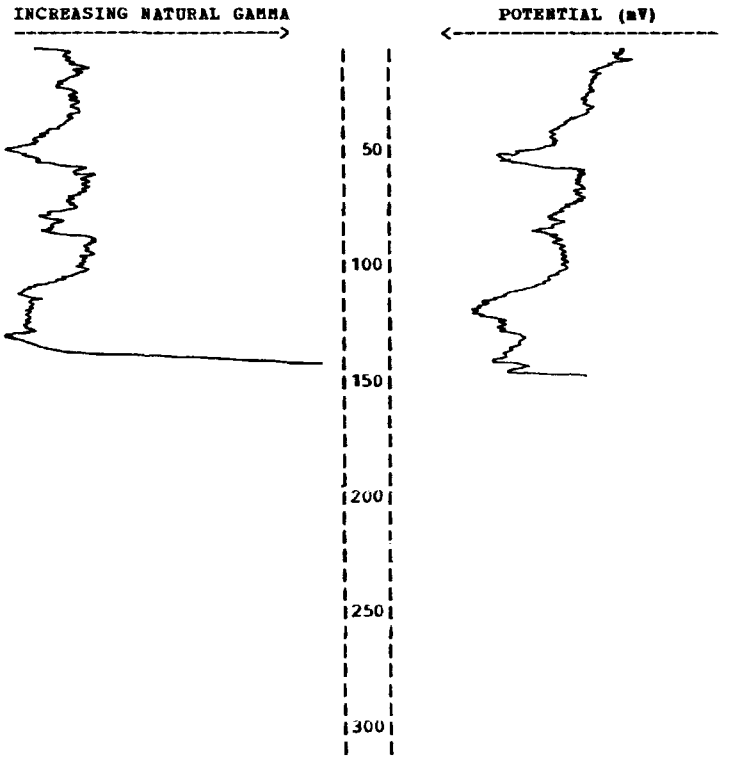


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Road bed; fill
10-15	Clay, silty, gray
15-20	Clay, silty, blue-gray
20-26	Clay, silty, gray-green
26-31	Clay, silty, gray-green, yellow-brown; shells
31-35	Clay, silty, gray-green
35-40	Clay, silty, gray-green, gray; shells
40-42	Wood
42-43	Clay, silty, gray
43-47	Sand and gravel, fine, gray
47-51	Sand and gravel, fine to coarse, gray
51-52	Clay, gray
52-57	Sand and gravel, fine to coarse; clay, gray
57-61	Till; blue-gray

Casing record: set 2 inch pipe to 58 feet, slotted from 53 to 58 feet, gravel packed

LOCATION: 081-44-01BBAA WC-179 STATION ID: 415148-0955515-01

ALTITUDE: 1075 FEET (NGVD 1929) DEPTH: 148 FEET DATE COMPLETED: May 19, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-14	Clay, silty, yellow-brown, yellow-gray
14-20	Clay, silty, yellow-gray, gray
20-27	Clay, gray grading to gray green
27-34	Clay, yellow-gray to yellow-brown
34-37	Clay, blue-gray, gray; shells
37-40	Clay, silty, sandy, oxidized, brown, yellow-brown
40-45	Clay, silty, sandy, yellow-gray; shells
45-48	Clay, silty, blue-gray; shells
48-56	Sand and gravel, fine to coarse, boulders
56-57	Till, yellow-brown
57-75	Till, blue-gray
75-85	Till, sandy, gravelly, blue-gray; sand and gravel layers
85-109	Till, sandy, gravelly, blue-gray
109-142	Sand and gravel, fine to coarse, gray-green; boulders, occasional
	PENNSYLVANIAN
142-146	Shale (slate-like), black; coal
146-148	Shale, gray

Table 2. Logs of wells and test holes--Continued.

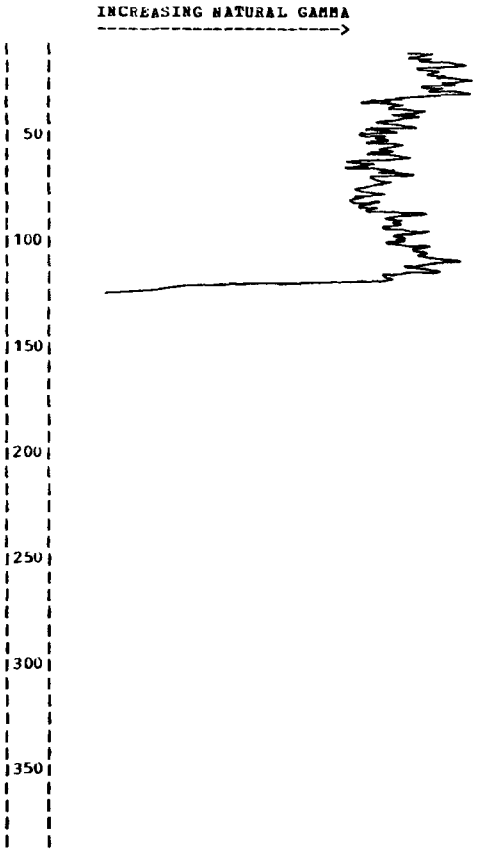
LOCATION: 081-44-9BBDC WC-24 STATION ID: 415046-0955847-01

