TEMPERATURE GRADIENTS AND HEAT FLOW
IN THE ALVORD VALLEY,
HARNEY COUNTY, OREGON

VOLUME II - APPENDICES A and B

for

ANADARKO PRODUCTION COMPANY

HOUSTON, TEXAS

by

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Berkeley, California

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OSTI-55

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under Springs mas file there is one combined hole for each *

Appendix AEquilibrium Temperature Profiles, Temperature Logs
and Graphic Lithologic Logs

	<u>Page</u>
* MICKEY SPRINGS	
Hole P-1	A-1
Hole AN-A-4A (78-4A).	A-3
Hole AN-A-5 (78-5).	A-5
Hole AN-A-5R (78-5R).	A-7
Hole AN-A-6 (78-6).	A-9
Hole AN-A-7 (78-7).	A-11
Hole AN-A-9 (78-9).	A-13
Hole AN-A-8 (78-8).	A-15
Hole 79-8	A-17
Hole 79-7	A-19
Hole P-5	A-21
Hole P-29	A-23
Hole AN-A-12 (78-12).	A-25
* ALVORD SPRINGS	
North of Alvord Anomaly	
Hole AN-A-72 (78-12).	A-27
Hole AN-A-73 (78-73).	A-29
East of Alvord Anomaly	
Hole AN-A-22 (78-22).	A-31
Hole 79-1	A-33
Hole 79-5	A-35
Hole AN-A-31 (78-31).	A-37
Hole P-28	A-39
Hole P-25	A-41
East Side of Steens Frontal Fault	
Hole AN-A-26 (78-26).	A-43
Hole AN-A-26R (78-26R).	A-45
Hole AN-A-75 (78-75).	A-47
Hole AN-A-76 (78-76).	A-49
West Side of Steens Frontal Fault	
Hole 80-5R	A-51
Hole 80-2	A-53
Hole 80-1	A-55
Hole AN-A-77 (78-77).	A-57

Page

ALVORD SPRINGS

Indian Creek Fault

Hole 79-4 A-59

Hole 79-4R A-61

Hole 79-3 A-63

Hole 80-6 A-65

South of Alvord Anomaly

Hole AN-A-34 (78-34). A-67

Hole AN-A-44 (78-44). A-69

Hole AN-A-49 (78-49). A-71

* BORAX LAKE

Hole P-21 A-73

Hole P-22 A-75

Hole AN-B-60 (78-60). A-77

Hole AN-B-62 (78-62). A-79

Hole AN-B-63 (78-63). A-81

Hole AN-B-64 (78-64). A-83

Hole AN-B-64R (78-64R). A-85

Hole AN-B-65 (78-65). A-88

Hole AN-B-68 (78-68). A-90

Explanation of symbols used in lithologic columns.

Gravel

Basalt

Sand, sandstone

Rhyolite, felsite, feldspar
porphyry

Silt, siltstone

Dacite, trachyte, trachy-
andesite, latite

Clay, claystone

Tuff

Lithified, well-cemented
sandstone

Aphanitic igneous rock

Breccia, volcanic
sediments

Altered volcanic rock

Rounded mixed volcanics

N.S. = No sample

C.S. = Contaminated sample

L.C. = Lost circulation

4.26 [= Conductivity sample

T.S. = Thin Section

TEMPERATURE LOG

P-1

T. 32 S., R. 36 E., NE 1/4 of SE 1/4, Sec. 17

2/19/75 10:20 AM

Trade Data

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	10.80	51.44
20	15.80	60.44
30	15.60	60.08
40	15.60	60.08
50	15.85	60.53
60	16.00	60.80
70	16.20	61.16
80	16.45	61.61
90	16.90	62.42
100	17.27	63.09
110	17.45	63.41
120	17.50	63.50
130	17.65	63.77
140	17.82	64.08
150	17.95	64.31
160	18.10	64.58
170	18.20	64.76

TEMPERATURE LOG

AN-A-4a

T. 32 S., R. 36 E., SE $\frac{1}{4}$ of SW $\frac{1}{4}$, Sec. 32

Hole completed 8/14/78

Survey #2 8/28/78 11:30 AM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F
10	-	-
20	14.68	58.42
30	16.25	61.25
40	14.05	57.29
50	13.90	57.02
60	14.00	57.20
70	14.28	57.70
80	14.45	58.01
90	14.55	58.19
100	14.70	58.46
110	14.85	58.73
120	15.84	60.51
130	15.20	59.36
140	15.26	59.47
150	15.36	59.65
160	15.50	59.90
170	15.66	60.19
180	15.85	60.53
190	16.06	60.91
200	16.32	61.38
210	16.75	62.15
220	16.86	62.35
230	17.00	62.60
240	17.14	62.85
250	17.25	63.05
260	17.38	63.28
270	17.46	63.43

TEMPERATURE LOG -- ALVORD DESERT -- MICKEY SPRINGS

Hole AN-A-4a

8/28/78

Survey #2

°F

95 09 49

3.86

3.66

0
40
80
120
160
200
240
280
320
360
400
440
480

Depth, in feet

TEMPERATURE LOG

AN-A-5

T. 33 S., R. 36 E., SE $\frac{1}{4}$ of SE $\frac{1}{4}$, Sec. 6

Hole completed 8/21/78

Survey #3 8/28/78 10:40 AM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	-	-
20	16.82	62.28
30	17.20	62.96
40	18.16	64.69
50	18.94	65.91
60	19.78	67.60
70	20.62	69.12
80	21.50	70.70
90	22.74	72.93
100	23.84	74.91
110	24.42	75.96
120	24.88	76.78
130	25.35	77.63
140	25.84	78.51
150	26.20	79.16
160	27.12	80.82
170	27.96	82.33
180	28.32	82.97
190	28.54	83.37
200	28.64	83.55
210	28.70	83.66
220	28.75	83.75
230	28.77	83.79
240	28.77	83.79
250	28.50	83.30
260	28.70	83.66
270	28.70	83.66
280	28.70	83.66
290	28.68	83.62
300	28.68	83.62

TEMPERATURE LOG -- ALVORD DESERT -- MICKEY SPRINGS

Hole AN-A-5

8/28/78

Survey #3

°F

62 66 70 74 78 82 86

TEMPERATURE LOG

AN-A-5R

T. 33 S., R. 36 E., SE ¼ of SE ¼, Sec. 6

Hole completed 9/15/78

Survey #3 10/4/78 7:25 AM

Logged by GeothermEx, Inc.

Depth, in feet	°F	°C	Depth, in feet	°F	°C	Depth, in feet	°F	°C
20	65.7	18.7	600	90.3	32.4	1,180	98.6	37.0
40	68.7	20.4	620	90.0	32.2	1,200	99.3	37.4
60	72.1	22.3	640	90.1	32.3	1,220	99.7	37.6
80	74.7	23.7	660	90.1	32.3	1,240	100.0	37.8
100	76.6	24.8	680	91.0	32.8	1,260	100.6	38.1
120	79.7	26.5	700	91.0	32.8	1,280	101.1	38.4
140	81.5	27.5	720	91.0	32.8	1,300	101.3	38.5
160	83.8	28.8	740	91.0	32.8	1,320	101.8	38.8
180	83.8	28.8	760	91.2	32.9	1,340	102.4	39.1
200	85.6	29.8	780	91.6	33.1	1,360	102.9	39.4
220	86.0	30.0	800	91.9	33.3	1,380	103.6	39.8
240	86.4	30.2	820	92.5	33.6	1,400	104.2	40.1
260	86.9	30.5	840	92.7	33.7	1,420	104.7	40.4
280	86.9	30.5	860	93.0	33.9	1,440	105.3	40.7
300	86.9	30.5	880	93.2	34.0	1,460	105.8	41.0
320	86.9	30.5	900	93.6	34.2	1,480	106.5	41.4
340	86.9	30.5	920	93.7	34.3	1,500	106.9	41.6
360	86.9	30.5	940	94.1	34.5	1,520	107.6	42.0
380	87.1	30.6	960	94.5	34.7	1,540	108.6	42.6
400	87.4	30.8	980	94.8	34.9	1,560	108.9	42.7
420	87.6	30.9	1,000	95.2	35.1	1,580	109.4	43.0
440	87.9	31.1	1,020	95.5	35.3	1,600	110.1	43.4
460	88.7	31.5	1,040	95.9	35.5	1,620	110.8	43.8
480	88.8	31.6	1,060	96.3	35.7	1,640	111.4	44.1
500	89.4	31.9	1,080	96.6	35.9	1,660	112.1	44.5
520	89.4	31.9	1,100	97.2	36.2	1,680	112.6	44.8
540	89.8	32.1	1,120	97.3	36.3	1,700	113.4	45.2
560	90.1	32.3	1,140	97.9	36.6	1,720	114.1	45.6
580	90.3	32.4	1,160	98.2	36.8	1,740	114.8	46.0
						1,750	115.5	46.4

TEMPERATURE LOG

AN-A-6

T. 33 S., R. 36 E., SW $\frac{1}{4}$ of SW $\frac{1}{4}$, Sec. 7

Hole completed 8/29/78

Survey #3 9/5/78 10:30 AM

Logged by GeothermEx, Inc.

Depth, in feet	$^{\circ}\text{F}$	$^{\circ}\text{C}$	Depth, in feet	$^{\circ}\text{F}$	$^{\circ}\text{C}$
10	-	-	210	75.24	24.02
20	67.01	19.45	220	75.24	24.02
30	67.78	19.88	230	75.29	24.05
40	69.80	21.00	240	75.29	24.05
50	71.33	21.85	250	75.31	24.06
60	72.10	22.28	260	75.34	24.08
70	72.43	22.46	270	75.42	24.12
80	73.15	22.86	280	75.49	24.16
90	73.54	23.08	290	75.49	24.16
100	73.76	23.20	300	75.56	24.20
110	74.12	23.40	310	75.60	24.22
120	74.70	23.72	320	75.70	24.28
130	74.75	23.75	330	75.70	24.28
140	74.77	23.76	340	75.74	24.30
150	75.09	23.94	350	75.81	24.34
160	75.09	23.94	360	75.83	24.35
170	75.13	23.96	370	75.85	24.36
180	75.20	24.00	380	76.19	24.55
190	75.20	24.00	390	76.68	24.82
200	75.24	24.02	400	77.09	25.05

TEMPERATURE LOG -- ALVORD DESERT -- MICKEY SPRINGS

Hole AN-A-6
9/5/78
Survey #3

TEMPERATURE LOG

AN-A-7

T 33 S., R. 34 E., NE $\frac{1}{4}$ of SW $\frac{1}{4}$, Sec. 18

Hole completed 8/23/78

Survey #3 9/2/78 1:00 PM

Logged by GeothermEx, Inc.

Depth, in feet	$^{\circ}\text{C}$	$^{\circ}\text{F}$
10	-	-
20	14.02	57.24
30	13.94	57.09
40	14.22	57.60
50	14.52	58.14
60	14.69	58.44
70	14.85	58.73
80	15.05	59.09
90	15.20	59.36
100	15.33	59.59
110	15.50	59.90
120	15.62	60.12
130	15.84	60.51
140	15.96	60.73
150	16.24	61.23
160	16.42	61.56
170	16.62	61.92
180	16.80	62.24
190	16.98	62.56
200	17.10	62.78
210	17.22	63.00
220	17.32	63.18
230	17.42	63.36
240	17.55	63.59
250	17.70	63.86
260	17.79	64.02
270	17.92	64.26
280	18.10	64.58
290	18.38	65.08
300	18.46	65.23

TEMPERATURE LOG -- ALVORD DESERT -- MICKEY SPRINGS

Hole AN-A-7
9/2/78
Survey #3

TEMPERATURE LOG

AN-A-9

T. 33 S., R. 36 E., SW $\frac{1}{4}$ of NW $\frac{1}{4}$, Sec. 19

Hole completed 8/28/78

Survey #3 9/4/78 9:45 AM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>	<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	-	-	260	17.65	63.77
20	18.40	65.12	270	17.80	64.04
30	17.96	64.33	280	17.92	64.26
40	17.36	63.25	290	17.92	64.26
50	16.88	62.38	300	17.94	64.29
60	16.40	61.52	310	17.99	64.38
70	16.46	61.63	320	18.06	64.51
80	15.26	59.47	330	18.10	64.58
90	15.18	59.32	340	18.18	64.72
100	15.35	59.58	350	18.35	65.03
110	15.44	59.79	360	18.54	65.37
120	15.58	60.04	370	18.54	65.37
130	15.80	60.44	380	18.56	65.41
140	15.85	60.53	390	18.65	65.57
150	16.06	60.91	400	18.74	65.73
160	16.16	61.09	410	18.80	65.84
170	16.38	61.48	420	18.88	65.98
180	16.48	61.66	430	18.90	66.02
190	16.67	62.01	440	19.00	66.20
200	16.78	62.20	450	19.05	66.29
210	17.25	63.05	460	19.11	66.40
220	17.26	63.07	470	19.20	66.56
230	17.35	63.23	480	19.30	66.74
240	17.45	63.41	490	19.35	66.83
250	17.55	63.59	500	19.42	66.96

TEMPERATURE LOG -- ALVORD DESERT -- MICKEY SPRINGS

Hole AN-A-9
9/4/78
Survey #3

TEMPERATURE LOG

AN-A-8

T. 33 S., R. 35 E., NE $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 23

Hole completed 8/15/78

Survey #3 8/26/78 11:30 AM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	-	-
20	13.96	57.13
30	13.80	56.84
40	13.96	57.13
50	14.28	57.70
60	14.70	58.46
70	15.05	59.09
80	15.38	59.68
90	15.75	60.35
100	16.00	60.80
110	16.35	61.43
120	16.55	61.79
130	16.75	62.15
140	17.00	62.60
150	17.20	62.96
160	17.46	63.43
170	17.66	63.79
180	17.88	64.18
190	18.26	64.87
200	18.36	65.05
210	18.72	65.70
220	19.00	66.20
230	19.20	66.56

TEMPERATURE LOG -- ALVORD DESERT -- MICKEY SPRINGS

Hole AN-A-8
8/26/78
Survey #3

TEMPERATURE LOG

AN-A-79-8

T. 33 S., R. 35 E., NE $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 14

Hole completed 11/14/79

Survey #2 11/27/79 10:00 AM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°F</u>	<u>°C</u>
10	79.2	26.2
20	90.1	32.3
30	102.2	39.0
40	114.6	45.9
50	116.8	47.1
60	116.2	46.8
70	111.4	44.1
80	111.2	44.0
90	114.3	45.7
100	116.6	47.0
110	119.5	48.6
120	123.3	50.7
125	126.5	52.5

TEMPERATURE LOG -- ALVORD DESERT -- MICKEY SPRINGS

Hole AN-A-79-8
Survey #2, 11/27/79

TEMPERATURE LOG

AN-A-79-7

T. 33 S., R. 35 E., SW $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 14

Hole completed 11/18/79

Survey #2 11/27/79 8:30 AM

Logged by GeothermEx, Inc.

Depth, in feet	$^{\circ}\text{F}$	$^{\circ}\text{C}$	Depth, in feet	$^{\circ}\text{F}$	$^{\circ}\text{C}$
10	65.7	18.7	160	130.6	54.8
20	83.3	28.5	170	131.5	55.3
30	86.7	30.4	180	133.2	56.2
40	90.5	32.5	190	134.2	56.8
50	95.9	35.5	200	135.7	57.6
60	100.9	38.3	210	137.1	58.4
70	105.3	40.7	220	138.7	59.3
80	109.8	43.2	230	140.4	60.2
90	113.5	45.3	240	142.0	61.1
100	117.5	47.5	250	143.4	61.9
110	121.1	49.6	260	144.7	62.6
120	124.2	51.2	270	146.1	63.4
130	126.1	52.3	280	147.6	64.2
140	127.8	53.2	290	149.2	65.1
150	129.6	54.2	296	150.1	65.6

TEMPERATURE LOG -- ALVORD DESERT -- MICKEY SPRINGS

Hole AN-A-79-7
Survey #2, 11/27/79

TEMPERATURE LOG

P-5

T. 33 S., R. 35 E., C of Sec. 15

2/26/75 1:30 PM

Trade Data

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	14.10	57.38
20	18.50	65.30
30	19.75	67.55
40	21.05	69.89
50	22.25	72.05
60	23.10	73.58
70	23.80	74.84
80	24.25	75.65

TEMPERATURE LOG

P-29

T. 33 S., R. 35 E., SE 1/4 of SE 1/4, Sec. 4

4/23/75 2:30 PM

Trade Data

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	8.65	47.57
20	11.20	52.16
30	11.30	52.34
40	11.30	52.34
50	11.40	52.52
60	11.55	52.79
70	11.60	52.88
80	11.70	53.06
90	11.95	53.51
100	12.15	53.87
110	12.25	54.05
120	12.50	54.50
130	12.65	54.77
140	12.90	55.22
150	13.15	55.67
160	13.35	56.03

TEMPERATURE LOG

AN-A-12

T. 33 S., R. 35 E., NE $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 33

Hole completed 8/21/78

Survey #3 8/30/78 1:30 PM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F
10	-	-
20	14.65	58.91
30	14.05	57.29
40	14.00	57.20
50	13.90	57.02
60	13.96	57.13
70	14.00	57.20
80	14.05	57.29
90	14.10	57.38
100	14.10	57.38
110	14.10	57.38
120	14.18	57.52
130	14.22	57.60
140	14.26	57.67
150	14.32	57.78
160	14.38	57.88
170	14.45	58.01
180	14.55	58.19
190	14.65	58.37
200	14.74	58.53
210	14.84	58.71
220	14.94	58.89
230	15.03	59.05
240	15.12	59.22
250	15.25	59.45
260	15.34	59.61
270	15.42	59.76
280	15.50	59.90
290	15.58	60.04
300	15.65	60.17

TEMPERATURE LOG -- ALVORD DESERT -- MICKEY SPRINGS

Hole AN-A-12
8/30/78
Survey #3

TEMPERATURE LOG

AN-A-72

T. 34 S., R. 34 E., SW $\frac{1}{4}$ of NW $\frac{1}{4}$, Sec. 9

Hole completed 9/23/78

Survey #3 9/30/78 10:30 AM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>	<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	-	-	240	16.5	61.7
20	14.3	57.7	250	16.8	62.2
30	14.0	57.2	260	17.0	62.6
40	14.2	57.5	270	17.1	62.8
50	14.2	57.6	280	17.2	63.0
60	14.3	57.7	290	17.3	63.1
70	14.4	57.9	300	17.5	63.5
80	14.6	58.3	310	17.7	63.8
90	14.7	58.5	320	17.8	64.0
100	14.9	58.8	330	17.9	64.2
110	15.1	59.1	340	18.0	64.4
120	15.2	59.3	350	18.2	64.8
130	15.2	59.4	360	18.3	64.9
140	15.3	59.5	370	18.4	65.1
150	15.5	59.9	380	18.5	65.3
160	15.6	60.1	390	18.7	65.7
170	15.6	60.1	400	18.9	66.0
180	15.8	60.4	410	19.2	66.6
190	15.8	60.4	420	19.5	67.1
200	16.0	60.8	430	19.7	67.5
210	16.1	61.0	440	19.7	67.5
220	16.3	61.4	450	20.1	68.1
230	16.5	61.7	460	20.3	68.5
			462	20.6	69.1

TEMPERATURE LOG -- ALVORD DESERT - ALVORD SPRINGS

Hole AN-A-72

9/30/78

Survey #3

°F

56 60 64 68 72

TEMPERATURE LOG

AN-A-73

T. 34 S., R. 34 E., NW ¼ of SW ¼, Sec. 16

Hole completed 9/25/78

Survey #3 10/3/78 12:00 PM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F	Depth, in feet	°C	°F
10	-	-	250	18.35	65.03
20	14.84	58.71	260	18.50	65.30
30	14.25	57.65	270	18.60	65.48
40	14.60	58.28	280	18.95	66.11
50	14.65	58.37	290	19.20	66.56
60	14.80	58.64	300	19.35	66.83
70	14.05	57.29	310	19.55	67.19
80	15.15	59.27	320	19.70	67.46
90	15.25	59.45	330	20.15	68.27
100	15.40	59.72	340	20.30	68.54
110	15.65	60.17	350	20.45	68.81
120	15.80	60.44	360	20.70	69.26
130	15.95	60.71	370	20.90	69.62
140	16.00	60.80	380	21.20	70.16
150	16.25	61.25	390	21.35	70.43
160	16.45	61.61	400	21.60	70.88
170	16.60	61.88	410	21.85	71.33
180	16.75	62.15	420	22.05	71.69
190	17.15	62.87	430	22.30	72.14
200	17.35	63.23	440	22.55	72.59
210	17.45	63.41	450	22.70	72.86
220	17.60	63.68	460	22.95	73.31
230	17.80	64.04	470	23.10	73.58
240	18.15	64.67	478	23.25	73.85

TEMPERATURE LOG -- ALVORD DESERT - ALVORD SPRINGS

Hole AN-A-73

10/3/78

Survey #3

°F

TEMPERATURE LOG

AN-A-22

T. 34 S., R. 34 E., SE $\frac{1}{4}$ of SE $\frac{1}{4}$, Sec. 16

Hole completed 8/11/78

Survey #3 8/17/78 4:00 PM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F	Depth, in feet	°C	°F
10	-	-	260	17.11	62.80
20	14.72	58.50	270	17.17	62.91
30	15.07	59.13	280	17.34	63.21
40	15.37	59.67	290	17.49	63.48
50	15.48	59.86	300	17.68	63.82
60	15.62	60.12	310	17.83	64.09
70	15.74	60.33	320	17.97	64.35
80	15.86	60.55	330	18.20	64.76
90	15.94	60.69	340	18.40	65.12
100	16.00	60.80	350	18.54	65.37
110	16.08	60.94	360	18.72	65.70
120	16.17	61.11	370	18.88	65.98
130	16.22	61.20	380	19.01	66.22
140	16.21	61.18	390	19.16	66.49
150	16.27	61.29	400	19.32	66.78
160	16.33	61.39	410	19.43	66.97
170	16.37	61.47	420	19.59	67.26
180	16.41	61.54	430	19.75	67.55
190	16.46	61.63	440	19.87	67.77
200	16.47	61.65	450	20.03	68.05
210	16.51	61.72	460	20.13	68.23
220	16.52	61.74	470	20.32	68.58
230	16.53	61.75	480	20.47	68.85
240	16.55	61.79	490	20.62	69.12
250	16.96	62.53	496	20.70	69.26

TEMPERATURE LOG -- ALVORD DESERT - ALVORD SPRINGS

Hole AN-A-22

8/17/78

Survey #3

°F

58 62 66 70

4.22

TEMPERATURE LOG

AN-A-79-1

T. 34 S., R. 35 E., SW $\frac{1}{4}$ of NW $\frac{1}{4}$, Sec. 18

Hole completed 11/12/79

Survey #3 11/26/79 2:00 PM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°F</u>	<u>°C</u>	<u>Depth, in feet</u>	<u>°F</u>	<u>°C</u>
66	57.34	14.08	656	92.55	33.64
98	59.81	15.45	689	94.46	34.70
131	60.55	15.86	722	96.40	35.78
164	62.62	17.01	755	98.19	36.77
197	64.36	17.98	787	99.81	37.67
230	65.80	18.78	820	102.22	39.01
262	68.05	20.03	853	104.32	40.18
295	70.32	21.29	886	106.32	41.29
328	72.36	22.42	919	108.39	42.44
361	74.41	23.56	951	110.21	43.45
394	76.39	24.66	984	111.78	44.32
427	78.40	25.78	1,017	113.77	45.43
459	80.46	26.92	1,050	115.70	46.58
492	82.56	28.09	1,083	116.92	47.18
525	84.61	29.23	1,115	119.08	48.38
558	86.56	30.31	1,148	120.90	49.39
591	88.52	31.40	1,178	122.54	50.30
623	90.50	32.50			

