UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Geophysical surveys at the Getchell and Preble disseminated gold deposits, Humboldt County, Nevada

by

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Open File Report 84-795

1984

INTRODUCTION

In late June of 1984, the U.S. Geological Survey conducted geophysical studies of two disseminated gold deposits along the eastern flank of the Osgood Mountains in Humboldt County, Nevada (fig. 1). These geophysical investigations were done as part of the U.S. Geological Survey (USGS) Development of Assessment Techniques (DAT) Program to research, assess, and develop exploration techniques and models for mineral deposits. Several geophysical techniques were employed at the Getchell Mine and the Preble prospect. The data from those surveys are presented in this publication with no interpretation in order to effect timely public release. The geophysical methods used were the Very Low Frequency electromagnetic method (VLF), Horizontal loop electromagnetic method (Slingram), total field magnetics, and Spectral Induced Polarization (SIP). The general objectives of the geophysical surveys are: 1) to construct integrated geological and geophysical models which would be useful in mineral assessment and exploration programs, 2) to demonstrate geophysical applications for disseminated gold exploration, and 3) to characterize the petrophysical properties of these ore deposits and their host rocks.

GENERAL GEOLOGY

The geology of the Osgood Mountains has been described by Hotz and Willden (1964) and the geology of the Getchell mine by Joralemon (1951), and Berger (1975). Little detailed geology has been published on the Preble deposit. The Preble and Getchell deposits are disseminated gold deposits occuring in carbonate-bearing host rocks. The ore bodies are considered to be related to major stratigraphic and structural features of the region. The deposits occur in highly faulted terrane and the orebodies generally spread

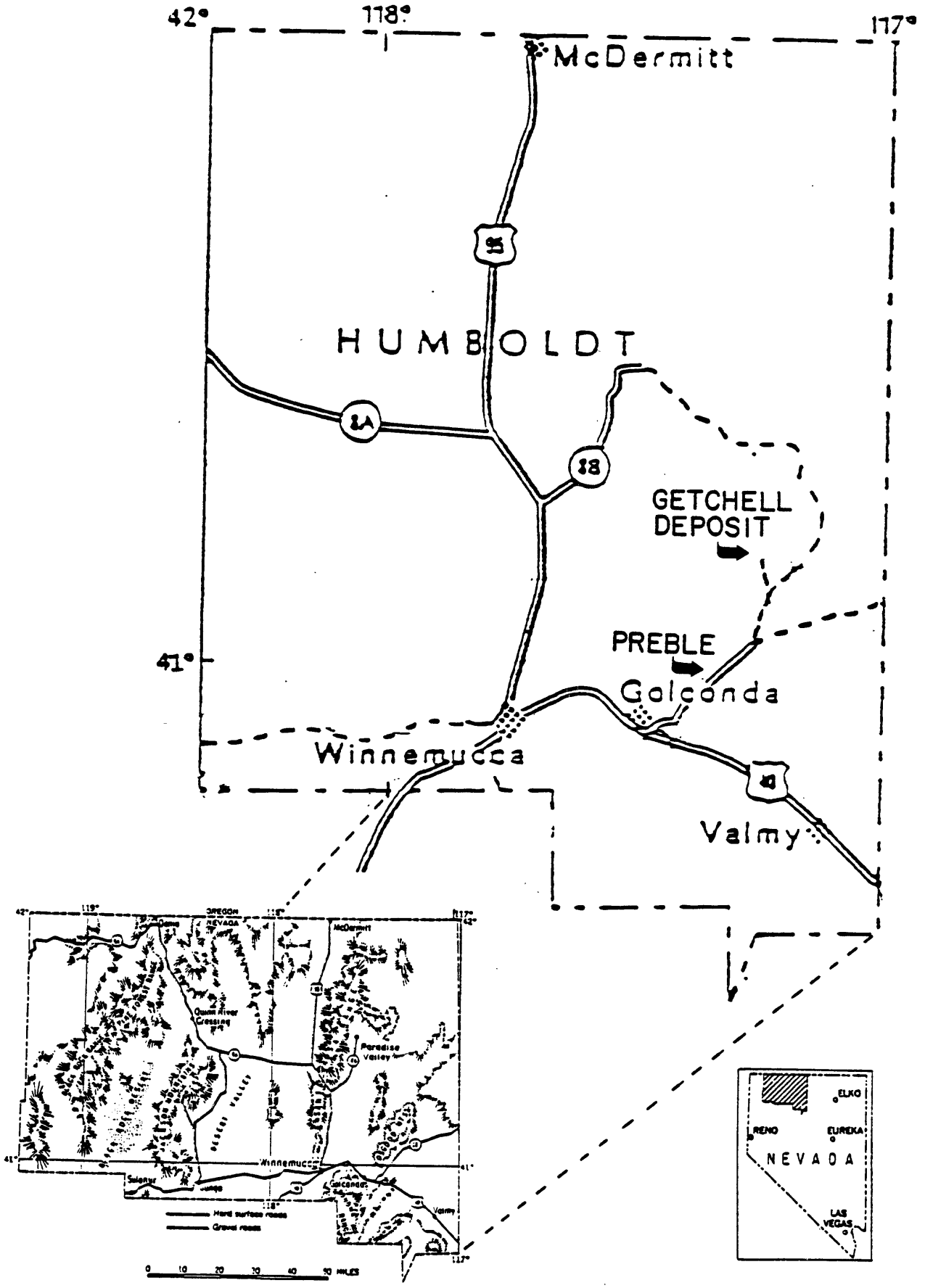

Figure 1. Location map showing the location of Humboldt County, and approximate location of the Getchell and Preble deposits.

out laterally from normal faults. The gold deposits of the Getchell mine are in fractured rocks along the Getchell fault zone, predominantly in the Preble formation of Cambrian age. In this area the Getchell fault trends north-northwest.

Geophysical Surveys

A suite of geophysical data was collected on several lines in the area of the Getchell Mine and the Preble deposit (fig. 2&3). The instrumentation[1] used to obtain this data were:

A. Electromagnetic Method

1. VLF - Geonics EM16 & EM 16R
2. Horizontal Loop - APEX MaxMin II

B. Magnetic Method

1. Protron Magnetometer - Scintrex MP-3

C. Electrical Method

1. Induced Polarization - Zonge GDP-12 (modified)

North-east and east-west trending profiles (G-1 and G-2) using EM and magnetics were done in the Getchell mine area, and three in-situ SIP lines were done in the open pit areas of the Getchell mine. The survey in the Getchell mine area consisted of one northeast trending profile approximately 2,500 ft north of the north pit and one northwest-trending profile just south of the middle pit (fig. 2). Two locations were selected for small scale in-situ SIP measurements in "typical" mineralized rock (fig. 2). East-west and northwest-trending profiles (P1, P2, P3, and 777) were done at the Preble deposit using the EM and magnetic methods (fig. 3). On all profiles the

[1]Use of specific brand names does not directly or indirectly constitute endorsement by the USGS, but are used for descriptive purposes only.

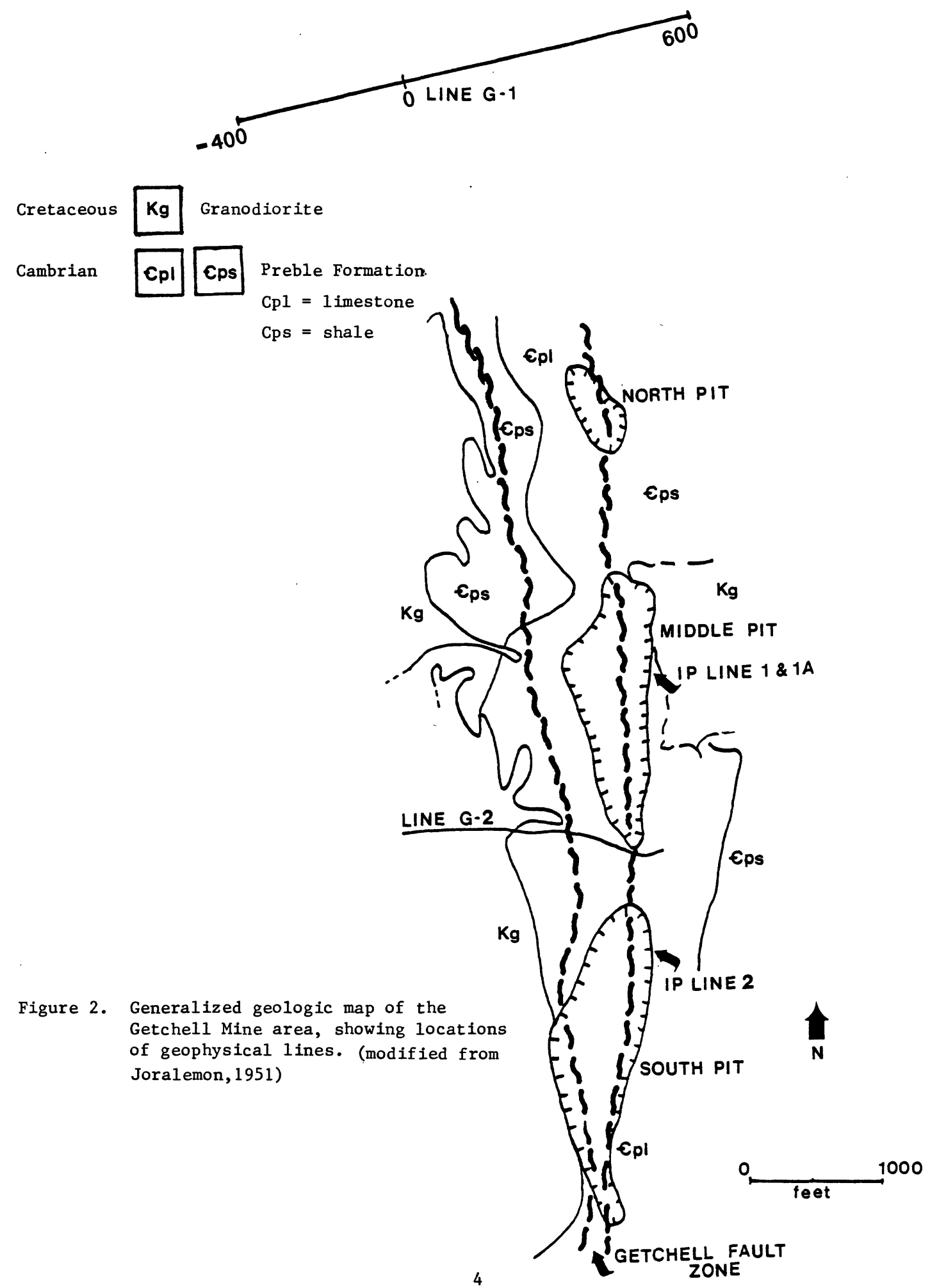

Figure 2. Generalized geologic map of the Getchell Mine area, showing locations of geophysical lines. (modified from Joralemon, 1951)

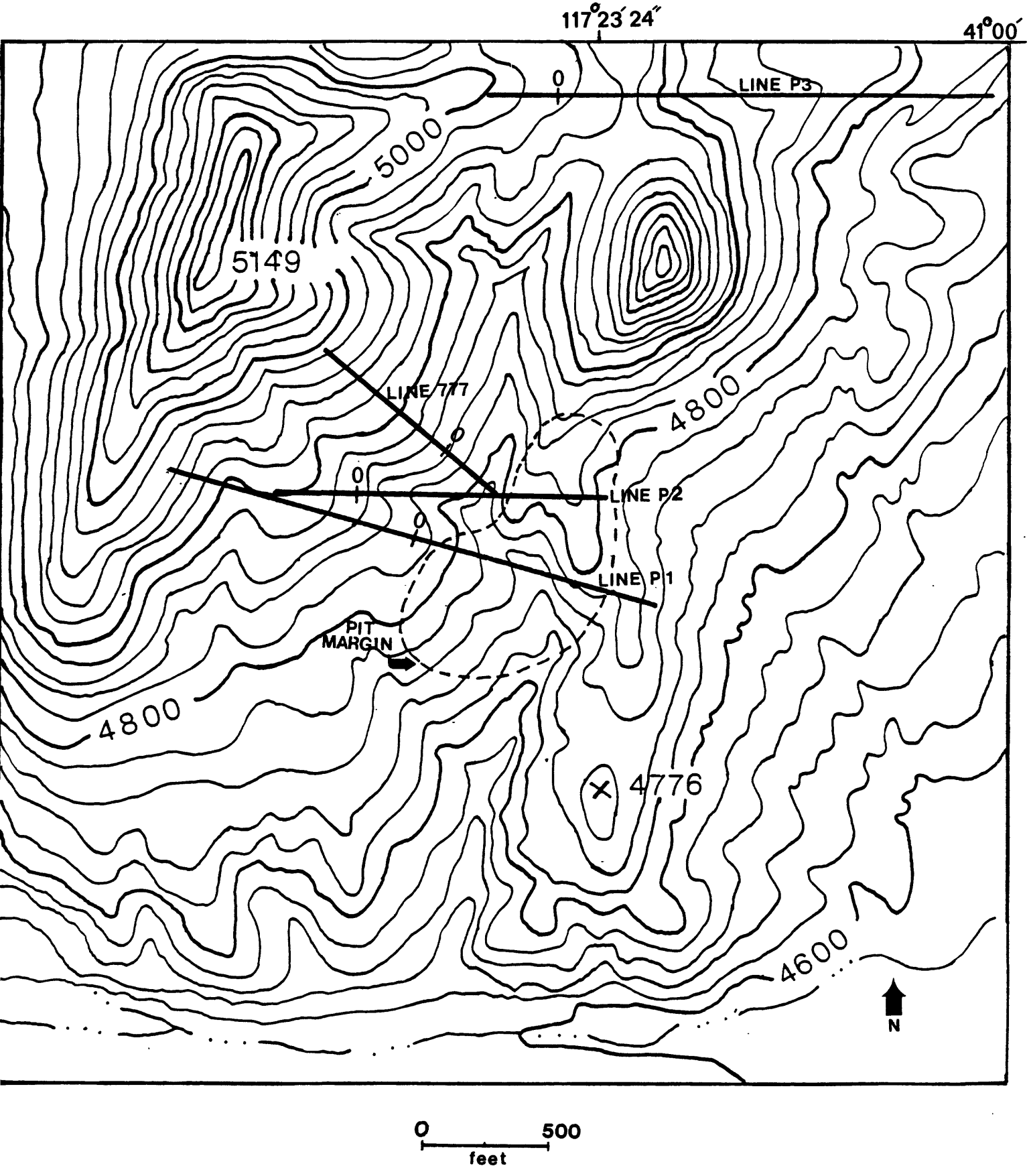

Figure 3. Map showing location of geophysical lines in the Preble deposit area.

numbers corresponding to stations west of station zero (0) are negative and the numbers corresponding to stations east of station zero are positive.

