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GEOLOGICAL SURVEY

Geophysical Data from the Blacktail Mountain Drilling site, Flathead County, Montana

by

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Introduction

Geophysical investigations at the Blacktail Mountain drillsite in Flathead County, Montana were designed to geophysically characterize the Spokane formation and to determine if any anomalies are associated with its copper occurrences. Ground studies consisted of magnetic, electrical, and electromagnetic surveys. Drill holes were logged for gamma ray, neutron-neutron, density, caliper, electrical resistivity, and induced polarization. The purpose of this report is to present the data accumulated in those surveys. No detailed interpretations of the data are made in this report. Future reports will deal with physical properties, measurements made on core samples from the drill site, and interpretations of the geophysical studies presented here. A general reference for the techniques mentioned in this report is Telford and others (1976).

Caution must be used in examining the results of some of the ground geophysical surveys. In particular, the magnetic and VLF data were greatly influenced by the presence of a number of cultural sources in the vicinity of the drillsite. The magnetic measurements were influenced by pieces of scrap metal lying at or near the surface in several areas. The VLF measurements in the eastern half of the surveyed area were obviously distorted by a powerline running along the roadway.

Plates 1 and 2 are basemaps for the geology, drill holes, and geophysical surveys. They are both at 1: 500 scale. The coordinates used on plate 2 are in feet and relate to the coordinates used in locating ground geophysical data listed in the appendices.

Ground Magnetics

A ground, total-field magnetic survey was made using a proton-precession magnetometer with a 0.25 gamma sensitivity. Measurements were made on the grid of E-W profiles with a nominal station separation of 50 feet (~15 m). Profiles were separated by approximately 200 feet (~60 m). Plate 2 locates the general magnetic grid.

The magnetic data has been corrected for diurnal varations by use of a similar magnetometer in an automatically recording base station. After diurnal corrections, computer contour maps were made of the observed data and of the first residual. The residual field was derived by subtracting a surface of the form:

$$S_1 = 57883.855 - .00751\ (x) + .00766\ (y)$$

from the observed data. Plate 3 is the contoured observed field with a constant level of 57,000 gammas removed. Plate 4 is the first residual map. A listing of the coordinates and field values used in creating these maps is in appendix A.

VLF

VLF is an electromagnetic technique that uses the signals from distant radio stations to measure lateral variations in the electrical properties of the near-surface rocks. In this environment, the depth of investigation of this technique is about 60 meters. Four different measurements were made with the VLF system, dip-angle, quadrature, apparent resistivity, and phase angle. These quantities were measured on the same grid as the magnetic data. Computer contoured maps are shown in plates 5 through 8. A data listing is in appendix B.

Slingram

Slingram is a moving source and receiver electromagnetic system with which the in-phase and out-of-phase component at five frequencies, 222 Hz., 444 Hz., 888 Hz., 1777 Hz., and 3555 Hz are measured. Four profiles with a transmitter-receiver separation of 100 feet (~30 m) and one sounding were made using this system. The depth of penetration is about 50 feet (~15 m). No obvious anomalies that might be associated with conductors within the green or purple beds were detected. The locations of the profiles and the sounding are shown on plate 2.

Vertical Electrical Soundings

Two vertical electrical soundings (VES) were made using the Schlumberger array. These soundings were made in perpendicular directions (N-S and E-W) centered at drill hole BT-1. The sounding data are plotted on figures 1 and 2.

Induced Polorization Measurements

Induced Polorization (IP) surveys were made along three lines as indicated on plate 2. The surveys were made with a dipole-dipole configuration using 25 (~ 7.6 m) foot dipoles. The results of the survey are plotted in standard pseudosection form in figures 3, 4 and 5. The basic data set shown in these figures comprises part of a set of spectral IP measurements made in the frequency range from 0.03 to 1000 Hz. The full data set will be released in an open file report along with electrical property measurements of selected samples of the drill core. No attempt has been made to quantitatively compare the time-domain drill hole IP logs with the frequency-domain surface IP surveys.

Borehole Geophysics

Well logs were made in 16 of the 22 drill holes available at the Blacktail Mountain site (table 1). Locations of drill holes are plotted on plate 1. Results are presented on plates 9, 10 and 11. The nuclear logs (natural gamma and neutron-neutron on plate 9 and density with caliper on plate 10) show subtle correlations with minor lithologic variations within the green and purple layers of the Spokane Formation. However, in general, the nuclear logs are remarkably uniform, indicating that rock density is relatively constant and that moisture content and clay concentrations are generally low. The caliper logs indicate that the holes are uniform in diameter (12 cm) below the surface rubble zone, except in hole BT-27 where a large washout (30 cm), probably caused by a fracture zone, occurs at a depth of 40 meters.

The 8-inch normal electrical resistivity (8" N Rt) logs and induced polarization (I.P.) logs shown on plate 11 are more anomalous. In particular, the sulfide mineralization of unit g3 is reflected by a strong induced polarization high and resistivity low anomaly on all of the logs that penetrate this layer. The 8-inch normal logs show some additional low resistivity zones that do not extend from hole to hole (for example, zone p4 in hole BT-3 and zones p1, g1, and p2 in hole BT-26). These anomalies probably represent local increses in porosity caused by changes in rock texture or by fracturing. Layers p5 and g5 are characterized by low resistivities on most of the logs that penetrate them, indicating that this zone is consistently higher in porosity than most other zones. It should be noted that the resistivity values on all of the logs are generally very high (typically 10,000 ohm-

meters) indicating that the porosity is generally very low (less than 1%).

An apparent discrepancy exists between borehole and surface resistivity measurements. The 16-inch normal resistivity log in hole BT-1 with resistivities ranging up to as high as 12,000 ohm-meters is approximately a factor of 5 greater than resitivities indicated by the VES soundings made at BT-1. The source of this discrepancy cannot be determined at this time. Detailed electrical properties measurements of the core samples should be useful in reconciling the borehole and surface measurements.