ALTITUDE: 1160 FEET (NGVD 1929) DEPTH: 228 FEET DATE COMPLETED: November 11, 1981

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-15	Loess, brown
15-25	Loess, yellow-brown
25-68	Loess, silty, sandy, soft, yellow-brown
68-69	Boulder, red granite
69-77	Till or clay, silty, yellow-tan
77-80	Till, very gravelly, oxidized, brown
80-84	As above, with gravel layers
84-88	Sand and gravel, fine to coarse, cemented, oxidized, brown
88-93	Till, yellow-tan
93-100	Clay, silty, yellow-tan
100-107	Clay, silty, sandy, dark specks, yellow-gray
107-110	Sand, fine grading to a sand and gravel, gray
110-120	Sand and gravel, fine to coarse, cemented, oxidized, brown, yellow-brown
120-130	Sand and gravel, cemented, oxidized, yellow-brown
130-134	Till, yellow to blue-gray
134-140	Till, blue-gray
140-150	Till, blue-gray; sand layers, fine to medium; occasional boulders
150-155	As above, gray-green
155-200	Till, very sandy, blue-gray; sand layers
200-210	Till, very sandy, blue-gray
	PENNSYLVANIAN
210-213	Shale, light gray
218-221	Shale, gray; limestone, argillaceous; lots of fossils
221-224	Shale, black; coal, thin layer at 224 feet
224-228	Shale, gray

LOCATION: 081-44-18AADA WC-23 STATION ID: 414955-0960006-01

ALTITUDE: 1075 FEET (NGVD 1929) DEPTH: 209 FEET DATE COMPLETED: November 5, 1981



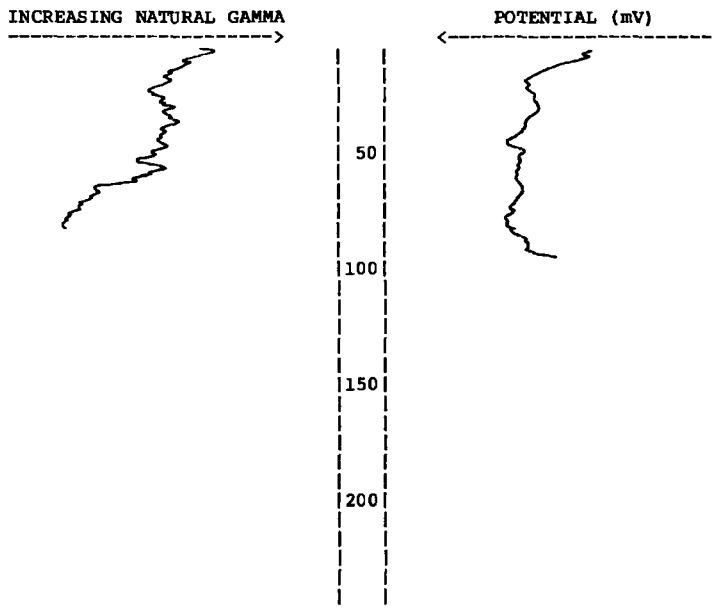
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-29	Till, yellow-brown
29-33	Till, blue-gray
33-35	Till, yellow-brown
35-40	Till, blue-gray, yellow-gray
40-64	Till, blue-gray
64-68	Sand and gravel
68-112	Till, blue-gray
	PENNSYLVANIAN
112-128	Sandstone, fine to medium, tan
128-130	Shale, silty, sandy, light gray, maroon
130-140	Shale, light gray, maroon, yellow-brown
140-150	Shale, gray-green, maroon, yellow
150-151	Limestone, gray, dark at bottom
151-154	Limestone, gray shale
154-158	Shale, black; coal at bottom
158-159	Shale, gray
159-174	Shale, gray-green, silty; siltstone, occasional thin layer
174-180	Shale, silty, reddish-brown, gray-green
180-187	Shale, silty, gray, yellow-brown
187-197	Shale, silty, gray
197-199	Shale, silty, some sandy, dark gray
199-200	Shale, gray-green
200-202	Limestone, tan, brown
202-209	Limestone, light colored; shale at bottom, gray, yellow