TEMPERATURE LOG

AN-A-79-5

T. 34 S., R. 34 E., NE $\frac{1}{4}$ of NW $\frac{1}{4}$, Sec. 33

Hole completed 10/29/79

Survey #3 11/26/79 1:00 PM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°F</u>	<u>°C</u>
10	58.6	14.8
20	56.5	13.6
30	55.4	13.0
40	55.6	13.1
50	55.9	13.3
60	56.1	13.4
70	56.5	13.6
80	56.7	13.7
90	57.0	13.9
100	56.8	13.8
110	57.0	13.9
120	57.2	14.0

TEMPERATURE LOG

AN-A-31

T. 35 S., R. 34 E., NE $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 4

Hole completed 8/12/78

Survey #3 8/27/78 3:30 PM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	-	-
20	11.45	52.61
30	11.46	52.62
40	11.60	52.88
50	11.86	53.35
60	12.12	53.82
70	12.35	54.23
80	12.64	54.75
90	12.84	55.11
100	13.08	55.54
110	13.38	56.08
120	13.52	56.34
130	13.85	56.93
140	14.16	57.49
150	14.46	58.03
160	14.82	58.68
170	15.10	59.18
180	15.36	59.65
190	15.61	60.10
200	15.82	60.48
210	16.08	60.94
220	16.38	61.48
230	16.62	61.92
240	17.02	62.64
250	17.32	63.18
260	17.64	63.75
270	17.94	64.29
280	18.24	64.83
290	18.60	65.48
300	18.85	65.93

TEMPERATURE LOG -- ALVORD DESERT - ALVORD SPRINGS

Hole AN-A-31
8/27/78

°F

Survey #3

TEMPERATURE LOG

P-28

T. 34 S., R. 35 E., SW 1/4 of SW 1/4, Sec. 31

4/23/75 11:20 AM

Trade Data

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	9.20	48.56
20	11.00	51.80
30	11.45	52.61
40	11.75	53.15
50	12.15	53.87
60	12.50	54.50
70	12.85	55.13
80	13.15	55.67
90	13.50	56.30
100	13.80	56.84
110	14.15	57.47
120	14.50	58.10
130	14.80	58.64
140	15.20	59.36
150	15.55	59.99
160	16.00	60.80
170	16.35	61.43
180	16.70	62.06
190	17.05	62.69
200	17.45	63.41
210	17.70	63.86

TEMPERATURE LOG

P-25

T. 34 S., R. 35 E., NE 1/4 of SW 1/4, Sec. 27

4/23/75 12:05 PM

Trade Data

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	9.40	48.92
20	14.00	57.20
30	14.60	58.28
40	14.60	58.28
50	14.60	58.28
60	14.75	58.55
70	14.85	58.73
80	15.00	59.00
90	15.15	59.27
100	15.30	59.54
110	15.45	59.81
120	15.60	60.08
130	15.70	60.26
140	15.90	60.62
150	16.05	60.89
160	16.25	61.25
170	16.40	61.52
180	16.55	61.79
190	16.70	62.06
200	16.95	62.51
210	17.10	62.78
220	17.25	63.05
230	17.40	63.32
240	17.55	63.59
250	17.80	64.04
260	18.00	64.40
270	18.15	64.67
280	18.35	65.03
290	18.60	65.48
300	18.75	65.75

TEMPERATURE LOG

AN-A-26

T. 34 S., R. 34 E., NE ¼ of NE ¼, Sec. 29

Hole completed 8/8/78

Survey #3 8/19/78 2:30 PM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F	Depth, in feet	°C	°F
10	-	-	260	23.77	74.79
20	15.13	59.23	270	24.15	75.47
30	15.30	59.54	280	24.60	76.28
40	15.85	60.53	290	25.07	77.13
50	16.18	61.12	300	25.43	77.77
60	16.54	61.77	310	25.86	78.55
70	16.72	62.10	320	26.27	79.29
80	16.97	62.55	330	26.72	80.10
90	17.20	62.96	340	27.18	80.92
100	17.51	63.52	350	27.54	81.57
110	17.82	64.08	360	27.97	82.35
120	18.20	64.76	370	28.40	83.12
130	18.53	65.35	380	28.85	83.93
140	18.80	65.84	390	29.21	84.58
150	19.21	66.58	400	29.62	85.32
160	19.52	67.14	410	29.99	85.98
170	19.91	67.84	420	30.41	86.74
180	20.42	68.76	430	30.88	87.58
190	20.94	69.69	440	31.22	88.20
200	21.19	70.14	450	31.68	89.02
210	21.56	70.81	460	32.67	89.73
220	21.92	71.46	470	35.54	90.57
230	22.54	72.57	480	32.92	91.26
240	22.97	73.35	490	33.31	91.96
250	23.37	74.07	500	33.68	92.62
			503	33.77	92.79

TEMPERATURE LOG -- ALVORD DESERT - ALVORD SPRINGS
°F

Hole AN-A-26
8/19/78
Survey #3

TEMPERATURE LOG

AN-A-26R

T. 34 S., R. 34 E., SE $\frac{1}{4}$ of SE $\frac{1}{4}$., Sec. 29

Hole completed 10/3/78

Survey #3 11/15/79 9:00 AM

Logged by GeothermEx, Inc.

Depth, in feet	°F	°C	Depth, in feet	°F	°C
66	60.84	16.02	1,050	130.30	54.61
98	63.00	17.22	1,083	132.08	55.60
131	65.25	18.47	1,115	133.74	56.52
164	67.32	19.62	1,148	135.16	57.31
197	69.31	20.73	1,181	136.40	58.00
230	72.23	22.35	1,214	137.68	58.71
262	75.27	24.04	1,247	138.90	59.39
295	77.70	25.39	1,280	140.07	60.04
328	80.00	26.61	1,312	141.24	60.69
361	82.44	28.02	1,345	142.36	61.31
394	85.06	29.48	1,378	143.37	61.87
427	87.73	30.96	1,411	144.55	62.53
459	90.79	32.66	1,444	145.53	63.07
492	92.39	33.55	1,476	146.41	63.56
525	95.22	35.12	1,509	147.29	64.05
558	97.48	36.38	1,542	148.23	64.57
591	100.26	37.92	1,575	149.14	65.08
623	102.92	39.40	1,608	150.22	65.68
656	105.37	40.76	1,640	150.93	66.07
689	107.94	42.19	1,673	152.10	66.72
722	110.26	43.48	1,706	153.27	67.37
755	112.57	44.76	1,739	154.06	67.81
787	114.75	45.97	1,772	154.67	68.15
820	117.07	47.26	1,804	155.39	68.55
853	119.00	48.36	1,837	155.91	68.84
886	121.19	49.55	1,870	156.29	69.05
919	122.77	50.43	1,903	156.83	69.35
951	124.74	51.52	1,936	156.99	69.44
984	126.59	52.55	1,969	156.85	69.36
1,017	128.61	53.67	2,001	157.01	69.45

TEMPERATURE LOG

AN-A-75

T. 34 S., R. 34 E., NE $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 32

Hole completed 10/28/79

Survey #3 11/26/79 10:00 AM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°F</u>	<u>°C</u>	<u>Depth, in feet</u>	<u>°F</u>	<u>°C</u>
10	67.5	19.7	210	88.9	31.6
20	74.8	23.8	220	88.0	31.1
30	80.1	26.7	230	87.1	30.6
40	81.0	27.2	240	86.5	30.3
50	83.5	28.6	250	86.9	30.5
60	84.7	29.3	260	88.2	31.2
70	85.6	29.8	270	88.9	31.6
80	87.1	30.6	280	89.4	31.9
90	88.2	31.2	290	89.8	32.1
100	89.6	32.0	300	90.0	32.2
110	90.9	32.7	310	90.1	32.3
120	92.3	33.5	320	90.5	32.5
130	93.0	33.9	330	90.9	32.7
140	93.9	34.4	340	91.4	33.0
150	94.3	34.6	350	92.1	33.4
160	93.7	34.3	360	92.8	33.8
170	93.0	33.9	370	93.4	34.1
180	92.1	33.4	380	94.1	34.5
190	91.0	32.8	390	95.0	35.0
200	90.0	32.2	400	95.9	35.5

TEMPERATURE LOG

AN-A-76

T. 34 S., R. 34 E., NE $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 5

Hole completed 9/18/78

Survey #3 9/27/78 12:00 PM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F	Depth, in feet	°C	°F
10	-	-	240	32.1	89.8
20	16.9	62.4	250	32.3	90.1
30	17.5	63.5	260	33.1	91.6
40	18.0	64.4	270	33.6	92.5
50	19.0	66.2	280	34.0	93.2
60	19.8	67.6	290	34.5	94.1
70	20.8	69.4	300	35.1	95.2
80	21.7	71.1	310	35.6	96.1
90	22.5	72.5	320	36.0	96.8
100	23.2	73.8	330	36.4	97.5
110	23.8	74.8	340	36.9	98.4
120	24.4	75.9	350	37.3	99.1
130	25.2	77.4	360	37.8	100.0
140	25.7	78.3	370	38.1	100.6
150	26.4	79.5	380	38.6	101.5
160	27.0	80.6	390	38.9	102.0
170	27.9	82.2	400	39.1	102.4
180	28.3	82.9	410	39.8	103.6
190	29.3	84.7	420	40.2	104.4
200	29.6	85.2	430	40.3	104.5
210	30.1	86.2	440	40.9	105.6
220	30.9	87.6	450	41.5	106.7
230	31.4	88.5	460	41.5	106.7

TEMPERATURE LOG -- ALVORD DESERT - ALVORD SPRINGS

Hole AN-A-76
9/27/78
Survey #3

°F

TEMPERATURE LOG

AN-A-80-5R

T. 34 S., R. 34 E., SW ¼ of NE ¼, Sec. 29

Completion Date 5/7/80

Survey #3 8/6/80 1:20 PM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F	Depth, in feet	°C	°F
20	26.1	79.0	520	98.0	208.4
40	29.2	84.6	540	98.1	208.6
60	33.9	93.0	560	98.1	208.6
80	39.0	102.2	580	98.1	208.6
100	45.3	113.5	600	98.1	208.6
120	52.0	125.6	620	98.1	208.6
140	57.3	135.1	640	98.2	208.8
160	60.0	141.6	660	98.2	208.8
180	64.1	147.4	680	98.2	208.8
200	67.6	153.7	700	98.2	208.8
220	72.3	162.1	720	98.2	208.8
240	77.1	170.8	740	98.1	208.6
260	80.8	177.4	760	98.1	208.6
280	84.5	184.1	780	98.0	208.4
300	88.7	191.7	800	98.0	208.4
320	90.4	194.7	820	97.9	208.2
340	92.3	198.1	840	97.8	208.0
360	94.0	201.2	860	97.7	207.9
380	95.4	203.7	880	97.6	207.7
400	96.3	205.3	900	97.5	207.5
420	96.7	206.1	920	97.3	207.1
440	97.0	206.6	940	97.1	206.8
460	97.4	207.3	960	97.0	206.6
480	97.6	207.7	980	96.8	206.2
500	97.8	208.0	995	96.7	206.1

Maximum reading thermometer: 211°F

AN-A-80-3K
Survey #3 8/6/80
AN-A-20-5R

TEMPERATURE LOG

AN-A-80-2

T. 34 S., R. 34 E., W $\frac{1}{2}$ of SE $\frac{1}{4}$, Sec. 29

Completion Date 6/23/80

Survey #3 8/6/80 10:25 AM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>	<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	--	--	220	81.6	178.9
20	18.9	66.0	230	83.0	181.4
30	23.7	74.7	240	84.0	183.2
40	27.8	82.0	250	85.7	186.3
50	31.8	89.2	260	86.9	188.4
60	35.8	96.4	270	88.1	190.6
70	39.0	102.2	280	89.5	193.1
80	42.5	108.5	290	90.6	195.1
90	46.7	116.1	300	91.6	196.9
100	50.2	122.4	310	92.6	198.7
110	54.0	129.2	320	93.6	200.5
120	57.3	135.1	330	94.4	201.9
130	60.4	140.7	340	95.1	203.2
140	64.3	147.7	350	95.9	204.6
150	67.6	153.7	360	96.6	205.9
160	72.9	163.2	370	97.0	206.6
170	74.1	165.4	380	98.9	210.0
180	75.5	167.9	390	99.7	211.5
190	76.9	170.4	400	100.4	212.7
200	78.3	172.9	402	100.4	212.7
210	80.0	176.0

TEMPERATURE LOG

AN-A-80-1

T. 34 S., R. 34 E., NW $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 32

Completion Date 6/20/80

Survey #3 8/6/80 7:00 AM

Logged by GeothermEx Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	21.0	69.8
20	26.8	80.2
30	32.9	91.2
40	38.0	100.4
50	40.2	104.4
60	44.3	111.7
70	48.5	119.3
80	52.8	127.0
90	55.1	131.2
100	57.3	135.1
110	61.2	142.2
120	62.4	144.3
130	63.8	146.8
140	67.9	154.2
150	69.8	157.6
160	71.9	161.4
170	73.7	164.7
180	75.0	167.0
190	81.5	178.7
200	82.7	180.9
210	83.8	182.8
220	85.7	186.3
230	89.1	192.4

Maximum reading thermometer: 194°F

TEMPERATURE LOG

AN-A-77

T. 34 S., R. 34 E., SW $\frac{1}{4}$ fo NE $\frac{1}{4}$, Sec. 32

Hole completed 9/28/78

Survey #3 10/7/78 1:00 PM

Logged by GeothermEx, Inc.

Depth, in feet	$^{\circ}\text{C}$	$^{\circ}\text{F}$
10	-	-
20	31.5	88.7
30	37.5	99.5
40	45.0	113.0
50	49.8	121.6
60	54.1	129.4
70	58.1	136.6
80	62.1	143.8
90	66.0	150.8
100	68.7	155.7
110	71.5	160.7
120	73.7	164.7
130	77.7	171.9
140	80.6	177.1
150	84.8	184.6
160	87.7	189.9
170	88.5	191.3
180	88.6	191.5
188	88.7	191.7

TEMPERATURE LOG -- ALVORD DESERT - ALVORD SPRINGS Hole AN-A-77
Survey #3 10/7/78

TEMPERATURE LOG

AN-A-79-4

T. 34 S., R. 34 E., NE $\frac{1}{4}$ of NW $\frac{1}{4}$, Sec. 32

Hole completed 10/15/79

Survey #3 11/1/79 11:45 AM

Logged by GeothermEx, Inc.

<u>Depth,</u> <u>in feet</u>	<u>°F</u>	<u>°C</u>	<u>Depth,</u> <u>in feet</u>	<u>°F</u>	<u>°C</u>
20	60.1	15.6	230	109.6	43.1
30	61.0	16.1	240	111.9	44.4
40	62.6	17.0	250	114.6	45.9
50	67.5	19.7	260	116.2	46.8
60	70.0	21.1	270	118.8	48.2
70	72.1	22.3	280	120.7	49.3
80	74.1	23.4	290	122.7	50.4
90	76.3	24.6	300	124.9	51.6
100	78.3	25.7	310	126.7	52.6
110	80.8	27.1	320	129.9	54.4
120	83.1	28.4	330	131.2	55.1
130	86.7	30.4	340	132.4	55.8
140	88.5	31.4	350	135.7	57.6
150	90.0	32.3	360	138.0	58.9
160	91.8	33.2	370	140.0	60.0
170	94.8	34.9	380	142.2	61.2
180	97.5	36.4	390	145.2	62.9
190	100.2	37.9	400	146.7	63.7
200	102.9	39.4	410	148.3	64.6
210	105.3	40.7	420	149.9	65.5
220	107.2	41.8	423	150.6	65.9

TEMPERATURE LOG -- ALVORD DESERT -- ALVORD SPRINGS
°F

Hole AN-A-79-4
Survey #3. 11/1/79

TEMPERATURE LOG

AN-A-79-4R

T. 34 S., R. 34 E., Ctr., NW $\frac{1}{4}$, Sec. 32

Completion Date 6/6/80

Survey #4 8/6/80 3:15 PM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F	Depth, in feet	°C	°F
20	19.8	67.6	540	75.9	168.6
40	19.8	67.6	560	78.0	172.4
60	21.5	70.7	580	79.7	175.5
80	24.2	75.6	600	80.9	177.6
100	26.5	79.7	620	82.8	181.0
120	28.9	84.0	640	84.6	184.3
140	31.6	88.9	660	86.3	187.3
160	34.1	93.4	680	87.2	189.0
180	37.2	99.0	700	86.4	187.5
200	39.8	103.6	720	86.7	188.1
220	42.1	107.8	740	87.7	189.9
240	44.9	112.8	760	88.7	191.7
260	48.0	118.4	780	89.0	192.2
280	50.6	123.1	800	89.3	192.7
300	53.2	127.8	820	89.6	193.3
320	55.7	132.3	840	89.8	193.6
340	58.0	136.4	860	90.1	194.2
360	60.3	140.5	880	90.4	194.7
380	61.9	143.4	900	90.7	195.3
400	64.6	148.3	920	90.7	195.3
420	65.9	150.6	940	90.5	194.9
440	67.2	153.0	960	90.3	194.5
460	68.8	155.8	980	89.8	193.6
480	70.3	158.5	1,000	89.7	193.5
500	71.7	161.1	1,020	89.3	192.7
520	73.7	164.7	1,040	88.7	191.7

Maximum reading thermometer: 172°F

TEMPERATURE LOG

AN-A-79-3

T. 34 S., R. 34 E., NE $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 31

Hole completed 10/21/79

Survey #3 11/7/79 12:00 PM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°F</u>	<u>°C</u>
20	62.1	16.7
30	61.7	16.5
40	62.1	16.7
50	62.8	17.1
60	65.8	18.8
70	67.6	19.8
80	69.6	20.9
90	71.4	21.9
100	73.0	22.8
120	76.3	24.6
140	79.7	26.5
160	83.1	28.4
180	86.4	30.2
200	89.6	32.0
220	92.8	33.8
240	96.1	35.6
260	99.3	37.4
280	102.6	39.2
300	106.0	41.1
320	109.2	42.9
340	111.2	44.0
360	116.1	46.7
380	119.5	48.6
400	122.9	50.8
420	127.6	53.1
440	131.4	55.2
460	135.0	57.2

TEMPERATURE LOG -- ALVORD DESERT -- ALVORD SPRINGS

Hole AN-A-79-3
Survey #3, 11/7/79

TEMPERATURE LOG

AN-A-80-6

T. 34 S., R. 34 E., NE $\frac{1}{4}$ of SW $\frac{1}{4}$ of SE $\frac{1}{4}$, Sec. 30

Completion Date 6/19/80

Survey #3 8/6/80 6:50 PM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F	Depth, in feet	°C	°F
10	--	--	250	32.3	90.1
20	16.8	62.2	260	33.1	91.6
30	15.7	60.3	270	34.1	93.4
40	15.6	60.1	280	35.1	95.2
50	15.8	60.4	290	36.1	97.0
60	16.2	61.2	300	37.2	99.0
70	17.0	62.6	310	38.3	100.9
80	17.8	64.0	320	40.5	104.9
90	18.6	65.5	330	41.5	106.7
100	19.5	67.1	340	42.3	108.1
110	20.5	68.9	350	43.4	110.1
120	21.5	70.7	360	44.7	112.5
130	22.3	72.1	370	46.4	115.5
140	23.2	73.8	380	47.7	117.9
150	24.0	75.2	390	49.0	120.2
160	24.8	76.6	400	50.3	122.5
170	25.5	77.9	410	51.4	124.5
180	26.4	79.5	420	52.1	125.8
190	27.1	80.8	430	52.8	127.0
200	27.9	82.2	440	53.5	128.3
210	28.8	83.8	450	54.2	129.6
220	29.6	85.3	460	54.7	130.5
230	30.4	86.7	467	55.4	131.7
240	31.5	88.7			

Maximum reading thermometer: 133°F

TEMPERATURE LOG

AN-A-34

T. 34 S., R. 34 E., NE $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 8

Hole completed 8/15/78

Survey #3 8/31/78 9:45 AM

Logged by GeothermEx, Inc.