References

Telford, W. M., Geldart, L P., Sheriff, R. E., and Keys, D. A., 1976, Applied Geophysics: Cambridge University Press, New York, 860 p.

Hole Number	Well Logs					
	Gamma Ray	Neutron-Neutron	Density	Caliper	Electrical Resistivity	Induced Polarization
1	X	X	X	X	X	X
2	X	X	X	X	X	X
3	X	X			X	X
4						
6	X	X	X	X	X	X
7	X	X	X	X	X	X
8	X	X	X	X	X	X
10	X	X	X	X	X	X
11	X	X	X	X	X	X
12	X	X			X	X
13	X	X	X	X	X	X
15	X	X	X	X	X	X
16	X	X	X	X	X	X
17						
19						
20						
21	X	X	X	X		
22						
24	X	X	X	X	X	X
25					X	X
26	X	X	X	X	X	X
27	X	X	X	X		

Table 1 - - Borehole logging measurements at Blacktail Mountain drilling site, Montana.

Figures

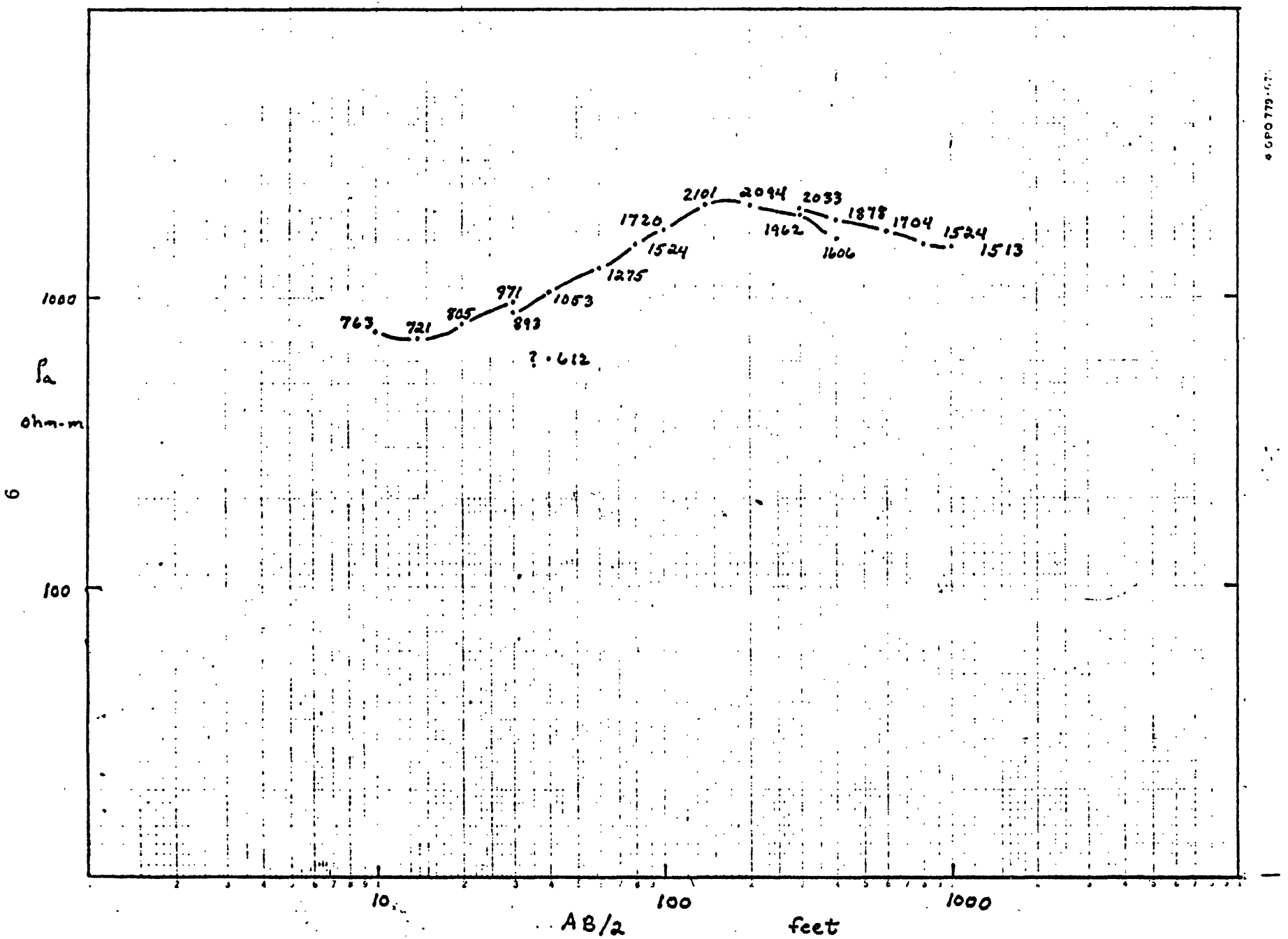

Figure 1- - Ves 1.