GETCHELL

Line G-1 in the Getchell area north of the north pit was surveyed in using tape and Brunton compass to total 1.1 kms in length. The station interval for line G-1 is 12.5 meters. VLF data, consisting of tilt angle (dip) and quadrature readings were taken every 12.5 meters and apparent resistivity and phase angle readings were taken every 25 meters along the entire line. Two different VLF stations were used in the survey, NLK in Seattle, Washington at a frequency of 24.8 Khz, and NAA in Cutler, Maine at a frequency of 24.0 Khz. Horizontal loop electromagnetic (HLEM) readings were done at two different coil spacings of 125 and 200 meters, every 25 meters. Line G-2 just south of the middle pit follows a jeep road trending east-west. Magnetic and VLF measurements were made every 10 meters over this line.

Three small scale in-situ spectral induced polarization (SIP) lines were measured in the Getchell mine area (fig. 2). IP line 1 is located just east of the middle pit, directly in the Getchell fault zone, and is 20 meters in length. IP line 1A is perpendicular to IP line 1, and is 8 meters in length (fig. 4). Measurements were taken in a freshly dug prospect pit located in highly sheared and altered Preble Formation (fig. 4). The rock appears to be altered limestone composed almost entirely of clay and black carbonaceous material. Joralemon (1951) refers to this material as "gumbo", consisting of minute subhedral quartz crystals, embedded in a submicroscopic intergrowth of quartz and amorphous carbon. Measurements were taken here to define the

electrical properties of this material. Non-polarizing, lead-lead chloride electrodes were used in a dipole-dipole array with an "a" spacing of two meters.

IP line 2 is located along the east wall of the south pit (fig. 2). This line is normal to an area that varies in mineralization along the Getchell fault zone (fig. 5). A 2 meter wide fault surface containing clay and carbonaceous material ("gumbo") is exposed in the pit wall here. The argillite beds have been sheared and tightly folded, and alteration and oxidation is abundant along the entire line. This particular location was chosen because of the variations in structure and mineralization which may be representative of a larger exploration problem. At this location lead electrodes were inserted directly into the outcrop in a dipole-dipole array with the "a" spacing equal to two meters.

PREBLE

The survey in the Preble area consisted of four profiles generally normal to the structure (fig. 3). All lines have a 12.5 meter station spacing. Line P-1 trends east-west and is located directly over mineralized rock. VLF data, consisting of dip and quad readings were taken at each station and apparent resistivity and phase angle data were taken every 25 meters. Horizontal loop (HLEM) readings were taken every 25 meters at 125 meter and 200 meter coil spacings. Magnetic data was collected at each station on all four lines. A Scintrex MP-3 unit was used as a magnetic base station to correct for diurnal variations in both surveys, with the cycle time set at 10 seconds.

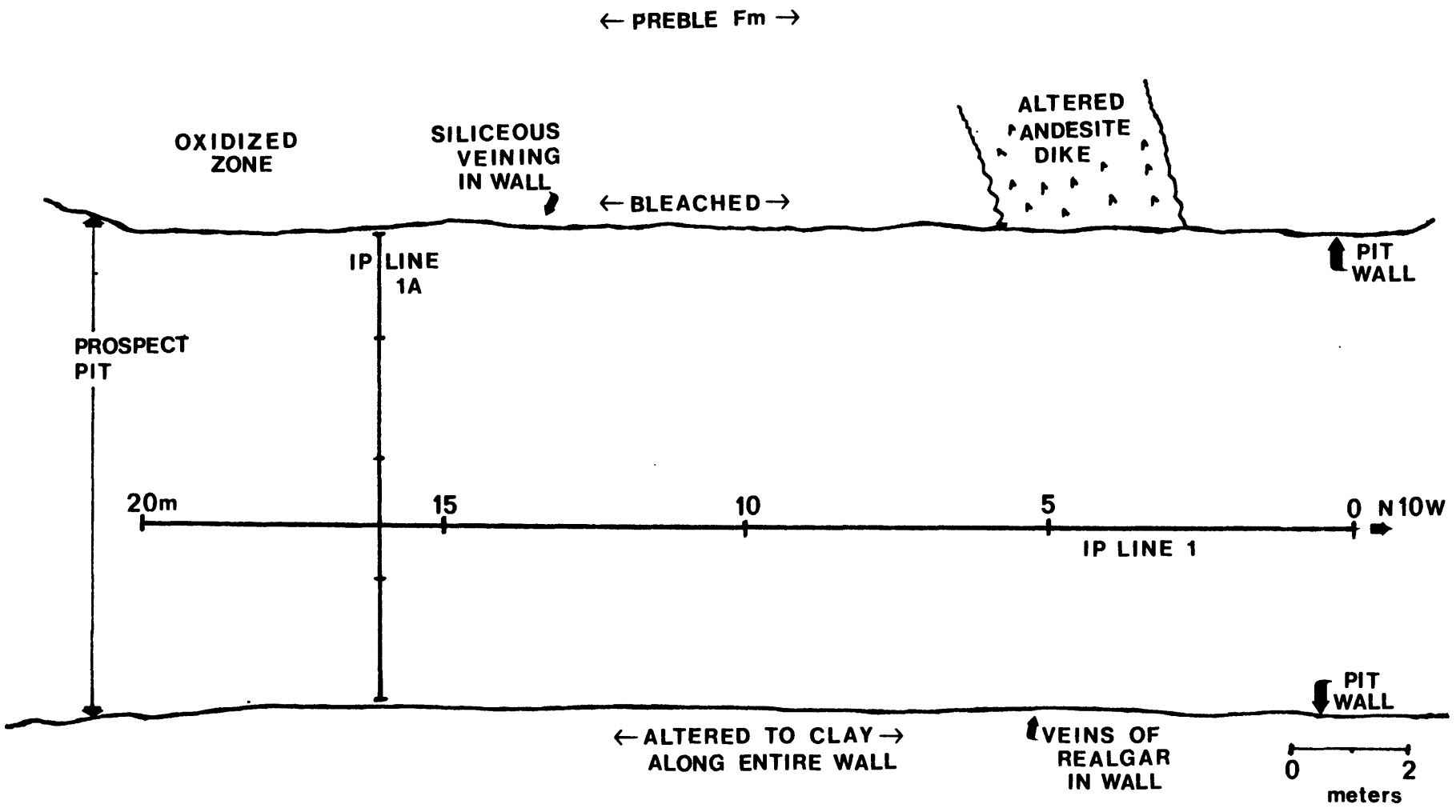

Figure 4. Geologic sketch (plan view) of prospect pit showing IP lines 1 and 1A in the bottom of the pit, located east of the middle pit in the Getchell mine area.

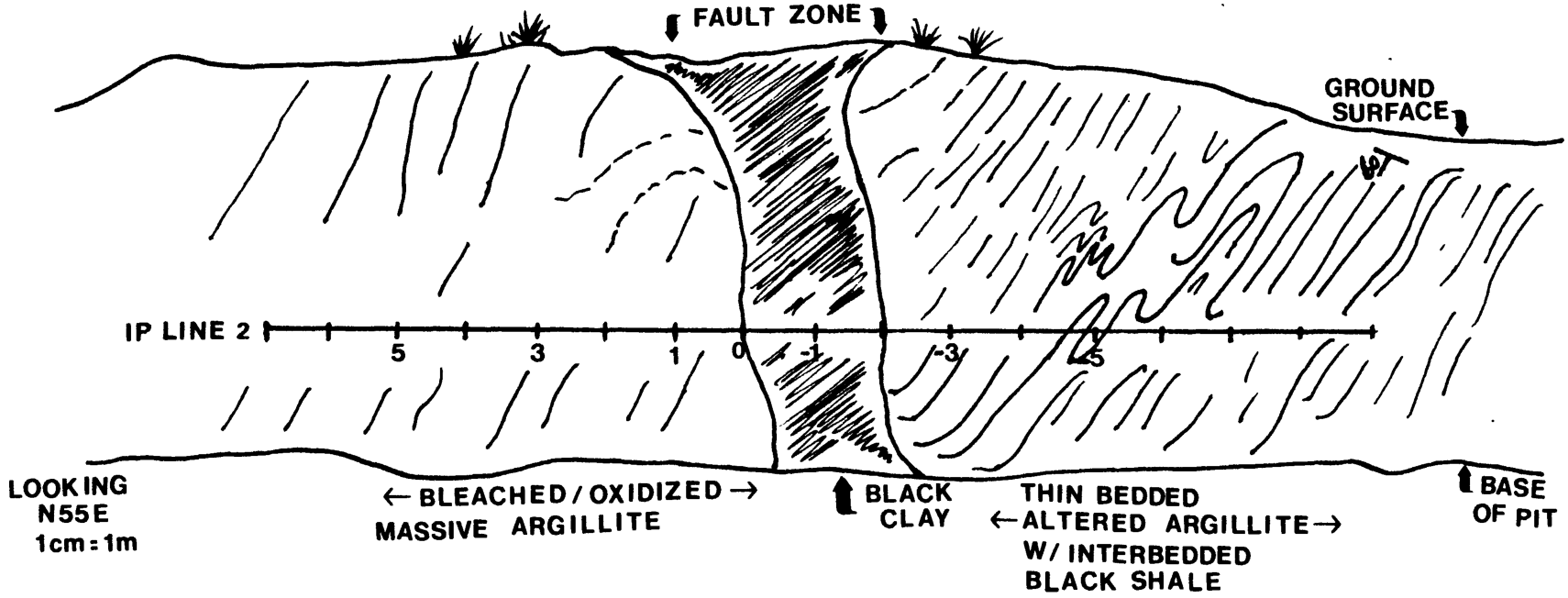

Figure 5. Geologic sketch of east wall of the south pit in the Getchell mine area, showing location of IP line 2.

DATA REDUCTION

The data reduction and plotting was done on a Hewlett Packard 85 system with programs written in-house (Raab, 1983, 1984). Note that in some cases the plotting programs plot highs or lows that may not be supported by actual data points. The magnetic data is automatically corrected for diurnal variations by internal software in the MP-3 units. A reference value of 54,000 gammas has been subtracted from all the magnetic readings before plotting. The data are plotted as profiles at a scale of 1:3000. VLF and MaxMin data have not been corrected for topographic effects, although the MaxMin data was corrected by subtracting the lowest frequency (222 Hz) from all the other frequencies. Further data reduction such as topographic effects, Fraser filtering etc. will be performed on all data sets. Correlation of all geophysical data and geologic data will be completed in the near future.

DATA PRESENTATION

The data are presented as profiles plotted at a scale of 1:3000 and as numerical tables in appendices A and B. Appendix A contains data from the Getchell mine area and appendix B contains data from the Preble deposit area. The order of presentation in each appendix is 1) total field magnetic data, 2) horizontal loop electromagnetic (HLEM) data, 3) very low frequency (VLF) electromagnetic data, 4) spectral induced polarization (SIP) data.

The magnetic data are plotted as gammas, after a reference value of 54000 gammas was subtracted from each reading, versus the station location. Tabulated magnetic data are presented after each profile showing the actual magnetic reading.

The horizontal loop electromagnetic (HLEM) data are presented as stacked profiles of five frequencies, 222, 444, 888, 1777, and 3555 Hz. The data are

plotted as station location versus percent (%) values of the primary field strength at the receiver; % in-phase (IP), and % out-of-phase (OP). Tabulated HLEM data follows each profile. Two different coil spacings of 125 and 200 meters are each plotted separately. The lowest frequency (222 Hz) has been subtracted from all the other frequencies to correct for topographic effects.

The very low frequency (VLF) electromagnetic data are plotted as station location versus apparent resistivity and the phase angle by which E leads H, in degrees. Also plotted is station location versus tilt angle or the vertical in-phase component of the polarization ellipsoid, and the quadrature or the vertical out-of-phase component of the polarization ellipsoid. Tabulated VLF data follows each profile. The two frequencies of 24.8 KHz (Seattle, Wash.) and 24.0 KHz (Cuttler, Maine) are plotted separately.

Basic Principles of Spectral Induced Polarization

The spectral induced polarization method utilizes the characteristics of some rocks to store and release electrical energy through a variety of mechanisms. For a detailed account of these mechanisms the reader is referred to: Madden and Cantwell (1967), Sumner (1976), Washburne (1982) and Olhoeft (1982). The two fundamental parameters measured are amplitude and phase of the received voltage relative to current waveform that is transmitted into the ground. The observed changes in amplitude and phase as a function of frequency result from conduction and polarization processes that produce the IP effect in rocks. These changes in amplitude and phase are commonly plotted on logarithmic scales (Smith et. al., 1983).

