



SOUTHERN METHODIST UNIVERSITY

INSTITUTE FOR THE STUDY OF EARTH AND MAN
GEOTHERMAL LABORATORY
DALLAS, TEXAS 75275

- _____ CRC
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- _____ JCM
- _____ KPR

April 14, 1978

*Mr. Ora Rostad, Lead flow
AMAX Co., Idaho*

✓ OH Mr. Ora Rostad
JAT AMAX Exploration, Inc.
 12620 West Cedar Drive
 Denver, Colorado 80226

- _____ LOK
- _____ FIS
- _____ DRAFT
- _____ SEC

Dear Ora:

I am enclosing a more complete set of data from the Golden Age mine area in Idaho than I sent you previously. This doesn't change any of those results, but will give you a little bit better idea of what we actually found there. I have included a complete temperature-depth listing from all the holes we have logged, and for each logging (two of the holes have been logged twice). I have also enclosed two temperature-depth plots showing the data. One of the temperature-depth plots shows the two temperature sets obtained from Drill Hole #11; the first, during a break in the drilling period in 1976, and the second, in 1977. The temperatures in the '76 logging are above those of the '77 logging in the upper part of the hole. This is because of the heating effect of the drilling fluid. The temperatures are almost exactly the same near the bottom of the hole, because during the period of rest, the temperatures at the bottom of the drill hole have almost recovered to the original rock temperatures. Of course, the better temperature gradient to use is of that obtained from the '77 logging, which does not show the influence of drilling. This gradient is relatively high for the central Idaho area, on the order of 35-40°C/km.

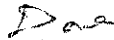
The second plot shows all of the temperature measurements from the various drill holes. The data from Drill Hole #11 are the most satisfactory. I have been wondering about the curvature of the data from DDH-5 for some period of time. It would appear now that there may be some downflow of water entering the hole at shallow depths and exiting somewhere deep in the borehole. This flow would depress the temperatures and cause the curved gradient observed in that hole. The true curve would probably be very similar to that observed in DDH-11. There were a couple of very strange segments in the curve for DDH-11. In particular, in the region between 200 and 225 meters (656 and 738 feet), and between 285 and 300 meters (935 to 984 feet), we observed temperature spikes of several °C. We are not sure whether these spikes are equipment problems or represent conditions in the borehole. If this hole is still open,



we would like to try to log it again next summer to see if these spikes persist. If they do, it implies that there is relatively warmer water moving upwards past the drill hole in these two sections of the hole. Even though the water is moving past the drill hole, it does not seem to be entering the drill hole.

All in all, these data are consistent with the fact that heat flow in this area is well above the regional background value, caused by some deep heat source probably associated with the hot springs along the south fork of the Payette. Whatever the heat source is, it would have to be several miles wide and if it extends all along the Payette, it would be very long. I don't quite know how to interpret the nature of this source, but certainly do imply there is a very large, relatively potent heat source present somewhere in the area.

Sincerely yours,



David D. Blackwell
Associate Professor of Geophysics

ddb/cjg

LOCATION: CHALLIS AVE, IDAHO
BN/ EE-16AAB
HOLE NUMBER: DDH- 1
DATE MEASURED: 6/24/72

DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOTHERMAL GRADIENT	
		DEG C	DEG F	DEG C/KM	DEG F/100 FT
5.0	16.4	5.510	41.92	0.0	0.0
10.0	32.8	6.120	43.02	122.0	6.7
15.0	49.2	6.620	43.92	100.0	5.5
20.0	65.6	6.720	44.10	20.0	1.1
25.0	82.0	6.810	44.26	18.0	1.0
30.0	98.4	6.940	44.49	26.0	1.4
35.0	114.8	7.080	44.74	28.0	1.5
40.0	131.2	7.220	45.00	28.0	1.5
45.0	147.6	7.370	45.27	30.0	1.6
50.0	164.0	7.520	45.54	30.0	1.6
50.0	196.8	7.750	46.02	27.0	1.5
70.0	229.6	7.950	46.31	16.0	0.9
80.0	262.4	8.140	46.65	19.0	1.0
90.0	295.2	8.390	47.10	25.0	1.4
100.0	328.0	8.660	47.59	27.0	1.5