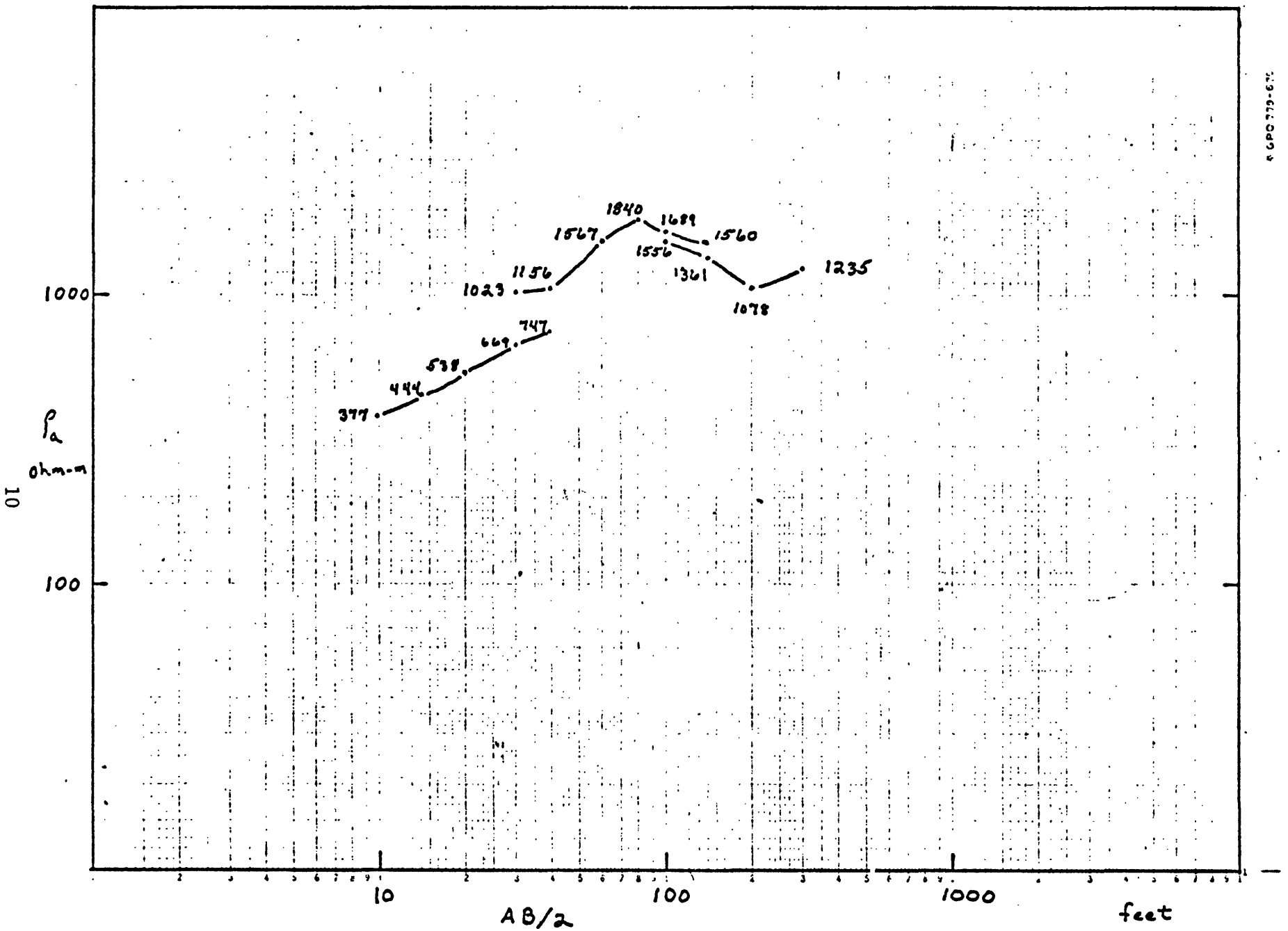

Figure 2- - Ves 2.