Acknowledgements

The authors would like to acknowledge the following people: Robert Horton and Gerda Abrams of the U.S. Geological Survey for their help in the data collection and data entry; William Bagby of the U.S. Geological Survey for advice and consultation on the geological parameters; personnel from the Getchell and Pinson mines for their help and cooperation.

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Smith, B. D., Tippens, C. L., Flanigan, V. J., and Sadek, H., 1983, Preliminary results of spectral induced polarization measurements, Wadi Bidah district, Kingdom of Saudi Arabia: U.S. Geological Survey Open-File Report OF-03-70.

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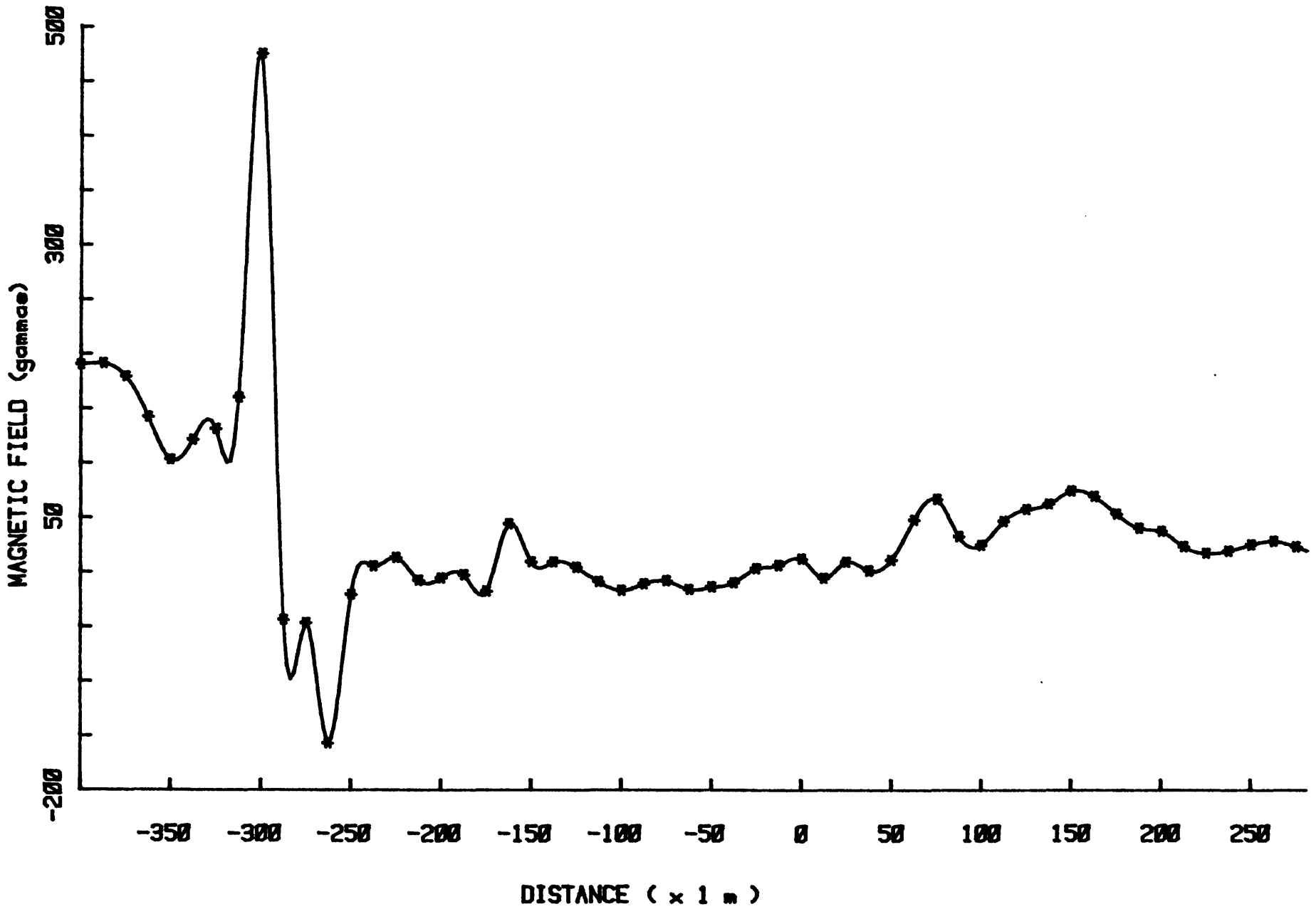
APPENDIX A

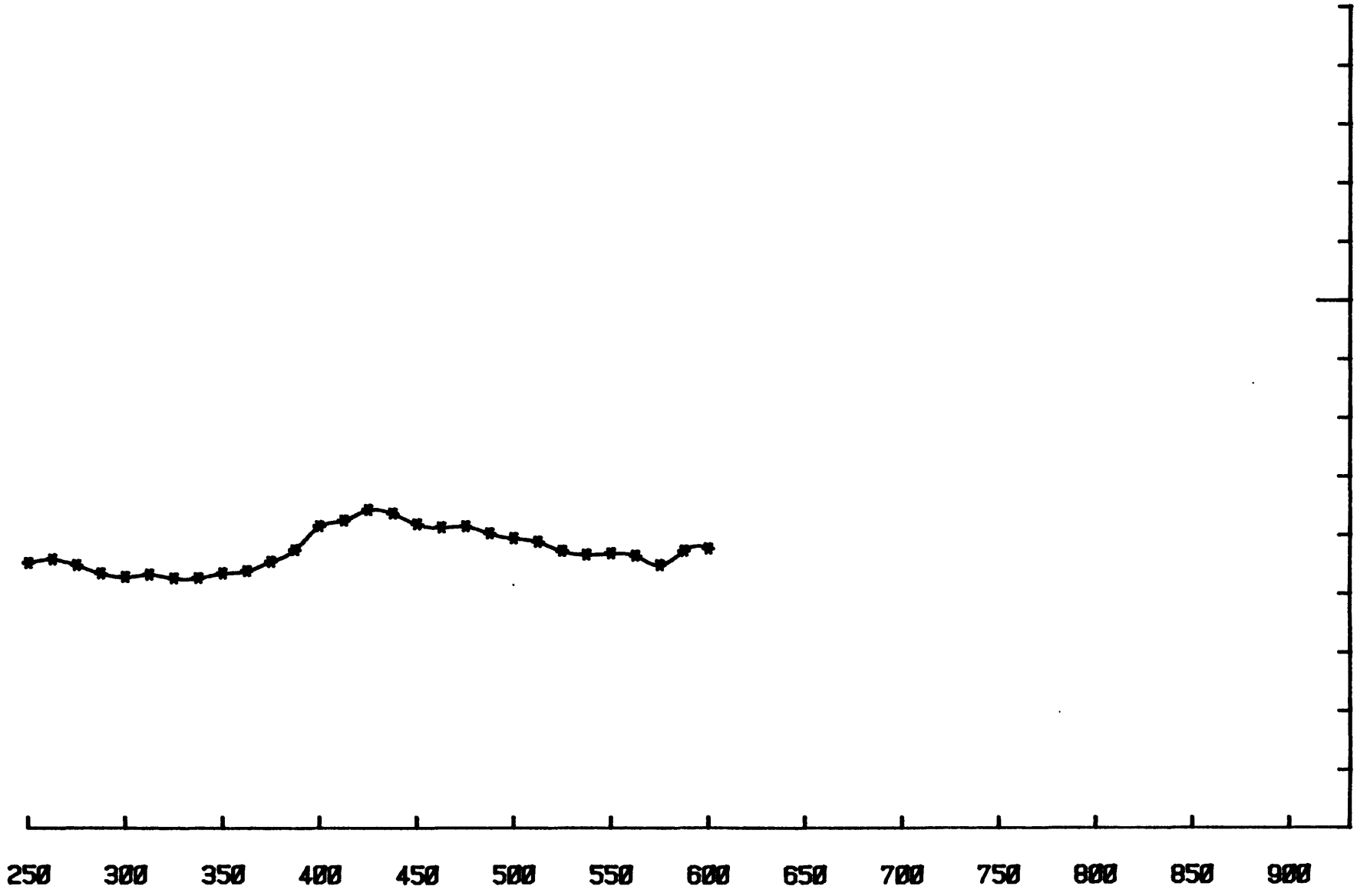
Geophysical data in the GETCHELL mine area

Data Type	Plot	Line	Description
Magnetic Data	(2 sheets)	Line G1	
Magnetic Data		Line G2	
HLEM Data	(2 sheets)	Line G1	(125 m coil spacing)
HLEM Data	(2 sheets)	Line G1	(200 m coil spacing)
VLF Data	(2 sheets)	Line G1	(Apparent resistivity and phase angle, 24.8 KHz, Seattle)
VLF Data	(2 sheets)	Line G1	(Tilt angle (dip) and % Quadrature, 24.8 KHz, Seattle)
VLF Data	(2 sheets)	Line G1	(Apparent resistivity and phase angle, 24.0 KHz, Cuttler, Maine)
VLF Data	(2 sheets)	Line G	(Tilt Angle (Dip) and % Quadrature, 24.0 KHz, Cuttler, Maine)
VLF Data		Line G2	(Apparent resistivity and Phase angle, 24.8 KHz, Seattle)
VLF Data		Line G2	(Tilt angle (Dip) and % Quadrature, 24.8 KHz, Seattle)
SIP Data		IP Line 1	Frequency vs. Phase
SIP Data		IP Line 1A	Frequency vs. Phase
SIP Data		IP Line 2	Frequency vs. Phase
SIP Data		IP Line 2	Apparent Resistivity Pseudo-Section

MAGNETIC DATA

Lines G-1 and G-2


GETCHELL LINE 1 06/24/84
MAP SCALE = 1:3000
MAGNETIC FIELD (gammas)
500
300
50
-200
-350
-300
-250
-200
-150
-100
-50
0
50
100
150
200
250
DISTANCE (x 1 m)


250
300
350
400
450
500
550
600
650
700
750
800
850
900

GETCHELL 06/24/84 LINE = 1
MULTIPLY STATION * 1 REFERENCE VALUE = 54000
NUMBER OF BASE STATIONS = 0 NUMBER OF STATIONS = 81

BASE STATION READINGS

N	TIME	MAG

TRAVERSE READINGS

STATION	TIME	MAG
-400.0	0: 0	54190.00
-387.5	0: 0	54191.00
-375.0	0: 0	54179.00
-362.5	0: 0	54142.00
-350.0	0: 0	54103.00
-337.5	0: 0	54121.00
-325.0	0: 0	54131.00
-312.5	0: 0	54160.00
-300.0	0: 0	54475.00
-287.5	0: 0	53956.00
-275.0	0: 0	53953.00
-262.5	0: 0	53843.00
-250.0	0: 0	53979.00
-237.5	0: 0	54005.00
-225.0	0: 0	54013.00
-212.5	0: 0	53992.00
-200.0	0: 0	53994.00
-187.5	0: 0	53997.00
-175.0	0: 0	53982.00
-162.5	0: 0	54044.00
-150.0	0: 0	54009.00
-137.5	0: 0	54009.00
-125.0	0: 0	54004.00
-112.5	0: 0	53991.00
-100.0	0: 0	53983.00
-87.5	0: 0	53989.00
-75.0	0: 0	53992.00
-62.5	0: 0	53984.00
-50.0	0: 0	53986.00
-37.5	0: 0	53990.00
-25.0	0: 0	54003.00
-12.5	0: 0	54006.00
+0.0	0: 0	54012.00
+12.5	0: 0	53994.00
+25.0	0: 0	54009.00
+37.5	0: 0	54001.00
+50.0	0: 0	54011.00
+62.5	0: 0	54048.00
+75.0	0: 0	54067.00
+87.5	0: 0	54033.00
+100.0	0: 0	54025.00
+112.5	0: 0	54047.00
+125.0	0: 0	54058.00
+137.5	0: 0	54063.00
+150.0	0: 0	54075.00
+162.5	0: 0	54070.00
+175.0	0: 0	54054.00

GETCHELL 06/24/84 LINE = 1
MULTIPLY STATION * 1 REFERENCE VALUE = 54000
NUMBER OF BASE STATIONS = 0 NUMBER OF STATIONS = 81