Casing record: set 2 inch pipe to 126 feet, slotted from 108 to 126 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 081-44-32DDDD WC-187 STATION ID: 414638-0955859-01

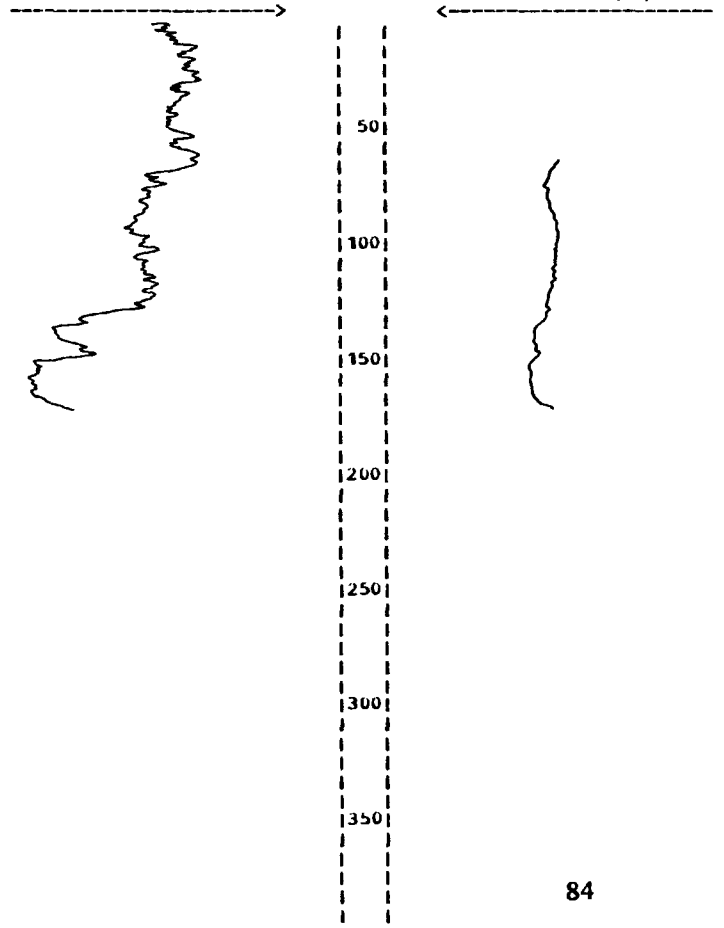
ALTITUDE: 1040 FEET (NGVD 1929) DEPTH: 81 FEET DATE COMPLETED: May 25, 1983



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Road bed; top soil
10-14	Clay, silty, dark gray
14-18	Clay, silty, brown
18-27	Clay, silty, gray
27-36	Clay, silty, yellow-gray
36-41	Clay, silty, gray grading to gray-green; snail shells
41-50	Clay, silty, soft, gray-green; wood; snail shells
50-60	Sand, fine; clay, silty, sandy, gray, gray-green; wood; silt
60-64	Sand, very fine to coarse, gray, brown at base; silt; clay; wood
64-73	Sand and gravel, fine to coarse, brown, yellow-brown
	CRETACEOUS DAKOTA FORMATION
73-81	Sandstone, fine, tan, yellow-brown