LOCATION: CHALLIS AMS, IDAHO
 9N/ 6E-16AD
 HOLE NUMBER: DDH- 5
 DATE MEASURED: 7/31/72

DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOHERMAL GRADIENT	
		DEG C	DEG F	DEG C/KM	DEG F/100 FT
25.0	82.0	7.040	44.67	0.0	0.0
30.0	98.4	7.050	44.69	2.0	0.1
35.0	114.8	7.080	44.74	6.0	0.3
40.0	131.2	7.110	44.80	6.0	0.3
45.0	147.6	7.130	44.83	4.0	0.2
50.0	164.0	7.170	44.91	8.0	0.4
55.0	180.4	7.260	45.07	18.0	1.0
60.0	196.8	7.310	45.16	10.0	0.5
65.0	213.2	7.370	45.27	12.0	0.7
70.0	229.6	7.440	45.39	14.0	0.8
75.0	246.0	7.520	45.54	16.0	0.9
80.0	262.4	7.570	45.63	10.0	0.5
85.0	278.8	7.650	45.77	16.0	0.9
90.0	295.2	7.740	45.93	18.0	1.0
95.0	311.6	7.810	46.06	14.0	0.8
100.0	328.0	7.890	46.20	16.0	0.9
105.0	344.4	8.000	46.40	22.0	1.2
110.0	360.8	8.100	46.58	20.0	1.1
115.0	377.2	8.200	46.76	20.0	1.1
120.0	393.6	8.310	46.96	22.0	1.2
125.0	410.0	8.390	47.10	16.0	0.9
130.0	426.4	8.500	47.30	22.0	1.2
135.0	442.8	8.600	47.48	20.0	1.1
140.0	459.2	8.700	47.66	20.0	1.1
145.0	475.6	8.800	47.84	20.0	1.1
150.0	492.0	8.890	48.00	18.0	1.0
155.0	508.4	8.990	48.18	20.0	1.1
160.0	524.8	9.120	48.42	26.0	1.4
165.0	541.2	9.220	48.60	20.0	1.1
170.0	557.6	9.330	48.79	22.0	1.2
175.0	574.0	9.460	49.03	26.0	1.4
180.0	590.4	9.610	49.30	30.0	1.6
185.0	606.8	9.770	49.59	32.0	1.8
190.0	623.2	9.880	49.78	32.0	1.8
195.0	639.6	10.050	50.09	34.0	1.9
200.0	656.0	10.200	50.36	30.0	1.6
205.0	672.4	10.360	50.65	32.0	1.8
210.0	688.8	10.540	50.97	36.0	2.0
215.0	705.2	10.690	51.24	30.0	1.6