BASE STATION READINGS

N	TIME	MAG

TRAVERSE READINGS

STATION	TIME	MAG
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+200.0	0: 0	54038.00
+212.5	0: 0	54024.00
+225.0	0: 0	54018.00
+237.5	0: 0	54020.00
+250.0	0: 0	54026.00
+262.5	0: 0	54029.00
+275.0	0: 0	54024.00
+287.5	0: 0	54017.00
+300.0	0: 0	54014.00
+312.5	0: 0	54016.00
+325.0	0: 0	54013.00
+337.5	0: 0	54013.00
+350.0	0: 0	54017.00
+362.5	0: 0	54019.00
+375.0	0: 0	54027.00
+387.5	0: 0	54037.00
+400.0	0: 0	54057.00
+412.5	0: 0	54062.00
+425.0	0: 0	54071.00
+437.5	0: 0	54068.00
+450.0	0: 0	54059.00
+462.5	0: 0	54056.00
+475.0	0: 0	54057.00
+487.5	0: 0	54051.00
+500.0	0: 0	54047.00
+512.5	0: 0	54044.00
+525.0	0: 0	54036.00
+537.5	0: 0	54033.00
+550.0	0: 0	54034.00
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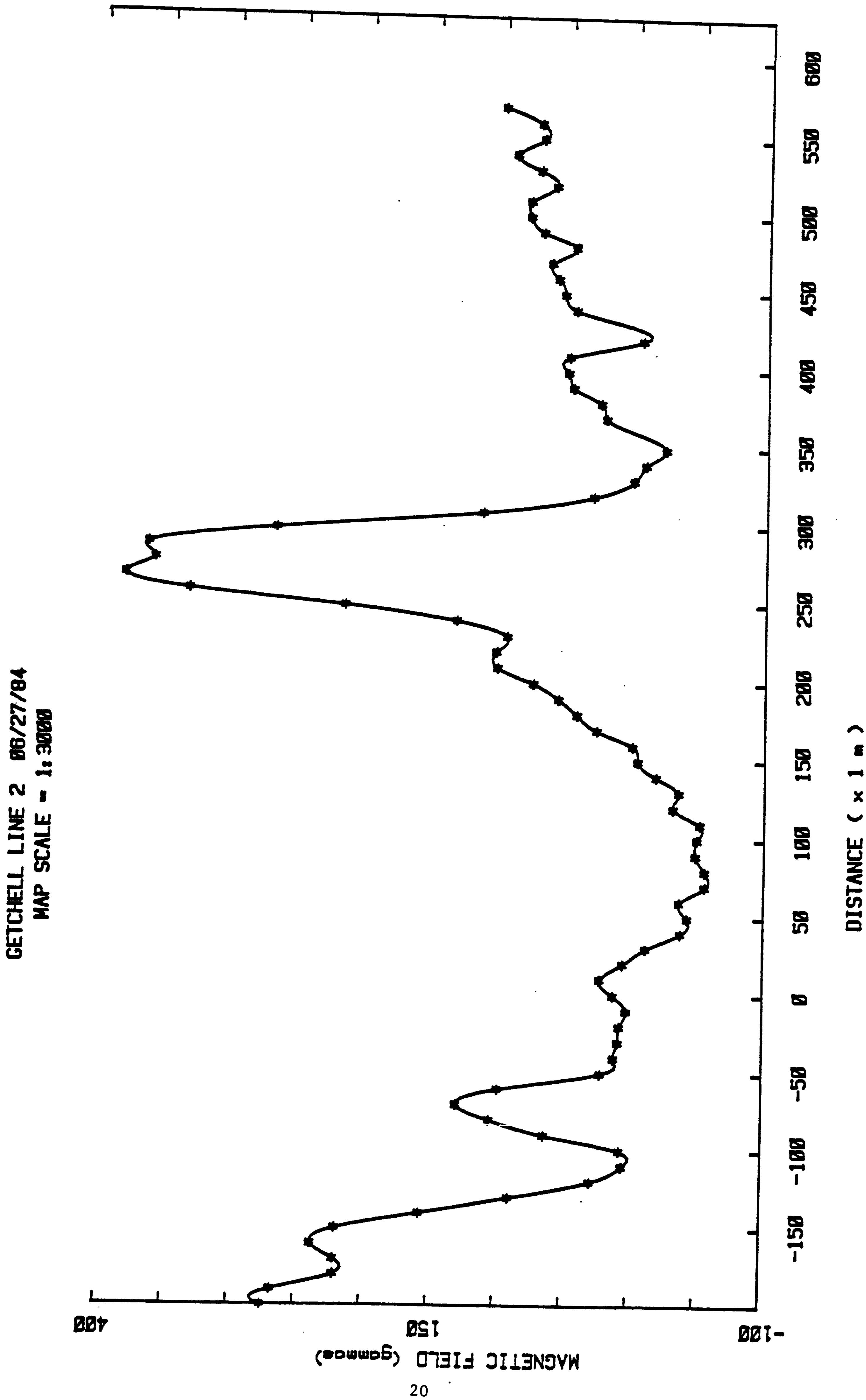
+600.0	0: 0	54038.00


GETCHELL LINE 2 Ø8/27/84
MAP SCALE = 1:3ØØØ
DISTANCE (x 1 m)
-15Ø
-1ØØ
-5Ø
Ø
5Ø
1ØØ
15Ø
2ØØ
25Ø
3ØØ
35Ø
4ØØ
45Ø
5ØØ
55Ø
6ØØ
MAGNETIC FIELD (gamma)
4ØØ
15Ø
-1ØØ

GETCHELL 06/27/84 LINE = 2
MULTIPLY STATION * 1 REFERENCE VALUE = 54000
NUMBER OF BASE STATIONS = 0 NUMBER OF STATIONS = 76

BASE STATION READINGS

N	TIME	MAG

TRAVERSE READINGS

STATION	TIME	MAG
-200.0	0: 0	54274.00
-190.0	0: 0	54267.00
-180.0	0: 0	54220.00
-170.0	0: 0	54220.00
-160.0	0: 0	54237.00
-150.0	0: 0	54219.00
-140.0	0: 0	54156.00
-130.0	0: 0	54089.00
-120.0	0: 0	54028.00
-110.0	0: 0	54004.00
-100.0	0: 0	54006.00
-90.0	0: 0	54063.00
-80.0	0: 0	54104.00
-70.0	0: 0	54129.00
-60.0	0: 0	54098.00
-50.0	0: 0	54021.00
-40.0	0: 0	54011.00
-30.0	0: 0	54008.00
-20.0	0: 0	54007.00
-10.0	0: 0	54002.00
+0.0	0: 0	54012.00
+10.0	0: 0	54022.00
+20.0	0: 0	54005.00
+30.0	0: 0	53988.00
+40.0	0: 0	53962.00
+50.0	0: 0	53957.00
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+80.0	0: 0	53944.00
+90.0	0: 0	53951.00
+100.0	0: 0	53950.00
+110.0	0: 0	53948.00
+120.0	0: 0	53968.00
+130.0	0: 0	53964.00
+140.0	0: 0	53981.00
+150.0	0: 0	53995.00
+160.0	0: 0	53999.00
+170.0	0: 0	54026.00
+180.0	0: 0	54041.00
+190.0	0: 0	54055.00
+200.0	0: 0	54074.00
+210.0	0: 0	54101.00
+220.0	0: 0	54102.00
+230.0	0: 0	54094.00
+240.0	0: 0	54132.00
+250.0	0: 0	54216.00
+260.0	0: 0	54333.00
+270.0	0: 0	54381.00

GETCHELL 06/27/84 LINE = 2
MULTIPLY STATION * 1 REFERENCE VALUE = 54000
NUMBER OF BASE STATIONS = 0 NUMBER OF STATIONS = 76

BASE STATION READINGS

N	TIME	MAG

TRAVERSE READINGS

STATION	TIME	MAG
+280.0	0: 0	54359.00
+290.0	0: 0	54364.00
+300.0	0: 0	54268.00
+310.0	0: 0	54113.00
+320.0	0: 0	54030.00
+330.0	0: 0	54000.00
+340.0	0: 0	53991.00
+350.0	0: 0	53976.00
+370.0	0: 0	54021.00
+380.0	0: 0	54025.00
+390.0	0: 0	54046.00
+400.0	0: 0	54050.00
+410.0	0: 0	54049.00
+420.0	0: 0	53994.00
+440.0	0: 0	54044.00
+450.0	0: 0	54053.00
+460.0	0: 0	54058.00
+470.0	0: 0	54063.00
+480.0	0: 0	54045.00
+490.0	0: 0	54070.00
+500.0	0: 0	54080.00
+510.0	0: 0	54080.00
+520.0	0: 0	54061.00
+530.0	0: 0	54073.00
+540.0	0: 0	54091.00
+550.0	0: 0	54071.00
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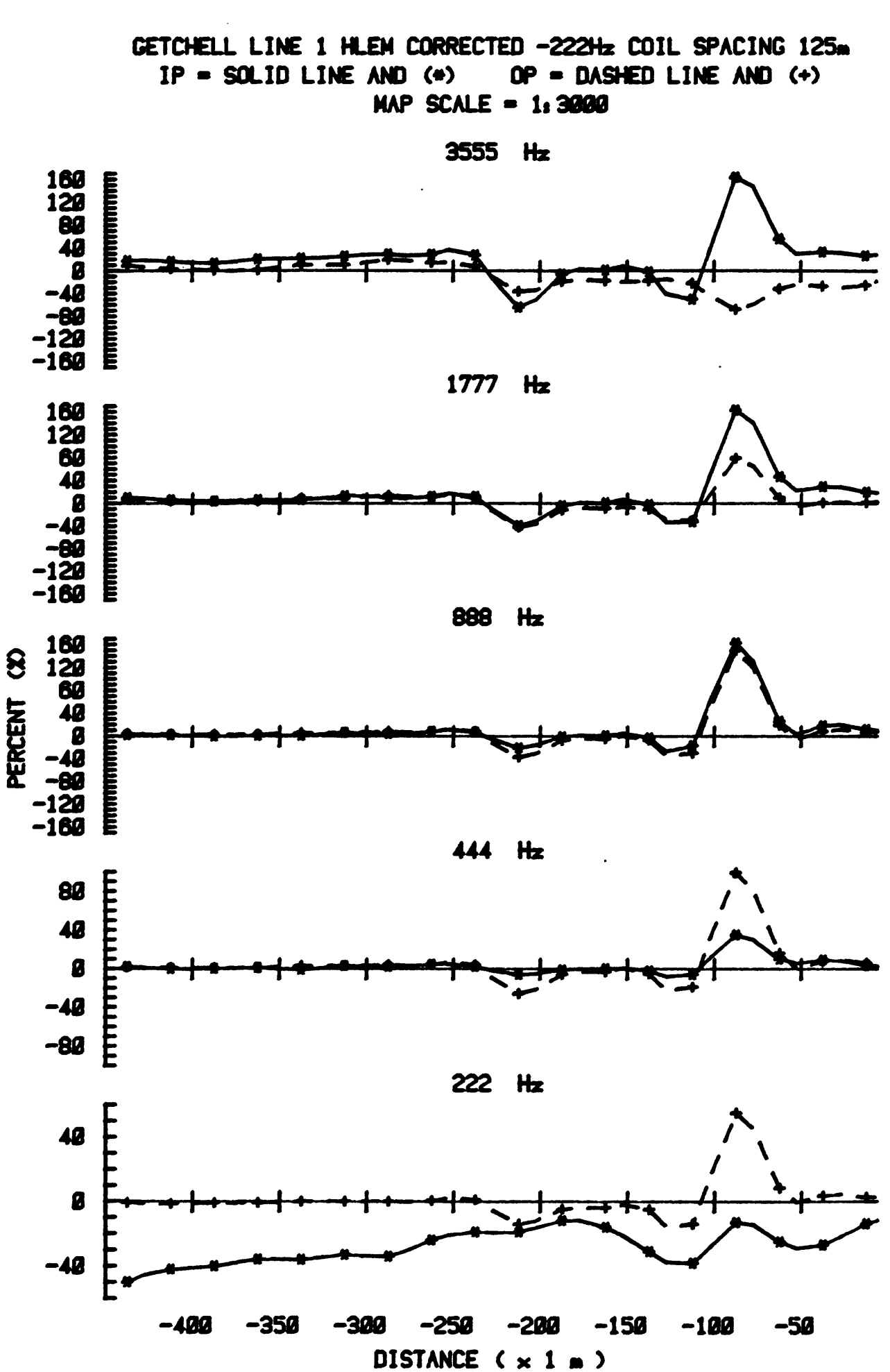
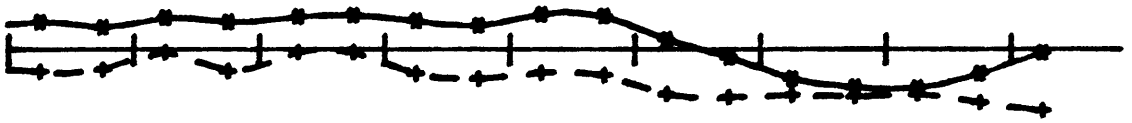
+570.0	0: 0	54100.00

HLEM DATA

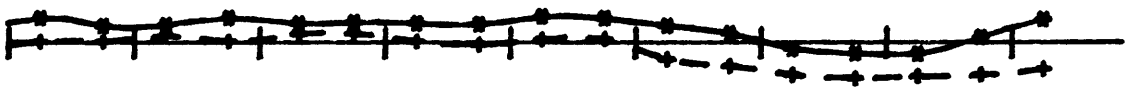
Line G-1


GETCHELL LINE 1 HLEM CORRECTED -222Hz COIL SPACING 125m
IP = SOLID LINE AND (*) OP = DASHED LINE AND (+)
MAP SCALE = 1:3000
3555 Hz
1777 Hz
888 Hz
444 Hz
222 Hz
PERCENT (%)
160
120
80
40
0
-40
-80
-120
-160
-400 -350 -300 -250 -200 -150 -100 -50
DISTANCE (x 1 m)