LOCATION: 081-44-33CABB WC-186 STATION ID: 414700-0955838-01

ALTITUDE: 1130 FEET (NGVD 1929) DEPTH: 177 FEET DATE COMPLETED: May 25, 1983

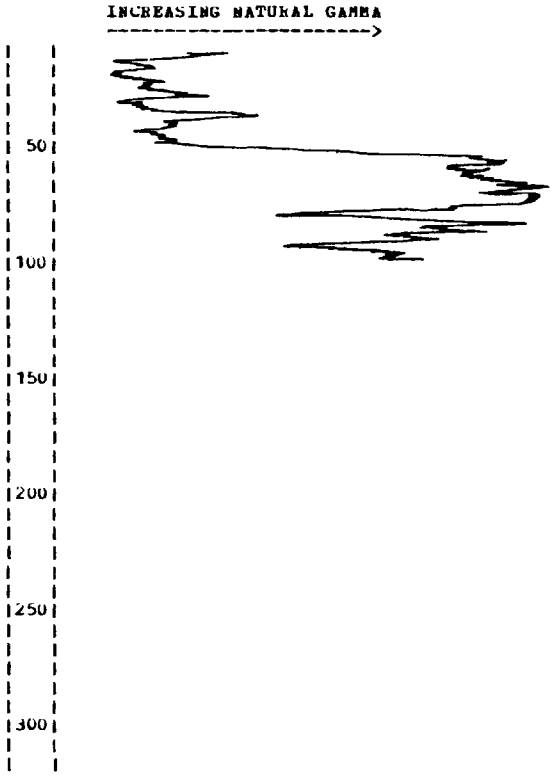


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed
5-25	Loess, yellow-tan
25-41	Loess, hard, yellow-brown, brown
41-54	Loess, hard, yellow-brown, yellow-tan; snails
54-57	Clay, silty, brown, yellow-brown; loess, hard
57-70	Loess, yellow-brown, yellow-tan
70-90	Clay, silty, yellow-tan; loess
90-100	Loess, yellow-tan grading to yellow-gray
100-102	Clay, silty, gray; loess
102-130	Clay, silty, yellow-tan, yellow-gray; loess
130-136	Clay, sandy, silty, blue-gray; sand, very fine
136-137	Sand and gravel, fine to medium, olive
137-144	Sand, fine to coarse, well cemented, yellow-tan
144-151	Sand and gravel, fine to coarse, cemented, brown, yellow-brown
	CRETACEOUS DAKOTA FORMATION
151-165	Sandstone, fine, hard, yellow-tan
165-171	Sandstone, fine to coarse, yellow-brown, tan
	PENNSYLVANIAN
171-172	Shale, gray-green, yellow-gray
172-177	Shale, yellow-gray, reddish-brown gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-29-18CAAA WC-116 STATION ID: 415449-0941615-01

ALTITUDE: 960 FEET (NGVD 1929) DEPTH: 101 FEET DATE COMPLETED: August 24, 1983

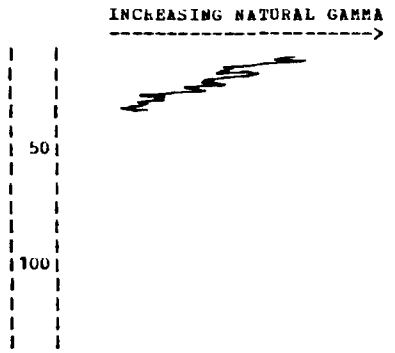


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Clay, very sandy, brown
6-11	Sand, very fine to coarse, brown; shells
11-17	Sand and gravel, fine, gray-tan; shells
17-26	Sand and gravel, fine to coarse, gray; shells
26-31	Sand, fine to coarse, gray
31-34	Clay or till, very sandy, gray
34-46	Sand and gravel, fine to coarse
46-48	Clay or till, sandy, blue-gray; shale, reworked
	PENNSYLVANIAN
48-60	Shale, silty, sandy, reworked, olive; pyrite
60-73	Shale, silty, sandy, gray; siltstone; pyrite
73-80	Sandstone, lime cemented; siltstone, hard; shale layers, silty; pyrite
80-101	Sandstone, fine, silty, interbedded, hard; shale, silty, gray

Casing record: set 2 inch pipe to 100 feet, slotted from 89 to 100 feet, gravel packed

LOCATION: 082-29-18CBAA WC-115 STATION ID: 415448-0941634-01

ALTITUDE: 965 FEET (NGVD 1929) DEPTH: 34 FEET DATE COMPLETED: August 23 1982



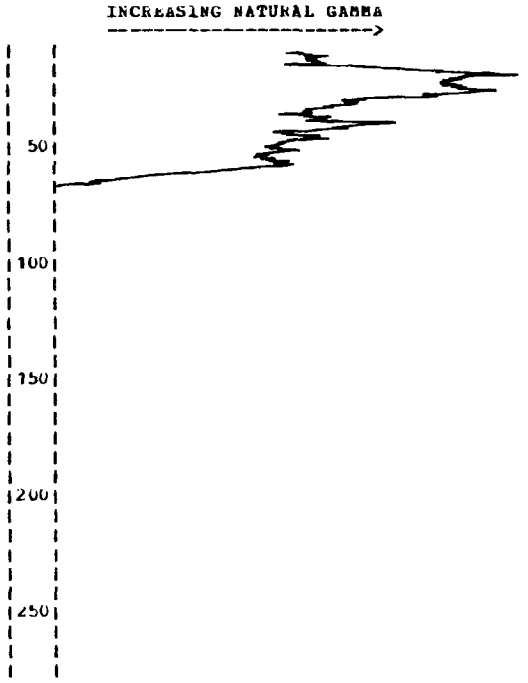
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Clay, sandy, dark brown
6-8	Sand and gravel, fine to medium, brown; clay mixed
8-10	Sand and gravel, fine to medium, brown
10-29	Sand and gravel, fine to coarse, tan to yellow-brown
29-34	Till, sandy, blue-gray