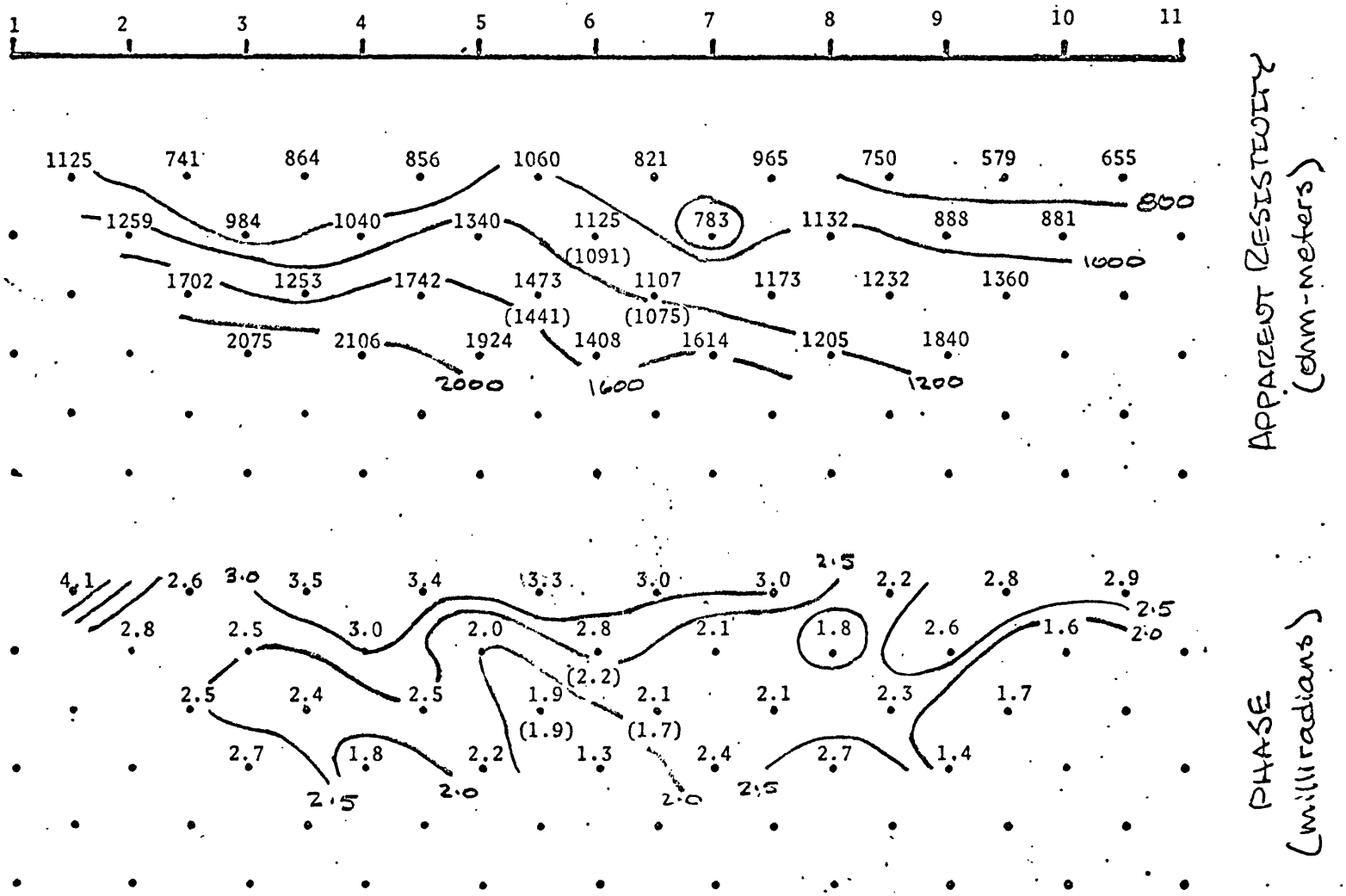

Figure 3. - - IP line 1. Electrical pseudo - section measured at .1 Hz. with 25 foot (≈ 7.6m) dipoles.

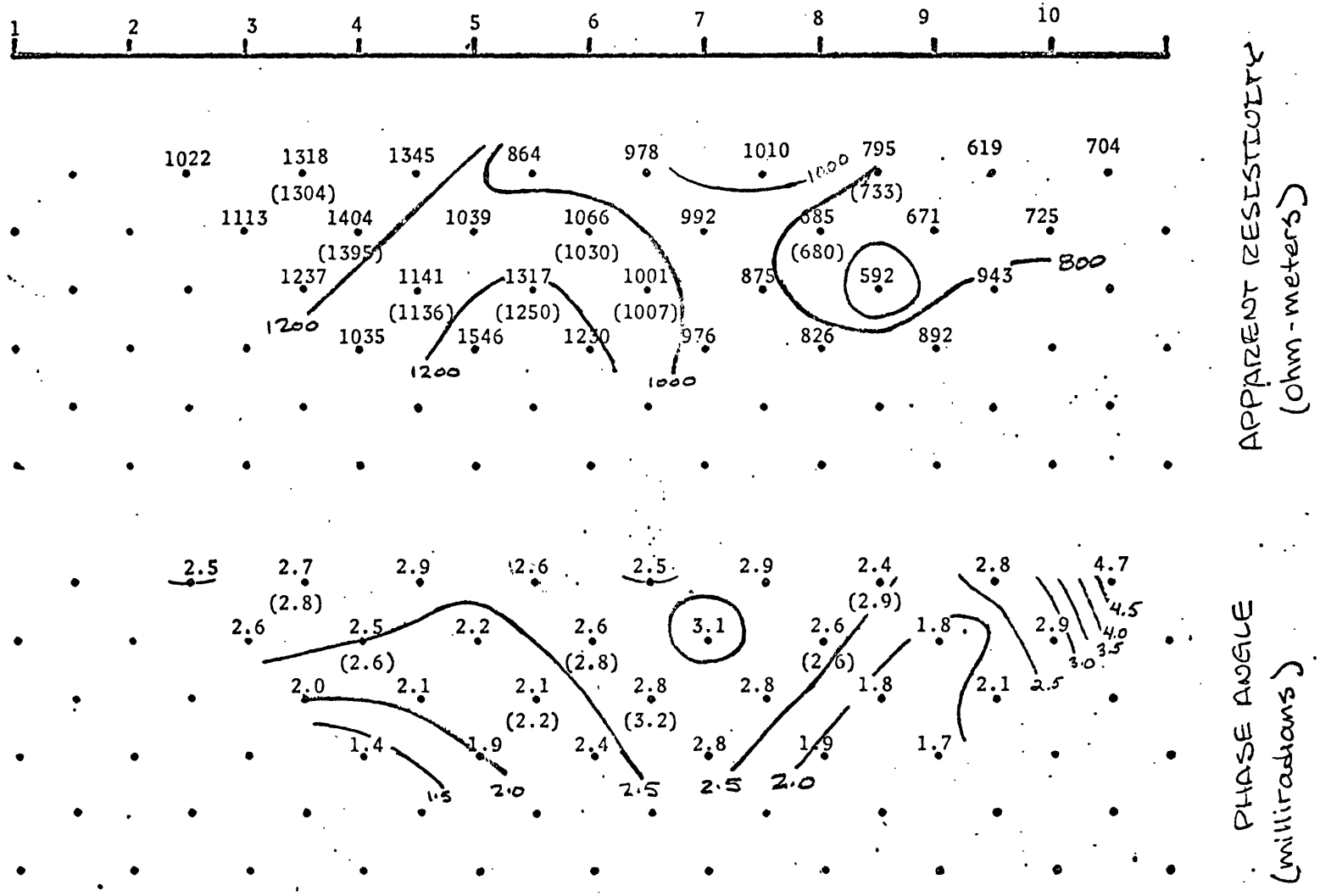

Figure 4.- - IP line 2. Electrical pseudo - section measured at .1 Hz. with 25 foot (≈ 7.6m) dipoles.