3555 Hz



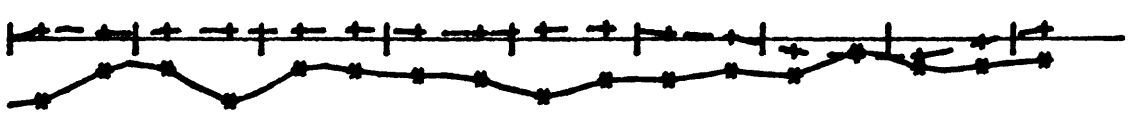
1777 Hz



888 Hz

444 Hz

222 Hz

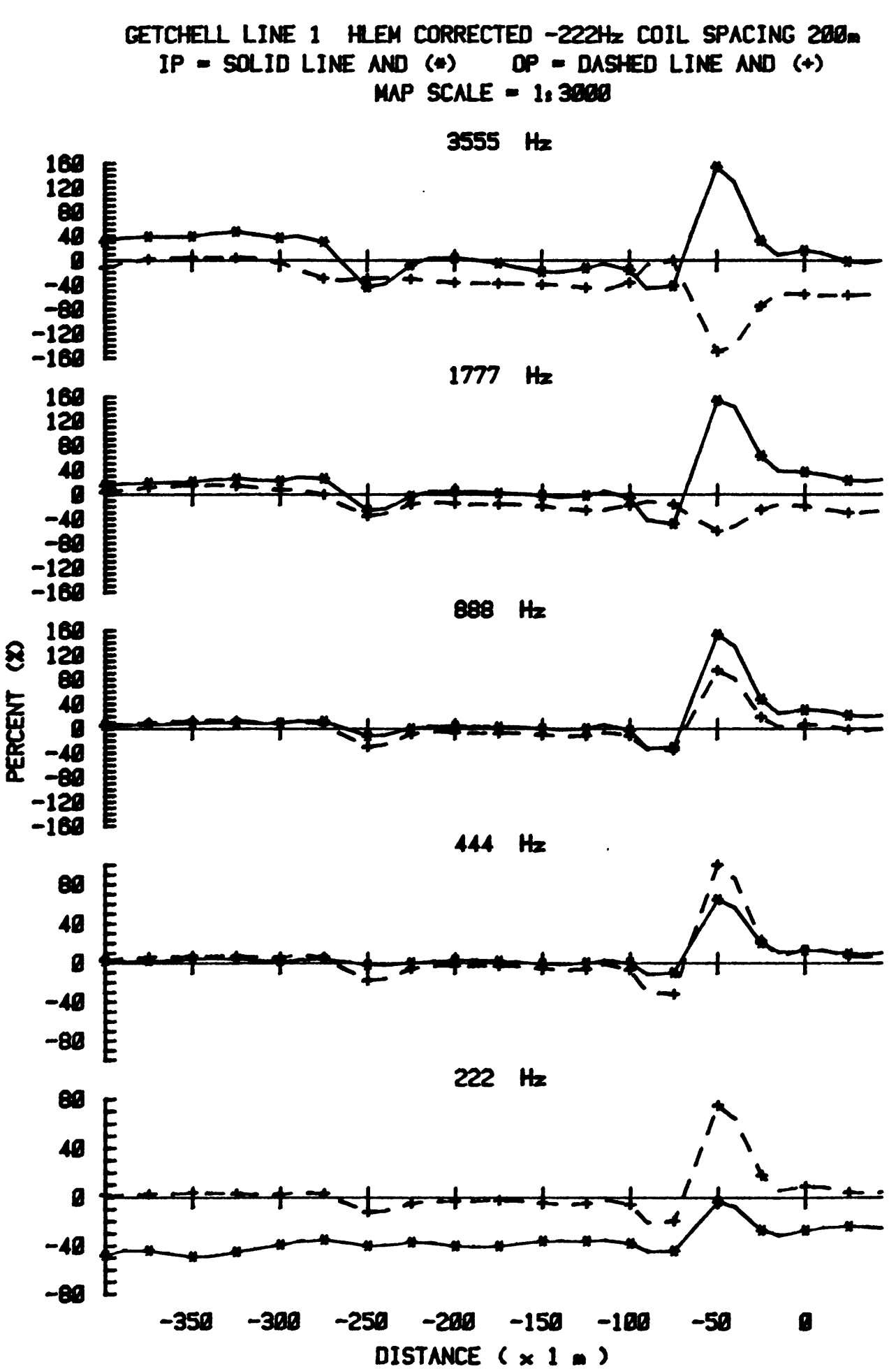


0 50 100 150 200 250 300 350

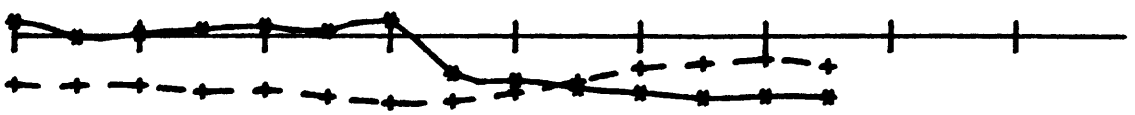
PERCENT (%) OUT-PHASE

CORRECTED SLINGRAM DATA
GETCHELL SLINGRAM 125M/400FT LINE = G1 6/26/84
COIL SPACING = 125M MULTIPLY STATION * 1
NUMBER OF FREQUENCIES = 5 NUMBER OF STATIONS = 33

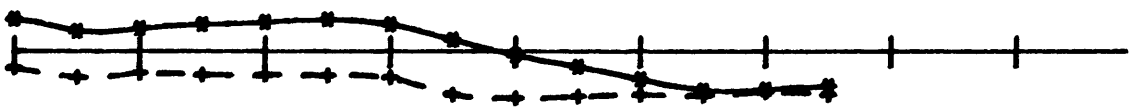
	FREQUENCY 222		FREQUENCY 444		FREQUENCY 888		FREQUENCY 1777		FREQUENCY 3555	
STATION	IP	OP	IP	OP	IP	OP	IP	OP	IP	OP
-437.5	-50.0	-1.0	+2.0	+1.5	+2.0	+4.0	+10.0	+7.0	+18.0	+9.0
-412.5	-42.0	-1.5	+0.0	+1.0	+2.0	+3.0	+6.0	+4.0	+16.0	+3.0
-387.5	-40.0	-1.0	+0.0	+1.0	+0.0	+3.0	+4.0	+4.0	+13.0	+.5
-362.5	-36.0	-1.0	+1.0	+1.0	+1.0	+3.0	+6.0	+4.0	+20.0	+1.0
-337.5	-36.0	+0.0	-1.0	+3.0	+1.0	+5.5	+6.0	+9.0	+21.5	+10.0
-312.5	-33.0	+0.0	+3.0	+3.0	+6.0	+6.0	+13.0	+9.0	+25.0	+10.0
-287.5	-34.0	+0.0	+2.0	+4.0	+4.0	+8.0	+10.0	+14.0	+29.0	+19.0
-262.5	-24.0	+.5	+4.5	+4.0	+8.0	+7.5	+12.0	+11.0	+28.0	+14.0
-237.5	-19.0	+1.0	+2.0	+4.0	+7.0	+8.0	+12.0	+10.0	+27.0	+7.5
-212.5	-19.0	-14.0	-6.0	-26.0	-21.0	-37.0	-39.0	-42.0	-64.0	-36.0
-187.5	-12.0	-5.0	-1.0	-6.0	-1.0	-8.0	-4.0	-12.0	-6.0	-19.0
-162.5	-16.0	-4.0	+0.0	-3.0	+.5	-5.0	+1.0	-9.0	+1.0	-18.0
-137.5	-31.0	-5.0	-2.0	-5.0	-3.0	-7.0	-2.0	-10.0	-2.0	-18.0
-112.5	-38.0	-14.0	-6.0	-19.0	-17.0	-30.0	-32.0	-30.0	-50.0	-22.0
-87.5	-13.0	+55.0	+35.0	+99.0	+163.0	+150.0	+163.0	+79.0	+163.0	-68.0
-62.5	-25.0	+8.5	+10.0	+16.0	+26.5	+19.0	+47.0	+10.0	+56.0	-32.0
-37.5	-27.0	+3.5	+9.0	+7.5	+18.0	+8.0	+29.5	+1.0	+33.0	-27.0
-12.5	-14.0	+2.5	+4.0	+6.0	+11.5	+7.0	+20.0	+1.0	+26.5	-25.0
+12.5	-13.0	+3.5	+3.0	+7.0	+11.5	+10.0	+21.0	+8.0	+38.0	-4.0
+37.5	-27.0	+3.5	+9.0	+7.5	+18.0	+8.0	+29.5	+1.0	+33.0	-27.0
+65.5	-13.0	+3.5	+4.0	+7.0	+11.5	+11.0	+22.5	+10.0	+39.0	-4.0
+87.5	-14.0	+4.0	+3.0	+7.5	+13.5	+12.5	+24.0	+11.0	+41.0	-4.0
+112.5	-16.0	+3.0	+5.0	+5.5	+13.0	+7.0	+23.0	+1.0	+34.0	-30.0
+137.5	-17.5	+2.5	+2.5	+4.5	+10.5	+5.0	+21.5	-3.0	+28.5	-36.0
+162.5	-25.0	+4.0	+7.0	+8.0	+17.0	+10.0	+31.0	+3.5	+42.0	-29.0
+187.5	-18.0	+4.5	+6.0	+9.5	+16.0	+12.0	+29.0	+4.0	+40.0	-32.0
+212.5	-18.0	+2.0	+4.0	+4.0	+11.0	+1.5	+20.0	-21.0	+12.0	-55.0
+237.5	-14.0	+.5	+3.5	+.5	+9.5	-5.5	+11.0	-29.0	-10.0	-59.0
+262.5	-16.0	-5.5	+1.5	-8.0	+2.0	-23.0	-8.0	-40.0	-36.0	-56.0
+287.5	-5.5	-7.5	+.5	-11.5	-2.0	-27.0	-13.5	-44.0	-46.5	-58.0
+312.5	-12.5	-7.5	+.5	-11.5	-.5	-26.0	-14.5	-42.0	-47.5	-55.0
+337.5	-12.0	-1.5	+4.0	-2.0	+10.0	-12.0	+6.0	-40.0	-30.0	-65.0
+362.5	-9.5	+4.0	+8.0	+6.0	+19.5	+.5	+27.5	-33.0	-4.5	-75.0


GETCHELL LINE 1 HLEM CORRECTED -222Hz COIL SPACING 200m
IP = SOLID LINE AND (*) OP = DASHED LINE AND (+)
MAP SCALE = 1:3000
3555 Hz
1777 Hz
888 Hz
444 Hz
222 Hz
PERCENT (%)
160
120
80
40
0
-40
-80
-120
-160
-350 -300 -250 -200 -150 -100 -50 0
DISTANCE (x 1 m)