Casing record: set 2 inch to 30 feet, slotted from 20 to 30 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-29-18DBAA WC-117 STATION ID: 415449-0941556-01

ALTITUDE: 1005 FEET (NGVD 1929) DEPTH: 90 FEET DATE COMPLETED: August 25, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-1	Top soil
1-10	Till, gravelly, yellow-tan, yellow-brown
10-12	Till, sandy, gravelly, blue-gray
12-16	Till, sandy, brown, gray
16-36	Clay, silty, yellow-gray at top, blue-gray; wood
36-40	Till, sandy, olive
40-42	Till, yellow-brown
42-54	Till, olive
54-60	Sand and gravel, fine to coarse, yellow-brown; till layers
60-84	Sand, fine to coarse, possibly cemented, tan; gravel
84-86	As above; clay mixed
	PENNSYLVANIAN
86-90	Shale, silty, sandy, gray, light gray; siltstone layers

Casing record: set 2 inch pipe to 75 feet, slotted from 65 to 75 feet, gravel packed

LOCATION: 082-30-13ADDC WC-119 STATION ID: 415449-0941654-01

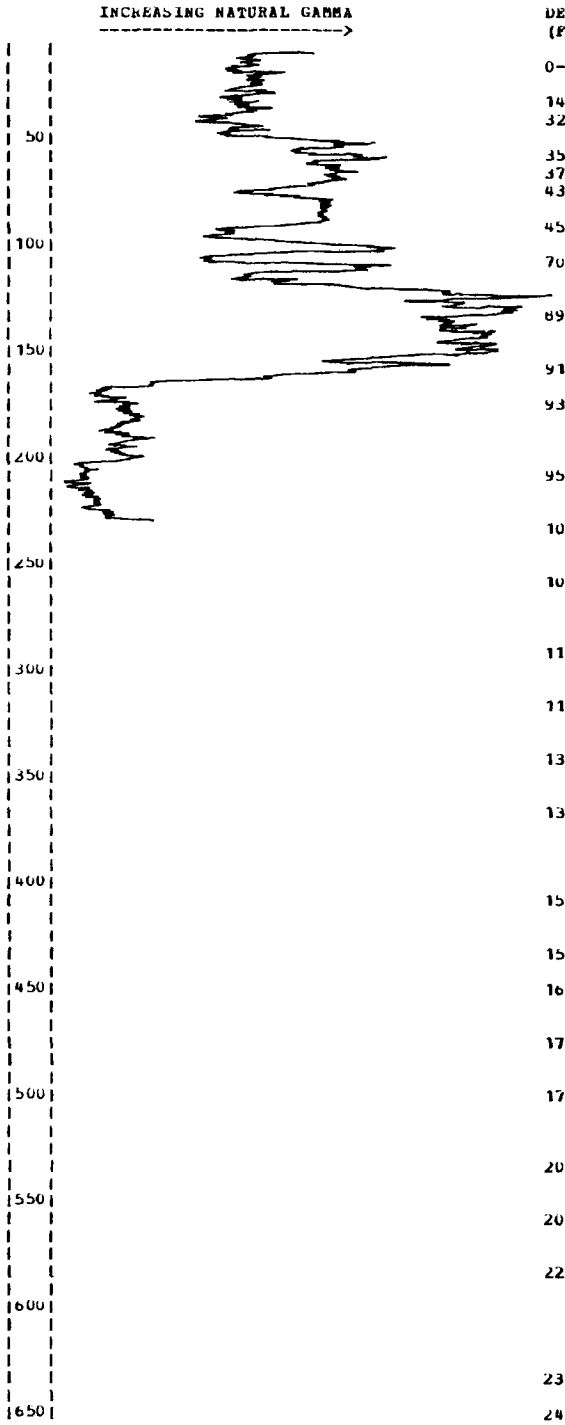
ALTITUDE: 965 FEET (NGVD 1929) DEPTH: 115 FEET DATE COMPLETED: August 27, 1982

DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-6	Road bed
6-9	Clay, sandy, gravelly, brown
9-10	Clay, sandy and gravelly, yellow-brown;
10-15	Sand and gravel, fine to very coarse, brown, tan
15-22	Sand and gravel, fine to coarse, yellow-brown
22-24	Sand and gravel, fine to very coarse, gray
24-48	Till, sandy, gravelly, soft, blue-gray
48-50	Sand and gravel, fine to coarse, gray; wood
50-70	Till, sandy, gravelly, blue-gray
70-80	Sand and gravel, fine to coarse, gray-tan; wood
80-104	Sand and gravel, fine, some cemented, gray
	PENNSYLVANIAN
104-115	Sandstone, silty, gray, tan; shale; organics