LOCATION: CHALLIS AMS, IDAHO
 BN/ 6E-16RAD
 HOLE NUMBER: DDH- 5
 DATE MEASURED: 7/31/72

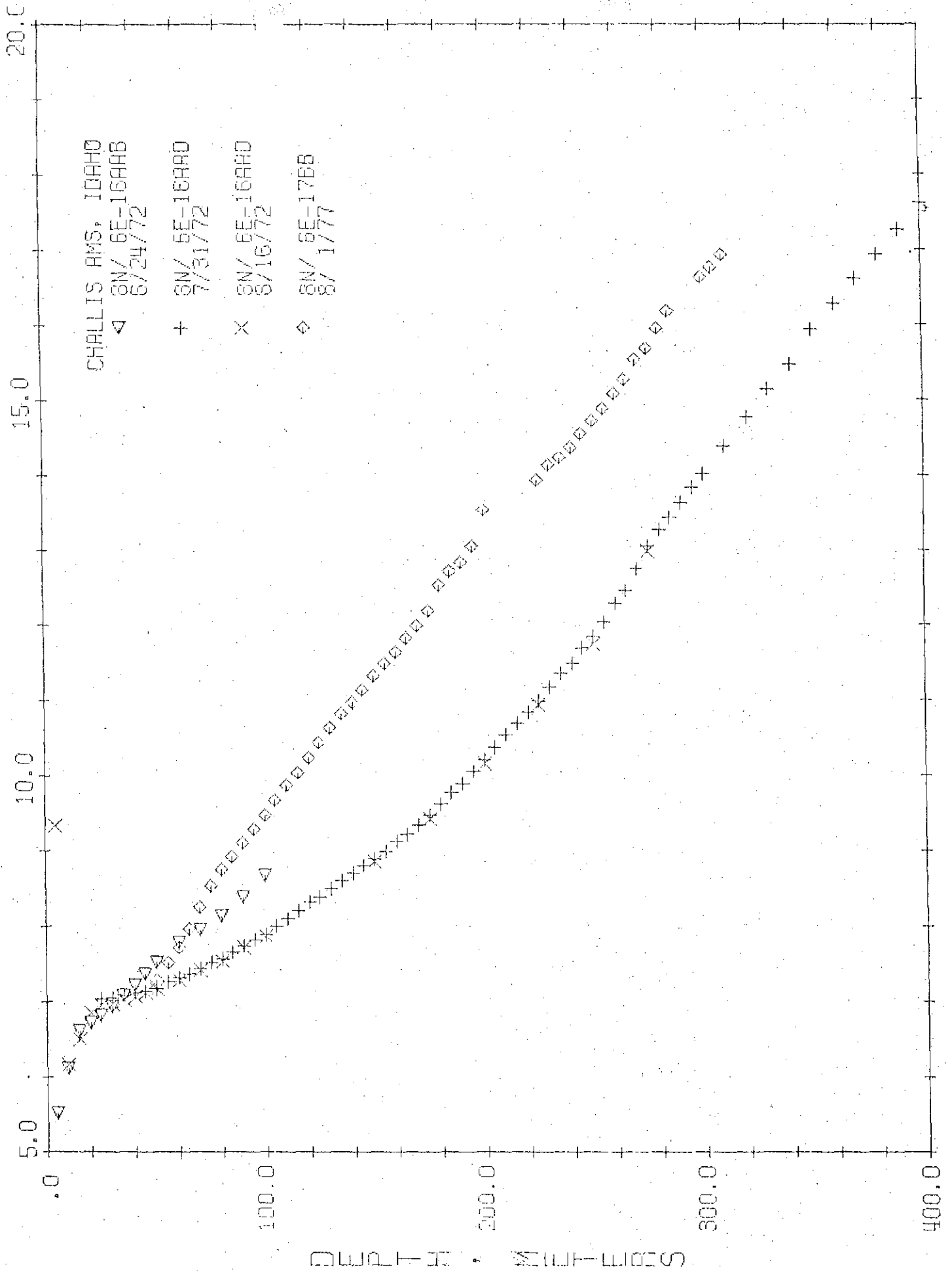
PAGE 2

DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOTHERMAL GRADIENT	
		DEG C	DEG F	DEG C/KM	DEG F/100 FT
220.0	721.6	10.840	51.51	30.0	1.6
225.0	738.0	10.950	51.78	30.0	1.6
230.0	754.4	11.160	52.09	34.0	1.9
235.0	770.8	11.350	52.43	38.0	2.1
240.0	787.2	11.490	52.68	28.0	1.5
245.0	803.6	11.680	53.02	38.0	2.1
250.0	820.0	11.830	53.29	30.0	1.6
255.0	836.4	12.030	53.65	40.0	2.2
260.0	852.8	12.280	54.10	50.0	2.7
265.0	869.2	12.450	54.41	34.0	1.9
270.0	885.6	12.750	54.95	60.0	3.3
275.0	902.0	13.050	55.49	60.0	3.3
280.0	918.4	13.270	55.89	44.0	2.4
285.0	934.8	13.440	56.19	34.0	1.9
290.0	951.2	13.640	56.55	40.0	2.2
295.0	967.6	13.840	56.91	40.0	2.2
300.0	984.0	14.020	57.24	36.0	2.0
310.0	1016.8	14.380	57.88	36.0	2.0
320.0	1049.6	14.760	58.57	38.0	2.1
330.0	1082.4	15.130	59.23	37.0	2.0
340.0	1115.2	15.470	59.85	34.0	1.9
350.0	1148.0	15.930	60.67	46.0	2.5
360.0	1180.8	16.280	61.30	35.0	1.9
370.0	1213.6	16.610	61.90	33.0	1.8
380.0	1246.4	16.930	62.47	32.0	1.8
390.0	1279.2	17.270	63.09	34.0	1.9
400.0	1312.0	17.610	63.70	34.0	1.9