Depth, in feet	$^{\circ}\text{C}$	$^{\circ}\text{F}$
10	-	-
20	17.04	62.67
30	17.46	63.43
40	18.26	64.87
50	18.85	65.93
60	19.50	67.10
70	20.06	68.11
80	20.58	69.04
90	21.08	69.94
100	21.54	70.77
110	22.00	71.60
120	22.40	72.32
130	22.74	72.95
140	23.04	73.47
150	23.24	73.83
160	23.46	74.23
170	23.72	74.70
180	23.88	74.98
190	24.00	75.20
200	24.25	75.65
210	24.34	75.81
220	24.40	75.92
230	24.50	76.10
240	24.60	76.28
250	24.70	76.46
260	24.75	76.55
270	24.80	76.64
280	24.86	76.75
290	24.94	76.89
300	24.96	76.93

TEMPERATURE LOG -- ALVORD DESERT - ALVORD SPRINGS

Hole AN-A-34

8/31/78

Survey #3

°F

TEMPERATURE LOG

AN-A-44

T. 36 S., R. 34 E., SW $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 6

Hole completed 10/2/78

Survey #2 10/8/78 10:00 AM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>	<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	-	-	260	17.4	63.3
20	13.6	56.5	270	17.6	63.7
30	13.4	56.1	280	17.8	64.0
40	13.4	56.1	290	18.0	64.4
50	13.6	56.4	300	18.2	64.7
60	13.9	57.0	310	18.3	64.9
70	14.3	57.7	320	18.5	65.3
80	14.3	57.7	330	18.7	65.6
90	14.3	57.7	340	18.9	66.0
100	14.4	57.9	350	19.0	66.2
110	14.6	58.3	360	19.2	66.6
120	14.7	58.5	370	19.4	66.9
130	14.8	58.6	380	19.5	67.1
140	15.1	59.2	390	19.6	67.3
150	15.3	59.5	400	19.8	67.6
160	15.5	59.9	410	20.0	68.0
170	15.6	60.1	420	20.1	68.1
180	15.9	60.6	430	20.3	68.5
190	16.1	61.0	440	20.4	68.7
200	16.3	61.3	450	20.5	68.9
210	16.5	61.7	460	20.8	69.4
220	16.7	62.0	470	20.9	69.6
230	16.8	62.2	480	21.1	70.0
240	17.0	62.6	490	21.2	70.2
250	17.2	62.9	500	21.3	70.3

TEMPERATURE LOG -- ALVORD DESERT - ALVORD SPRINGS

Hole AN-A-44

10/8/78

Survey #2

°F

56 60 64 68 72

TEMPERATURE LOG

AN-A-49

T. 36 S., R. 35 E., SW $\frac{1}{4}$ of SE $\frac{1}{4}$, Sec. 6

Hole completed 9/21/78

Survey #3 9/29/78 2:15 PM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>	<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	-	-	260	17.5	63.5
20	15.1	59.1	270	17.6	63.7
30	14.8	58.7	280	17.9	64.2
40	14.8	58.7	290	18.0	64.4
50	14.9	58.8	300	18.2	64.8
60	15.1	59.1	310	18.5	65.3
70	15.2	59.4	320	18.5	65.3
80	15.2	59.4	330	18.6	65.5
90	15.4	59.7	340	18.9	66.0
100	15.4	59.7	350	18.9	66.0
110	15.4	59.7	360	19.1	66.4
120	15.5	59.9	370	19.4	66.9
130	15.8	60.4	380	19.7	67.5
140	15.8	60.4	390	20.0	68.0
150	15.8	60.4	400	20.2	68.3
160	15.9	60.6	410	20.3	68.5
170	16.0	60.8	420	20.7	69.3
180	16.3	61.3	430	20.9	69.6
190	16.4	61.5	440	21.2	70.1
200	16.4	61.5	450	21.3	70.3
210	16.6	61.9	460	21.4	70.5
220	16.8	62.3	470	21.5	70.7
230	16.8	62.3	480	21.9	71.4
240	17.1	62.8	490	22.2	72.0
250	17.2	63.0	500	22.2	72.0

TEMPERATURE LOG -- ALVORD DESERT - ALVORD SPRINGS

Hole AN-A-49
9/29/78

Survey #3

TEMPERATURE LOG

P-21

T. 37 S., R. 34 E., SW 1/4 of NE 1/4. Sec. 7

4/2/75 9:40 AM

Trade Data

Depth, in feet	°C	°F
10	11.80	53.24
20	11.85	53.33
30	12.00	53.60
40	12.15	53.87
50	12.30	54.14
60	12.50	54.50
70	12.65	54.77
80	12.80	55.04
90	12.95	55.31
100	13.10	55.58
110	13.25	55.85
120	13.40	56.12
130	13.55	56.39
140	13.70	56.66
150	13.80	56.84
160	13.90	57.02
170	14.00	57.20
180	14.10	57.38
190	14.25	57.65
200	14.40	57.92
210	14.55	58.19
220	14.65	58.37
230	14.80	58.64
240	14.95	58.91
250	15.10	59.18
260	15.25	59.45
270	15.40	59.72
280	15.60	60.08
290	15.80	60.44
300	16.00	60.80

TEMPERATURE LOG

P-22

T. 37 S., R. 33 E., NW 1/4 of NW 1/4, Sec. 4

4/2/75 2:45 PM

Trade Data

Depth, <u>in feet</u>	<u>°C</u>	<u>°F</u>
10	10.80	51.44
20	13.90	57.02
30	14.40	57.92
40	14.82	58.68
50	15.30	59.54
60	15.50	59.90
70	15.72	60.30
80	15.95	60.71
90	16.15	61.07
100	16.55	61.79
110	16.80	62.24
120	17.00	62.60
130	17.20	62.96
140	17.40	63.32
150	17.60	63.68
160	17.80	64.04
170	18.10	64.58
180	18.30	64.94
190	18.50	65.30
200	18.70	65.66
210	18.85	65.93
220	19.05	66.29
230	19.25	66.65
240	19.45	67.01
250	19.65	67.37
260	19.85	67.73
270	20.05	68.09
280	20.30	68.54
290	20.55	68.99
300	20.80	69.44

TEMPERATURE LOG

AN-B-60

T. 37 S., R. 33 E., SW $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 15

Hole completed 9/8/78

Survey #3 9/16/78 11:30 AM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F	Depth, in feet	°C	°F
10	-	-	260	36.4	97.5
20	15.4	59.8	270	37.2	99.0
30	15.7	60.3	280	38.0	100.4
40	16.3	61.3	290	38.9	102.0
50	16.9	62.4	300	39.8	103.6
60	17.7	63.9	310	40.6	105.1
70	18.5	65.3	320	41.4	106.5
80	19.3	66.7	330	42.1	107.8
90	20.3	68.5	340	42.9	109.2
100	21.2	70.2	350	43.7	110.7
110	22.2	71.9	360	44.5	112.1
120	23.1	73.6	370	45.3	113.5
130	24.0	75.2	380	46.0	114.8
140	24.8	76.7	390	47.0	116.6
150	25.3	77.5	400	47.6	117.7
160	26.3	79.3	410	48.3	118.9
170	27.2	81.0	420	49.1	120.4
180	28.1	82.6	430	49.8	121.6
190	29.1	84.4	440	50.6	123.1
200	29.8	85.6	450	51.3	124.3
210	30.5	86.9	460	52.1	125.8
220	31.9	89.4	470	52.6	126.7
230	33.1	91.6	480	53.3	127.9
240	34.1	93.4	490	54.2	129.6
250	35.3	95.5			

TEMPERATURE LOG -- ALVORD DESERT - BORAX LAKE

Hole AN-B-60
Survey #3 9/16/78

TEMPERATURE LOG

AN-B-62

T. 37 S., R. 33 E., NE $\frac{1}{4}$ of SW $\frac{1}{4}$, Sec. 20

Hole completed 9/10/78

Survey #3 9/16/78 9:30 AM

Logged by GeothermEx, Inc.

<u>Depth,</u> <u>in feet</u>	<u>°C</u>	<u>°F</u>	<u>Depth,</u> <u>in feet</u>	<u>°C</u>	<u>°F</u>
10	16.67	62.01	260	20.40	68.72
20	13.75	56.75	270	20.76	69.37
30	14.43	57.97	280	21.13	70.03
40	14.45	58.01	290	21.55	70.79
50	14.34	57.81	300	22.00	71.60
60	14.47	58.05	310	22.46	72.43
70	14.75	58.55	320	22.79	73.02
80	14.95	58.91	330	23.07	73.53
90	15.30	59.54	340	23.31	73.96
100	15.42	59.76	350	23.56	74.41
110	15.61	60.10	360	23.80	74.84
120	15.80	60.44	370	23.96	75.13
130	15.98	60.76	380	24.16	75.49
140	16.21	61.18	390	24.36	75.85
150	16.52	61.74	400	24.55	76.19
160	16.71	62.08	410	24.75	76.55
170	17.28	63.11	420	24.88	76.78
180	17.61	63.70	430	25.05	77.09
190	17.98	64.36	440	25.20	77.36
200	18.40	65.12	450	25.35	77.63
210	18.73	65.71	460	25.53	77.95
220	19.06	66.31	470	25.70	78.26
230	19.38	66.88	480	25.87	78.57
240	19.70	67.46	490	26.09	78.96
250	20.05	68.09	500	26.30	79.34

TEMPERATURE LOG -- ALVORD DESERT - BORAX LAKE

Hole AN-B-62
9/16/78
Survey #3

°F

56 60 64 68 72 76 80

Lost Circulation

Depth, in feet

0
40
80
120
160
200
240
280
320
360
400
440
480

A-80

3.33

3.62

TEMPERATURE LOG

AN-B-63

T. 37 S., R. 33 E., Ctr. of Sec. lines 16 & 21, Sec. 21

Completion date 4/8/80

Survey #4 4/28/80 9:10 AM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>	<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	12.8	55.0	260	29.3	84.7
20	14.4	57.9	270	29.6	85.3
30	15.3	59.5	280	30.0	86.0
40	16.5	61.7	290	30.4	86.7
50	16.9	62.4	300	30.8	87.4
60	17.4	63.3	310	31.2	88.2
70	18.0	64.4	320	31.7	89.1
80	18.5	65.3	330	32.1	89.8
90	19.1	66.4	340	32.6	90.7
100	19.7	67.5	350	33.1	91.6
110	20.3	68.5	360	33.5	92.3
120	20.9	69.6	370	33.9	93.0
130	21.5	70.7	380	34.3	93.7
140	22.1	71.8	390	34.9	94.8
150	22.7	72.9	400	35.5	95.9
160	23.5	74.3	410	36.1	97.0
170	24.2	75.6	420	36.6	97.9
180	24.9	76.8	430	37.1	98.8
190	25.5	77.9	440	37.6	99.7
200	26.2	79.2	450	38.1	100.6
210	26.9	80.4	460	38.6	101.5
220	27.5	81.5	470	39.2	102.6
230	28.0	82.4	480	39.7	103.5
240	28.5	83.3	490	40.2	104.4
250	28.9	84.0	497	40.5	104.9

Maximum reading thermometers: 104°, 106°F

TEMPERATURE LOG -- ALVORD DESERT - BORAX LAKE

Hole AN-B-03
4/28/80
Survey #4

TEMPERATURE LOG

AN-B-64

T. 37 S., R. 33 E., NE ¼ of SW ¼, Sec. 22

Hole completed 9/6/78

Survey #3 9/13/78 12:45 PM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F	Depth, in feet	°C	°F
10	-	-	260	58.88	137.98
20	27.00	80.60	270	59.70	139.46
30	28.46	83.23	280	60.24	140.43
40	30.05	86.09	290	60.78	141.40
50	31.92	89.46	300	61.40	142.52
60	34.04	93.27	310	61.82	143.28
70	36.50	97.70	320	62.30	144.14
80	39.25	102.65	330	62.80	145.04
90	41.55	106.79	340	63.05	145.49
100	43.28	109.90	350	63.40	146.12
110	45.10	113.18	360	63.85	146.93
120	46.72	116.10	370	64.08	147.34
130	47.85	118.13	380	64.42	147.96
140	48.82	119.88	390	64.76	148.57
150	49.85	121.73	400	65.04	149.07
160	50.56	123.00	410	65.32	149.58
170	51.82	125.28	420	65.55	149.99
180	52.85	127.13	430	65.88	150.58
190	53.90	129.02	440	66.22	151.20
200	54.92	130.86	450	66.50	151.70
210	56.25	133.25	460	66.90	152.42
220	56.86	134.35	470	67.32	153.18
230	57.35	135.23	480	67.76	153.97
240	57.88	136.18	490	68.40	155.12
250	58.45	137.21	500	69.05	156.29

TEMPERATURE LOG -- ALVORD DESERT - BORAX LAKE

Hole AN-B-64
Survey #3 9/13/78

3.85

A-84

TEMPERATURE LOG

AN-B-64R

T. 37 S., R. 33 E., Ctr., W $\frac{1}{2}$, Sec. 22

Completion date 3/29/80

Survey #4 4/19/80 11:15 AM

Logged by GeothermEx, Inc.

Depth, in feet	°C	°F	Depth, in feet	°C	°F
10	26.4	79.5	310	63.1	145.6
20	28.7	83.7	320	63.5	146.3
30	30.1	86.2	330	63.8	146.8
40	31.8	89.2	340	64.0	147.2
50	33.3	91.9	350	64.4	147.9
60	35.3	95.5	360	64.6	148.3
70	37.4	99.3	370	64.8	148.6
80	40.9	105.6	380	65.1	149.2
90	42.4	108.3	390	65.2	149.4
100	43.9	111.0	400	65.6	150.1
110	45.5	113.9		64.0	147.2
120	47.3	117.1	410	65.8	150.4
130	48.2	118.8	420	66.1	151.0
140	49.2	120.6		64.2	147.6
150	49.7	121.5	430	66.2	151.2
160	50.5	122.9	440	66.4	151.5
170	53.0	127.4		64.7	148.5
180	53.8	128.8	450	66.6	151.9
190	54.4	129.9	460	66.7	152.1
200	56.3	133.3		64.8	148.6
210	57.3	135.1	470	67.0	152.6
220	58.1	136.6	480	67.3	153.1
230	58.7	137.7		65.3	149.5
240	59.5	139.1	490	67.8	154.0
250	60.0	140.0	500	68.5	155.3
260	60.7	141.3		66.1	151.0
270	61.0	141.8	510	----	----
280	61.9	143.4	520	68.3	154.9
290	62.3	144.1	530	----	----
300	62.7	144.9	540	69.9	157.8

TEMPERATURE LOG

AN-B-64R

Survey #4 (continued)

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
550	-----	-----
560	74.0	165.2
570	-----	-----
580	76.9	170.4
590	-----	-----
600	79.9	175.8
610	-----	-----
620	82.9	181.3
630	-----	-----
640	86.3	187.3
650	-----	-----
660	89.5	193.1
670	-----	-----
680	92.9	199.3
690	-----	-----
700	95.6	204.1

Maximum reading thermometer: 500' - 158°F
700' - 206°F

TEMPERATURE LOG

AN-B-65

T. 37 S., R. 33 E., SE $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 23

Hole completed 10/3/78

Survey #2 10/9/78 11:00 AM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	-	-
20	13.8	56.8
30	12.5	54.5
40	12.9	55.2
50	13.7	56.7
60	13.8	56.9
70	14.0	57.2
80	14.0	57.2
90	14.1	57.4
100	14.3	57.7
110	14.6	58.3
120	14.8	58.6
130	15.1	59.2
140	15.4	59.7
150	15.7	60.3
160	16.0	60.8
170	16.3	61.3
180	16.7	62.1
190	17.1	62.8
200	17.3	63.1
210	17.7	63.9
220	18.0	64.4
230	18.2	64.8
240	18.5	65.3
250	18.9	66.0
260	19.2	66.6
270	19.5	67.1
280	19.8	67.6
290	20.2	68.4
300	20.6	69.1
310	20.9	69.6
320	21.2	70.2
330	21.5	70.7
340	21.9	71.4
350	22.3	72.1
360	22.7	72.9
370	23.0	73.4
380	23.2	73.8

TEMPERATURE LOG -- ALVORD DESERT - BORAX LAKE

Hole AN-B-65
10/9/78
Survey #2

TEMPERATURE LOG

AN-B-68

T. 37 S., R. 33 E., SW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 27

Completion date 4/10/80

Survey #3 4/25/80 10:20 AM

Logged by GeothermEx, Inc.

<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>	<u>Depth, in feet</u>	<u>°C</u>	<u>°F</u>
10	14.1	57.4	270	46.2	115.2
20	20.1	68.2	280	46.5	115.7
30	22.2	72.0	290	47.3	117.1
40	24.7	76.5	300	47.9	118.2
50	26.6	79.9	310	48.3	118.9
60	28.4	83.1	320	48.7	119.7
70	29.9	85.8	330	49.1	120.4
80	31.3	88.3	340	49.4	120.9
90	32.8	91.0	350	49.8	121.6
100	34.0	93.2	360	50.1	122.2
110	35.3	95.5	370	50.4	122.7
120	36.3	97.3	380	50.7	123.3
130	37.4	99.3	390	51.0	123.8
140	38.3	100.9	400	51.3	124.3
150	39.1	102.4	410	51.6	124.9
160	39.8	103.6	420	51.9	125.4
170	40.5	104.9	430	52.2	126.0
180	41.0	105.8	440	52.6	126.7
190	41.3	106.3	450	53.0	127.4
200	42.1	107.8	460	53.3	127.9
210	42.6	108.7	470	53.7	128.7
220	43.3	109.9	480	54.1	129.4
230	44.0	111.2	490	54.4	129.9
240	44.6	112.3	500	54.7	130.5
250	45.2	113.4	501.5	54.8	130.6
260	45.6	114.1			

Maximum reading thermometers: 130°, 132°F

Hole AN-B-68
4/25/80
Survey #3

TEMPERATURE LOG -- ALVORD DESERT - BORAX LAKE

Appendix B

Detailed Lithologic Descriptions of Drill Holes

	<u>Page</u>
MICKEY SPRINGS	
Hole P-1	B-1
Hole AN-A-4A (78-4A)	B-2
Hole AN-A-5, AN-A-5R (78-5, 78-5R)	B-3
Hole AN-A-6 (78-6)	B-10
Hole AN-A-7 (78-7)	B-11
Hole AN-A-9 (78-9)	B-12
Hole AN-A-8 (78-8)	B-14
Hole 79-8	B-15
Hole 79-7	B-16
Hole P-5	B-18
Hole P-29	B-19
Hole AN-A-12 (78-12)	B-20
ALVORD SPRINGS	
North of Alvord Anomaly	
Hole AN-A-72 (78-72)	B-21
Hole AN-A-73 (78-73)	B-24
East of Alvord Anomaly	
Hole AN-A-22 (78-22)	B-26
Hole 79-1	B-28
Hole 79-5	B-30
Hole AN-A-31 (78-31)	B-31
Hole P-28	B-32
Hole P-25	B-33
East Side of Steens Frontal Fault	
Hole AN-A-26, AN-A-26R (78-26, 78-26R)	B-34
Hole AN-A-75, (78-75)	B-39
Hole AN-A-76, (78-76)	B-42
West Side of Steens Frontal Fault	
Hole 80-5, 80-5R	B-44
Hole 80-2	B-50
Hole 80-1	B-53
Hole AN-A-77 (78-77)	B-55

Page

ALVORD SPRINGS

Indian Creek Fault

Hole 79-4	B-57
Hole 79-4R	B-60
Hole 79-3	B-68
Hole 80-6	B-71

South of Alvord Anomaly

Hole AN-A-74 (78-34).	B-74
Hole AN-A-44 (78-44).	B-76
Hole AN-A-49 (78-49).	B-78

BORAX LAKE

Hole P-21	B-80
Hole P-22	B-81
Hole AN-B-60 (78-60).	B-82
Hole AN-B-62 (78-62).	B-83
Hole AN-B-63 (78-63).	B-85
Hole AN-B-64 (78-64).	B-88
Hole AN-B-64R (78-64R).	B-89
Hole AN-B-65 (78-65).	B-95
Hole AN-B-68 (78-68).	B-96

LITHOLOGIC LOG

P-1

(Received from Phillips Petroleum Co.)

Depth
Interval,
Feet

GL-115	ALLUVIAL FAN DEPOSIT, many kinds of rock chips present.
115-170 TD	BASALT, black, massive, fine-grained, hard.

LITHOLOGIC LOG

AN-A-4A

Depth
Interval,
Feet

Completion
Date:
8/13/78

GL-20	100% CLAY and SILT, sandy.
20-40	85% CLAY, green. 15% SAND and GRAVEL, up to 5 mm. sized clasts of primarily basalt. Artesian flow at 20 feet depth of approximately 10 gallons per minute.
40-60	80% CLAY, green to gray. 20% SAND and GRAVEL, as above.
60-80	70% CLAY, as above. 30% SAND and GRAVEL, as above.
80-120	80% CLAY, as above. Clay becomes gritty from 90 to 120 feet. 20% SAND and GRAVEL, as above. <u>Conductivity sample taken at interval 100-110.</u>
120-140	75% SAND, fine, and CLAY, silty. 25% SAND and GRAVEL, as above.
140-150	80% SAND, very fine, dark-colored, basaltic clasts. 10% SAND and GRAVEL, as above. 10% CLAY.
150-160	80% CLAY. 20% SAND, fine.
160-220	100% CLAY.
220-300 TD	100% BASALT, dark-colored, aphanitic, massive, in angular chips 1 to 6 inches in diameter. <u>Conductivity sample taken at interval 240-260.</u>

LITHOLOGIC LOG

AN-A-5
AN-A-5R

Depth
Interval,
Feet

Completion Dates:
8/21/78 (GL to 300)
9/15/78 (300 to TD)

GL-10	100% CLAY.
10-20	50% GRAVEL, sandy, 2 to 12 mm. sized angular to rounded clasts of basalt and rhyolite. 30% CLAY. 20% SAND, volcanic.
20-40	80% CLAY, gritty. 20% SAND and GRAVEL, as above. Clasts appear more rounded in interval 30 to 40 feet.
40-50	70% GRAVEL, up to 2 cm. sized well-rounded clasts of basalt. 30% CLAY, gritty, gray.
50-60	70% GRAVEL, as above, with clasts of vesicular basalt. 30% CLAY, as above.
60-70	60% GRAVEL, as above, basalt is not vesicular. 40% CLAY, as above.
70-80	50% GRAVEL, as above. 50% CLAY, as above.
80-90	50% SAND and GRAVEL, up to 2-1/2 cm. sized angular to sub-rounded volcanic clasts. 50% CLAY.
90-100	80% CLAY. 20% GRAVEL, as above.
100-110	85% CLAY. 15% GRAVEL, up to 7 mm. sized angular to rounded volcanic clasts.
110-120	75% CLAY. 25% GRAVEL, as above.
120-130	50% CLAY. 50% GRAVEL, as above, but up to 12 mm in size.

AN-A-5, AN-A-5R, Continued

130-150	70% GRAVEL, as above. 30% CLAY.
150-160	60% CLAY, gritty. 40% GRAVEL, as above.
160-170	60% GRAVEL, as above. 40% CLAY.
170-180	50% BASALT, dark, aphanitic, massive, vesicular. 30% CLAY. 20% GRAVEL, as above.
180-190	100% BASALT, as above.
190-250	100% BASALT, as above, except red in color and with some zeolitic(?) mineralization.
250-260	50% BASALT, as above, with addition of red vesicular component. 50% SAND, dark, fine-grained, rounded volcanic clasts.
260-270	70% SAND, as above. 30% BASALT, gray to red, possibly detrital.
270-280	50% SAND, fine, and CLAY, gritty. 50% GRAVEL, up to 9 mm. sized angular to sub-rounded volcanic clasts.
280-300	100% BASALT, dark-gray to red.
300-310	100% BASALT, vesicular, with 5% silica replacement.
310-320	95% BASALT, red, vesicular, with secondary silica. 5% GRAVEL, basaltic.
320-330	100% BASALT, red and black, fractured, massive, with secondary silica.
330-340	100% BASALT, black to gray, massive, with secondary silica.
340-360	80% BASALT, black, gray and red, with some secondary silica. 20% VOLCANIC ROCK, light-colored, black and red.
360-370	90% BASALT, as above. 10% VOLCANIC ROCK, as above.
370-380	100% BASALT, red, massive, vesicular, with soft buff-colored secondary mineral replacement.

AN-A-5, AN-A-5R, Continued

380-410	100% BASALT, red and black, with some secondary silica replacement.
410-430	90% SANDSTONE, reddish-brown, fine-grained, well-cemented. 10% BASALT, black.
430-440	No sample, but bit was coated with clay.
440-450	80% CLAY, brown. 20% BASALT, black.
450-460	70% SAND and GRAVEL, composed of black and red basalt. 30% CLAY, brown, soft.
460-470	70% SAND and GRAVEL, as above. 30% CLAY, brown, firm.
470-480	70% CLAY, brown, firm. 30% SAND and GRAVEL, composed of black and red basalt.
480-490	90% CLAY, brown, firm. 10% SAND and GRAVEL, basaltic, as above.
490-520	100% CLAY, brown, of which top 20 feet is firm.
520-540	90% CLAY, brown, soft to firm. 10% SAND and GRAVEL, composed of black basalt. <u>Conductivity sample taken at interval 520-530.</u>
540-620	100% CLAY, brown, firm.
620-630	70% CLAY, brown, firm. 30% MUDSTONE, dark-brown, moderately well-cemented.
630-640	60% CLAY, brown, firm. 40% SAND and GRAVEL, basaltic, and MUDSTONE, as above.
640-660	40% MUDSTONE, dark-brown, as above. 30% CLAY, as above. 30% SAND and GRAVEL, basaltic, as above.
660-670	100% CLAY and MUDSTONE. Minor black detrital basalt. <u>Conductivity sample taken.</u>
670-700	100% BASALT, black, massive. Minor brown firm clay.
700-740	100% BASALT, black, massive, with some green secondary minerals. Minor brown firm clay.