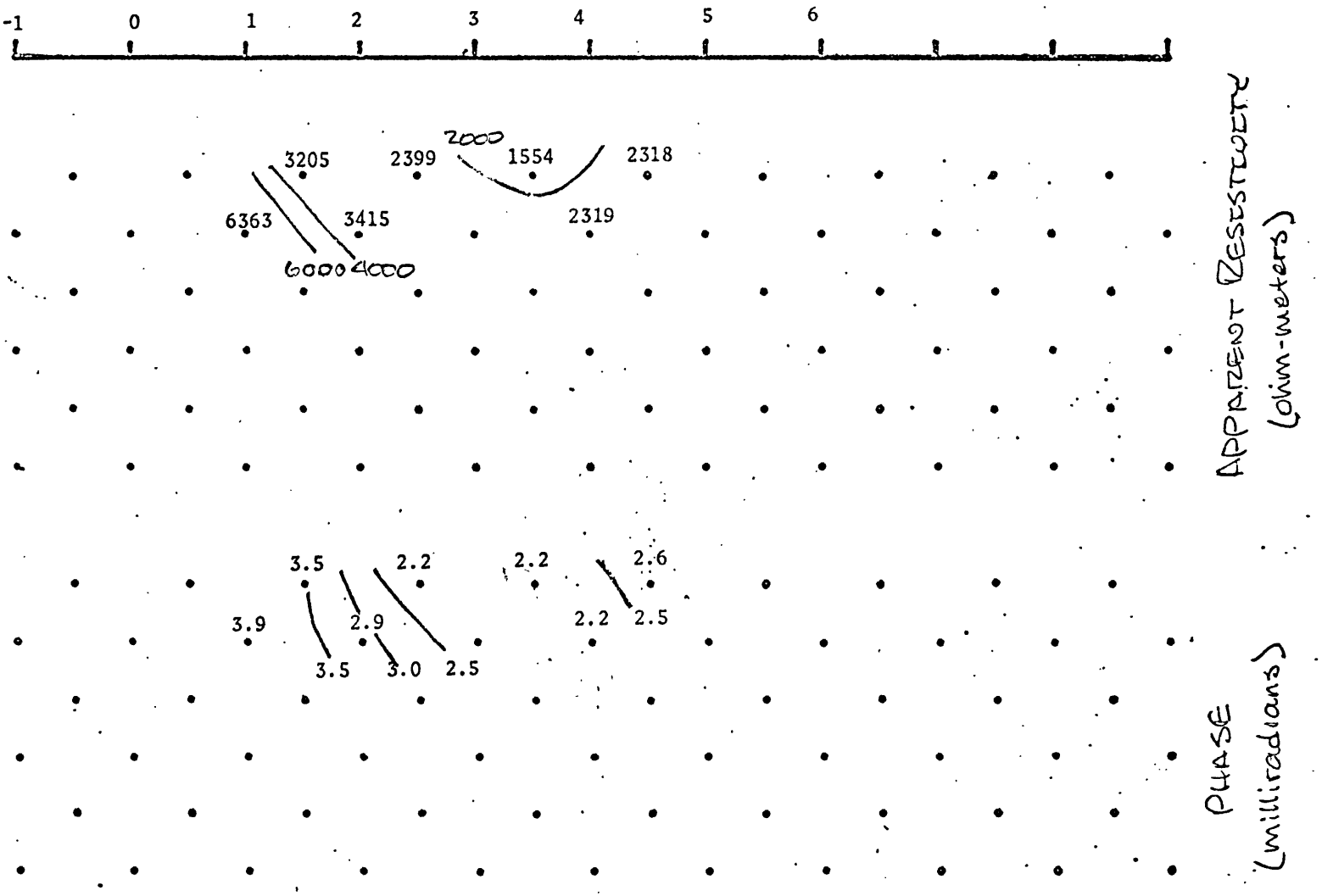

Figure 5.- - IP line 3. Electrical pseudo - section measured at .1 Hz. with 25 foot (≈ 7.6m) dipoles.

Plates

Plate 1--Geologic and drill hole map

2--Geophysical base map

3--Observed magnetic field (a constant of 57,000 γ removed from data)

4--First residual of magnetic field

5--VLF dip in percent

6--VLF quadrature in percent

7--VLF apparent resistivity in ohm-meters

8--VLF phase in degrees

9--Neutron-neutron and natural gamma logs of selected Blacktail Mountain drill holes

10--Density and caliper logs of selected Blacktail Mountain drill holes

11--Electrical resistivity and induced polarization logs of selected Blacktail Mountain drill holes

Appendix A - Ground Magnetic Data

Column 1 - x coordinate in feet

2 - y coordinate in feet

3 - observed field (-57000 γ)

4 - Surface 1

5 - Residual

25.00	-1000.00	877.00	876.01	0.99
23.75	-950.02	877.30	876.40	0.90
22.50	-900.03	863.80	876.79	-12.99
21.25	-850.05	877.30	877.16	0.14
20.00	-800.06	875.80	877.50	-1.70
18.75	-750.08	881.80	877.97	3.83
17.50	-700.09	881.80	878.36	3.44
16.25	-650.11	877.00	878.75	-1.75
15.00	-600.12	878.80	879.15	-0.35
13.75	-550.14	882.00	879.54	2.46
12.50	-500.16	874.00	879.93	-5.93
11.25	-450.17	880.50	880.32	0.18
10.00	-400.19	893.00	880.71	12.29
8.76	-350.20	883.80	881.11	2.69
7.51	-300.22	880.50	881.50	-1.00
6.26	-250.23	884.30	881.89	2.41
5.01	-200.25	885.60	882.28	3.32
3.76	-150.27	881.80	882.66	-0.86
2.51	-100.28	880.50	883.07	-2.57
1.26	-50.30	875.30	883.46	-8.16
0.01	-0.31	891.80	883.85	7.95
-1.24	49.67	867.30	884.25	-16.95
-2.49	99.66	873.50	884.64	-11.14
-3.74	149.64	872.00	885.03	-13.03
-4.99	199.63	883.00	885.42	-2.42
-6.24	249.61	886.30	885.81	0.49
-7.49	299.59	880.40	886.21	-5.81
-8.74	349.58	884.80	886.60	-1.80
-9.99	399.56	878.80	886.99	-8.19
-11.24	449.55	886.00	887.38	-1.38
-12.49	499.53	878.00	887.78	-9.78
-13.74	549.52	892.50	888.17	4.33
-14.99	599.50	881.20	888.56	-7.36
-16.24	649.48	888.50	888.95	-0.45
-17.49	699.47	886.50	889.35	-2.85
-18.74	749.45	886.80	889.74	-2.94
-19.99	799.44	890.00	890.13	-0.13
-21.24	849.42	883.50	890.52	-7.02
-22.49	899.41	896.30	890.92	5.38
-23.73	949.39	887.30	891.31	-4.01
-24.98	999.38	893.80	891.70	2.10
-490.00	-400.00	881.90	884.47	-2.57
-440.00	-400.00	884.90	884.10	0.80
-390.00	-400.00	878.60	883.72	-5.12
-340.00	-400.00	880.10	883.34	-3.24
-290.00	-400.00	883.40	882.97	0.43
-240.00	-400.00	893.90	882.59	11.31
-190.00	-400.00	896.60	882.22	14.38
-140.00	-400.00	880.90	881.84	-0.94
-115.00	-400.00	885.60	881.65	3.95
-90.00	-400.00	902.40	881.47	20.93
-65.00	-400.00	883.90	881.28	2.62
-40.00	-400.00	884.40	881.09	3.31
10.00	-400.00	893.00	880.72	12.28
60.00	-400.00	887.10	880.34	6.76
110.00	-400.00	881.10	879.96	1.14
160.00	-400.00	882.60	879.59	3.01
210.00	-400.00	876.90	879.21	-2.31
260.00	-400.00	882.10	878.84	3.27