LOCATION: CHALLIS AMS, IDAHO
 BN/ 6E-16AAD
 HOLE NUMBER: DDH- 5
 DATE MEASURED: 8/16/72

DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOTHERMAL GRADIENT	
		DEG C	DEG F	DEG C/KM	DEG F/100 FT
5.0	16.4	9.340	48.81	0.0	0.0
10.0	32.8	6.160	43.09	-636.0	-34.9
15.0	49.2	6.500	43.70	68.0	3.7
20.0	65.6	6.850	44.33	70.0	3.8
25.0	82.0	6.950	44.51	20.0	1.1
30.0	98.4	6.970	44.55	4.0	0.2
35.0	114.8	7.010	44.62	8.0	0.4
40.0	131.2	7.050	44.71	10.0	0.5
45.0	147.6	7.110	44.80	10.0	0.5
50.0	164.0	7.170	44.91	12.0	0.7
60.0	196.8	7.280	45.10	11.0	0.6
70.0	229.6	7.410	45.34	13.0	0.7
80.0	262.4	7.540	45.57	13.0	0.7
90.0	295.2	7.720	45.90	18.0	1.0
100.0	328.0	7.870	46.17	15.0	0.8
150.0	492.0	8.850	47.93	19.6	1.1
175.0	574.0	9.420	48.96	22.8	1.3
200.0	656.0	10.150	50.27	23.2	1.6
225.0	738.0	10.940	51.69	31.6	1.7
250.0	820.0	11.740	53.13	32.0	1.8
275.0	902.0	12.980	55.36	49.6	2.7

TEMPERATURE, DEG C



LOCATION: CHALLIS(AMS) ID.
 SN/ 6E-17BB
 HOLE NUMBER: DDH-11
 DATE MEASURED: 7/ 4/76

DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOHERMAL GRADIENT	
		DEG C	DEG F	DEG C/KM	DEG F/100 FT
35.0	114.8	7.810	46.06	0.0	0.0
40.0	131.2	7.890	46.20	16.0	0.9
45.0	147.6	8.080	46.54	38.0	2.1
50.0	164.0	8.210	46.78	26.0	1.4
55.0	180.4	8.400	47.12	38.0	2.1
60.0	196.8	8.650	47.57	50.0	2.7
65.0	213.2	9.090	48.36	88.0	4.8
70.0	229.6	9.230	48.61	28.0	1.5
75.0	246.0	9.640	49.35	82.0	4.5
80.0	262.4	9.790	49.62	30.0	1.6
85.0	278.8	9.940	49.89	30.0	1.6
90.0	295.2	10.130	50.23	38.0	2.1
95.0	311.6	10.310	50.56	36.0	2.0
100.0	328.0	10.510	50.92	40.0	2.2
105.0	344.4	10.720	51.30	42.0	2.3
110.0	360.8	10.920	51.66	40.0	2.2
115.0	377.2	11.160	52.09	48.0	2.6
120.0	393.6	11.370	52.47	42.0	2.3
125.0	410.0	11.410	52.54	8.0	0.4
130.0	426.4	11.480	52.66	14.0	0.8
135.0	442.8	11.640	52.95	32.0	1.8
140.0	459.2	11.790	53.22	30.0	1.6
145.0	475.6	11.940	53.49	30.0	1.6
150.0	492.0	12.060	53.71	24.0	1.3
155.0	508.4	12.190	53.94	26.0	1.4
160.0	524.8	12.340	54.21	30.0	1.6
165.0	541.2	12.490	54.48	30.0	1.6
170.0	557.6	12.620	54.72	26.0	1.4
175.0	574.0	12.760	54.97	28.0	1.5
180.0	590.4	12.920	55.26	32.0	1.8
185.0	606.8	13.060	55.51	28.0	1.5
190.0	623.2	13.210	55.78	30.0	1.6
195.0	639.6	13.330	56.00	24.0	1.3
200.0	656.0	13.470	56.25	28.0	1.5
205.0	672.4	13.610	56.50	28.0	1.5
210.0	688.8	13.740	56.73	26.0	1.4
215.0	705.2	13.870	56.97	26.0	1.4
220.0	721.6	14.010	57.22	28.0	1.5
225.0	738.0	14.110	57.40	20.0	1.1