MICKEY SPRINGS

AN-A-5, AN-A-5R, Continued

740-780	100% BASALT, black (80%) and red (10%), partly vesicular, with 10% green very fine-grained soft secondary mineral replacement. <u>Conductivity sample taken at interval 760-770.</u>
780-820	90% BASALT, black, with some secondary mineral replacement. 10% CLAY, brown, firm. Trace gray mudstone.
820-880	90% BASALT, as above, with minor amount of quartz between 820 and 860. 10% CLAY, as above. <u>Conductivity sample taken at interval 820-820.</u>
880-890	90% BASALT, as above, with some red basalt. 10% CLAY, as above.
890-900	50% SAND and GRAVEL, composed of red and black basalt. 50% CLAY, brown, firm and MUDSTONE, gray.
900-910	50% BASALT, black. 50% FINE-GRAINED ROCK, gray to brown, with hardness greater than 5, containing small particles of quartz. Minor clay and mudstone.
910-920	50% BASALT, black. 50% CLAY, brown, firm, with some quartz.
920-940	70% BASALT, black. 30% CLAY, brown, firm and MUDSTONE, gray. <u>Conductivity sample taken at interval 920-930.</u>
940-960	90% BASALT, black. 10% CLAY, brown, firm and MUDSTONE, gray. Minor white quartz.
960-980	No samples.
980-990	95% BASALT, black, massive(?). 5% CLAY, brown, firm and MUDSTONE, gray. Minor quartz and unidentified yellow rock.
990-1000	No sample.
1000-1010	95% BASALT, black, massive(?). 5% CLAY, brown, firm. Minor quartz.
1010-1020	70% BASALT, black. 30% CLAY, brown, firm. Minor quartz.

AN-A-5, AN-A-5R, Continued

1020-1090	95% BASALT, black, massive(?). 5% CLAY, brown, firm and MUDSTONE. Minor quartz. <u>Conductivity sample taken at interval 1040-1050.</u>
1090-1100	No sample.
1100-1110	100% BASALT, black and red, fractured, with green secondary minerals, minor quartz.
1110-1160	95% BASALT, black to dark-gray, aphanitic. Minor quartz, green secondary minerals, and chalcedony. 5% CLAYSTONE, brown, soft, and minor brown firm clay. <u>Conductivity sample taken at interval 1120-1130.</u>
1160-1180	70% BASALT, dark-gray, aphanitic. 30% VOLCANIC ROCK, reddish-brown, slightly vesicular with partial filling of vesicles with white and green minerals. Minor green chalcedony.
1180-1220	90% BASALT, dark-gray, aphanitic, with occasional blue coating. 10% VOLCANIC ROCK, red, with some secondary quartz. Minor free chalcedony.
1220-1260	95% BASALT, dark-gray, aphanitic. 5% CLAYSTONE, brown, hard. Minor blue-gray rock with conchoidal fracture, green chalcedony and red volcanic rock. <u>Conductivity sample taken at interval 1240-1250.</u>
1260-1270	60% BASALT, dark-gray, aphanitic. 40% CLAYSTONE, light-brown.
1270-1280	100% BASALT, dark-gray to dark-brown, aphanitic.
1280-1290	50% BASALT, greenish-gray, aphanitic. 50% VOLCANIC ROCK, reddish-brown, with occasional dark-gray inclusions.
1290-1300	90% BASALT, greenish-gray to dark-gray. 10% CLAYSTONE, light-brown.
1300-1310	100% BASALT, greenish-gray, aphanitic.
1310-1330	60% BASALT, gray to dark-gray. 35% VOLCANIC ROCK, reddish-brown, hard, aphanitic, with occasional quartz-filled vesicles. 5% light-blue to colorless chalcedony. <u>Conductivity sample taken at interval 1320-1330.</u>

AN-A-5, AN-A-5R, Continued

1330-1340	75% VOLCANIC ROCK, reddish-brown to pink, vesicular. 25% BASALT, greenish-gray. Minor chalcedony.
1340-1350	90% VOLCANIC ROCK, as above, with occasional inclusions of dark-gray basalt and white quartz. 10% BASALT, as above.
1350-1370	60% VOLCANIC ROCK, reddish-brown. 40% BASALT, dark-gray. Minor light-brown claystone.
1370-1380	Most of sample consisted of lost-circulation material. Rock material consisted of dark-gray aphanitic basalt and a hard green aphanitic volcanic rock.
1380-1390	75% VOLCANIC ROCK, green, aphanitic, with olivine(?). 25% BASALT, dark-gray, aphanitic, with abundant blue chalcedony.
1390-1400	100% VOLCANIC ROCK, green to greenish-gray, hard, aphanitic, with minor light-blue chalcedony and olivine(?).
1400-1430	70% BASALT, greenish-gray, aphanitic. 30% VOLCANIC ROCK, reddish-brown.
1430-1450	100% BASALT, greenish-brown to greenish gray, hard, aphanitic. Minor quartz.
1450-1470	50% BASALT, greenish-gray, aphanitic. 50% VOLCANIC ROCK, reddish-brown, with occasional dark-gray inclusions. <u>Conductivity sample taken at interval 1460-1470.</u>
1470-1480	75% BASALT, greenish-gray to dark-gray. 25% VOLCANIC ROCK, reddish-brown.
1480-1490	75% VOLCANIC ROCK, reddish-brown, vesicular, with vesicles partly filled with dark greenish-gray mineral and occasional clear colorless quartz. 25% BASALT, dark greenish, gray, fine to medium-grained.
1490-1530	100% BASALT, dark-brown to dark-gray, aphanitic, with some clear colorless quartz. <u>Conductivity sample taken at interval 1520-1530.</u>
1530-1580	100% BASALT, dark-gray to dark-greenish gray, with occasional vesicles. Minor light-blue chalcedony.

AN-A-5, AN-A-5R, Continued

1580-1600	60% VOLCANIC ROCK, reddish-brown, finely porous. 35% BASALT, brown to dark-gray. 5% CLAYSTONE, light-brown, soft.
1600-1640	95% BASALT, dark-brown to dark-gray, aphanitic. 5% VOLCANIC ROCK, reddish-brown. Minor light-brown claystone.
1640-1660	60% VOLCANIC ROCK, reddish-brown to brown, slightly vesicular. 35% BASALT, dark-gray. 5% CLAYSTONE, light-brown. <u>Conductivity sample taken at interval 1640-1650.</u>
1660-1670	75% BASALT, dark-gray to dark-brown. 25% VOLCANIC ROCK, reddish-brown. Minor light-brown claystone.
1670-1680	90% BASALT, dark-gray, aphanitic. 10% VOLCANIC ROCK, red.
1680-1690	65% BASALT, dark-gray to greenish-gray. 35% VOLCANIC ROCK, reddish-brown. Both rock types contain light-blue veinlets of chalcedony. Minor free calcite.
1690-1710	90% BASALT, dark-gray and dark-greenish-gray. 5% VOLCANIC ROCK, red. 5% CLAYSTONE, light-brown.
1710-1720	80% BASALT, greenish-gray. 20% VOLCANIC ROCK, reddish-brown.
1720-1750	90% BASALT, green to dark-gray. 5% VOLCANIC ROCK, red. 5% CLAYSTONE, light-brown.
1750-1755 TD	80% BASALT, dark-greenish-gray. 20% CLAYSTONE, light-brown, soft. Minor light-blue chalcedony.

LITHOLOGIC LOG

AN-A-6

Depth
Interval,
FeetCompletion
Date:
8/23/78

GL-20	100% SILT, sandy.
20-30	80% CLAY, silty. 20% GRAVEL, up to 7 mm. sized well-rounded basaltic clasts.
30-50	100% GRAVEL, as above.
50-80	75% GRAVEL, up to 15 mm. sized angular to well-rounded basaltic clasts. 25% CLAY.
80-120	85% GRAVEL, up to 4 mm., basaltic, as above. 15% CLAY.
120-190	100% GRAVEL, up to 20 mm., angular to well-rounded, basaltic.
190-200	No sample.
200-220	100% GRAVEL, as above.
220-260	90% GRAVEL, up to 12 mm., angular to sub-rounded, basaltic. 10% CLAY, green.
260-270	50% GRAVEL, as above. 50% BASALT, dark, aphanitic.
270-290	70% BASALT, dark, massive, aphanitic. 30% GRAVEL, as above.
290-380 TD	No samples. Drilling conditions and penetration rates indicate massive fractured basalt.

LITHOLOGIC LOG

AN-A-7

Depth
Interval,
FeetCompletion
Date:
8/23/78

GL-10	100% SILT, sandy.
10-90	100% GRAVEL, 4 to 25 mm. sized angular to rounded clasts of dark basalt, with some boulders.
90-120	90% GRAVEL, as above, up to 15 mm. in size. 10% SAND, fine, basaltic.
120-170	65% GRAVEL, as above. 35% CLAY, gray, gritty.
170-180	70% CLAY. 30% GRAVEL, as above.
180-190	70% GRAVEL, up to 6 mm. subangular basaltic clasts. 30% CLAY.
190-200	No sample.
200-210	50% GRAVEL, up to 13 mm. sized angular to rounded basaltic clasts. 50% CLAY, gray.
210-220	100% CLAY.
220-230	60% CLAY. 40% GRAVEL, as above.
230-240	100% CLAY.
240-260	50% GRAVEL, as above. 50% CLAY.
260-270	100% VOLCANIC ROCK, red, vesicular, believed to be from massive flow. <u>Conductivity sample taken.</u>
270-290	80% VOLCANIC ROCK, red, as above. 20% GRAVEL, up to 7 mm. sized subangular basalt clasts.
290-300 TD	100% GRAVEL, up to 12 mm. sized subangular red and black basalt clasts.

LITHOLOGIC LOG

AN-A-9

Depth Interval, Feet	Completion Date: 8/29/78
GL-30	100% SAND and GRAVEL, up to 18 mm. sized subrounded to rounded black basalt clasts.
30-70	100% SAND and GRAVEL, as above, but mixture of red and black basalt.
70-80	95% SAND and GRAVEL, up to 10 mm. subrounded to rounded red and black basalt clasts. 5% CLAY, orange.
80-90	100% SAND and GRAVEL, as above.
90-100	90% SAND and GRAVEL, as above. 10% SANDSTONE, red, fine-grained, medium well-cemented.
100-120	80% SANDSTONE, brown to orange, fine to coarse-grained, medium well-cemented. 20% SAND and GRAVEL, up to 12 mm. sized black and red basalt.
120-130	80% SAND and GRAVEL, as above, up to 6 mm. 20% SANDSTONE, as above.
130-160	90% BASALT, red, highly altered. 10% SAND and GRAVEL, as above.
160-190	60% SAND and GRAVEL, as above, with clasts of red and black vesicular basalt. 35% BASALT, altered, as above. 5% CLAY, brown.
190-200	80% SAND and GRAVEL, as above. 15% BASALT, altered, as above. 5% CLAY, brown.
200-220	100% SAND and GRAVEL, up to 15 mm. sized black and red vesicular basalt.
220-240	60% SAND and GRAVEL, as above. 40% BASALT, black.
240-270	100% SAND and GRAVEL, up to 24 mm. sized red and black vesicular basalt.

AN-A-9, Continued

270-280	100% SAND and GRAVEL, up to 24 mm., gray and red basalt.
280-310	60% BASALT, gray. 40% SAND and GRAVEL, up to 12 mm., gray basalt.
310-340	90% BASALT, black. 10% SAND and GRAVEL, up to 6 mm. sized black basaltic clasts.
340-400	70% BASALT, black, gray and red. 25% SAND and GRAVEL, as above. 5% CLAY, red.
400-410	No sample.
410-420	70% BASALT, as above. 25% SAND and GRAVEL, as above. 5% CLAY, as above.
420-500 TD	100% BASALT, black, massive.

LITHOLOGIC LOG

AN-A-8

Depth Interval, Feet	Completion Date: 8/15/78
GL-10	80% CLAY, greenish-gray. 20% SAND and GRAVEL, 2 to 7 mm. sized angular basalt clasts.
10-40	95% CLAY, brown. 5% SAND and GRAVEL, up to 7 mm. subrounded to well-rounded basalt.
40-100	90% CLAY, gray, gritty. 10% SAND and GRAVEL, as above.
100-110	No sample.
110-120	90% CLAY, green. 10% SAND, up to 4 mm. well-rounded basaltic clasts.
120-130	No sample. Lost circulation.
130-140	50% CLAY, gray, gritty. 50% BASALT, dark-colored, massive, aphanitic.
140-180	80% BASALT, as above. 20% CLAY.
180-230	90% BASALT, as above. 10% VOLCANIC ROCK, red, vesicular. Minor clay.
230-240 TD	100% BASALT, as above. <u>Conductivity sample taken.</u>

LITHOLOGIC LOG

AN-A-79-8

Depth
Interval,
Feet

Completion
Date:
11/14/79

GL-10	100% GRAVEL, up to 10 mm. sized subangular to subrounded clasts of basalt.
10-20	90% SAND, coarse, up to 1 mm. sized rounded clasts of basalt. 10% SANDSTONE, less than .5 mm. sized rounded basalt clasts in clay matrix.
20-30	100% GRAVEL, up to 15 mm. sized subangular to subrounded clasts of basalt.
30-40	50% GRAVEL, less than 10 mm. sized subangular clasts of basalt. 50% SAND, coarse, less than 1 mm. sized rounded basalt clasts.
40-60	100% GRAVEL, 5 to 10 mm. sized subangular basalt clasts.
60-80	100% SAND, less than .5 mm. sized rounded basalt clasts.
80-130 TD	50% GRAVEL, up to 10 mm. sized rounded basalt clasts. 50% SAND, up to 1 mm. sized subrounded basalt clasts.

LITHOLOGIC LOG

AN-A-79-7

Depth Interval, Feet	Completion Date: 11/18/79
GL-10	100% GRAVEL, sandy, 5 to 15 mm. sized angular to sub-angular basalt clasts.
10-20	50% GRAVEL, sandy, as above. 50% CLAY, silty, medium-brown, hard, friable.
20-30	100% BASALT(?), dark-grayish-black, aphanitic.
30-40	35% BASALT, as above, some red. 35% BRECCIA, dark-green, altered, with large red igneous rock fragments. 30% CLAY, silty, as above.
40-50	70% CLAY, silty, as above. 20% CLAY, bluish-gray, plastic, soft. 10% BASALT, dark-gray, aphanitic.
50-70	75% BASALT, dark-gray to dark greenish-black, very fine-grained. 20% CLAY, silty, brown, friable, as above. 5% CLAY, bluish-gray, soft, plastic.
70-90	100% BASALT, dark grayish-black, sometimes brecciated and cut by silica veins containing fragments of host rock.
90-100	100% BASALT, grayish-black to greenish-black, aphanitic. Some is highly brecciated with silica veins.
100-110	100% BASALT, as above, grayish-black, greenish-black and red, aphanitic.
120-130	100% BASALT, as above, with some fragments of clear quartz.
130-140	100% BASALT, as above. Trace hard buff-colored tuff(?) with small feldspar(?) crystals.
140-160	100% BASALT, as above, dark greenish-brown, brown and red, very fine-grained, brecciated.

AN-A-79-7, Continued

160-180		100% BASALT, as above. Trace buff-colored tuff, as above.
180-210		100% BASALT, as above; containing quartz vein-filling with included clasts of basalt.
210-220		100% BASALT, as above. Trace buff-colored crystal tuff, as above.
220-240		100% BASALT, as above, some vesicular.
240-250		100% BASALT, predominantly dark-green.
250-300	TD	100% BASALT, as above, with occasional porphyritic texture.

LITHOLOGIC LOG

P-5

(Received from Phillips Petroleum Co.)

Depth
Interval,
Feet

GL-80 TD

PEDIMENT GRAVELS.

LITHOLOGIC LOG

P-29

(Received from Phillips Petroleum Co.)

Depth
Interval,
Feet

GL-120 PEDIMENT SANDS AND GRAVELS.

120-160 TD BASALT, black, massive, slightly altered.

LITHOLOGIC LOG

AN-A-12

Depth
Interval,
FeetCompletion
Date:
8/21/78

GL-140	90%	GRAVEL, up to 24 mm. sized sub-rounded to well-rounded mixed volcanic but primarily basaltic clasts.
	10%	SAND, coarse, at interval 10 to 20.
140-150	50%	GRAVEL, as above.
	50%	SAND, up to 2 mm. sized moderately sorted volcanic clasts, with predominantly quartz and felsic composition.
150-160	70%	GRAVEL, as above.
	30%	SAND, as above.
160-170	50%	GRAVEL, as above.
	50%	SAND, as above.
170-190	60%	GRAVEL, as above.
	40%	SAND, as above.
190-200	60%	CLAY.
	40%	SAND and GRAVEL, as above.
200-230	70%	GRAVEL, as above.
	30%	CLAY.
230-260	70%	CLAY.
	30%	GRAVEL, as above.
260-270	70%	GRAVEL, as above.
	30%	CLAY.
270-280	50%	GRAVEL, as above.
	50%	CLAY.
280-300 TD	70%	SAND and GRAVEL, as above.
	30%	CLAY.

LITHOLOGIC LOG

AN-A-72

Depth
Interval,
Feet

Completion
Date:
9/23/78

GL - 20	60% CLAY, brown. 40% SAND and GRAVEL, up to 25 mm sized angular to rounded clasts consisting of reddish-brown porphyritic rhyolite (?) with quartz and feldspar phenocrysts, dark-gray to black basalt with hornblende phenocrysts, light-gray to tan cherts, light-gray to brown well-lithified sedimentary rock, and light-gray well-lithified tuffs.
20 - 30	60% SAND and GRAVEL, as above. 40% CLAY, brown.
30 - 50	60% SAND and GRAVEL, as above, but clasts are primarily basaltic. 40% CLAY, brown.
50 - 60	100% SAND and GRAVEL, as above.
60 - 70	80% SAND and GRAVEL, as above. 20% CLAY, brown.
70 - 80	50% SAND and GRAVEL, with clasts of 80% basalt, 20% chert. 40% CLAY, brown. 10% CLAY, light-gray, tuffaceous.
80 - 90	70% CLAY, brown. 30% SAND and GRAVEL, as above, composed of 65% basalt and 35% tan chert and tuffs.
90-100	60% CLAY, brown. 40% SAND and GRAVEL, mixed lithology as in interval GL to 20.
100-120	60% SAND and GRAVEL, as above with some green angular fragments of altered volcanic rock. 40% CLAY, brown.
120-130	60% CLAY, brown. 40% SAND and GRAVEL, of predominantly basaltic composition.
130-140	80% CLAY, light-gray, tuffaceous. 20% SAND and GRAVEL, as in interval GL to 20.

AN-A-72, Continued

140-160	60% CLAY, light-gray. 40% SAND and GRAVEL of primarily red rhyolite(?) composition.
160-190	60% SAND and GRAVEL, up to 25 mm angular to well-rounded clasts of red rhyolite and minor chert. 40% CLAY, light-gray to brown.
190-200	60% SAND and GRAVEL, as in interval GL to 20. 30% CLAY, brown. 10% CLAY, light-gray, tuffaceous.
200-230	70% SAND and GRAVEL, of mixed lithology, as above. 30% CLAY, brown.
230-240	90% SAND and GRAVEL, as above. 10% CLAY, light-gray.
240-280	90% SAND and GRAVEL, of primarily red rhyolite with minor chert. 10% CLAY, light-gray.
280-290	90% SAND and GRAVEL of mixed lithology as in GL to 20. 10% CLAY, light-gray.
290-300	50% SAND and GRAVEL, mixed lithology, as above. 30% CLAY, brown. 20% CLAY, light-brown.
300-320	70% CLAY, light-gray, tuffaceous. 30% SAND and GRAVEL, as above.
320-340	60% CLAY, light-gray. 40% SAND and GRAVEL, of primarily rhyolite composition.
340-360	60% SAND and GRAVEL, predominantly red rhyolite clasts. 40% CLAY, light-gray.
360-380	80% SAND and GRAVEL, angular to subangular clasts of red rhyolite. 20% CLAY, gray.
380-400	80% SAND and GRAVEL, angular to subrounded clasts of red rhyolite. 20% CLAY, gray. Minor altered greenish rock. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 380-390.</u>

ALVORD SPRINGS

North of Alvord Anomaly

AN-A-72, Continued

400-467 TD 90% SAND and GRAVEL, angular to subrounded clasts of
 basalt.

 10% CLAY, brown.

CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 440-450.

LITHOLOGIC LOG

AN-A-73

Depth Interval, Feet	Completion Date: 9/25/78
GL - 10	60% SAND and GRAVEL, up to 25 mm sized angular to well-rounded clasts of reddish pink flow-banded rhyolite with quartz and feldspar and some secondary chalcedony, dark-gray to black fine-grained basalts with iron oxide staining, and banded opaline cherts. 40% CLAY, brown.
10 - 50	70% CLAY, grayish brown. 30% SAND and GRAVEL, as above.
50 - 70	50% CLAY, brown. 50% SAND and GRAVEL, as above, with addition of brecciated rhyolite.
70-100	70% CLAY, brown. 30% SAND and GRAVEL, as above.
100-130	60% CLAY, brown. 40% SAND and GRAVEL, as above, with minor green well-lithified clasts containing weathered biotite flakes.
130-170	70% CLAY, brown. 30% SAND and GRAVEL, as above, with minor brown well-lithified sedimentary rock fragments, and rhyolite breccia.
170-210	50% CLAY, brown. 50% SAND and GRAVEL, of primarily basaltic composition, and remaining clasts of mixed lithology, as above. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 180-190.</u>
21-240	70% SAND and GRAVEL, as above, with a green hard aphanitic rock, and a brown well-lithified sedimentary rock component. 30% CLAY, brown.
240-300	70% SAND and GRAVEL of primarily basaltic composition, with the remaining clasts of mixed lithology, as above, with some minor quartz or chalcedony. 20% CLAY, brown. 10% CLAY, light gray. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 280-290.</u>

AN-A-73, Continued

300-370	85% SAND and GRAVEL, up to 6 mm sized angular to subangular clasts of primarily (60-80%) basalt, with remainder as above. 15% CLAY, brown. Trace light gray clay. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 360-370.</u>
370-440	65% SAND and GRAVEL, of mixed lithology, as above. 35% CLAY, brown.
440-460	70% SAND and GRAVEL, of mixed lithology, as above. 30% CLAY, brown. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 440-450.</u>
460-480 TD	75% SAND and GRAVEL of primarily (80%) basalt clasts. 25% CLAY, brown.

LITHOLOGIC LOG

AN-A-22

Depth
Interval,
Feet

Completion
Date:
8/11/78

GL - 40	100% GRAVEL, 4 to 24 mm subrounded to well-rounded clasts of primarily pink rhyolite, lesser dark aphanitic basalt and secondary chalcedony.
40 - 50	90% GRAVEL, as above. 10% CLAY.
50 - 80	65% GRAVEL, as above. 35% CLAY.
80 - 90	60% GRAVEL, as above. 30% CLAY. 10% SAND, up to 2 mm rounded clasts of mixed volcanic lithology with secondary quartz.
90-100	40% GRAVEL, as above, but up to 12 mm in size. 30% SAND, as above. 30% CLAY.
100-130	80% GRAVEL, as above. 10% SAND, as above. 10% CLAY.
130-150	90% GRAVEL, as above. 10% CLAY.
150-190	80% GRAVEL, as above. 10% SAND, as above. 10% CLAY.
190-210	90% GRAVEL, as above. 10% SAND, as above.
210-220	80% GRAVEL, sandy, up to 20 mm rounded clasts of mixed volcanic lithology including basalts and rhyolites. 10% SAND, as above. 10% CLAY.
220-240	70% GRAVEL, as above. 20% CLAY. 10% SAND, as above.