310.00	-400.00	886.90	878.46	8.44
360.00	-400.00	873.10	878.09	-4.99
410.00	-400.00	863.40	877.71	-14.31
460.00	-400.00	875.90	877.34	-1.44
510.00	-400.00	871.40	876.96	-5.56
-495.00	-200.00	877.40	886.04	-8.64
-445.00	-200.00	887.90	885.67	2.23
-395.00	-200.00	894.20	885.29	8.91
-345.00	-200.00	885.20	884.91	0.29
-295.00	-200.00	885.20	884.54	0.66
-245.00	-200.00	882.40	884.16	-1.76
-195.00	-200.00	873.70	883.79	-10.09
-145.00	-200.00	880.90	883.41	-2.51
-95.00	-200.00	883.70	883.04	0.66
-45.00	-200.00	885.90	882.66	3.24
5.00	-200.00	885.60	882.29	3.31
55.00	-200.00	878.70	881.91	-3.21
105.00	-200.00	877.20	881.53	-4.33
155.00	-200.00	880.20	881.16	-0.96
205.00	-200.00	878.40	880.78	-2.38
255.00	-200.00	880.20	880.41	-0.21
305.00	-200.00	879.40	880.03	-0.63
355.00	-200.00	869.90	879.66	-9.76
405.00	-200.00	881.20	879.28	1.92
455.00	-200.00	877.20	878.91	-1.71
505.00	-200.00	872.20	878.53	-6.33
555.00	-200.00	878.20	878.15	0.05
605.00	-200.00	876.20	877.78	-1.58
-385.00	-60.00	882.90	886.15	-3.25
-360.93	-73.24	893.70	886.01	7.69
-336.86	-66.49	898.20	885.86	12.34
-288.72	-52.97	884.20	885.62	-1.42
-240.58	-39.46	885.70	885.36	0.34
-192.44	-25.95	885.90	885.10	0.80
-144.30	-12.44	885.20	884.84	0.36
-96.16	1.06	886.70	884.59	2.11
-50.00	0.00	887.20	884.23	2.97
0.00	0.00	891.80	883.86	7.94
50.00	0.00	895.70	883.48	12.22
100.00	0.00	895.70	883.10	12.60
150.00	0.00	892.70	882.73	9.97
200.00	0.00	892.40	882.35	10.05
250.00	0.00	882.90	881.98	0.92
300.00	0.00	879.70	881.60	-1.90
350.00	0.00	888.40	881.23	7.17
400.00	0.00	873.40	880.85	-7.45
450.00	0.00	881.90	880.48	1.42
500.00	0.00	885.70	880.10	5.60
550.00	0.00	877.70	879.72	-2.02
-505.00	200.00	883.90	889.18	-5.28
-455.00	200.00	890.60	888.81	1.79
-405.00	200.00	889.90	888.43	1.47
-355.00	200.00	895.40	888.05	7.35
-305.00	200.00	892.10	887.68	4.42
-255.00	200.00	886.90	887.30	-0.40
-205.00	200.00	880.10	886.93	-6.83
-180.00	200.00	876.60	886.74	-10.14
-155.00	200.00	872.90	886.55	-13.65
-130.00	200.00	850.60	886.36	-35.76
-105.00	200.00	850.10	886.18	-36.08

-80.00	200.00	868.90	885.99	-17.09
-55.00	200.00	879.40	885.80	-6.40
-5.00	200.00	883.00	885.45	-2.45
45.00	200.00	884.10	885.05	-0.95
95.00	200.00	879.90	884.67	-4.77
145.00	200.00	892.10	884.30	7.80
195.00	200.00	880.40	883.92	-3.52
245.00	200.00	881.10	883.55	-2.45
295.00	200.00	881.90	883.17	-1.27
345.00	200.00	878.60	882.80	-4.20
395.00	200.00	881.40	882.42	-1.02
445.00	200.00	890.90	882.05	8.85
495.00	200.00	891.90	881.67	10.23
-410.00	400.00	890.10	890.00	0.10
-360.00	400.00	886.90	889.62	-2.72
-310.00	400.00	883.40	889.25	-5.85
-260.00	400.00	886.60	888.87	-2.27
-210.00	400.00	891.60	888.50	3.10
-160.00	400.00	885.40	888.12	-2.72
-110.00	400.00	840.90	887.75	-46.85
-60.00	400.00	876.90	887.37	-10.47
-10.00	400.00	878.80	887.00	-8.20
40.00	400.00	879.40	886.62	-7.22
90.00	400.00	916.60	886.24	30.36
140.00	400.00	892.90	885.87	7.03
190.00	400.00	888.40	885.49	2.91
240.00	400.00	882.40	885.12	-2.72
290.00	400.00	875.10	884.74	-9.64
340.00	400.00	892.90	884.37	8.53
390.00	400.00	891.60	883.99	7.61
440.00	400.00	902.60	883.62	18.97
490.00	400.00	880.40	883.24	-2.84
-515.00	600.00	908.40	892.32	16.08
-465.00	600.00	900.60	891.95	8.65
-415.00	600.00	912.10	891.57	20.53
-365.00	600.00	900.60	891.19	9.41
-315.00	600.00	895.10	890.82	4.28
-265.00	600.00	891.60	890.44	1.16
-215.00	600.00	887.40	890.07	-2.67
-165.00	600.00	891.40	889.69	1.7
-115.00	600.00	890.40	889.32	1.0
-65.00	600.00	895.90	888.94	6.9
-15.00	600.00	891.20	888.57	2.6
35.00	600.00	889.90	888.19	1.7
85.00	600.00	886.90	887.81	-0.9
135.00	600.00	888.40	887.44	0.9
185.00	600.00	940.60	887.06	53.5
235.00	600.00	891.40	886.69	4.7
285.00	600.00	870.10	886.31	-16.2
335.00	600.00	880.10	885.94	-5.8
385.00	600.00	886.90	885.56	1.3
435.00	600.00	878.40	885.19	-6.7
485.00	600.00	892.10	884.81	7.2
-520.00	800.00	915.10	893.89	21.2
-470.00	800.00	900.10	893.52	6.5
-420.00	800.00	903.60	893.14	10.4
-370.00	800.00	888.10	892.76	-4.6
-320.00	800.00	878.40	892.39	-13.
-270.00	800.00	903.60	892.01	11.
-220.00	800.00	880.40	891.64	-1