LOCATION: CHALLIS(AMS) 1D.
8N/ 6E-17BB
HOLE NUMBER: DDH-11
DATE MEASURED: 7/ 4/76

PAGE 2

DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOTHERMAL GRADIENT	
		DEG C	DEG F	DEG C/KM	DEG F/100 FT
230.0	754.4	14.290	57.72	36.0	2.0
235.0	770.8	14.420	57.96	26.0	1.4
240.0	787.2	14.540	58.17	24.0	1.3
245.0	803.6	14.670	58.41	26.0	1.4
250.0	820.0	14.800	58.64	26.0	1.4
255.0	836.4	14.880	58.78	16.0	0.9
260.0	852.8	15.040	59.07	32.0	1.8

LOCATION: CHALLIS AMS, IDAHO
 SN/ 6E-17BB
 HOLE NUMBER: DDH-11
 DATE MEASURED: 8/ 1/77

DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOTHERMAL GRADIENT	
		DEG C	DEG F	DEG C/KM	DEG F/100 FT
50.0	164.0	7.290	45.12	0.0	0.0
55.0	180.4	7.520	45.54	46.0	2.5
60.0	196.8	7.720	45.90	40.0	2.2
65.0	213.2	7.960	46.33	48.0	2.6
70.0	229.6	8.250	46.85	58.0	3.2
75.0	246.0	8.530	47.35	56.0	3.1
80.0	262.4	8.750	47.75	44.0	2.4
85.0	278.8	8.920	48.06	34.0	1.9
90.0	295.2	9.100	48.38	36.0	2.0
95.0	311.6	9.290	48.72	38.0	2.1
100.0	328.0	9.470	49.05	36.0	2.0
105.0	344.4	9.670	49.41	40.0	2.2
110.0	360.8	9.860	49.75	38.0	2.1
115.0	377.2	10.030	50.05	34.0	1.9
120.0	393.6	10.240	50.43	42.0	2.3
125.0	410.0	10.440	50.79	40.0	2.2
130.0	426.4	10.640	51.15	40.0	2.2
135.0	442.8	10.810	51.46	34.0	1.9
140.0	459.2	10.970	51.75	32.0	1.8
145.0	475.6	11.130	52.03	32.0	1.8
150.0	492.0	11.310	52.36	36.0	2.0
155.0	508.4	11.480	52.66	34.0	1.9
160.0	524.8	11.640	52.96	32.0	1.8
165.0	541.2	11.810	53.26	34.0	1.9
170.0	557.6	11.990	53.58	36.0	2.0
175.0	574.0	12.130	53.94	40.0	2.2
180.0	590.4	12.320	54.35	68.0	3.7
185.0	606.8	12.720	54.90	38.0	2.1
190.0	623.2	12.830	55.09	22.0	1.2
195.0	639.6	13.050	55.49	44.0	2.4
200.0	656.0	13.530	56.35	36.0	2.3
225.0	738.0	13.940	57.09	16.4	0.9
230.0	754.4	14.130	57.43	38.0	2.1
235.0	770.8	14.240	57.63	22.0	1.2
240.0	787.2	14.370	57.87	26.0	1.4
245.0	803.6	14.550	58.19	36.0	2.0
250.0	820.0	14.720	58.50	34.0	1.9
255.0	836.4	14.890	58.80	34.0	1.9
260.0	852.8	15.080	59.14	38.0	2.1

LOCATION: CHALLIS AMS, IDAHO
8N/ 6E-17EB
HOLE NUMBER: DDH-11
DATE MEASURED: 8/ 1/77

PAGE 2

DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOTHERMAL GRADIENT	
		DEG C	DEG F	DEG C/KM	DEG F/100 FT
265.0	869.2	15.260	59.47	36.0	2.0
270.0	885.6	15.530	59.95	34.0	3.0
275.0	902.0	15.650	60.24	32.0	1.3
280.0	918.4	15.950	60.71	52.0	2.0
285.0	934.8	16.190	61.14	48.0	2.6
300.0	984.0	16.640	61.95	30.0	1.6
305.0	1000.4	16.750	62.17	24.0	1.0
310.0	1016.8	16.940	62.49	36.0	2.0

TEMPERATURE, DEG C