AN-A-22, Continued

240-250	50% CLAY 30% GRAVEL, as above. 20% SAND, as above.
250-270	70% GRAVEL, sandy, up to 24 mm well-rounded clasts of mixed volcanic lithology. 20% CLAY. 10% SAND, as above.
270-370	90% GRAVEL, as above. 10% SAND, as above.
370-400	80% GRAVEL, as above 15% SAND, as above. 5% CLAY.
400-430	75% GRAVEL, as above. 15% CLAY. 10% SAND, as above.
430-450	90% GRAVEL, sandy, up to 8 mm rounded clasts of mixed vol- canic lithology. 10% SAND, as above.
450-500 TD	80% GRAVEL, as above. 15% CLAY. 5% SAND, as above. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 450-460.</u>

LITHOLOGIC LOG

AN-A-79-1

Depth
Interval,
FeetCompletion
Date:
11/12/79

GL - 30	100% CLAY, silty, light-brown to greenish-brown, sticky.
30 - 40	60% CLAY, silty, as above. 40% ORGANIC MATTER, black, soft, fetid-smelling.
40-300	100% CLAY, black to dark-gray, very plastic, fetid-smelling, with occasional silt.
300-320	70% CLAY, black, plastic, as above. 30% CLAY, greenish-gray, somewhat less plastic.
320-330	100% CLAY, greenish-gray, plastic.
330-340	100% CLAY, greenish-gray to black.
340-400	100% CLAY, black, plastic.
400-540	100% CLAY, black to dark greenish-gray, plastic, organic smell.
540-560	100% CLAY, black, plastic, as above, with a small amount of brown silty clay with a few small (less than 7 mm) well- rounded clasts of dark-brown aphanitic rock.
560-570	100% CLAY, black, plastic, as above.
570-580	100% CLAY, black, plastic, with a few small (less than 5 mm) well-rounded clasts of aphanitic rock.
580-620	100% CLAY, black, plastic, as above.
620-630	80% CLAY, black, plastic, as above. 20% CLAY, sandy, brown, friable with a few small (less than 2 mm) well-rounded clasts.
630-640	100% CLAY, black, plastic, as above.
640-670	100% CLAY, black, as above with a few rounded clasts less than 3 mm in size.
670-680	90% CLAY, black, plastic, as above. 10% CLAY, silty, brown, friable.

AN-A-79-1, Continued

680 - 690	50% CLAY, black, plastic, as above. 50% CLAY, silty, brown, friable.
690 - 800	100% CLAY, black to dark-gray, plastic.
800 - 830	100% CLAY, dark greenish-gray, plastic.
830 - 840	100% CLAY, sandy, with a few less than 3 mm sized clasts.
840 - 850	100% CLAY, dark greenish-gray, plastic.
850 - 860	100% CLAY, sandy, with clasts less than 3 mm in size.
860 - 870	100% CLAY, dark-green and light-brown.
870 - 880	100% CLAY, dark-green and black, plastic.
880 - 890	100% CLAY, dark-green and brown sandy clay. Slight loss of circulation.
890 - 910	100% CLAY, dark-green and brown, plastic.
910 - 930	100% CLAY, sandy, dark-green and brown.
930 - 970	100% CLAY, predominantly dark-green with small amount friable brown clay.
970 - 990	100% CLAY, dark-green and black, plastic.
990-1000	100% CLAY, sandy, dark-green and brown.
1000-1090	100% CLAY, dark-green and black, plastic.
1090-1190 TD	100% CLAY, dark-green, black and brown, plastic. Complete loss of circulation at bottom of hole.

LITHOLOGIC LOG

AN-A-79-5

Depth
Interval,
Feet

Completion
Date:
10/29/79

GL - 10	100% GRAVEL, sandy, with up to 20 mm sized subangular clasts of basalt and rhyolite.
10 - 20	75% CLAY, brown, sticky 25% GRAVEL, up to 10 mm subangular to subrounded clasts of basalt, rhyolite, and tuffs.
20 - 30	100% CLAY, brown and yellowish-brown, very sticky.
30-110	100% CLAY, dark bluish-gray, sticky, with slight odor of organic decay. Lost circulation at 55 feet.
110-120	90% CLAY, blue-gray, as above. 10% SAND, with less than 2 mm subangular to subrounded clasts of basalt, rhyolite, and tuffs.
120-140	50% CLAY, as above. 50% GRAVEL, up to 5 mm subangular to subrounded clasts of basalt, rhyolite, and tuffs.
140-160	95% CLAY, as above. 5% SAND, up to 2 mm subrounded clasts of basalt and rhyolite.
160-170	90% CLAY, blue-black, as above. 10% SAND, coarse, and GRAVEL, fine
170-180 TD	75% CLAY, blue-black, not as plastic or sticky as above with some solid and friable clay. 25% SAND, fine, subangular clasts of basalt and rhyolite. Artesian flow of about 50 gallons per minute at 180 feet.

LITHOLOGIC LOG

AN-A-31

Depth
Interval,
Feet

Completion
Date:
8/12/78

GL-100 100% CLAY, brown to gray.
100-300 TD 100% CLAY, dark-gray to bluish-gray.

LITHOLOGIC LOG

P-28

(Received from Phillips Petroleum Co.)

Depth
Interval,
Feet

GL - 20	CLAY, brown.
20-210 TD	CLAY, blue.

LITHOLOGIC LOG

P-25

(Received from Phillips Petroleum Co.)

Depth
Interval,
Feet

GL - 50	No samples.
50-240	Pediment Gravels, minor sand.
240-300 TD	Pediment Gravels with 20-30% sand.

LITHOLOGIC LOG

AN-A-26
AN-A-26R

Depth
Interval,
Feet

Completion Dates:
8/8/78 (GL to 500)
10/3/78 (500 to TD)

GL - 40	100% GRAVEL, sandy, up to 24 mm angular, fairly well-sorted clasts of mixed volcanic lithology consisting primarily of tuffs and rhyolite, often with secondary quartz replacement in vugs.
40 - 50	90% GRAVEL, as above, up to 12 mm in size. 10% SILT.
50 - 90	100% GRAVEL, as above, up to 24 mm in size.
90-100	95% GRAVEL, as above. 5% SILT, clayey.
100-110	90% GRAVEL, sandy, up to 15 mm moderately sorted, as above. 10% SILT, clayey.
110-120	80% GRAVEL, as above. 10% SILT, clayey. 10% SAND, as above, mixed lithology.
120-130	80% GRAVEL, as above, up to 10 mm sized clasts. 20% SAND, as above.
130-150	80% GRAVEL, as above, with modal size of 8 mm. 10% SAND, as above. 10% SILT, clayey.
150-160	90% GRAVEL, as above. 10% SAND, as above.
160-170	80% GRAVEL, sandy, 2 to 24 mm (modal size 12 mm) angular clasts of mixed volcanic lithology. 20% SILT, clayey.
170-190	80% GRAVEL, up to 12 mm (modal size 9 mm) angular fragments, probably from boulders. 10% SAND, as above. 10% SILT, clayey.
190-200	100% GRAVEL, up to 12 mm (modal size 6 mm) angular clasts of mixed volcanic lithology of primarily rhyolites and tuffs, with 10% dark fine-grained basalt.

AN-A-26, AN-A-26R, Continued

200-240	85% GRAVEL, as above. Clasts are more rounded with increasing depth. 15% SILT, clayey.
240-250	85% GRAVEL, as above, but containing equal amounts of rhyolite and basalt. 15% SILT, clayey.
250-270	85% SAND, gravelly, up to 6 mm (modal size 2 mm), angular to subrounded, clasts of primarily basalt and rhyolite. 15% SILT, clayey.
270-280	50% SAND, gravelly, as above. 50% SILT, clayey, sandy.
280-300	70% SILT, sandy, clayey. 30% SAND, gravelly, as above. Clasts show increasing rounding with depth.
300-310	70% GRAVEL, sandy, 1 to 12 mm (modal size 6 mm) angular to subrounded clasts of mixed volcanic lithology of mostly basalt and rhyolite. 30% CLAY, sandy.
310-340	50% GRAVEL, as above. 50% CLAY, sandy.
340-350	50% CLAY. 50% GRAVEL, sandy, as above, consisting of 40% basaltic boulders.
350-360	50% CLAY. 50% GRAVEL, as above, but basalt not as predominant.
360-370	80% CLAY. 20% GRAVEL, sandy, 1 to 6 mm (modal size 4 mm) subrounded to rounded clasts of mixed volcanic lithology.
370-380	50% GRAVEL, as above. 50% CLAY.
380-400	80% CLAY, sandy. 20% SAND, gravelly, 1 to 4 mm (modal size 2 mm) angular to rounded clasts of predominantly basaltic composition.
400-430	85% CLAY 15% SAND, as above.

AN-A-26, AN-A-26R, Continued

430-470	75% CLAY. 25% SAND, as above.
470-500	60% CLAY. 40% SAND, as above.
500-510	70% SAND and GRAVEL, up to 12 mm well-rounded clasts of light-gray and reddish-brown rhyolites(?) with quartz and feldspar, black fine-grained basalt with slight iron-oxide staining, tan to brown cherts, and brecciated well-lithified tuffs with secondary quartz and chalcedony. 30% CLAY, brown.
510-530	70% SAND and GRAVEL, as above, with addition of hard green rock, possibly a rhyolite tuff. 30% CLAY, brown.
530-540	80% SAND and GRAVEL, as above, with addition of brown well-lithified sedimentary rock. 20% CLAY, light-brown.
540-490	75% SAND and GRAVEL, as above. 25% CLAY, light-brown. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 540-550.</u>
590-610	80% CLAY, light-brown. 20% SAND and GRAVEL, as above.
610-620	70% CLAY, light-brown. 30% SAND and GRAVEL, as above, with 50% basaltic component.
620-640	70% CLAY, light-brown. 30% SAND and GRAVEL, as above, with addition of friable brown sedimentary rock fragments.
640-650	50% CLAY, brown. 50% SAND and GRAVEL, as above, with addition of clear quartz.
650-690	60% SAND and GRAVEL, as above, with 70% basaltic clasts. 40% CLAY, brown. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 660-670.</u>
690-740	60% SAND and GRAVEL, up to 12 mm angular to subrounded clasts of 60% black basalt, and remaining portion of reddish brown and greenish-gray rhyolites, soft brown sedimentary rock, and clear white quartz. 40% CLAY, brown.

AN-A-26, AN-A-26 R, Continued

- 740-780 70% SAND and GRAVEL, as above, up to 6 mm, with trace zeolites(?).
30% CLAY, brown.
CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 760-770.
- 780-790 80% SAND and GRAVEL, as above, consisting of 80% black fine-grained basalt with iron oxide staining, reddish-brown flow-banded rhyolite(?), clear and white quartz or chalcedony, soft white mineral with green alteration (zeolite?), minor calcite.
20% CLAY, brown.
- 790-960 80% SAND and GRAVEL, as above, with addition of soft brown fine-grained rock component.
20% CLAY, brown.
CONDUCTIVITY SAMPLE TAKEN AT INTERVALS 840-850, 920-930.
- 960-1020 80% SAND and GRAVEL, up to 6 mm subangular clasts of predominantly weathered basalts, some with zeolites and calcite-filled amygdules and fractures, minor clear and white quartz or chalcedony, hard brown fine-grained rock with mafic phenocrysts and brown biotite flakes giving a faint planar fabric, and soft green mineral.
20% CLAY, brown.
- 1020-1060 80% SAND and GRAVEL, as above, with some basaltic clasts showing green alteration of feldspar phenocrysts.
20% CLAY, brown.
CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 1020-1030.
- 1060-1070 80% SAND and GRAVEL, as above, of basaltic composition in various states of weathering, some with zeolites and calcite filling voids and fractures with minor white and clear quartz or chalcedony and soft green mineral.
20% CLAY, brown.
- 1070-1150 80% SAND and GRAVEL, as above, with addition of reddish-brown rock with small mafic phenocrysts, and a flow-banded andesite(?).
20% CLAY, brown.
CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 1140-1150.
- 1150-1180 80% SAND and GRAVEL, as above, with increasing amounts of reddish-brown flow-banded rock with mafic phenocrysts.
20% CLAY, brown.
CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 1160-1170.

AN-A-26, AN-A-26 R, Continued

- 1180-1190 90% SAND, coarse, consisting of dark-gray basalt with mafic phenocrysts, weathered basalt, reddish-brown flow-banded andesite, and minor clear and white quartz.
10% CLAY.
- 1190-1220 90% SAND, as above, with addition of minor zeolites and calcite.
10% CLAY.
- 1220-1270 95% SAND and GRAVEL, up to 6 mm clasts of gray-black basalt, showing some green alteration, iron-oxide stained basalts, soft green altered tuffs, and minor white quartz or chalcedony.
5% CLAY, brown.
CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 1260-1270.
- 1270-1280 95% SAND and GRAVEL, as above, with addition of soft white mineral and calcite.
5% CLAY, brown.
- 1280-1420 100% GRAVEL, consisting of basalt, pinkish-brown andesite, green tuff, and minor quartz, zeolites, and calcite.
CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 1320-1330.
- 1420-1450 100% GRAVEL, consisting of purple-gray flow-banded andesite, basalt, green tuff, pinkish-brown andesite, and quartz.
- 1450-1570 100% GRAVEL, consisting of white tuff, weathered basalt, pinkish-brown andesite, purple andesite, and minor quartz.
CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 1560-1570.
- 1570-1800 90% GRAVEL, as above, with addition of hard green altered rock.
10% CLAY, grayish green.
CONDUCTIVITY SAMPLE TAKEN AT INTERVALS 1640-1650, 1730-1740.
- 1800-2000 TD 100% GRAVEL, with angular to subangular fragments of weathered basalt, white tuff, purple and pinkish-brown andesite, green tuff, and minor quartz.
CONDUCTIVITY SAMPLE TAKEN AT INTERVALS 1860-1870, 1960-1970.

LITHOLOGIC LOG

AN-A-75

Depth Interval, Feet	Completion Date: 10/28/79
GL - 20	100% GRAVEL, sandy, up to 10 mm subangular to subrounded clasts of basalt, rhyolite, and siliceous vein fillings.
20 - 40	100% GRAVEL, silty, up to 10 mm subangular to subrounded clasts, as above, with addition of white aphanitic rock with biotite phenocrysts.
40 - 50	90% GRAVEL, silty, as above. 10% CLAY, dark bluish-gray, plastic.
50 - 60	95% GRAVEL, silty, up to 15 mm subangular clasts, as above. 5% CLAY, sandy, dark bluish-gray, plastic.
60 - 70	100% GRAVEL, silty, up to 15 mm subangular to subrounded clasts of basalt, rhyolite, silica, white biotite-tuff and red tuff-breccia.
70 - 80	100% GRAVEL, silty, up to 15 mm subangular clasts of rhyolite, basalt and biotite-tuff. Minor purple "rhyolite" breccia with green clay replacement of clasts.
80 - 90	100% GRAVEL, silty, sandy, with up to 5 mm clasts, as above.
90-100	60% GRAVEL, silty, with up to 15 mm subangular clasts, as above. 40% CLAY, sandy, brown, plastic.
100-120	90% GRAVEL, silty, up to 10 mm subangular clasts of basalt and rhyolite with lesser amounts of silica and silicified tuffs. 10% CLAY, sandy, brown, plastic.
120-130	100% GRAVEL, silty, up to 10 mm subangular clasts of basalt and rhyolite.
130-140	90% GRAVEL, up to 7 mm subangular clasts of basalt and rhyolite. 10% CLAY, bluish-gray and brown, plastic.

AN-A-75, Continued

140-150	85% GRAVEL, silty, up to 20 mm subangular clasts of basalt and rhyolite with minor amount of silicified gray crystal tuff-breccia. 15% CLAY, sandy, brown, plastic.
150-160	100% GRAVEL, silty, up to 30 mm subangular to angular clasts of basalt, rhyolite, and gray crystal tuff with biotite and sanidine.
160-170	85% GRAVEL, up to 7 mm subangular to subrounded clasts of rhyolite, white silicified tuff, and lesser amount of basalt. 15% CLAY, sandy, brown, plastic.
170-180	90% GRAVEL, as above, predominantly rhyolite and basalt with lesser amount white to gray silicified tuff. 10% CLAY, as above.
180-190	100% GRAVEL, up to 30 mm sized angular to subangular clasts of predominantly basalt and rhyolite with minor white to gray tuffs.
190-200	90% GRAVEL, as above. 10% CLAY, brown, plastic.
200-210	90% GRAVEL, up to 10 mm but predominantly less than 5 mm sized clasts of basalt, rhyolite, white silicified tuff, and quartz. 10% CLAY, as above.
210-220	80% GRAVEL, as above. 20% CLAY, light-brown and dark bluish-gray, plastic.
220-230	90% GRAVEL, as above. 10% CLAY, light-brown, plastic.
230-240	100% GRAVEL, up to 10 mm sized angular to subrounded clasts, as above.
240-250	90% GRAVEL, up to 7 mm subangular to subrounded, as above. 10% CLAY, light-brown, plastic.
250-260	90% GRAVEL, up to 5 mm angular to subrounded, as above. 10% CLAY, as above.
260-270	90% GRAVEL, up to 10 mm, as above. 10% CLAY, as above.

AN-A-75, Continued

270-280	100% GRAVEL, up to 7 mm sized, as above.
280-290	100% GRAVEL, up to 5 mm sized, subangular to subrounded, as above.
290-300	85% GRAVEL, up to 5 mm subrounded clasts, as above. 15% CLAY, sandy, brown, soft.
300-320	100% GRAVEL, up to 5 mm angular to subrounded, as above.
320-340	90% GRAVEL, up to 7 mm subangular to subrounded, as above. 10% CLAY, brown, soft, plastic.
340-350	70% GRAVEL, 3 to 5 mm, as above. 30% CLAY, as above.
350-380	60% GRAVEL, up to 7 mm subangular to subrounded clasts, as above. 40% CLAY, light-brown and orange-red, plastic.
380-390	60% GRAVEL, as above. 40% CLAY, blue-gray and brown, plastic.
390-400 TD	60% GRAVEL, 2 to 5 mm subangular to subrounded, as above. 40% CLAY, light-brown, plastic.

LITHOLOGIC LOG

AN-A-76

Depth Interval, Feet	Completion Date: 9/18/78
GL - 10	75% CLAY, brown. 25% GRAVEL, sandy, up to 10 mm clasts of mixed lithology.
10 - 20	95% CLAY, brown and black. 5% GRAVEL, sandy, up to 25 mm clasts of mixed lithology.
20 - 40	95% RHYOLITE, black, aphanitic. 5% CLAY, brown, soft.
40 - 50	100% RHYOLITE, black to gray, hard.
50 - 60	60% RHYOLITE, gray, hard, massive. 40% SAND and GRAVEL, up to 20 mm sized clasts of rhyolite.
60 - 70	100% RHYOLITE, gray, hard, aphanitic. Trace quartz.
70-180	100% RHYOLITE, pinkish-gray to light-gray, aphanitic, with occasional dark phenocrysts, hematite stains, occasional light-blue streaks and white to light-green veinlets. Rhyolite is altered throughout sample and shows clay minerals, light-green soft minerals, and quartz or chalcedony. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 160-170.</u>
180-200	90% RHYOLITE, reddish-gray, altered, as above, but increasing in hardness with abundant white quartz or chalcedony. 10% CLAY, gray to red.
200-230	100% RHYOLITE, light-gray to very light pinkish to reddish-gray, with 15% clear colorless quartz phenocrysts and unidentified dark-gray phenocrysts. Trace free quartz or calcite.
230-240	100% ANDESITE(?), medium-gray, with dark phenocrysts and trace of white quartz.
240-260	100% RHYOLITE, as above, with abundant green chalcedony(?) and veinlets of soft white clay. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 250-260.</u>

AN-A-76, Continued

260-290	80% RHYOLITE, light pinkish-gray, altered with white clay alteration of feldspars and green chalcedony. 20% CLAY, light-red.
290-300	100% RHYOLITE, light-gray, with quartz phenocrysts.
300-310	80% CLAY, light-gray. 20% RHYOLITE(?), light-gray, with abundant green mineral.
310-320	70% RHYOLITE, light pinkish-gray with quartz and biotite phenocrysts and unidentified green mineral. 30% CLAY, light-gray.
320-340	100% RHYOLITE(?), light greenish-gray, with 10-15% green phenocrysts in light-gray, hard groundmass with trace of quartz veinlets.
340-350	70% RHYOLITE, pinkish-gray to greenish-gray with quartz and biotite phenocrysts. 30% ANDESITE(?), medium-gray, very hard, aphanitic.
350-360	100% RHYOLITE, light pink and brown, hard, with dark gray biotite(?) and quartz phenocrysts.
360-370	65% CLAY, reddish-brown. 35% RHYOLITE(?), reddish-brown, very hard, with white phenocrysts of feldspar(?).
370-380	55% RHYOLITE, light-gray, fractured, with quartz and biotite phenocrysts and black mineral-filled fractures. 40% VOLCANIC ROCK, reddish-brown, aphanitic. 5% ANDESITE(?), medium-gray, hard, aphanitic. <u>CONDUCTIVITY SAMPLE TAKEN.</u>
380-390	75% RHYOLITE, light-gray, as above. 15% VOLCANIC ROCK, reddish brown, aphanitic. 10% ANDESITE(?), medium-gray, hard, aphanitic.
390-400	90% RHYOLITE, light-gray, with biotite, as above. 10% VOLCANIC ROCK, red, soft, with abundant green mineral.
400-430	90% RHYOLITE, as above. 10% CLAY.
430-450	90% RHYOLITE, pink, purple, and white, medium to coarse-grained, with biotite. 10% VOLCANIC ROCK, red, soft. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 445-460.</u>
450-460 TD	100% RHYOLITE, as above.

LITHOLOGIC LOG

AN-A-80-5
AN-A-80-5R

Depth
Interval,
Feet

Completion
Date: 4/16/80,
5/7/80

GL-10 80% CLAY, greenish gray, soft.
 15% GRAVEL, angular to sub-angular, up to 15 mm
 in size. Fragments consist of red to black
 basalt, greenish-gray tuff with vesicle and
 fracture fillings.
 5% SAND, medium to coarse, angular to sub-rounded,
 composed predominantly of volcanic grains.

10-20 95% SILT, brown, soft.
 5% SAND and GRAVEL, as above.

20-30 90% CLAY and SILT, brown.
 10% SAND, medium to very coarse, as above.

Note: All of the above samples are characterized by the presence of
white to yellow aphanitic, hard material, possibly a secondary
filling or tuff.

30-40 50% CLAY, brown and gray, in chunks carrying sand
 and gravel.
 50% GRAVEL, angular, up to 45 mm in size, composed
 of white silica, altered red basalt, and other
 volcanic lithologies.

40-50 60% CLAY, as above.
 40% GRAVEL, as above, with one fragment of a horn-
 blende felsite (possibly dacite) with phenocrysts
 of hornblende up to 2 mm.

50-60 60% GRAVEL, as above, up to 35 mm in size.
 40% CLAY, as above.

60-70 75% CLAY, as above.
 25% GRAVEL, as above.

70-80 55% GRAVEL, as above, up to 35 mm in size.
 40% CLAY, as above.
 5% SAND, as above.

80-87 100% DACITE Boulder(?), fragments consist of a
 light, aphanitic rock containing phenocrysts
 of hornblende.