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-30-13CABA WC-118 STATION ID: 415449-0941732-01

ALTITUDE: 1035 FEET (NGVD 1929) DEPTH: 245 FEET DATE COMPLETED: August 25, 1982



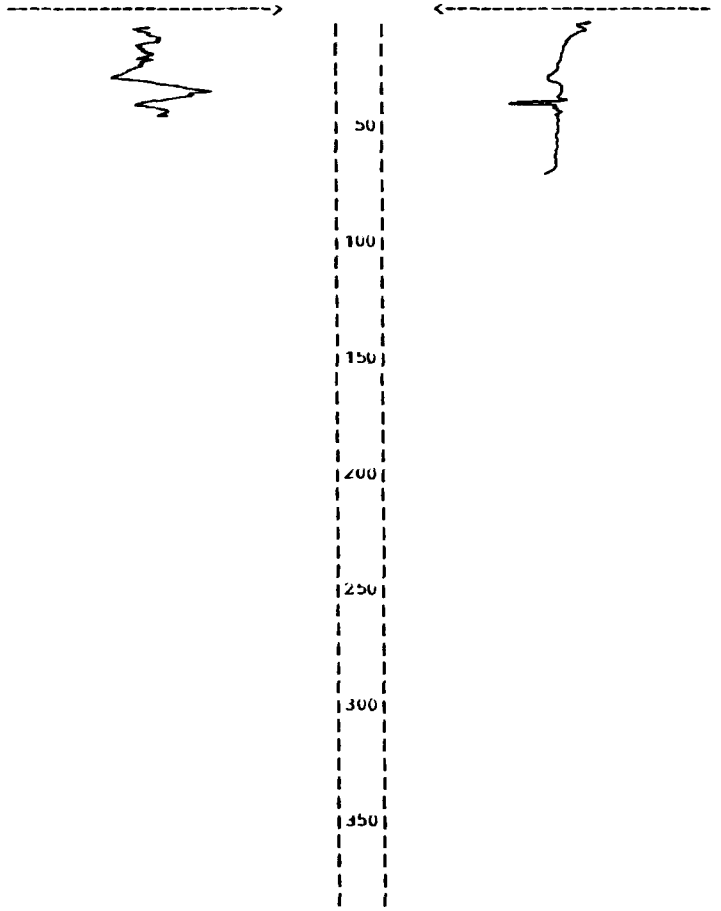
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-14	Till, sandy, gravelly, yellow-brown
14-32	Till, blue-gray
32-35	Till, olive to yellow-brown
35-37	Till, yellow-brown
37-43	Till, olive
43-45	Sand and gravel, fine to coarse, yellow-brown
45-70	Clay, hard, blue-gray; sand grains
70-89	As above, more sandy
	PENNSYLVANIAN
89-91	Sandstone, silty, well cemented, brown; pyrite
91-93	Limestone, silty, sandy, hard
93-95	Siltstone, gray; sandstone, brown; shale; pyrite; organics
95-100	Siltstone, sandy; shale, interbedded; pyrite; organics
100-105	Sandstone; siltstone; shale, interbedded; pyrite; organics
105-113	Siltstone, sandy; shale, interbedded; coal, thin streak; pyrite; organics
113-115	Limestone, silty, sandy, hard, gray; pyrite
115-130	Shale, silty; siltstone, interbedded; pyrite
130-135	Siltstone; sandstone; shale, interbedded; pyrite
135-150	Siltstone, sandy, interbedded; shale, silty, gray, gray-green; pyrite; organics
150-155	Sandstone; siltstone, sandy, hard; shale, interbedded; pyrite
155-161	Shale, silty; siltstone, sandy
161-170	Sandstone, well cemented, hard streaks, tan; siltstone
170-177	Limestone, fine to coarse, sandy, brown, tan
177-203	Sandstone, fine to coarse, less cemented, softer, brown, tan; organics
203-206	Sandstone, hard lime cemented, tan; limestone, very sandy
206-227	Sandstone, fine to very coarse, well cemented, tan
227-237	Limestone, sandy, hard, brown; organics; sandstone, well cemented
	MISSISSIPPIAN
237-240	Dolomite, brown, gray; chert, black
240-241	Dolomite, shaly, gray-green; chert, reddish-brown
241-243	Dolomite, brown, gray; chert; shale trace
243-245	Dolomite, brown