-170.00	800.00	878.10	891.20	-13.1
-120.00	800.00	852.90	860.89	-7.9
-70.00	800.00	808.10	890.51	-2.41
-20.00	800.00	890.00	890.14	-0.1
30.00	900.00	866.40	869.76	-3.3
80.00	800.00	890.90	869.38	1.5
130.00	800.00	888.60	889.01	-0.4
180.00	900.00	868.40	838.63	-20.2
230.00	800.00	898.60	888.20	10.3
280.00	800.00	894.50	887.80	6.7
330.00	800.00	886.10	887.51	0.5
380.00	800.00	899.40	887.13	12.27

Appendix B - VLF Data

Column 1 - x coordinate in feet

2 - y coordinate

3 - Dip (in percent)

4 - Quadrature (in percent)

5 - Apparent Resistivity (ohm-meters)

6 - Phase Angle (degrees)

25.00	-1000.00	-2.00	0.00	700.00	28.00
23.75	-950.02	-5.00	0.00	500.00	30.00
22.50	-900.03	-10.00	-2.00	1100.00	29.00
21.25	-850.05	-10.00	0.00	1200.00	36.00
20.00	-800.06	-10.00	0.00	1100.00	35.00
18.75	-750.08	-10.00	0.00	1500.00	37.00
17.50	-700.09	-8.00	-1.00	800.00	40.00
16.25	-650.11	-7.00	0.00	800.00	45.00
15.00	-600.12	-10.00	-1.00	1000.00	40.00
13.75	-550.14	-8.00	0.00	800.00	45.00
12.50	-500.16	-5.00	0.50	1000.00	40.00
11.25	-450.17	-5.00	1.50	700.00	45.00
10.00	-400.19	-5.00	-1.00	1100.00	40.00
8.76	-350.20	-5.00	1.00	1100.00	40.00
7.51	-300.22	-5.00	0.00	1900.00	40.00
6.26	-250.23	0.00	-1.00	2000.00	45.00
5.01	-200.25	0.00	-0.50	2000.00	40.00
3.76	-150.27	5.00	-1.00	2200.00	30.00
2.51	-100.28	5.00	-2.00	2000.00	30.00
1.26	-50.30	7.00	-1.00	1500.00	42.00
0.01	-0.31	7.00	-2.00	1700.00	41.00
-1.24	49.07	11.00	-3.00	1600.00	40.00
-2.49	99.66	10.00	-2.00	1200.00	30.00
-3.74	149.64	15.00	-1.00	1600.00	30.00
-4.99	199.63	15.00	-1.00	1200.00	30.00
-6.24	249.61	15.00	-3.00	1200.00	24.00
-7.49	299.59	15.00	-1.00	1200.00	22.00
-8.74	349.58	15.00	2.00	1000.00	24.00
-9.99	399.56	5.00	-4.00	500.00	30.00
-11.24	449.55	0.00	-5.00	200.00	40.00
-12.49	499.53	0.00	-10.00	240.00	45.00
-13.74	549.52	0.00	-7.00	250.00	40.00
-14.99	599.50	0.00	-7.00	500.00	30.00
-16.24	649.48	0.00	-2.00	600.00	40.00
-17.49	699.47	0.00	-3.00	700.00	40.00
-18.74	749.45	0.00	-8.00	700.00	40.00
-19.99	799.44	0.00	-5.00	1000.00	36.00
-21.24	649.42	0.00	-7.00	1200.00	38.00
-22.49	899.41	0.00	-6.00	1200.00	38.00
-23.73	949.39	0.00	-3.00	2000.00	40.00
-24.98	999.38	0.00	-4.00	1700.00	36.00
-340.00	-400.00	5.00	2.00	1000.00	56.00
-290.00	-400.00	0.00	2.00	500.00	40.00
-240.00	-400.00	-7.00	6.00	500.00	56.00
-190.00	-400.00	-4.00	3.00	180.00	53.00
-140.00	-400.00	-9.00	-1.00	4000.00	49.00
-90.00	-400.00	-8.00	-1.00	4000.00	47.00
-40.00	-400.00	-7.00	-5.00	1700.00	46.00
10.00	-400.00	-5.00	-1.00	1100.00	40.00
60.00	-400.00	-6.00	-4.00	1100.00	48.00
110.00	-400.00	-5.00	-6.00	1200.00	52.00
160.00	-400.00	-4.00	-8.00	1800.00	47.00
210.00	-400.00	-1.00	-12.00	1500.00	48.00
260.00	-400.00	4.00	-18.00	2200.00	47.00
310.00	-400.00	20.00	-35.00	450.00	54.00
360.00	-400.00	-50.00	13.00	900.00	32.00
410.00	-400.00	-45.00	27.00	5100.00	42.00
460.00	-400.00	-35.00	23.00	2400.00	44.00
510.00	-400.00	-24.00	18.00	1000.00	45.00
-395.00	-200.00	10.00	3.00	1100.00	52.00