LITHOLOGIC LOG

AN-A-80-5, AN-A-80-5R (continued)

87-90	100% GRAVEL and CLAY, as above.
90-100	70% CLAY, as above. 20% GRAVEL, as above, up to 18 mm in size. 10% SAND, as above.
100-110	85% CLAY, as above. 15% SAND, as above, fine to coarse-grained.
110-120	85% CLAY, as above. 10% GRAVEL, as above. 5% SAND, as above.
120-220	70% CLAY, as above. 30% SAND and GRAVEL, as above.
220-230	90% CLAY. 10% SAND, fine to coarse, consisting of mixed volcanic lithologies.
230-240	70% CLAY, as above. 30% SAND and GRAVEL, as above.
240-270	85% DACITE(?), angular to rounded, gray, with biotite. 15% RHYOLITE fragments, angular to rounded.
270-280	50% FELSITE, white, possibly an altered dacite. 30% Biotite DACITE, gray. 20% RHYOLITE fragments.
280-290	60% FELSITE, white. 40% Rounded grains of mixed volcanic lithologies.
290-300	50% Biotite DACITE, white to gray. 20% FELDSPAR PORPHYRY, pink, with minor biotite. 20% Mixed volcanic grains, predominantly rounded.
300-320	100% RHYOLITE(?), pink to maroon, angular fragments predominantly 1 to 8 mm in size, containing phenocrysts of feldspar, and minute dark minerals, in a pink to maroon groundmass. Possibly silici- fied, the sample is very hard with minor quartz.
320-330	80% Rounded mixed volcanics, probably slough. 20% RHYOLITE(?), as above.

LITHOLOGIC LOG

AN-A-80-5, AN-A-80-5R (continued)

330-340	50% RHYOLITE(?), brown, as above. 45% Rounded mixed volcanics, probably slough. 5% FELSITE, white.
340-350	85% RHYOLITE(?), light gray to brown, as above. 10% Rounded mixed volcanics, probably slough. 5% FELSITE, white, as above.
350-360	90% RHYOLITE(?), as above, with a few white to maroon-banded fragments. 10% Rounded mixed volcanics, probably slough.
360-380	90% FELSITE, white, light gray, and light brown, siliceous, with yellowish-orange (rust) colored coatings. 10% Rounded mixed volcanics.
380-390	70% FELSITE, white to light gray, as above, with accessory pyrite. 20% Rounded mixed volcanics. 10% RHYOLITE(?), brown, as above.
390-400	80% FELSITE, white to light gray, as above. 20% Rounded mixed volcanics, probably slough.
400-420	95% FELSITE, white to light gray, with the characteristic yellowish-orange (rust) colored staining, minor pyrite. 5% Rounded mixed volcanics, probably slough.
420-430	60% FELSITE, as above, with a few fragments silver- colored and magnetic metal coated with hematite(?). 35% Rounded mixed volcanics. 5% RHYOLITE or TUFF(?), pink.
430-460	90% FELSITE, white to light gray, angular fragments predominantly 1 to 5 mm in size. 5% RHYOLITE PORPHYRY, pink. 5% DACITE(?) PORPHYRY.
460-470	40% FELSITE, white. 40% FELSITE, gray. 10% RHYOLITE, pink banded. 10% RHYOLITE PORPHYRY, pink-orange.

LITHOLOGIC LOG

AN-A-80-5, AN-A-80-5R (continued)

470-480	60% FELSITE, gray, minor biotite crystals. 20% FELSITE, white. 20% RHYOLITE, as above.
480-510	90% RHYOLITE, purplish-gray, angular fragments, up to 10 mm in size. 10% Biotite TRACHYTE, white. Thin section made.
510-520	100% RHYOLITE, purplish-gray, angular fragments, up to 14 mm in size, with the median size range 3 to 5 mm.
520-530	100% RHYOLITE, purplish-gray, angular fragments up to 10 mm in size.
530-540	90% RHYOLITE, as above. 10% TRACHYTE, white to greenish-white, containing crystolites of euhedral biotite.
540-550	60% RHYOLITE, as above. 40% TRACHYTE, as above.
550-560	90% TRACHYTE, white. 10% RHYOLITE, as above. Thin section made.
560-570	Same as above, but average fragment size is smaller with medium size range of 2 to 4 mm.
570-580	80% TRACHYTE, white, angular fragments up to 15 mm in size. 20% RHYOLITE, pinkish-purple.
580-590	50% TRACHYTE, as above, angular fragments predominantly 3 to 5 mm in size, but up to 10 mm. 50% RHYOLITE, as above, angular fragments predominantly 3 to 5 mm in size, but up to 10 mm.
590-600	80% RHYOLITE, purplish-gray. 20% TRACHYTE, white.
600-610	100% RHYOLITE, pink and purplish-gray, as above.
610-620	100% DACITE PORPHYRY, dark purplish-gray, angular fragments ranging predominantly 2 to 4 mm in size, with white phenocrysts of Plagioclase up to 1 mm in size.

LITHOLOGIC LOG

AN-A-80-5, AN-A-80-5R (continued)

620-630	100% DACITE, as above, with fragments ranging from 3 to 12 mm. Thin section made.
630-640	100% DACITE or RHYOLITE, gray and white.
640-650	100% DACITE or RHYOLITE, as above, with average size of 1 to 3 mm.
650-670	No sample.
660-670	93% TRACHYTE, as above. 7% Biotite RHYOLITE, pink.
670-680	70% TRACHYTE or RHYOLITE, white, 30% DACITE, gray, as above.
680-720	100% TRACHYANDESITE, dark gray, angular fragments ranging from 1 to 3 mm in size, containing white phenocrysts of plagioclase up to 1 mm in size. Thin section made
720-740	100% TRACHYTE, white to gray, angular fragments between 2 to 4 mm in size.
740-750	CONTAMINATED SAMPLE.
750-760	95% TRACHYANDESITE, porphyritic, dark gray, angular fragments up to 10 mm, with white phenocrysts of plagioclase (euhedral to subhedral). 5% RHYOLITE, pink to gray, containing biotite. Thin section made.
760-770	100% TRACHYANDESITE, gray, angular fragments ranging from 2 to 5 mm.
770-780	95% TRACHYANDESITE, as above. 5% RHYOLITE, as above.
780-790	No sample.
790-800	100% TRACHYANDESITE, as above, angular fragments, between 1 and 4 mm in size.
800-810	70% TRACHYANDESITE, as above. 30% LATITE, orangish-red, containing biotite phenocrysts.

LITHOLOGIC LOG

AN-A-80-5, AN-A-80-5R (continued)

810-820	50% FELSITE, white, angular fragments, containing pyrite, between 2 and 4 mm in size. 50% TRACHYTE, light gray, as above.
820-840	90% TRACHYTE, as above. 10% FELSITE, as above.
840-850	50% LATITE, gray, 1 to 4 mm size. 50% TRACHYTE, white to light gray, 1 to 4 mm in size.
850-860	100% FELSITE, white, angular fragments, from 2 to 5 mm in size.
860-910	100% LATITE, medium to dark gray, angular fragments, 1 to 5 mm in size.
910-920	100% FELSITE, white, angular fragments, 1 to 3 mm in size, with pyrite.
920-930	100% BASALT, black, angular fragments, 2 to 5 mm in size, containing clear quartz and feldspar(?) phenocrysts. Thin section made.
930-940	100% LATITE, gray, angular fragments, 1 to 4 mm in size, containing white plagioclase phenocrysts up to 1 mm in size.
940-960	100% LATITE, purplish gray, angular fragments 2 to 5 mm in size. Thin section made.
960-1,000	100% LATITE, as above, with smaller sized fragments from 1 to 3 mm.

Note: Most samples were aphanitic with no recognizable phenocrysts. Above rock determinations were based primarily on color and general appearance of the rock, and not on mineralogy.

LITHOLOGIC LOG

AN-A-80-2

Depth Interval, Feet	Completion Date: 6/23/80
GL-10	70% GRAVEL, angular to sub-angular, size range predominantly 5-10 mm, up to 18 mm, with varied volcanic lithologies: massive and vesicular basalt, felsite, rhyolite, and tuff. 20% SAND, fine to coarse, angular to sub-rounded with same lithologies as gravels. 10% CLAY and SILT, red and brown.
10-20	75% SAND, as above. 20% GRAVEL, as above. 5% CLAY, as above.
20-40	60% TUFF, altering to clay, green, containing biotite, and clasts up to 15 mm. Most frag- ment 1 to 5 mm in size. 40% CLAY, green.
40-50	70% TUFF, as above, with fragments increasing in hardness and size, up to 10 mm. 30% CLAY, as above.
50-60	85% TUFF, as above, with fragments increasing in hardness and size, up to 20 mm. White spots in fragments that are altered to clay are prob- ably feldspars. 15% CLAY, as above.
60-70	95% TUFF, as above. 5% CLAY, as above.
70-80	100% TUFF, silicified, light to medium gray aphanitic groundmass, with yellowish-white altered pheno- crysts and angular clasts, 0.5 to 2 mm in size, many of which are fractured or broken. The frag- ments are angular, up to 20 mm in size. A number of fragments contain a blue-green soft coating, possibly a copper mineral (malachite or azurite).
80-90	95% TUFF, light green, altering to clay, with angular fragments up to 10 mm in size. 5% CLAY.

LITHOLOGIC LOG

AN-A-80-2 (continued)

90-100	95% BASALT, altered, reddish-brown, silicified, with soft altered phenocrysts of plagioclase up to 1 mm in size. Pyrite is present as disseminations and veins. 4% TUFF, as above, probably slough. 1% QUARTZ, white to clear, predominantly secondary fillings of vugs and fractures.
100-140	55% TUFF, yellowish-green, silicified. 45% BASALT, as above.
140-160	100% BASALT, as above. Fragments predominantly <3 mm in size, with some up to 23 mm.
160-170	100% BASALT, altered, as above, but pyritization is not present. Angular fragments predominantly 1 to 5 mm, with some up to 15 mm in size.
170-210	100% BASALT, altered, as above, containing a higher percentage of altered plagioclase phenocrysts, probably double the amount in above samples; with minor pyrite.
210-220	90% BASALT, as above. 10% CLAY, reddish-brown.
220-230	90% RHYOLITE, altered, banded, light pink to light gray, containing white and pink altered phenocrysts of probably K-spar. Fragments also contain minute crystals of hematite, and are angular, up to 15 mm in size. 10% BASALT, as above.
230-260	100% RHYOLITE, altered, as above, containing altered biotite phenocrysts.
260-280	100% TUFF, silicified, with angular fragments up to 15 mm in size.
280-290	100% TUFF, light gray, pink, and green.
290-320	100% TUFF, green to gray, silicified locally. Gray fragments are harder than the green. Fragments contain biotite, soft white altered clasts, and silica spherulites.

AN-A-80-2 (continued)

320-330	No sample.
330-360	100% TUFF, as above.
360-370	No sample.
370-380	100% TUFF, altered, as above, brown in color.
380-390	90% TUFF, altered, green, as above. 10% TUFF, altered, brown, as above.
390-420	100% TUFF, green, as above.
420-435 TD	No sample.

LITHOLOGIC LOG

AN-A-80-1

Depth
Interval,
Feet

Completion
Date:
6/20/80

GL-10	No sample.
10-20	70% SAND, fine to coarse, with predominantly volcanic clasts. 30% GRAVEL, angular to sub-rounded, up to 30 mm. in size, composed of volcanic lithologies.
20-40	75% GRAVEL, as above. 20% SAND, as above. 5% CLAY, red.
40-60	65% GRAVEL, as above. 30% SAND, as above. 5% CLAY, as above.
60-70	50% GRAVEL, as above. 40% SAND, as above. 10% CLAY, as above.
70-80	50% SAND, as above. 45% GRAVEL, as above, most clasts red to purple. 5% CLAY, as above.
80-90	55% GRAVEL, as above. 40% SAND, as above. 5% CLAY, purple.
90-120	50% GRAVEL, as above. 25% SAND, as above. 25% CLAY, purple to reddish-purple.
120-130	No sample.
130-140	50% GRAVEL, as above. 30% SAND, as above. 20% CLAY, as above.
140-160	50% GRAVEL, angular to sub-angular, up to 35 mm, clasts predominantly white, pink and green tuff, with lesser amounts of other volcanic lithologies. 40% SAND, fine to coarse, angular to sub-rounded, composed of predominantly quartz, feldspar, and other sedimentary volcanic lithologies, i.e., tuff breccia. 10% CLAY, as above.

LITHOLOGIC LOG

AN-A-80-1 (continued)

160-170	70% GRAVEL, as above. 25% SAND, as above. 5% CLAY, as above.
170-180	65% GRAVEL, as above, fragments mostly light green to pink. 30% SAND, as above. 5% CLAY, as above.
180-200	55% GRAVEL, more mafic than above. 25% CLAY, orangish-purple. 20% SAND, more mafic than above.
200-210	No sample.
210-240 TD	These samples showed a mixture of rocks observed in the upper portion of the hole and are probably slough. Rock is probably being ripped off the sides of hole, as hot water is dissolving foam.

LITHOLOGIC LOG

AN-A-77

Depth Interval, Feet	Completion Date: 9/28/78
GL - 10	80% SAND and GRAVEL, angular to well-rounded clasts of reddish-brown rhyolite with quartz and feldspar phenocrysts, flow-banded rhyolite with secondary quartz or chalcedony, gray rhyolite(?) with feldspar and biotite phenocrysts, white quartz or chalcedony chips, well-lithified rounded pebbles of brown sedimentary rock, and black basalt. 20% CLAY.
10 - 30	80% SAND and GRAVEL, as above, with addition of fragments of green altered rhyolite with brown biotite and feldspar phenocrysts. 20% CLAY.
30 - 40	80% SAND and GRAVEL, as above, with addition of clear botryoidal quartz. 20% CLAY.
40 - 60	80% RHYOLITE, green, altered, with biotite, quartz, and feldspar phenocrysts. 10% CLAY, gray to green. 10% GRAVEL, as above.
60 - 90	70% RHYOLITE, green, very friable, with quartz and feldspar phenocrysts. 20% CLAY, green. 10% GRAVEL, as above, of mixed lithology of predominantly varicolored rhyolite and minor basalt. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 70-80.</u>
90-100	90% RHYOLITE, reddish-pink, flow-banded. 10% GRAVEL, angular to subrounded, of mixed lithology, as above.
100-110	80% RHYOLITE, reddish-brown, flow-banded, as above. 10% RHYOLITE, green, friable. 10% GRAVEL, as above.
110-140	95% RHYOLITE, reddish-brown, flow-banded. 5% RHYOLITE, green, friable, with feldspar phenocrysts.

AN-A-77, Continued

140-160 85% RHYOLITE, reddish-brown, flow-banded.
 10% RHYOLITE, green, friable.
 5% GRAVEL, as above, possible cavings from above.
 CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 140-150.

160-188 TD 100% RHYOLITE, reddish-brown, flow-banded, with traces of
 white quartz and calcite.

LITHOLOGIC LOG

AN-A-79-4

Depth Interval, Feet	Completion Date: 10/15/79
G1- 10	80% GRAVEL, less than 5 mm sized clasts composed of weathered crystal tuffs and tuffaceous sediments. 20% SILT.
10- 20	80% CLAY, pale yellowish-white, plastic (montmorillonitic?). 20% GRAVEL, as above.
20- 30	100% CLAY, as above.
30- 40	60% CLAY, sandy, silty, pale green, plastic, with small (less than .5 mm) fragments of pale green altered tuffs and crystals of bronze-colored altered biotite and amphiboles. 40% CLAY, pale yellowish-white, as above.
40- 50	80% TUFF, pale green, altered, with relatively fresh bio- tite. 20% CLAY, pale green, plastic, as above.
50- 60	90% TUFF, as above. 10% CLAY, pale green to yellow, plastic, as above.
60- 80	80% TUFF, as above. 20% CLAY, as above.
80- 90	75% TUFF, as above. 25% CLAY, as above.
90-100	90% TUFF, as above. 10% CLAY, as above.
100-110	80% TUFF, biotite-crystal, pale green, silicified, as above. 20% CLAY, pale yellow to light green, plastic.
110-120	70% TUFF, biotite-crystal, pale green, silicified, with trace gray crystal tuff. 30% CLAY, as above.
120-130	90% TUFF, crystal, pale greenish-gray and medium greenish- gray, silicified, with fresh-appearing crystals of biotite and hornblende. 10% CLAY, pale greenish-gray, plastic.

AN-A-79-4, Continued

130-140	100% TUFF, crystal, pale greenish-gray to medium greenish-gray, silicified, as above. Trace clay.
140-150	100% TUFF, as above. Trace clay.
150-160	80% TUFF, silicified, as above, with addition of fine-grained olive-green crystal-tuff containing biotite and hornblende. 20% CLAY, pale greenish-gray, plastic.
160-170	100% TUFF, as above, Trace clay, pinkish.
170-180	55% TUFF, as above. 40% CLAY, purplish-gray, plastic. 5% TUFF BRECCIA, purplish, silicified.
180-190	50% TUFF, crystal, green, silicified, as above. 50% CLAY, purplish-red with minor pale-green. Trace red-purple silicified tuff-breccia containing biotite.
190-200	50% CLAY, purplish-red, plastic, with minor pale greenish-gray. 50% TUFF, crystal, green, silicified, as above. 10% TUFF-BRECCIA, purplish, with clasts of fine-grained intermediate rock with groundmass partially altered to clay.
200-220	50% TUFF, crystal, green, silicified, as above. 50% CLAY, purplish-red, plastic.
220-240	75% CLAY, purplish-gray with minor clasts of tuff or rhyolite. 25% TUFF, green, silicified, as above.
240-250	85% CLAY, purplish-gray, as above. 15% TUFF, green, as above.
250-260	85% CLAY, as above. 15% TUFF, as above. Minor purplish-gray aphanitic rock with chlorophaeite(?) - filled vesicles.
260-280	50% CLAY, gray to purplish-gray, plastic. 50% TUFF, green, silicified, as above.

AN-A-79-4, Continued

- 280-290 50% CLAY, as above.
 50% TUFF, as above.
 Minor fragments of gray aphanitic rock with bright-green
 cavity fillings.
- 290-300 75% CLAY, gray to light purplish-gray.
 20% TUFF, crystal, green, as above.
 5% RHYOLITE(?), red, altered, with bright-green amygdules
 of chlorophaeite(?).
- 300-310 50% CLAY, gray to purplish-gray, plastic.
 25% TUFF, green, silicified, as above.
 25% RHYOLITE(?), purplish-gray, aphanitic, with occasional
 quartz veinlets.
- 310-320 40% CLAY, light-gray, plastic.
 40% RHYOLITE(?) or rhyolite tuff-breccia, gray to purple-
 gray, aphanitic with biotite phenocrysts, lithic inclu-
 sions, and possible glass shards.
 20% TUFF, crystal, green, silicified.
- 320-340 80% CLAY, medium to light-gray, plastic.
 15% TUFF, crystal, green, as above.
 5% RHYOLITE(?), light-gray, porphyritic, fine-grained with
 phenocrysts of quartz, potassium, feldspar, and biotite.
- 340-370 60% CLAY, gray to pinkish-gray, plastic.
 25% TUFF, crystal, green, silicified, as above.
 15% RHYOLITE, pink, with textures of tuffs, breccias, and
 flows.
- 370-380 50% CLAY, gray to pinkish-gray, as above.
 35% TUFF, crystal, greenish-gray, as above.
 15% RHYOLITE, pink, with tuff and breccia textures.
- 380-390 75% CLAY, pinkish-gray, plastic, with small amount of yellow
 plastic clay.
 20% TUFF, green, as above.
 5% RHYOLITE, pink, tuff-texture.
- 390-400 50% CLAY, pinkish-gray to gray, plastic.
 25% TUFF, green, and tuff-breccias containing clasts of
 purple rhyolite.
 25% RHYOLITE, purple, with tuff and flow textures.
- 400-420 TD 50% TUFF, crystal, green, as above.
 25% TUFF, white to pale gray, aphanitic, appears silicified,
 with biotite, and potassium feldspar crystals, and
 glass shards.
 25% RHYOLITE, red to purple, welded tuffs and tuff-breccia
 textures.

LITHOLOGIC LOG

AN-A-79-4R

Depth
Interval,
Feet

Completion
Date:
6/6/80

GL-20	70% SAND and GRAVEL, subangular to subrounded, up to 14 mm in size, with clasts of basalt, tuff, calcite, olivine, and other felsic materials, all altered. 30% CLAY, brown, sticky.
20-30	70% SAND and GRAVEL, as above, with a higher percentage of felsic material. 30% CLAY, as above.
30-40	No sample.
40-50	50% TUFF, white to pale green with crystallites of biotite, all highly altered. 40% CLAY, light pale green. 10% SAND and GRAVEL, as above.
50-70	60% TUFF, pale green, with crystallites of biotite up to 1 mm. Angular to subrounded fragments up to 4 mm in size that are altering to clay. 40% CLAY, as above.
70-140	60% TUFF, as above, with approximately 5% gray tuff which contains no biotite. 40% CLAY, as above.
140-150	60% CLAY, purplish-gray, very sticky. 30% TUFF, as above. 10% RHYOLITE, purplish pink.
150-160	50% CLAY, as above. 30% TUFF, as above. 20% RHYOLITE, porphyritic, with phenocrysts of K-spar (white and pale green) and <1% biotite.
160-170	50% CLAY, as above. 25% TUFF, as above. 25% RHYOLITE, as above.
170-180	50% CLAY, as above. 30% TUFF, red-brown to purplish-gray, highly altered to clay. 20% TUFF, as above.

LITHOLOGIC LOG

AN-A-79-4R (continued)

180-190	50% CLAY, as above. 35% TUFF, as above, purplish-gray. 15% TUFF, as above, pale green.
190-200	No sample.
200-210	100% TUFF, pale green, angular to subrounded fragments, 1 to 4 mm in size, altered to clay, with minor pyrite.
210-220	100% TUFF, as above, with average fragment size of 1 mm.
220-250	100% TUFF, pale green and reddish-brown, altered, angular fragments 2 to 5 mm in size.
250-300	100% TUFF, as above, with fragments 1 to 3 mm in size.
300-330	100% TUFF, pale green to light gray, angular to sub- angular fragments 2 to 6 mm in size, containing 1 to 2% biotite phenocrysts that are altering to clay.
330-340	100% TUFF, pinkish-white to pale green, with biotite.
340-350	100% TUFF, white to pinkish-white, angular fragments 2 to 10 mm in size, containing <1% biotite and vein pyrite. Thin section made.
350-360	100% TUFF(?), white, angular fragments 1 to 6 mm in size.
360-370	95% TUFF(?), as above. 5% BASALT(?), black, angular fragments 2 to 5 mm in size containing disseminated pyrite.
370-380	100% TUFF(?), as above, containing pyrite and quartz with some fragments having pinkish-orange color (Fe staining?).
380-390	100% TUFF(?), as above. Minor black fragments (basalt?).
390-440	100% TUFF(?), as above.

LITHOLOGIC LOG

AN-A-79-4R (continued)

- 440-450 95% TUFF(?), white, aphanitic, silicic fragments containing minor mica.
5% Green, very fine-grained fragments, with a sugary texture. Some fragments show slickensides.
- 450-470 95% TUFF, as above, white and pink (iron straining), with vein fillings having clear (silicified?) walls, and gray clouded cores containing pyrite crystals.
5% Green fragments, as above.
- 470-480 90% ALTERED VOLCANIC ROCK, maroon to brown, containing phenocrysts of feldspar and biotite.
8% TUFF, as above.
2% Green-black, fine-grained VOLCANIC ROCK, green to black, fine-grained.
- 480-490 95% BASALT(?), gray-green, angular fragments 1 to 4 mm in size, composed of very small equant feldspar crystals (greenish) in a glassy, quartz-rich matrix, with minor amphibole(?) and magnetite(?).
5% ALTERED VOLCANIC ROCK, as above.
- 490-500 100% BASALT(?), as above.
Thin section made.
- 500-600 100% BASALT(?), as above, with zoning visible in some feldspars. The fragments are magnetic.
- 600-610 95-97% BASALT(?), as above.
~3-5% TUFF, pale green, probably slough.
- 610-620 50% CLAY, gray.
30% FELSITE, white to yellowish-white, to light green.
10% BASALT(?), as above.
10% TUFF, pale green, as above.
- 620-630 70% BASALT(?), as above.
30% CLAY, as above.
- 630-660 100% BASALT(?), as above in interval 500-600 feet.
- 660-670 75% FELSITE, white, aphanitic with micro-disseminated pyrite.
25% BASALT(?), as above.
Thin section made of felsite.