Casing record: set 2 inch pipe to 230 feet, slotted from 209 to 230 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-31-04DAAD WC-236 STATION ID: 415631-0942716-01

ALTITUDE: 1115 FEET (NGVD 1929) DEPTH: 127 FEET DATE COMPLETED: August 10, 1983

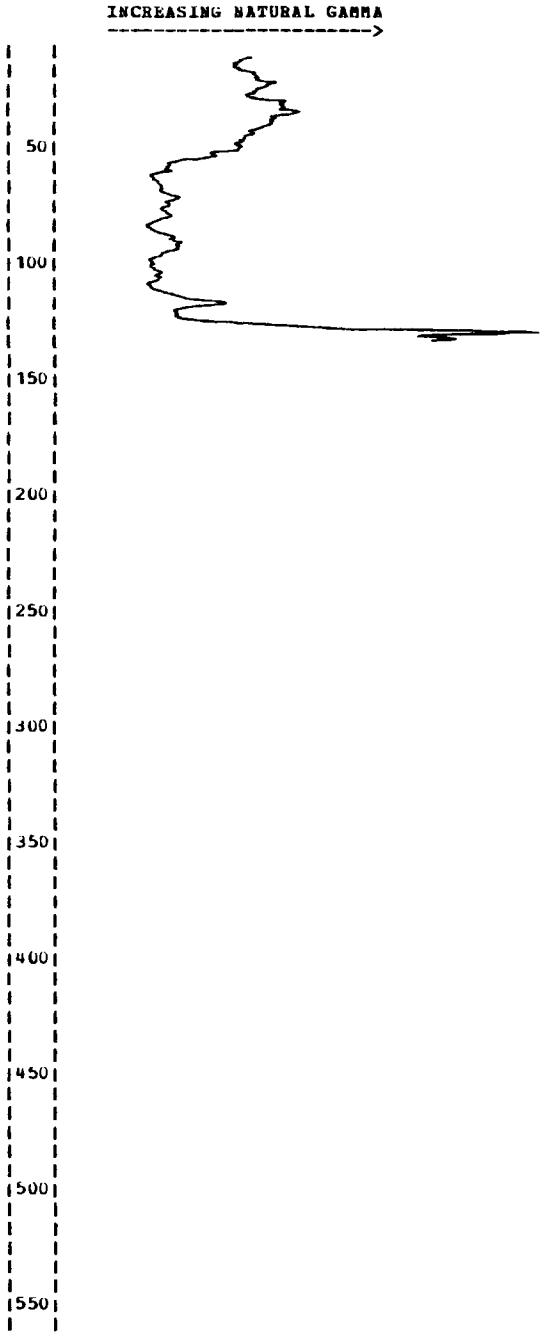


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-6	Clay, dark gray
6-8	Sand and gravel, fine to coarse; boulders
8-13	Till, yellow-tan
13-19	Till, yellow-gray grading to blue-gray; boulder at top
19-26	Till, blue-gray
26-30	Sand and gravel, fine to medium, gray-tan
30-32	Clay or till, sandy, yellow-brown
32-35	Clay, gray-tan
35-38	Clay, light brown
38-41	Boulder, quartzite
41-42	Till, yellow-tan
42-44	Till, very sandy, blue-gray
44-45	Boulder
45-72	Clay or till, sandy, yellow-brown
72-79	Sand, fine to coarse
79-82	Till or clay, sandy, yellow-brown
82-87	Till, blue-gray; sand and gravel
87-90	Sand and gravel, fine to medium, oxidized, yellow-brown; till, occasional layer
90-117	Sand and gravel, fine to medium, some oxidized, yellow-brown
117-120	Clay or till
	CRETACEOUS
DAKOTA FORMATION	
120-121	Sandstone, very coarse, hard
	PENNSYLVANIAN
121-123	Coal
123-127	Shale, silty, sandy, gray

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-31-10AAAA WC-235 STATION ID: 415608-0942607-01