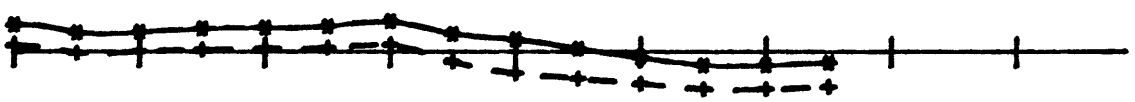
3555 Hz



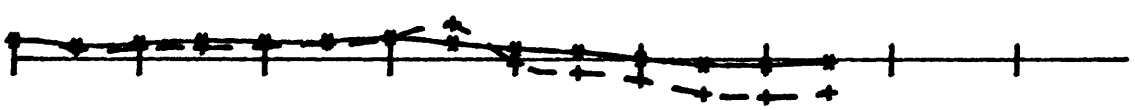
1777 Hz



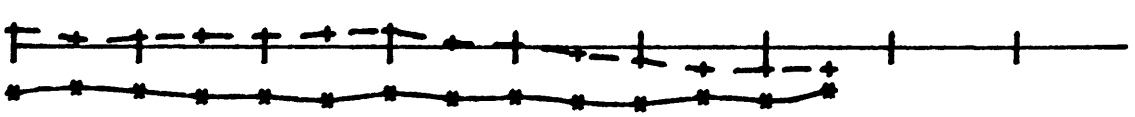
888 Hz



444 Hz



222 Hz



50 100 150 200 250 300 350 400

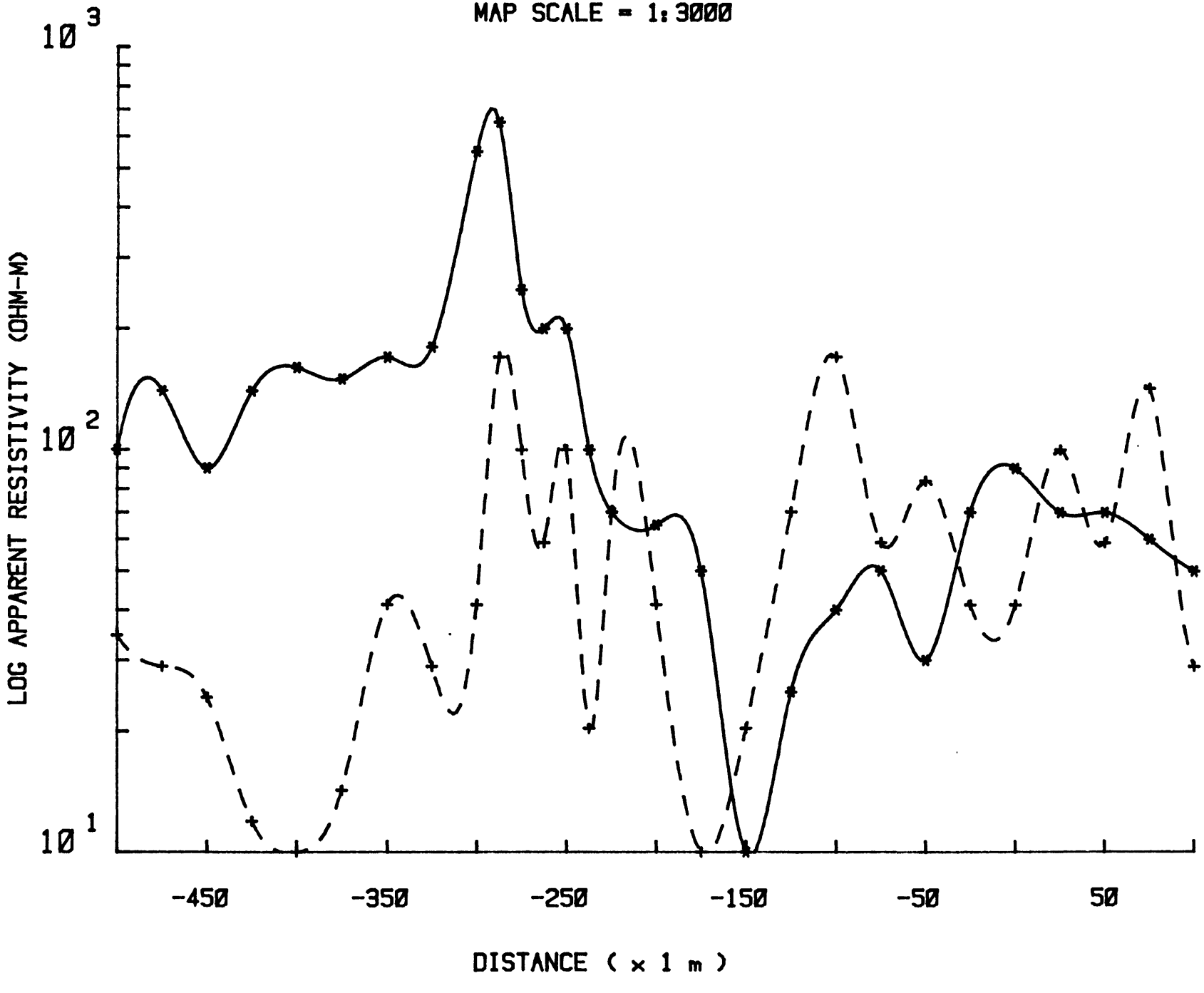
PERCENT (%) OUT-PHASE

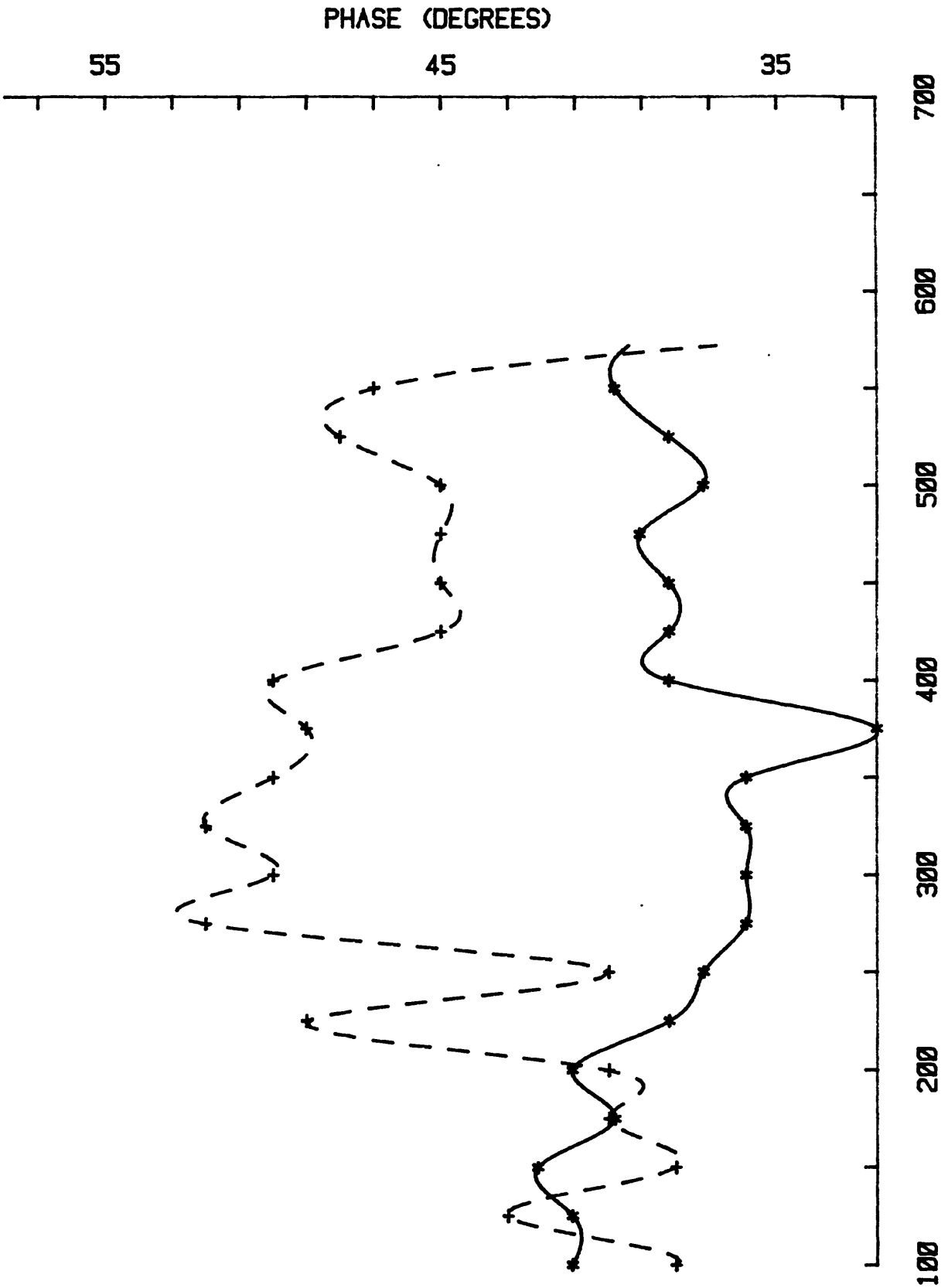
CORRECTED SLINGRAM DATA
GETCHELL SLINGRAM 200M/600FT LINE = G1 6/26/84
COIL SPACING = 200M MULTIPLY STATION * 1
NUMBER OF FREQUENCIES = 5 NUMBER OF STATIONS = 30

	FREQUENCY 222		FREQUENCY 444		FREQUENCY 888		FREQUENCY 1777		FREQUENCY 3555	
STATION	IP	OP	IP	OP	IP	OP	IP	OP	IP	OP
-400.0	-48.0	+1.5	+2.0	+3.5	+6.0	+5.0	+15.0	+3.5	+31.0	-12.0
-375.0	-44.0	+2.5	+2.0	+6.0	+7.0	+10.0	+19.0	+11.5	+39.0	+2.0
-350.0	-49.0	+3.5	+4.0	+7.0	+9.0	+13.0	+21.0	+15.0	+39.0	+4.0
-325.0	-45.0	+3.0	+4.0	+7.0	+10.0	+13.0	+26.0	+14.0	+47.0	+4.0
-300.0	-39.0	+2.5	+2.0	+6.0	+9.0	+9.0	+22.0	+7.5	+36.0	-4.0
-275.0	-35.0	+3.0	+4.0	+6.0	+12.0	+7.5	+26.0	-.5	+30.0	-30.0
-250.0	-40.0	-12.0	-2.0	-18.0	-12.0	-30.0	-26.0	-35.0	-44.0	-30.0
-225.0	-37.0	-5.0	+0.0	-6.0	+0.0	-9.0	-3.0	-16.0	-8.0	-31.0
-200.0	-40.0	-3.0	+3.0	-3.0	+4.0	-6.5	+5.0	-15.0	+3.0	-37.0
-175.0	-40.0	-2.5	+2.0	-3.0	+3.0	-7.5	+2.0	-16.0	-5.0	-38.0
-150.0	-36.0	-4.5	-1.0	-5.5	+0.0	-10.0	-2.0	-19.5	-19.0	-40.0
-125.0	-36.0	-5.0	+0.0	-6.5	+0.0	-11.5	-2.0	-26.0	-13.0	-45.0
-100.0	-38.0	-6.0	+0.0	-7.0	-3.0	-11.5	-6.0	-18.0	-16.0	-37.0
-75.0	-44.0	-19.5	-10.0	-32.0	-31.0	-35.0	-48.0	-16.0	-42.0	-.5
-50.0	-3.5	+75.0	+64.5	+100.0	+153.5	+95.0	+153.5	-60.0	+153.5	-150.0
-25.0	-27.0	+18.0	+20.5	+23.0	+48.0	+19.0	+63.0	-25.0	+32.0	-75.0
+0.0	-27.0	+9.0	+13.0	+13.0	+30.5	+7.0	+36.5	-19.0	+16.0	-56.0
+25.0	-24.0	+4.0	+9.0	+7.0	+21.5	-2.0	+22.5	-30.0	-2.0	-57.0
+50.0	-26.0	+5.0	+11.0	+7.5	+22.0	+0.0	+26.0	-25.0	+2.0	-57.0
+75.0	-29.0	+6.0	+13.0	+8.0	+26.0	+2.0	+30.5	-27.0	+7.0	-64.0
+100.0	-29.0	+6.0	+12.0	+9.0	+27.0	+3.5	+33.0	-27.0	+11.0	-62.0
+125.0	-31.0	+7.0	+12.5	+11.0	+28.5	+4.0	+36.0	-28.0	+5.0	-70.0
+150.0	-27.0	+9.0	+15.0	+14.0	+34.5	+8.0	+30.5	-30.0	+18.0	-77.0
+175.0	-30.0	+2.0	+11.0	+25.0	+20.0	-12.0	+13.0	-50.0	-43.0	-75.0
+200.0	-29.0	+1.0	+7.0	-3.5	+14.0	-25.0	-5.0	-54.0	-51.0	-65.0
+225.0	-32.0	-4.0	+5.0	-10.0	+3.0	-31.0	-18.0	-52.0	-60.0	-52.0
+250.0	-33.0	-8.0	+0.0	-15.0	-7.0	-37.0	-32.0	-50.0	-65.0	-37.0
+275.0	-29.0	-13.0	-4.0	-25.0	-16.0	-43.0	-45.0	-51.0	-71.0	-32.0
+300.0	-31.0	-13.0	-4.0	-27.0	-16.0	-43.0	-44.0	-47.0	-69.0	-27.0
+325.0	-25.0	-12.5	-2.0	-24.0	-13.0	-40.0	-40.0	-50.0	-70.0	-35.0

VLF DATA

Lines G-1 and G-2


GETCHELL VLF (24.0) LINE=G1 6-24-84
APP RESISTIVITY = SOLID LINE AND (*) - PHASE = DASHED LINE AND (+)
MAP SCALE = 1:3000
10 3
10 2
10 1
LOG APPARENT RESISTIVITY (OHM-M)
-450
-350
-250
-150
-50
50
DISTANCE (x 1 m)