LITHOLOGIC LOG

AN-A-79-4R (continued)

670-680	65% RHYOLITE, maroon, with phenocrysts of biotite, quartz and feldspar. 30% FELSITE, as above, probably slough. 5% BASALT, as above, probably slough. Thin section made of rhyolite and felsite.
680-690	50% RHYOLITE(?), maroon-brown, with phenocrysts of plagioclase and biotite. 45% FELSITE, as above. 3% BASALT, as above. 2% QUARTZ vein(?).
690-700	80% FELSITE, as above. 20% RHYOLITE(?), as above. Lost circulation at 692 feet.
700-710	No sample. <u>Lost Circulation.</u>
710-720	No sample. <u>Drilled Blind.</u>
720-730	No sample. <u>Drilled Blind.</u>
730-740	80% RHYOLITE(?), maroon-brown, as above, angular fragments 0.25 to 1 mm in size, containing pyrite. 15% FELSITE, as above, containing pyrite. 5% BASALT, as above.
740-750	100% RHYOLITE, as above.
750-760	100% RHYOLITE, as above, with fragment size range from 1 to 2 mm in size. Thin section made.
760-780	50% RHYOLITE, as above. 50% FELSITE, as above.
780-790	100% RHYOLITE, as above.
790-800	75% BASALT, black to dark green. 25% RHYOLITE and FELSITE, as above.
800-810	90% FELSITE, as above. 10% BASALT, as above.
810-820	75% FELSITE, as above, altered. 25% BASALT, as above.

LITHOLOGIC LOG

AN-A-79-4R (continued)

820-830	90% FELSITE, as above. 5% RHYOLITE(?), as above. 5% BASALT, as above.
830-840	No sample.
840-850	50% FELSITE, as above. 50% RHYOLITE, as above.
850-860	70% RHYOLITE, as above. 25% FELSITE, as above. <5% TUFF(?), green.
860-870	No sample.
870-880	No sample.
880-890	70% Rounded grains, mixed volcanic lithologies. 25% CLAY, green chips. 5% FELSITE, white, as above. Very small sample.
890-900	No sample.
900-910	95% FELSITE, white, as above. 5% CLAY, red chips. Sample composed mostly of lost circulation material.
910-920	100% FELSITE, white, as above. Sample composed mostly of lost circulation material.
920-940	93% RHYOLITE, maroon-brown, as above. 5% FELSITE, as above. 2% CLAY, green chips.
940-950	100% RHYOLITE, maroon-brown, with very small plagioclase phenocrysts in brown matrix, with pyrite crystals associated with quartz vein-fillings.
950-1,000	100% RHYOLITE, as above, with laminar structure in some fragments.
1,000-1,030	95% RHYOLITE, maroon, as above. 5% Green clay chips.
1,030-1,050	75% Aphanitic gray rock 25% RHYOLITE(?), maroon.

LITHOLOGIC LOG

AN-A-79-4R (continued)

1,050-1,070	100% BASALT, black, angular fragments predominantly <1 mm in size. Thin section made.
1,070-1,080	60% TUFF, white to gray fragments with some granular textures. 35% ALTERED TUFF(?), red-brown. 5% Green chips (Tuff?). Basalt fragments, probably slough.
1,080-1,090	No sample.
1,090-1,100	100% TUFF or Lapilli Tuff, pale green matrix, with fine white grains, angular to subrounded. Some fragments suggest bedding. There are a few red- brown fragments, probably from above, and a few gray fragments with minute black grains. Thin section made.
1,100-1,110	90% TUFF, as above. 10% Aphanitic, pinkish-orange fragments.
1,110-1,120	90% TUFF(?), white to purplish-gray, aphanitic. 10% TUFF, as above.
1,120-1,130	100% TUFF(?), white to purplish-gray, as above, angular fragments 1 to 4 mm in size. Thin section made.
1,130-1,140	Same as above.
1,140-1,170	100% RHYOLITE(?), yellowish-white to gray fragments, 2 to 5 mm in size, that are aphanitic and siliceous. Many fragments are banded, and some are brecciated or have angular clasts. The laminae are very small.
1,170-1,200	100% RHYOLITE(?), as above, with higher percentage of white to yellowish-white material. Thin section made.
1,200-1,240	100% RHYOLITE(?), banded, as above, with bands of purplish and brown, and bands or veins of clear quartz(?). Lost circulation at 1,220 feet.
1,240-1,250	No sample. Fractured interval.

LITHOLOGIC LOG

AN-A-79-4R (continued)

1,250-1,290	100% RHYOLITE, as above.
Thin section made.
1,290-1,370	No sample.
Lost circulation at 1,292 feet.
1,370-1,380	50% RHYOLITE, as above, white and maroon aphanitic angular fragments.
45% BASALT, greenish-black, glassy looking, angular fragments.
5% BASALT, altered, brownish-red, very soft.
1,380-1,400	75% BASALT, greenish-black, angular fragments up to 3 mm in size that are glassy looking.
20% FELSITE, white, to light gray, to light green.
5% BASALT, altered, reddish-brown, as above.
1,400-1,410	No sample.
1,410-1,420	100% BASALT(?), greenish-black, angular fragments, 1 to 4 mm in size, that are granular and contain quartz.
1,420-1,430	No sample.
1,430-1,440	No sample.
1,440-1,490	100% BASALT, as above.
Thin section made.
1,490-1,550	100% BASALT(?), as above, with angular fragments 1 to 2 mm in size.
1,550-1,560	50% FELSITE, white to very light gray, angular fragments, 1 to 3 mm in size.
50% BASALT(?), as above.
1,560-1,580	100% FELSITE, white to grayish white, angular fragments 1 to 4 mm in size, hard, probably siliceous. Some fragments are porphyritic with phenocrysts of altered white feldspar. A few fragments also contain disseminations and veinlets of pyrite.
1,580-1,600	100% FELSITE, as above, pink to purplish-gray, angular fragments 0.5 to 4 mm in size, containing red, reddish-brown, and black minute specks.
Lost circulation and fractures at 1,595 feet.
Thin section made.

LITHOLOGIC LOG

AN-A-79-4R (continued)

1,600-1,610	100% FELSITE, pale pink to purple, angular fragments 0.5 to 4 mm in size with banding, quartz veins, and disseminated pyrite. This could be either a welded tuff or a flow-banded rhyolite.
1,610-1,650	No sample, all lost circulation material. Fractures between 1,622 and 1,625 feet.
1,650-1,660	100% FELSITE, purple, banded, angular to subangular fragments 1 to 2 mm in size. Sample is mostly lost circulation material.
1,660-1,690	No sample, all lost circulation material.
1,690-1,730	95% FELSITE, light gray with purplish tint on some fragments. The fragments are angular, and between 0.5 to 2 mm in size. The purple tint is due to microspecks. 5% BASALT, black, probably slough from above. Thin section made.
1,730-1,760	No sample, all lost circulation material.
1,760-1,800	100% FELSITE, as above. Thin section made.
1,800-1,810 TD	No sample.

LITHOLOGIC LOG

AN-A-79-3

Depth Interval, Feet	Completion Date: 10/21/79
GL - 10	100% SILT, sandy, dark-brown, up to 5 mm sized clasts of weathered basalt with chalcedony vesicle-fillings. Trace green biotite crystal-tuff.
10 - 20	100% SILT, sandy, as above. No vesicles.
20 - 30	100% BASALT, orange-red to olive-brown, decomposed, partially brecciated.
30 - 40	75% BASALT, dark-green or olive-brown, weathered, partially brecciated with silica and possible cinnabar vein-fillings. Sample is similar to rock exposed at surface just south of 79-3. 25% CLAY, light-brown, plastic.
40 - 50	50% BASALT, olive-brown, friable, decomposed, partly brecciated. 50% BASALT(?), highly silicified with amygdulites of green chlorophaeite(?) rimmed zolite (?).
50 - 90	100% SILICIFIED BASALT(?), as above, with amygdulites, as above.
90-100	95% SILICIFIED BASALT(?), as above, but even more siliceous, friable, with red patches of iddingsite(?). 5% SILICIFIED TUFF(?), white siliceous material with red splotches; fragments are very fine and show trace of linear fabric.
100-110	95% BASALT(?), as above, dark-green, friable. 5% SILICIFIED TUFF(?), white to light-gray, seems to be associated with basalts.
110-120	80% BASALT(?), as above. 20% SILICIFIED TUFF(?), white, streaked with red and black with a definite linear fabric.
120-140	70% BASALT(?), purple, highly altered, with amygdulites and vein-fillings of soft white zeolite(?) and green chlorite(?) minerals which are zoned concentrically. 30% CLAY, purplish-brown, plastic.

AN-A-79-3, Continued

- 140-150 75% CLAY, purplish-brown, as above.
 25% BASALT, purple and some green, altered, with secondary
 minerals, as above.
- 150-170 75% CLAY, gray, soft, not as plastic as above.
 15% BASALT, green and purple, as above.
 10% CLAY, green, hard, friable, with crystals and fragments
 of purple basalt.
- 170-180 95% CLAY, light brownish-gray with purple streaks, plastic.
 5% Miscellaneous fragments of purple and dark-green igne-
 ous rocks and friable hard green clay, as above.
- 180-190 90% CLAY, as above.
 10% Miscellaneous fragments, as above.
- 190-210 100% CLAY, light brownish-gray, very sticky, plastic, with
 miscellaneous rock fragments, as above.
- 210-240 80% CLAY, as above.
 10% TUFF(?), pale green, friable, but somewhat plastic when
 wet. Contains crystals and fragments of aphanitic gray
 rock.
 10% APHANITIC IGNEOUS ROCK, dark-gray to purple.
- 240-270 75% CLAY, pale gray-brown, plastic, sticky.
 20% TUFF(?), pale green to white, as above.
 5% APHANITIC IGNEOUS ROCK, purplish-gray, as above, some
 with patches of green secondary mineralization.
- 270-300 70% CLAY, as above.
 15% TUFF, pale green, as above.
 15% APHANITIC IGNEOUS ROCK, medium gray to pink, as above.
- 300-310 50% CLAY, light-gray to brown, soft, plastic.
 30% TUFF or TUFF BRECCIA, green to pale greenish-white, with
 crystals of biotite and fragments of purplish-brown
 aphanitic rock with occasional flattened glass shards.
 20% APHANITIC IGNEOUS ROCK, light purplish-brown, as above.
 Trace dark basalt.
- 310-330 75% CLAY, as above.
 15% TUFF, as above.
 10% APHANITIC IGNEOUS ROCK, as above; some appear to be flow-
 banded and rhyolitic. Colors from purplish to reddish-
 brown and black with occasional patches of green second-
 ary minerals and minute metallic (pyrite?) specks.

AN-A-79-3, Continued

330-340	95% CLAY, as above. 5% TUFF and APHANITIC IGNEOUS ROCK, as above.
340-350	90% CLAY, as above. 10% TUFF, as above Trace dark aphanitic igneous rock.
350-370	85% CLAY, as above. 10% TUFF, as above. 5% APHANITIC IGNEOUS ROCK, as above.
370-390	85% CLAY, brown to light gray-brown, plastic. 10% TUFF, as above. 5% APHANITIC IGNEOUS ROCK, as above, with some reddish-brown in addition to purple and gray.
390-400	80% CLAY, light gray-brown, soft, plastic. 15% TUFF, as above. 5% APHANITIC IGNEOUS ROCK, purple, similar to clasts in tuffs.
400-420	60% CLAY, gray, soft, not cohesive. 30% TUFF(?), dark-green, fine-grained, harder than above, with no visible crystals or rock fragments, friable. 10% APHANITIC IGNEOUS ROCK, light purple-gray, as above.
420-430	50% CLAY, purple-red, soft. 45% APHANITIC IGNEOUS ROCK, purple-red, with irregular white flecks of secondary silica(?), partly altered to clay, friable. 5% TUFF, green, possibly caving.
430-440	50% CLAY, purple-red, soft. 50% APHANITIC IGNEOUS ROCK, purple-red, with some secondary silica and potassium feldspar crystals, massive.
440-450	50% CLAY, purple-red, soft. 40% APHANITIC IGNEOUS ROCK, red, partly altered to clay, as above. 10% TUFF, green, as above, possibly cavings.
450-460 TD	50% CLAY, purple-red, soft. 50% APHANITIC IGNEOUS ROCK, red, as above.

LITHOLOGIC LOG

AN-A-80-6

Depth Interval, Feet	Completion Date: 6/19/80
GL-10	90% RHYOLITE, gray to pink, aphanitic groundmass with phenocrysts of K-spar, plagioclase, biotite, and quartz. The biotite phenocrysts were euhedral, up to 2 mm in size, but predominantly 0.5 mm, and altering to gold color. 10% CLAY.
10-20	90-95% RHYOLITE, as above, angular fragments up to 22 mm in size that are predominantly flat. 5-10% CLAY, as above.
20-30	90-95% RHYOLITE, as above, fragment size is predominantly 2 to 6 mm, with a maximum of 10 mm. 5-10% CLAY, as above.
30-40	90-95% RHYOLITE, as above. Groundmass has a brownish-red color, with yellowish-white phenocrysts of plagioclase or K-spar. Fragments are not as flat as above. 5-10% CLAY, as above.
40-50	90-95% RHYOLITE, as above, with angular fragments 2 to 10 mm in size with rust-colored spots and lines, probably an iron-oxide alteration. 5-10% CLAY, as above.
50-70	90-95% RHYOLITE, as above, angular fragments predominantly 1 to 5 mm. One fragment showed a banded flow structure on microscopic scale. 5-10% CLAY, as above.
70-80	95-100% SAND, medium to very coarse, angular to sub-rounded, consisting predominantly of rhyolite, and material similar to above samples. 5% CLAY, as above.
80-90	100% RHYOLITE PORPHYRY, similar to rhyolite above. Angular fragments are 1 to 10 mm in size, with a yellowish green tint to matrix and phenocrysts.
90-110	100% RHYOLITE PORPHYRY, as above, but overall color of sample becoming grayer.

LITHOLOGIC LOG

AN-A-80-6 (continued)

110-120	100% BIOTITE DACITE PORPHYRY, with a gray groundmass (hard), and white phenocrysts of soft, altered plagioclase.
120-130	No sample.
130-140	No sample.
140-150	No sample.
150-160	No sample.
160-200	100% BIOTITE DACITE PORPHYRY, gray groundmass, with white to yellowish-white phenocrysts, and some phenocrysts of biotite and hornblende(?).
200-230	100% CRYSTAL TUFF, silicified, gray and similar in appearance to above, but more clasts are visible. One fragment showed silica-filled micro-fractures.
230-240	100% CRYSTAL TUFF, as above, with fragments up to 10 mm in size.
240-250	100% CRYSTAL TUFF, as above, with fragments up to 18 mm in size.
250-260	90% CRYSTAL TUFF, as above, with darker-colored matrix ranging from dark gray to brownish gray. 10% CLAY, red.
260-290	85% BASALT (Steens?) amygdaloidal, dark reddish-brown to gray, with green alteration or mineralization, and large plagioclase phenocrysts.
290-310	100% BASALT, brownish-red, fractured or brecciated, with fractures filled with white siliceous material.
310-320	100% BASALT, as above, with biotite phenocrysts.
320-330	100% BASALT, as above, containing considerable amount of biotite. Fragments have flat shape, up to 28 mm in size.
330-370	100% BASALT, as above, with large plagioclase(?) phenocrysts.
370-380	100% BASALTIC GLASS(?), green to purplish gray, with phenocrysts of biotite.

LITHOLOGIC LOG

AN-A-80-6 (continued)

390-400	No sample.
400-420	100% BASALTIC GLASS, as above, with flat angular fragments up to 16 mm.
420-435	100% BASALTIC GLASS, as above, with waxy luster.
435-450	100% VOLCANIC SEDIMENTS, fine sand to gravel, angular to subrounded, with varied lithologies: rhyolite, dacite tuff, quartz, and feldspar.
450-460	100% VOLCANIC SEDIMENTS, as above, with fines consisting of predominantly quartz, feldspar, biotite, and minor amounts of minute magnetite crystals.
460-470	100% VOLCANIC SEDIMENTS, as above, with gravel clasts as large as 40 mm. Possibly drilled through some boulders, as drilling was periodically hard.
470-500 TD	100% VOLCANIC SEDIMENTS, as above, with clasts up to 66 mm, and reddish coatings. These samples may be partly to predominantly slough material.

LITHOLOGIC LOG

AN-A-34

Depth Interval, Feet	Completion Date: 8/15/78
GL - 30	80% SILT, sandy. 20% GRAVEL, sandy, up to 12 mm sized well-rounded clasts of mixed volcanic composition.
30 - 40	50% SILT and GRAVEL, as above. 50% BASALT, aphanitic to medium-grained, with feldspar laths and calcite stringers.
40 - 60	100% BASALT, as above.
60 - 80	50% BASALT, as above. 50% BASALT, fine to medium-grained, with some black amygdules.
80-120	100% BASALT, gray to green, fine to medium-grained, massive. <u>CONDUCTIVITY SAMPLE TAKEN AT INTERVAL 90-100.</u>
120-140	90% BASALT, as above. 10% CLAY, gritty, gray.
140-170	70% BASALT, as above. 30% CLAY, gritty.
170-180	60% BASALT, as above. 40% CLAY, gritty.
180-190	90% CLAY. 10% SAND, coarse, subrounded clasts of basalt.
190-200	100% CLAY.
200-210	85% CLAY. 15% SAND and GRAVEL, up to 24 mm, subangular to rounded, basaltic.
210-250	85% CLAY, gritty. 15% GRAVEL(?), boulders of basalt.
250-260	50% CLAY, gritty. 50% GRAVEL(?), boulders of basalt.

AN-A-34, Continued

260-270	70% GRAVEL(?), basalt boulders, as above. 30% CLAY, gritty.
270-280	50% CLAY, gritty. 50% GRAVEL(?), basalt boulders, as above.
280-290	70% BASALT(?), massive flow. 30% CLAY, gritty. <u>CONDUCTIVITY SAMPLE TAKEN.</u>
290-300 TD	50% BASALT. 50% CLAY.

LITHOLOGIC LOG

AN-A-44

Depth
Interval,
Feet

Completion
Date:
10/2/78

GL - 20	100% CLAY and MUDSTONE, dark-brown.
20 - 30	75% CLAY and MUDSTONE, dark-brown. 25% CLAY, black.
30 - 40	90% CLAY and MUDSTONE, dark-brown. 10% CLAY, black.
40 - 60	60% SAND, up to 4 mm rounded clasts of black basalt. 30% CLAY and MUDSTONE, dark-brown. 10% CLAY, black. Trace clear subangular to subrounded quartz in interval 50-60.
60 - 70	60% SAND, 4 mm sized rounded clasts of red and black basalt. 35% CLAY, black. 5% OLIVINE and QUARTZ.
70 - 80	60% SAND, as above. 20% CLAY, black. 15% MUDSTONE, gray. 5% OLIVINE and QUARTZ.
80-100	60% MUDSTONE, gray. 20% CLAY, black. 15% SAND, as above, rounded black basalt clasts. 5% OLIVINE and QUARTZ.
100-120	60% GRAVEL, up to 10 mm rounded clasts of black basalt. 20% CLAY, black. 20% MUDSTONE, gray. Trace olivine, white and clear quartz, and zircon(?).
120-140	60% MUDSTONE, gray. 20% SAND, up to 4 mm rounded clasts of black basalt. 20% CLAY, black. Trace olivine, white and clear quartz, and zircon(?).
140-180	80% CLAY, black and gray. 20% SAND, as above. Trace olivine, quartz, and zircon(?).

AN-A-44, Continued

- 180-280 85% MUDSTONE, gray.
 10% SAND and GRAVEL, up to 10 mm, black basalt clasts,
 rounded.
 5% CLAY, gray.
 Trace quartz, zircon, and olivine.
- 280-380 85% CLAY, light-gray to black.
 10% SAND and GRAVEL, as above.
 5% MUDSTONE, gray.
 Trace zircon and quartz.
- 380-390 60% CLAY, black to dark-gray to dark-brown.
 40% SAND, less than 2 mm sized rounded, moderately well-
 sorted, composed of basalt, quartz, zircon, and mud-
 stone.
- 390-400 50% CLAY, as above.
 50% SAND and GRAVEL, up to 12 mm sized rounded and poorly-
 sorted clasts of primarily basalt, with minor zircon
 and quartz.
- 400-500 TD 100% SAND and GRAVEL, as above, with rounded clasts of black
 and red partly-vesicular basalt, gray mudstone, quartz,
 feldspars, zircon, and olivine.

LITHOLOGIC LOG

AN-A-49

Depth
Interval,
Feet

Completion
Date:
9/21/78

GL - 10	100% MUDSTONE, light-brown.
10 - 20	75% SAND, light-greenish-brown, fine-grained, equigranular, with mica. 25% MUDSTONE, light-brown.
20 - 30	100% SAND, as above.
30 - 60	75% GRAVEL, cobble-sized, well-rounded. 25% SAND, silty, light-green. Overall color of sample becomes yellowish between 40 and 50 feet, and greenish between 50 and 60 feet.
60 - 80	75% GRAVEL, cobble-sized, subangular to well-rounded, volcanic, with overall greenish color. 25% CLAY, green.
80 - 90	65% GRAVEL, cobble-sized, well-rounded clasts of dark-gray basalt. 35% CLAY, green.
90-110	55% GRAVEL, up to 20 mm angular basalt clasts. 45% CLAY, green.
110-130	90% GRAVEL, subangular to well-rounded cobbles of basalt. 10% CLAY, green.
130-200	100% GRAVEL, up to 12 mm sized well-rounded clasts of gray to multicolored volcanic rocks including some vesicular basalt.
200-290	100% GRAVEL, as above, subangular to well-rounded, with trace quartz.
290-300	95% GRAVEL, as above. 5% CLAY, green.
300-350	85% GRAVEL, as above. 15% CLAY, green.
350-360	60% GRAVEL, as above. 40% CLAY, green.

AN-A-49, Continued

360-380	75% CLAY, green and brown. 25% GRAVEL, sandy, up to 6 mm, as above.
380-390	95% CLAY, green, brown, and gray. 5% GRAVEL, fine, as above.
390-400	65% CLAY, as above. 35% GRAVEL, as above.
400-420	90% CLAY, reddish-brown. 10% GRAVEL, up to 12 mm subangular to well-rounded, with trace quartz.
420-440	95% CLAY, reddish-brown and green. 5% GRAVEL, fine, up to 6 mm, as above.
440-450	100% CLAY, silty, red, green, and gray.
450-460	95% CLAY, as above. 5% GRAVEL, fine, as above.
460-500 TD	100% CLAY, as above.

LITHOLOGIC LOG

P-21

(Received from Phillips Petroleum Co.)

Depth
Interval,
Feet

GL-20	100% CLAY, brown. Playa deposit.
20-40	SAND, fine, with minor clay.
40-90	GRAVEL and SAND with minor clay.
90-280	GRAVEL, with minor sand.
280-300 TD	SAND, medium to coarse-grained.