ALTITUDE: 1108 FEET (NGVD 1929) DEPTH: 125 FEET DATE COMPLETED: August 9, 1983



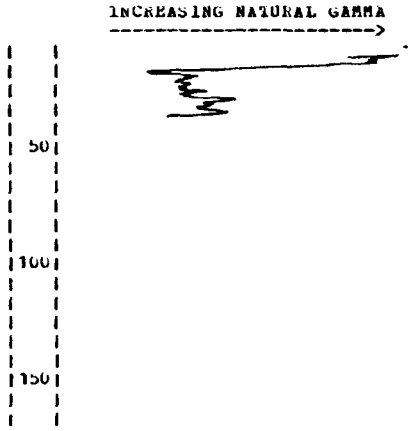
DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Fill: top soil
5-13	Till, gravelly at base, yellow-brown
13-15	Till, yellow-gray
15-17	Clay, brown
17-18	Clay, some sandy, yellow-brown
18-23	Till, yellow-brown
23-25	Clay, gray-brown grading to gray-tan
25-35	Clay, gray-tan
35-37	Clay, gray-brown
37-40	Till or clay, gray-brown to yellow-brown; sand
40-45	Till or clay, sandy, yellow-brown
45-47	Sand, fine to medium, gray-brown
47-49	Clay or till, sandy, yellow-gray
	CRETACEOUS
	DAKOTA FORMATION
49-55	Sandstone, fine to coarse, tan
55-60	Sandstone, fine to medium, tan; shale, thin streaks, some coarse
60-70	Sandstone, fine to coarse, tan, yellow-brown, brown layers; shale streaks
70-75	Sandstone, very coarse, tan; shale trace
75-80	Sandstone, fine to coarse, brown
80-82	Sandstone, fine to coarse, oxidized, brown
82-87	Sandstone, fine to very coarse, yellow-brown; shale
87-88	Ironstone conglomerate, dark brown
88-101	Sandstone, fine to very coarse (gravel), yellow-brown
101-109	Sandstone, fine to very coarse, brown, yellow-brown
109-112	Shale, silty, yellow, gray
112-121	Sandstone, fine to very coarse (gravel), yellow-brown
	PENNSYLVANIAN
121-122	Shale, black; coal
122-124	Coal
124-125	Shale, gray

Casing record: set 2 inch pipe to 125 feet, slotted from 111 to 120 feet, gravel packed

Table 2. Logs of wells and test holes--Continued.

LOCATION: 082-34-02AABB WC-152 STATION ID: 415659-0944606-01

ALTITUDE: 1170 FEET (NGVD 1929) DEPTH: 32 FEET DATE COMPLETED: September 30, 1982

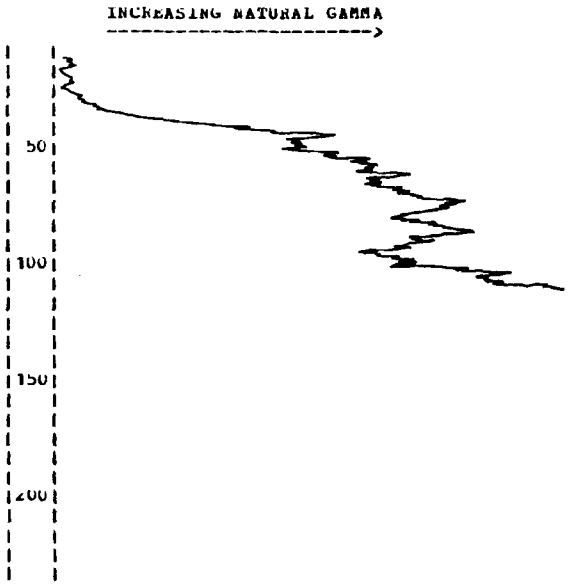


DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-5	Road bed; top soil
5-7	Clay, very dark
7-10	Clay, gray
10-12	Clay, silty, sandy, yellow-brown
12-25	Sand and gravel, fine to medium, some coarse, tan, yellow-tan
25-28	Sand and gravel, fine to medium, gray
28-32	Clay, silty, sandy, gray

Casing record: set 2 inch pipe to 31 feet, slotted from 24 to 27 feet, gravel packed --Casing was pulled after collecting water sample

LOCATION: 082-34-02ABBB WC-149 STATION ID: 415658-0944626-01

ALTITUDE: 1170 FEET (NGVD 1929) DEPTH: 105 FEET DATE COMPLETED: September 27, 1982



DEPTH (FEET)	DESCRIPTION OF MATERIALS
	QUATERNARY
0-10	Clay, silty, sandy, very dark gray
10-15	Sand and gravel, fine to coarse, silty, gray; clay; shells
15-20	Sand and gravel, fine to coarse, yellow-brown
20-30	Sand, fine to coarse, tan, gray; wood
30-40	As above, finer
40-50	Sand, silty, very fine to fine, gray
50-60	Silt; clay
60-88	Clay, very silty, gray; sand layers, very fine
88-96	Sand and gravel, fine to medium; clay
	PENNSYLVANIAN
96-105	Shale or clay, silty, light blue-gray

Casing record: set 2 inch pipe to 105 feet, slotted from 87 to 96 feet, gravel packed