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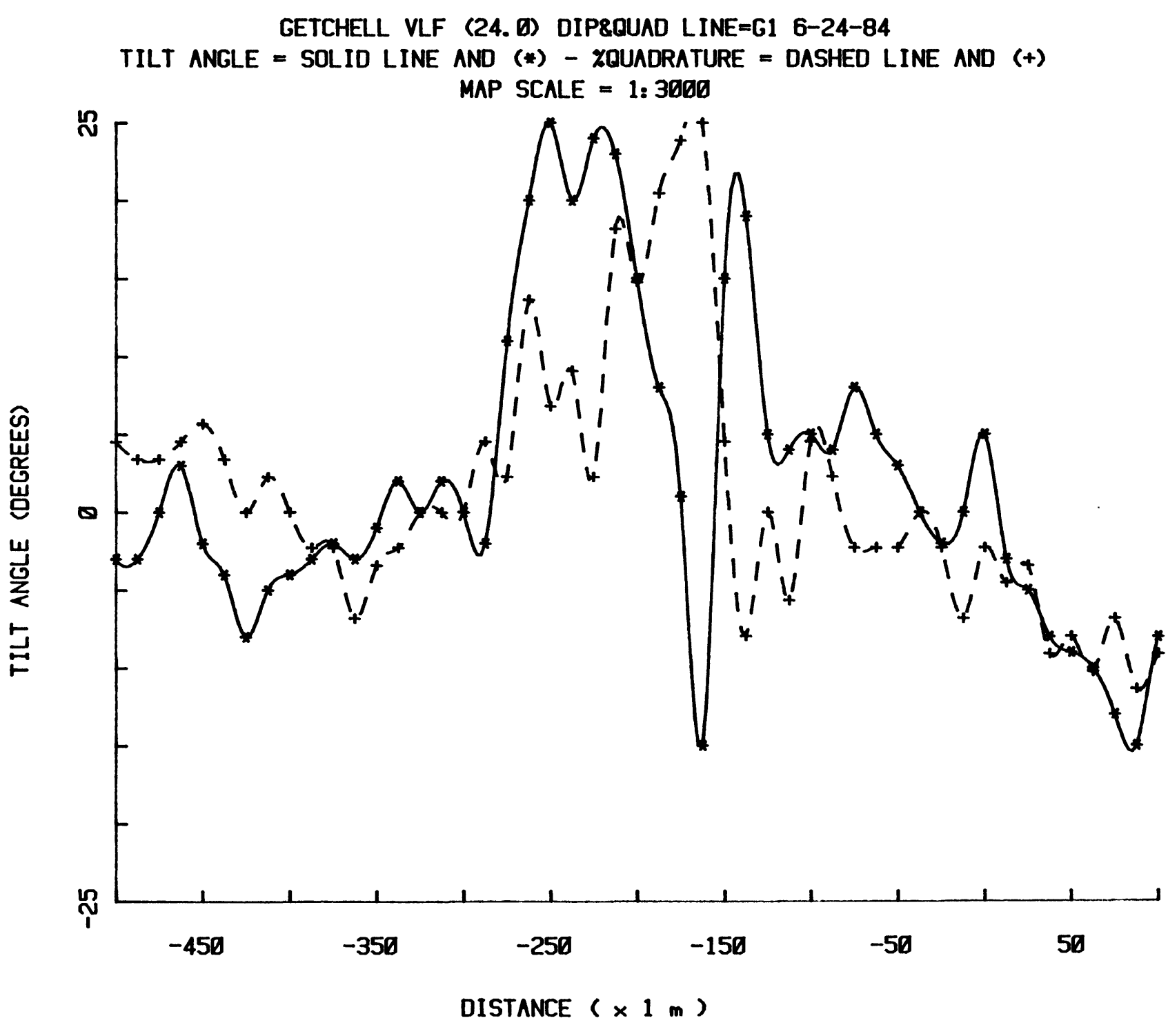
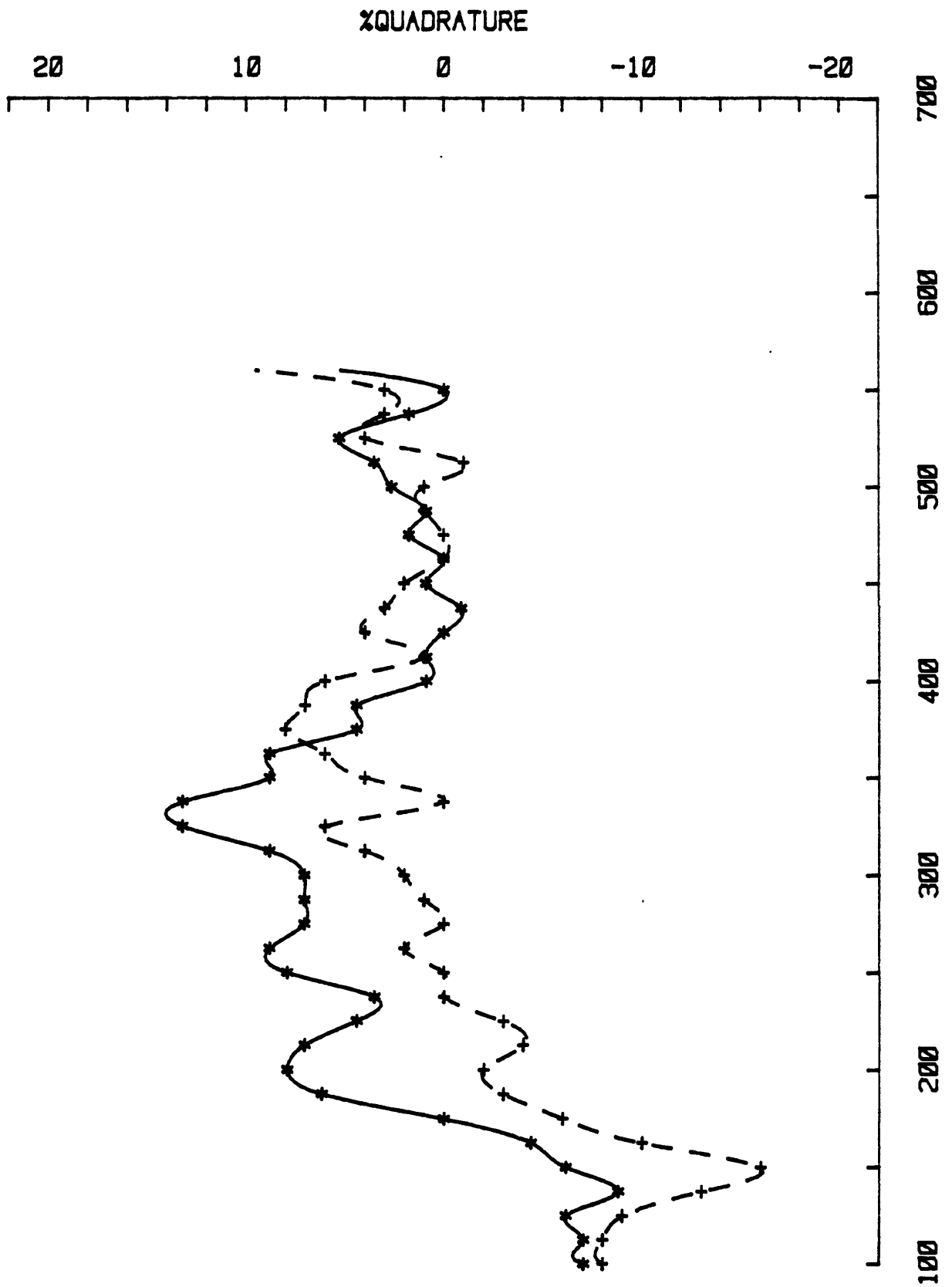
GETCHELL RES&PHASE 24 LINE = G1
6/24/84 MULTIPLY STATION * 1
NUMBER OF STATIONS = 46

STATION	RES	PHASE
-500.0	+100.0	39.0
-475.0	+140.0	38.0
-450.0	+90.0	37.0
-425.0	+140.0	33.0
-400.0	+160.0	32.0
-375.0	+150.0	34.0
-350.0	+170.0	40.0
-325.0	+180.0	38.0
-300.0	+550.0	40.0
-287.5	+650.0	48.0
-275.0	+250.0	45.0
-262.5	+200.0	42.0
-250.0	+200.0	45.0
-237.5	+100.0	36.0
-225.0	+70.0	43.0
-200.0	+65.0	40.0
-175.0	+50.0	32.0
-150.0	+10.0	36.0
-125.0	+25.0	43.0
-100.0	+40.0	48.0
-75.0	+50.0	42.0
-50.0	+30.0	44.0
-25.0	+70.0	40.0
+0.0	+90.0	40.0
+25.0	+70.0	45.0
+50.0	+70.0	42.0
+75.0	+60.0	47.0
+100.0	+50.0	38.0
+125.0	+50.0	43.0
+150.0	+60.0	38.0
+175.0	+40.0	40.0
+200.0	+50.0	40.0
+225.0	+30.0	49.0
+250.0	+25.0	40.0
+275.0	+20.0	52.0
+300.0	+20.0	50.0
+325.0	+20.0	52.0
+350.0	+20.0	50.0
+375.0	+10.0	49.0
+400.0	+30.0	50.0
+425.0	+30.0	45.0
+450.0	+30.0	45.0
+475.0	+35.0	45.0
+500.0	+25.0	45.0
+525.0	+30.0	48.0
+550.0	+40.0	47.0


GETCHELL VLF (24.0) DIP&QUAD LINE=G1 6-24-84
TILT ANGLE = SOLID LINE AND (*) - %QUADRATURE = DASHED LINE AND (+)
MAP SCALE = 1:3000
25
0
-25
TILT ANGLE (DEGREES)
-450
-350
-250
-150
-50
50
DISTANCE (x 1 m)



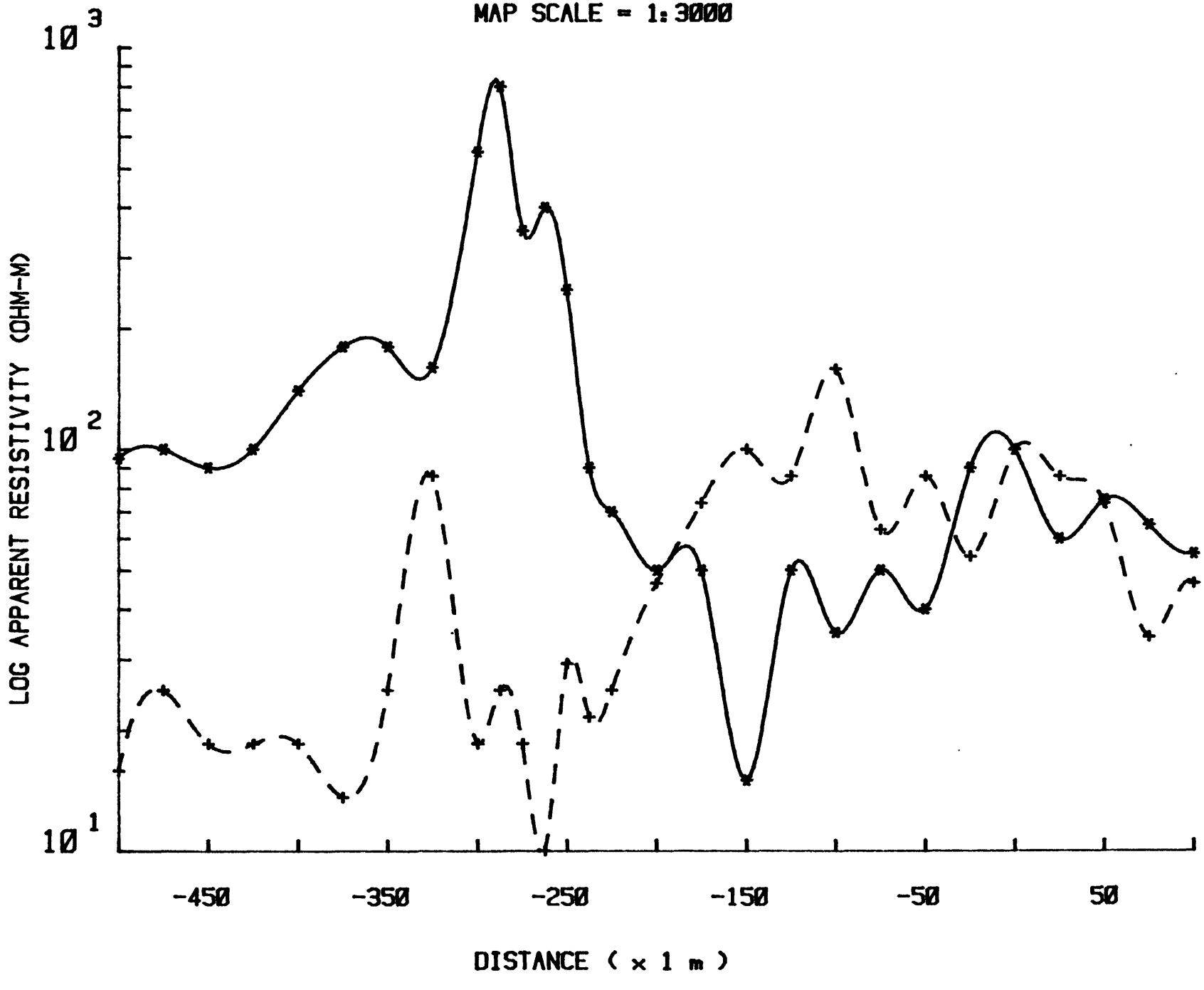
PAGE 2

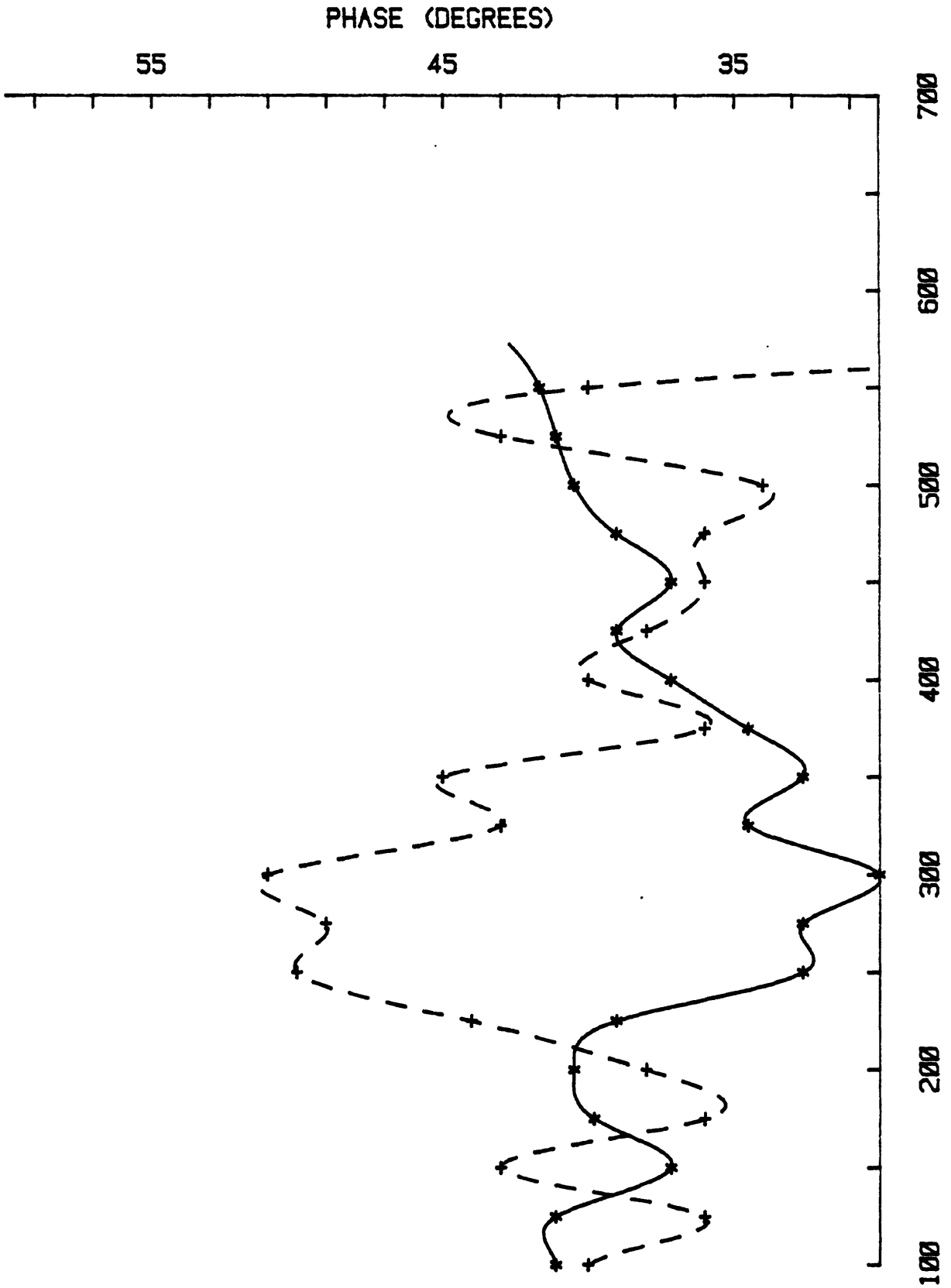
GETCHELL DIP%QUAD 24 LINE = G1
6/24/84 MULTIPLY STATION * 1
NUMBER OF STATIONS = 85