-345.00	-200.00	9.00	2.00	1000.00	48.00
-295.00	-200.00	6.00	-3.00	750.00	47.00
-245.00	-200.00	0.00	1.00	450.00	53.00
-195.00	-200.00	-2.00	1.00	210.00	53.00
-145.00	-200.00	0.00	-1.00	3200.00	47.00
-95.00	-200.00	-1.00	-2.00	2400.00	45.00
-45.00	-200.00	-0.20	-2.00	2200.00	47.00
5.00	-200.00	0.00	-0.50	2000.00	40.00
55.00	-200.00	2.00	-5.00	2200.00	44.00
105.00	-200.00	5.00	-4.00	950.00	47.00
155.00	-200.00	8.00	-4.00	2100.00	49.00
205.00	-200.00	15.00	-12.00	1200.00	45.00
255.00	-200.00	35.00	-29.00	500.00	40.00
305.00	-200.00	50.00	-24.00	220.00	40.00
-286.72	-52.97	5.00	-1.00	1400.00	49.00
-240.58	-39.46	1.00	0.00	600.00	40.00
-192.44	-25.95	-1.00	0.00	500.00	47.00
-144.30	-12.44	1.00	0.00	5500.00	49.00
-96.16	1.08	4.00	-1.00	5500.00	39.00
-50.00	0.00	3.00	-1.00	1400.00	39.00
0.00	0.00	7.00	-2.00	1700.00	41.00
50.00	0.00	9.00	-4.00	1700.00	41.00
100.00	0.00	15.00	-7.00	800.00	44.00
150.00	0.00	23.00	-14.00	550.00	43.00
200.00	0.00	40.00	-20.00	480.00	32.00
250.00	0.00	-45.00	8.00	350.00	43.00
300.00	0.00	-30.00	27.00	1700.00	29.00
350.00	0.00	-10.00	26.00	2600.00	35.00
400.00	0.00	-9.00	27.00	1600.00	39.00
450.00	0.00	-6.00	22.00	3200.00	35.00
500.00	0.00	-5.00	20.00	4000.00	39.00
-405.00	200.00	-1.00	-2.00	1400.00	36.00
-355.00	200.00	2.00	0.00	600.00	42.00
-305.00	200.00	2.00	0.00	450.00	40.00
-255.00	200.00	0.00	-1.00	2000.00	34.00
-205.00	200.00	2.00	0.00	2000.00	36.00
-155.00	200.00	6.00	1.00	650.00	40.00
-105.00	200.00	10.00	1.00	3500.00	35.00
-55.00	200.00	12.00	1.00	2200.00	33.00
-5.00	200.00	15.00	-1.00	1200.00	30.00
45.00	200.00	5.00	12.00	800.00	26.00
95.00	200.00	35.00	-16.00	1200.00	10.00
145.00	200.00	-35.00	16.00	200.00	90.00
195.00	200.00	-20.00	15.00	600.00	36.00
245.00	200.00	-15.00	22.00	1100.00	35.00
295.00	200.00	-15.00	16.00	2000.00	36.00
345.00	200.00	-12.00	15.00	2600.00	34.00
395.00	200.00	-9.00	13.00	1600.00	34.00
445.00	200.00	-7.00	11.00	1900.00	36.00
495.00	200.00	-5.00	10.00	1600.00	36.00
-410.00	400.00	3.00	0.00	650.00	36.00
-360.00	400.00	5.00	-2.00	600.00	34.00
-310.00	400.00	0.00	-1.00	900.00	34.00
-260.00	400.00	0.00	-1.00	2400.00	28.00
-210.00	400.00	0.00	-2.00	1400.00	31.00
-160.00	400.00	0.00	-4.00	600.00	30.00
-110.00	400.00	0.00	-4.00	700.00	32.00
-60.00	400.00	2.00	-5.00	700.00	32.00
-10.00	400.00	5.00	-4.00	500.00	30.00
40.00	400.00	0.00	-14.00	1600.00	34.00

90.00	400.00	-5.00	-3.00	1200.00	32.0
140.00	400.00	-5.00	44.00	500.00	54.0
190.00	400.00	-10.00	20.00	900.00	45.0
240.00	400.00	-10.00	17.00	1200.00	45.0
290.00	400.00	-10.00	12.00	4000.00	40.0
340.00	400.00	-10.00	11.00	4000.00	36.0
390.00	400.00	-10.00	13.00	4000.00	36.0
-415.00	600.00	2.00	0.00	500.00	35.0
-365.00	600.00	2.00	0.00	800.00	36.0
-315.00	600.00	5.00	0.00	700.00	43.0
-265.00	600.00	3.00	-2.00	5000.00	30.0
-215.00	600.00	5.00	0.00	2400.00	34.0
-165.00	600.00	5.00	-1.00	800.00	38.0
-115.00	600.00	9.00	0.00	1400.00	36.0
-65.00	600.00	5.00	-7.00	600.00	40.0
-15.00	600.00	0.00	-7.00	500.00	30.0
35.00	600.00	0.00	-12.00	400.00	45.0
85.00	600.00	5.00	-13.00	1100.00	40.0
135.00	600.00	7.00	-21.00	650.00	36.0
185.00	600.00	0.00	6.00	1400.00	50.0
235.00	600.00	-2.00	32.00	500.00	45.0
285.00	600.00	2.00	20.00	2400.00	47.0
335.00	600.00	2.00	22.00	2800.00	46.0
385.00	600.00	5.00	11.00	4000.00	45.0
435.00	600.00	5.00	13.00	4000.00	45.0
485.00	600.00	5.00	11.00	5000.00	36.0