LITHOLOGIC LOG

P-22

(Received from Phillips Petroleum Co.)

Depth
Interval,
Feet

GL-100	SAND and GRAVEL, fine.
100-120	SAND with minor gravel.
120-300 TD	SAND, coarse, and GRAVEL.

LITHOLOGIC LOG

AN-B-60

Depth
Interval,
FeetCompletion
Date:
9/8/78

GL-10	60% SAND, up to 2 mm. sized well-rounded clasts. 40% GRAVEL, up to 6 mm. well-rounded clasts of basalt, with secondary quartz.
10-20	60% SAND and SANDSTONE, up to 2 mm., loosely lithified. 40% GRAVEL, as above.
20-30	80% CLAY. 20% SANDSTONE, friable, as above.
30-40	70% GRAVEL, well-rounded volcanic clasts with chalcedony. 20% SAND, up to 2 mm. sized clasts. 10% CLAY.
40-50	90% SANDSTONE, arkosic. 10% CLAY.
50-60	60% SANDSTONE, as above. 40% GRAVEL, well-rounded volcanic clasts, as above.
60-80	70% GRAVEL, as above. 30% SANDSTONE, as above.
80-90	100% CLAY, sandy, gritty.
90-100	90% CLAY, gritty. 10% SAND, with clasts composed of basalt and quartz.
100-120	55% CLAY. 45% SAND.
120-260	90% CLAY, gritty. 10% SAND. <u>Conductivity sample taken at interval 220-230.</u>
260-500 TD	100% CLAY, black to gray, with distinct sulfurous smell. <u>Conductivity sample taken at interval 400-410.</u>

LITHOLOGIC LOG

AN-B-62

Depth
Interval,
FeetCompletion
Date:
9/10/78

GL-30	75% CLAY, brown. 25% SAND and GRAVEL, up to 4 mm. well-rounded volcanic clasts with secondary quartz.
30-40	No sample. <u>Lost Circulation.</u>
40-60	100% CLAY, brown, gritty.
60-90	90% CLAY, brown. 10% GRAVEL, up to 24 mm. sized rounded clasts.
90-120	65% CLAY. 35% GRAVEL, up to 6 mm. subangular to well-rounded volcanic clasts with secondary quartz.
120-150	95% CLAY. 5% SAND.
150-160	100% CLAY.
160-170	75% CLAY. 25% GRAVEL, sandy, up to 20 mm. subangular to rounded volcanic clasts.
170-180	100% CLAY.
180-190	85% CLAY. 15% SAND, up to 2 mm. rounded clasts.
190-210	70% SAND and GRAVEL, 1 to 12 mm. sized subangular to well-rounded volcanic clasts. 30% CLAY.
210-240	50% SAND and GRAVEL, as above, rounded, with secondary quartz. 50% CLAY.
240-270	55% CLAY. 45% SAND and GRAVEL, as above. <u>Conductivity sample taken at interval 260-270.</u>
270-290	70% CLAY. 30% SAND and GRAVEL, as above.

AN-B-62, Continued

290-300	90% SAND and GRAVEL, as above. 10% SILT, clayey.
300-320	80% CLAY. 20% SAND, up to 2 mm. rounded clasts.
320-330	50% GRAVEL, sandy, up to 12 mm. rounded volcanic clasts with chalcedony. 50% CLAY.
330-340	60% SAND and GRAVEL, up to 12 mm. sized rounded clasts. 40% QUARTZ.
340-350	50% CLAY. 50% SAND and GRAVEL, up to 12 mm. sized rounded volcanic clasts.
350-370	70% CLAY. 30% SAND and GRAVEL, as above, with secondary quartz.
370-500 TD	90% CLAY. 10% SAND and GRAVEL, up to 7 mm. sized rounded clasts of primarily red volcanics. <u>Conductivity sample taken at interval 460-470.</u>

LITHOLOGIC LOG

AN-B-63

Depth,
Interval,
Feet

Completion
Date:
4/8/80

GL-10	70% SAND, fine to coarse-grained, angular to sub-rounded, with grains of quartz, feldspar, chert, and other volcanic lithic fragments. 20% GRAVEL, predominantly pebble sized up to 15 mm, with predominantly volcanic lithic fragments. 10% CLAY, brown, carrying fine sand.
20-40	50% SAND, as above. 25% GRAVEL, as above. 20% CLAY, as above. 5% SANDSTONE, gray, angular fragments, with an open framework of fine well-indurated sand. Grains are angular to sub-rounded, consisting of quartz, feldspar, magnetite(?), and basalt lithic fragments.
40-50	50% SAND, as above. 25% GRAVEL, as above, up to 25 mm. 25% CLAY, as above.
50-60	45% SAND, as above. 25% CLAY, as above. 20% GRAVEL, as above. 10% CLAYSTONE or SILTSTONE, brown, angular fragments that can be broken with fingernail.
60-70	60% SAND, as above, with size predominantly coarse as above. 25% CLAY and CLAYSTONE, as above. 15% GRAVEL, as above.
70-80	50% SAND, as above. 30% CLAY and CLAYSTONE, brown claystone containing black streaks of organic matter. 20% GRAVEL, as above.
80-90	50% SAND, as above, fine to coarse-grained. 30% CLAY and CLAYSTONE, as above. 20% GRAVEL, as above.
90-100	60% SAND, as above. 20% GRAVEL, as above. 20% CLAY and CLAYSTONE, as above.

LITHOLOGIC LOG

AN-B-63 (continued)

100-110	60% SAND, as above. 25% GRAVEL, as above. 15% CLAY, as above.
110-140	50% SAND, as above. 40% CLAY, as above, mostly washed away. 10% GRAVEL, as above.
140-150	85% CLAYSTONE, light brown, easily crushed or broken with fingernail. 10% GRAVEL, as above. 5% SAND, as above.
150-160	60% CLAYSTONE, brown. 15% GRAVEL, as above. 15% SILTSTONE, greenish-gray. 10% SAND, as above.
160-170	60% CLAYSTONE, as above. 25% SAND, as above. 10% SILTSTONE and CLAY, greenish-gray. 5% GRAVEL, as above.
170-180	50% SILTSTONE, or CLAY, greenish gray, as above. 30% CLAYSTONE, brown, as above. 15% SAND, as above. 5% GRAVEL, as above.
180-190	70% SILTSTONE or CLAYSTONE, greenish-gray, as above, can be broken with fingernail. 25% CLAY and CLAYSTONE, brown, as above, can be broken with fingernail. 5% SAND, fine to medium, and silt.
190-200	65% CLAYSTONE, green, with average size much smaller than above. 30% CLAYSTONE and CLAY, brown, with average fragment size much smaller than above. 5% SAND, as above.
200-210	80% CLAY and CLAYSTONE, greenish gray, as above. 10% CLAY and CLAYSTONE, brown, as above. 10% SAND, as above.
210-220	90% CLAY and CLAYSTONE, greenish gray, in clay balls, with fragment size 1 to 5 mm. 5% CLAY, brown, as above. 5% SAND, as above.

LITHOLOGIC LOG

AN-B-63 (continued)

220-250	95% CLAY and CLAYSTONE, greenish gray, angular fragments up to 12 mm that can be broken with fingernail. 5% SAND, as above.
250-260	70% CLAY and CLAYSTONE, greenish gray, as above. 15% CLAY and CLAYSTONE, brown, as above. 15% SAND, as above.
260-270	90% CLAY and CLAYSTONE, greenish gray, as above. 5% CLAY and CLAYSTONE, brown, as above. 5% SAND, as above.
270-280	80% CLAY and CLAYSTONE, greenish gray clay is soft and sticky, carrying very fine black sand and silt, which is hard to wash out. 19% SAND, fine to coarse, sub-angular to sub-rounded. 1% GRAVEL, up to 15 mm, angular to rounded.
280-290	75% CLAY, brown and gray, sticky, soft, forming balls carrying coarse sand and gravel. 25% SAND and GRAVEL, medium to coarse, angular to sub-rounded, with gravel up to 12 mm.
290-300	65% CLAY, brown, gray, and beige, as above. 25% SAND and GRAVEL, as above. 10% CLAYSTONE, greenish gray, angular fragments that can be broken with fingernail.
330-350	70% CLAY, as above. 30% SAND and gravel, as above.
350-360	90% CLAY, brown to reddish brown. 10% SAND and GRAVEL, as above.
360-400	80% CLAY, as above. 20% SAND and gravel, as above.
400-430	60% CLAY, brown, as above, but softer and washes away. 30% SAND, fine to coarse, predominantly medium sized grains. 10% CLAY and CLAYSTONE, green gray, as above.
430-500 TD	50% CLAY, brown, as above. 50% SAND and GRAVEL, medium-sized sand to small pebbles, up to 12 mm in size.

LITHOLOGIC LOG

AN-B-64

Depth
Interval,
FeetCompletion
Date:
9/6/78

GL-10	100% SAND, up to 2 mm. sized volcanic clasts with secondary quartz.
10-50	80% SAND and GRAVEL, up to 12 mm. well-rounded volcanic clasts. 20% SANDSTONE, medium-grained well-rounded, friable, or predominantly quartz.
50-60	90% CLAY. 10% SAND and GRAVEL, as above.
60-100	60% CLAY. 40% GRAVEL, sandy, up to 12 mm. sized clasts of volcanic composition.
100-130	85% CLAY. 15% SAND and GRAVEL, up to 12 mm. sized well-rounded basaltic clasts.
130-140	100% CLAY, green.
140-200	90% CLAY, green. 10% SAND, up to 2 mm. well-rounded volcanic clasts.
200-500 TD	100% CLAY, gray, with occasional sand to fine-gravel lenses of well-rounded volcanics and secondary quartz. <u>Conductivity sample taken at interval 400-410.</u>

LITHOLOGIC LOG

AN-B-64R

Depth Interval, Feet	Completion Date: 3/29/80
GL-10	90% SAND, medium to coarse, up to 1 mm sized, angular to subrounded grains of quartz, chert, and mafic minerals. 10% SILT, brown. Trace gravel.
10-20	80% GRAVEL, 5 to 10 mm sized angular to subangular grains of volcanic rock and quartz. 10% SAND, coarse, as above. 10% SILT, brown.
20-30	90% CLAY, light brown, unconsolidated to weakly lithified. 10% SILT, brown.
30-40	75% FINE SANDS, occasionally consolidated. 25% SILTS.
40-50	70% SAND, medium to coarse, as above. 25% GRAVEL, 5 to 7 mm sized subangular grains of predominantly dark aphanitic basalt. 5% SILT, brown.
50-60	80% SAND, fine to coarse, as above. 15% SILT, brown. 5% CLAY.
60-70	95% SAND, coarse, with 1 mm average sized angular to subangular grains of quartz, multicolored chert and dark colored rock. 5% SILT and fine sand.
70-80	100% SAND, fine to coarse, as above. Minor SILT.
80-90	100% SAND, as above, predominantly subangular.
90-100	100% SAND, very coarse, angular grains of quartz and chert.
100-130	100% SAND, as above, with abundant dark colored grains.

LITHOLOGIC LOG

AN-B-64R (continued)

130-140	50% CLAY, sandy, blue-gray, sticky. 45% SAND, very fine to coarse, mostly contained in clay-balls. 5% GRAVEL, probable cave-in from upper hole.
140-150	60% CLAY, blue-gray, sticky. 40% SAND, as above.
150-180	50% CLAY, as above. 50% SAND, mostly in clay balls, as above, with lesser amounts of free sand. Minor gravel, probably slough.
180-190	60% CLAY, blue-gray, sticky. 40% SAND, very fine-grained, contained in clays.
190-200	60% SAND, as above. 40% CLAY, as above.
200-210	70% SAND, very fine to coarse, angular to subrounded grains of quartz, feldspar, and volcanic rock. 30% CLAY, as above.
210-230	80% SAND, as above. 20% CLAY, as above.
230-240	No sample.
240-250	90% SAND, as above. 5% CLAY, as above. 5% GRAVEL, pebble size up to 8 mm.
250-260	90% SAND, as above. 10% CLAY, as above.
260-330	95% SAND, as above. 5% CLAY, as above.
330-360	100% SAND, as above.
360-370	95% SAND, as above. 5% CLAY, as above.
370-390	50% SILT and SAND, very fine, unconsolidated to moderately lithified, in colors of medium gray, to brownish-gray. 40% SAND, fine, with grains of quartz and volcanic rocks. 10% CLAY, gray-green.

LITHOLOGIC LOG

AN-B-64R (continued)

390-400	90% SAND, fine, with clasts as above. 10% SILTSTONE, SANDSTONE, and CLAYSTONE.
400-410	80% SAND, fine. 20% SILTSTONE, SANDSTONE, and CLAYSTONE.
410-420	65% SAND, fine, some in brown clay-balls. 35% CLAYSTONE, gray-green. Minor gray siltstone.
420-430	90% SAND, fine, some in brown and gray clay-balls. 10% CLAYSTONE, gray-green. Minor gray siltstone.
430-460	60% SAND, fine to very fine, unconsolidated to moderately lithified, composed of quartz and volcanic rock, some in brown-gray clay balls. 40% CLAYSTONE, gray-green. Minor gray siltstone.
460-480	90% SAND, fine to very fine, as above. 10% CLAYSTONE and SILTSTONE, as above.
480-490	80% SAND, very fine to coarse, angular to rounded grains of quartz, feldspar, volcanic rock. 20% CLAYSTONE or SILTSTONE, grayish green to gray, in angular chips which can be easily crushed between fingernails.
490-500	75% SAND, as above, with greater proportion of coarse-sized grains. 25% CLAYSTONE or SILTSTONE, as above.
500-510	70% SAND, as above. 20% CLAYSTONE, green, chips up to 15 mm in size, can be crushed with fingers. 5% SILTSTONE, gray, harder than claystone. 5% CLAY, brown to gray, soft, in balls with sand.
510-520	75% SAND, as above. 22% CLAYSTONE, green, as above. 3% SILTSTONE, gray, as above.
520-530	70% SAND, as above. 25% CLAYSTONE, green, as above. 5% CLAY, brown-gray, soft. Minor gray siltstone.

LITHOLOGIC LOG

AN-B-64R (continued)

530-540	70% SAND, as above. 20% CLAYSTONE, green, as above. 10% CLAY, brownish-gray, in small soft balls containing sand. Minor gray siltstone.
540-550	80% SAND, as above. 15% CLAYSTONE, green. 5% CLAY, brown-gray, soft, in balls.
550-560	No sample.
560-590	75% SAND, as above. 20% CLAYSTONE, green, as above. 5% CLAY, brown-gray, as above.
590-600	75% SAND, as above. 20% CLAYSTONE, green, chips up to 25 mm in size. 5% CLAY, brown-gray, soft, containing sand.
600-610	60% SAND, as above. 20% CLAYSTONE, green, as above. 20% CLAY, brown-gray, in balls containing fine sand.
610-620	50% SAND, as above. 30% CLAY, brown-gray, in balls, as above. 20% CLAYSTONE, green, as above.
620-650	60% SAND, as above. 25% CLAY, brown-gray, as above. 15% CLAYSTONE, green, as above.
650-660	60% SAND, fine to coarse. 30% SILT, brown, SAND, very fine, and CLAY. 10% CLAYSTONE, gray-green, as above.
660-670	60% SAND, as above. 35% SILT, CLAY and SAND, as above. 5% CLAYSTONE, as above.
670-690	50% SAND, fine to medium-grained. 50% CLAY, brown, SILT, and SAND, very fine, probably mostly irregular interbeds with the coarser sand.
690-700	60% SAND, as above. 40% CLAY, SILT, and SAND, as above.

LITHOLOGIC LOG

AN-B-64R (continued)

700-710	No sample.
710-740	60% SAND, as above. 40% CLAY, SILT, and SAND, very fine, as above.
740-750	70% SAND, fine to medium. 30% CLAY-SILT, brown.
750-790	50% SAND, as above. 50% CLAY-SILT, brown and red-brown.
790-820	50% SAND, as above, fine to medium, but predominantly fine-grained. 50% CLAY-SILT, mostly brown, less red-brown.
820-840	50% SAND, very fine to coarse, angular to sub-rounded, with grains consisting predominantly of quartz and volcanic lithologies. 50% CLAY-SILT, brown, reddish brown, and gray.
840-850	50% SAND, as above. 50% CLAY-SILT, with <5% gray-green claystone.
850-860	75% CLAY-SILT, brown. 25% SAND, predominantly fine, with some medium to coarse.
860-870	75% CLAY-SILT, brown and red-brown. 25% SAND, as above.
870-880	60% CLAY-SILT, same as above. 40% SAND, as above.
880-890	70% CLAY-SILT, as above. 30% SAND, as above.
890-920	80% CLAY-SILT, as above. 20% SAND, as above.
920-930	90% CLAY, as above. 10% SAND, as above.
930-940	95% CLAY, as above. 5% SAND, probably slough.
940-970	100% CLAY, poor sample with traces of sand.

LITHOLOGIC LOG

AN-B-64R (continued)

970-980	90% CLAY, brown, washing into drilling mud. 10% SAND, as above.
980-990	95% CLAY, brown. 5% SAND, fine, and SILT.
990-1,020	95% CLAY, brown, and grayish brown. 5% SAND, very fine to medium.
1,020-1,050	60% CLAY, grayish brown. 40% SAND, as above, very fine to medium.
1,050-1,070	60% CLAY, as above, with one piece of soft, green clay. 40% SAND, as above.
1,070-1,080	60% CLAYSTONE or SILTSTONE, light to dark blue-green. Moderately hard, can be broken with fingernail. 30% CLAY, brown, as above (most washed away). 10% SAND, as above.
1,080-1,090	50% CLAY, blue-green, chips up to 5 mm, can be broken with fingernail. 30% CLAY, brown, washed away. 20% SAND, as above.
1,090-1,100	100% CLAY, blue-green, reddish brown, and white, containing sand and silt (approximately 5%).
1,100-1,110	90% BASALT, black, angular fragments, up to 5 mm. 10% CLAY, blue green.
1,110-1,140 TD	100% BASALT, black, dense, angular, up to 5 mm. Sample contaminated with uphole material.

LITHOLOGIC LOG

AN-B-65

Depth
Interval,
FeetCompletion
Date:
10/3/78

GL-20	100% CLAY, dark-brown to dark-gray.
20-40	75% SAND and GRAVEL, up to 12 mm. sized poorly sorted subangular to rounded clasts of mixed lithology including black basalt, red vesicular basalt, white quartz and zircon. 25% CLAY, dark-gray to black.
40-50	95% SAND, gravelly, up to 6 mm. sized clasts, as above. 5% CLAY, dark gray to black.
50-60	100% SAND, up to 4 mm. sized well-sorted, subrounded to rounded clasts, as above.
60-80	100% SAND and GRAVEL, up to 12 mm. sized poorly sorted clasts, as above.
80-180	90% SAND and GRAVEL, as above. 10% CLAY, brown and gray.
180-200	75% SAND and GRAVEL, up to 8 mm. sized poorly sorted subangular to subrounded clasts of mixed lithology including black basalt, red vesicular basalt, quartz, feldspar, olivine, zircon and chert. 25% MUDSTONE, gray.
200-442 TD	90% SAND and GRAVEL, as above. 10% CLAY, gray.

LITHOLOGIC LOG

AN-B-68

Depth
Interval,
Feet

Completion
Date:
4/10/80

GL-10	No sample.
10-20	70% CLAY, green. 15% SAND, medium to coarse, sub-angular to rounded, with predominantly dark grains. 15% GRAVEL, size up to 30 mm, sub-angular to sub- rounded, with predominantly basalt or other volcanic rock fragments.
20-30	70% CLAY, brown and green. 20% SAND, as above. 10% GRAVEL, as above, up to 15 mm.
30-90	90% CLAY, brown. 10% SAND, predominantly medium to very coarse, sub-angular to sub-rounded grains of quartz, feldspar, and volcanic rock. Minor GRAVEL up to 15 mm, as above.
90-100	90% CLAY, brown, as above. 7% SAND, as above. 3% CLAYSTONE, brown, angular fragments, up to 10 mm that can be broken with fingernail, containing black streaks and patches, possible organic matter.
100-110	85% CLAY, brown, as above. 15% SAND, as above.
110-120	70% CLAY, brown, as above. 20% GRAVEL, up to 15 mm, as above. 10% SAND, medium to very coarse, as above.
120-130	90% CLAY, as above. 3% SAND, as above. 7% GRAVEL, as above.
130-140	90% CLAY, as above. 5% SAND, as above. 5% GRAVEL, as above.
140-150	75% CLAY, as above. 10% SAND, as above. 15% GRAVEL, as above, angular to sub-rounded, up to 25 mm.

LITHOLOGIC LOG

AN-B-68 (continued)

150-160	60% CLAY, as above. 25% SAND, as above. 15% GRAVEL, as above, up to 10 mm in size.
160-170	80% CLAY, as above. 15% SAND, as above. 5% GRAVEL, as above.
170-190	85% CLAY, as above. 10% SAND, as above. 5% CLAYSTONE, brown, as above, in interval 90 to 100.
190-200	85% CLAY, as above. 15% SAND and GRAVEL, as above.
200-210	80% CLAY, as above. 10% SAND, as above. 10% GRAVEL, as above, up to 15 mm in size.
210-220	85% CLAY, as above. 10% SAND, as above. 5% GRAVEL, as above.
220-240	90% CLAY, as above. 10% SAND and GRAVEL, as above.
240-250	85% CLAY, as above. 10% SAND, as above. 5% CLAYSTONE, as above.
250-260	50% CLAY, as above. 25% SAND, medium to coarse. 25% GRAVEL, predominantly pebble size.
260-270	70% CLAY, as above. 20% SAND, as above. 10% GRAVEL, as above.
270-290	75% CLAY, as above. 25% SAND and GRAVEL.
290-300	70% CLAY, as above. 20% SAND, as above. 10% GRAVEL, as above.
300-320	60% CLAY, brown, as above. 30% SAND, medium to coarse, sub-angular to sub-rounded. 10% GRAVEL, as above.

LITHOLOGIC LOG

AN-B-68 (continued)

320-340	90% CLAY, as above. 10% SAND and GRAVEL, as above.
340-350	50% CLAY, as above. 50% SAND, medium to very coarse, as above.
350-360	70% CLAY, as above. 30% SAND and GRAVEL, as above.
360-370	90% SAND, predominantly medium-grained with some small gravel up to 5 mm. 10% CLAY, as above.
370-380	90% GRAVEL, with some coarse sand, as above, up to 12 mm. 10% CLAY, as above.
380-390	50% CLAY, brown and green, as above. 50% SAND, medium to coarse, as above.
390-400	60% CLAY, as above. 40% SAND, as above.
400-410	60% CLAY, as above. 40% SAND and GRAVEL, as above.
410-420	70% CLAY, as above. 20% SAND, as above. 10% GRAVEL, as above.
420-430	50% CLAY, as above. 40% SAND, as above. 10% GRAVEL, as above.
430-440	60% SAND, medium to coarse-grained, sub-angular to rounded, consisting of ~50% quartz and feldspar, with 50% volcanic grains. 20% GRAVEL, as above, volcanic grains. 20% CLAY, as above.
440-450	40% CLAY, green. 35% GRAVEL, as above, up to 25 mm. 25% SAND, as above.
450-460	60% CLAY, green, as above. 40% SAND and GRAVEL.

LITHOLOGIC LOG

AN-B-68 (continued)

460-490	70% CLAY, green, as above. 30% SAND and GRAVEL, as above.
490-500	50% CLAY, as above. 30% SAND, as above. 20% GRAVEL, as above.