STATION	TILT	%QUAD
-500.0	-3.0	4.0
-487.5	-3.0	3.0
-475.0	+0.0	3.0
-462.5	+3.0	4.0
-450.0	-2.0	5.0
-437.5	-4.0	3.0
-425.0	-8.0	0.0
-412.5	-5.0	2.0
-400.0	-4.0	0.0
-387.5	-3.0	-2.0
-375.0	-2.0	-2.0
-362.5	-3.0	-6.0
-350.0	-1.0	-3.0
-337.5	+2.0	-2.0
-325.0	+0.0	0.0
-312.5	+2.0	0.0
-300.0	+0.0	0.0
-287.5	-2.0	4.0
-275.0	+11.0	2.0
-262.5	+20.0	12.0
-250.0	+25.0	6.0
-237.5	+20.0	8.0
-225.0	+24.0	2.0
-212.5	+23.0	16.0
-200.0	+15.0	13.0
-187.5	+8.0	18.0
-175.0	+1.0	21.0
-162.5	-15.0	22.0
-150.0	+15.0	4.0
-137.5	+19.0	-7.0
-125.0	+5.0	0.0
-112.5	+4.0	-5.0
-100.0	+5.0	4.0
-87.5	+4.0	2.0
-75.0	+8.0	-2.0
-62.5	+5.0	-2.0
-50.0	+3.0	-2.0
-37.5	+0.0	0.0
-25.0	-2.0	-2.0
-12.5	+0.0	-6.0
+0.0	+5.0	-2.0
+12.5	-3.0	-4.0
+25.0	-5.0	-3.0
+37.5	-8.0	-8.0
+50.0	-9.0	-7.0
+62.5	-10.0	-9.0
+75.0	-13.0	-6.0
+87.5	-15.0	-10.0
+100.0	-8.0	-8.0
+112.5	-8.0	-8.0
+125.0	-7.0	-9.0
+137.5	-10.0	-13.0

ETCHELL DIP&QUAD 24 LINE = G1
/24/84 MULTIPLY STATION # 1
UMBER OF STATIONS = 85

STATION	TILT	%QUAD
+150.0	-7.0	-16.0
+162.5	-5.0	-10.0
+175.0	+0.0	-6.0
+187.5	+7.0	-3.0
+200.0	+9.0	-2.0
+212.5	+8.0	-4.0
+225.0	+5.0	-3.0
+237.5	+4.0	0.0
+250.0	+9.0	0.0
+262.5	+10.0	2.0
+275.0	+8.0	0.0
+287.5	+8.0	1.0
+300.0	+8.0	2.0
+312.5	+10.0	4.0
+325.0	+15.0	6.0
+337.5	+15.0	0.0
+350.0	+10.0	4.0
+362.5	+10.0	6.0
+375.0	+5.0	8.0
+387.5	+5.0	7.0
+400.0	+1.0	6.0
+412.5	+1.0	1.0
+425.0	+0.0	4.0
+437.5	-1.0	3.0
+450.0	+1.0	2.0
+462.5	+0.0	0.0
+475.0	+2.0	0.0
+487.5	+1.0	1.0
+500.0	+3.0	1.0
+512.5	+4.0	-1.0
+525.0	+6.0	4.0
+537.5	+2.0	3.0
+550.0	+0.0	3.0


GETCHELL VLF (24.8) RES&PHASE LINE=G1 6-24-84
APP RESISTIVITY = SOLID LINE AND (*) - PHASE = DASHED LINE AND (+)
MAP SCALE = 1:3000
LOG APPARENT RESISTIVITY (OHM-M)
10 3
10 2
10 1
-450
-350
-250
-150
-50
50
DISTANCE (x 1 m)



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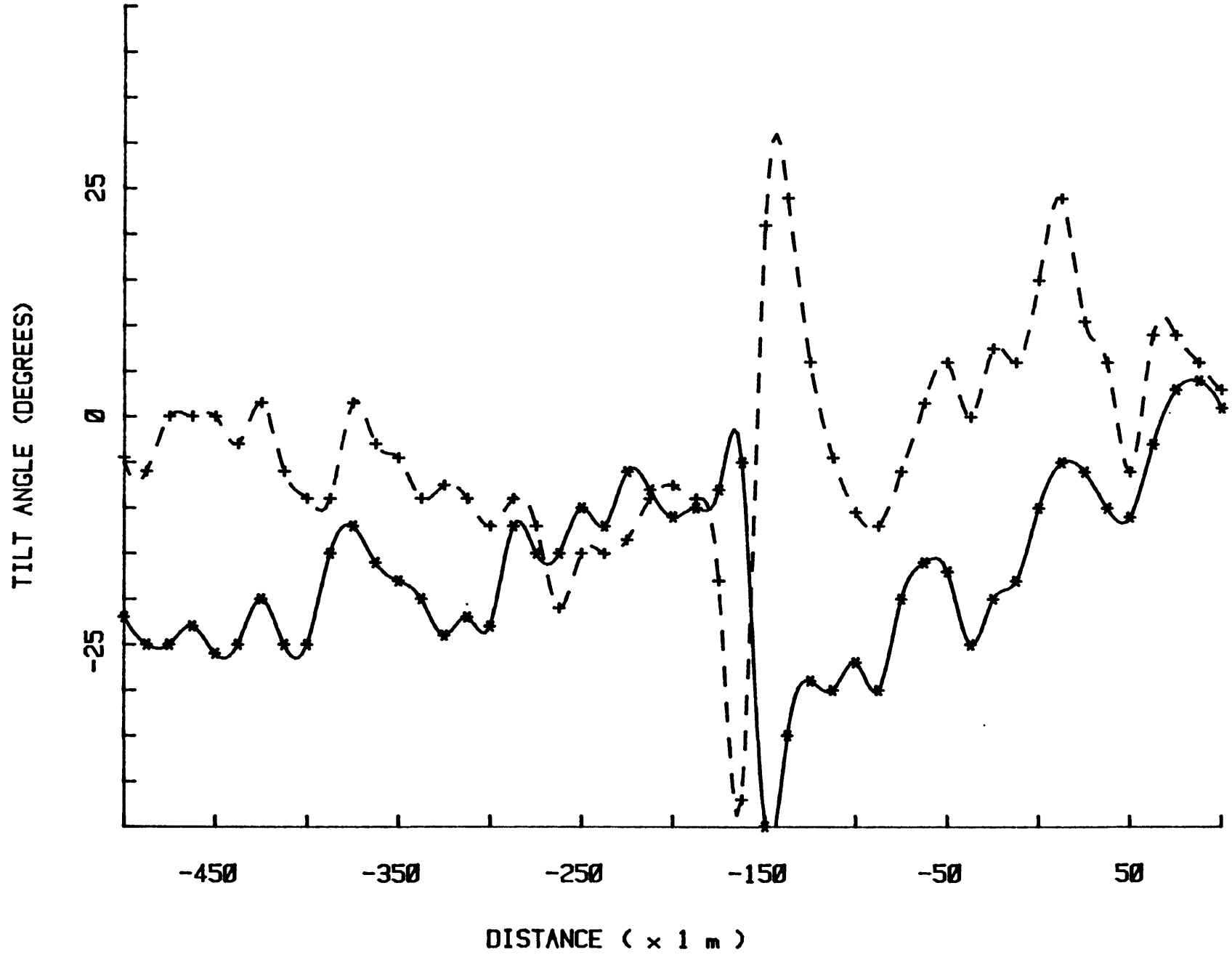
GETCHELL RES&PHASE 24.8 LINE = G-1
6/24/84 MULTIPLY STATION * 1
NUMBER OF STATIONS = 46

STATION	RES	PHASE
-500.0	+95.0	33.0
-475.0	+100.0	36.0
-450.0	+90.0	34.0
-425.0	+100.0	34.0
-400.0	+140.0	34.0
-375.0	+180.0	32.0
-350.0	+180.0	36.0
-325.0	+160.0	44.0
-300.0	+550.0	34.0
-287.5	+800.0	36.0
-275.0	+350.0	34.0
-262.5	+400.0	30.0
-250.0	+250.0	37.0
-237.5	+90.0	35.0
-225.0	+70.0	36.0
-200.0	+50.0	40.0
-175.0	+50.0	43.0
-150.0	+15.0	45.0
-125.0	+50.0	44.0
-100.0	+35.0	48.0
-75.0	+50.0	42.0
-50.0	+40.0	44.0
-25.0	+90.0	41.0
+0.0	+100.0	45.0
+25.0	+60.0	44.0
+50.0	+75.0	43.0
+75.0	+65.0	38.0
+100.0	+55.0	40.0
+125.0	+55.0	36.0
+150.0	+30.0	43.0
+175.0	+45.0	36.0
+200.0	+50.0	38.0
+225.0	+40.0	44.0
+250.0	+15.0	50.0
+275.0	+15.0	49.0
+300.0	+10.0	51.0
+325.0	+20.0	43.0
+350.0	+15.0	45.0
+375.0	+20.0	36.0
+400.0	+30.0	40.0
+425.0	+40.0	38.0
+450.0	+30.0	36.0
+475.0	+40.0	36.0
+500.0	+50.0	34.0
+525.0	+55.0	43.0
+550.0	+60.0	40.0

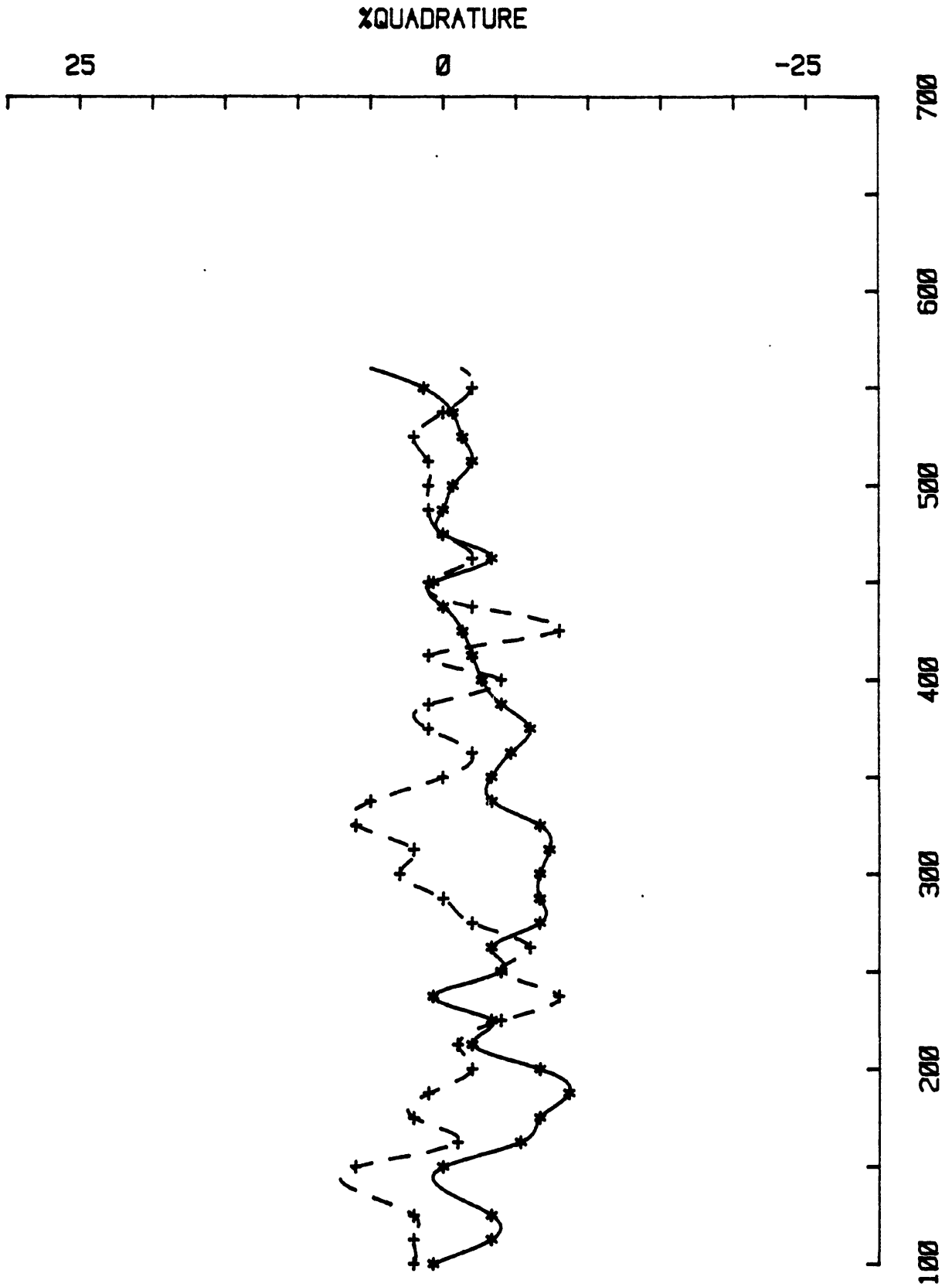

GETCHELL VLF (24.8) DIP&QUAD LINE=G1 6-24-84
TILT ANGLE = SOLID LINE AND (*) - %QUADRATURE = DASHED LINE AND (+)
MAP SCALE = 1:3000
TILT ANGLE (DEGREES)
25
0
-25
-450
-350
-250
-150
-50
50
DISTANCE (x 1 m)

GETCHELL DIP&QUAD 24.8 LINE = G-1
6/24/84 MULTIPLY STATION * 1
NUMBER OF STATIONS = 84

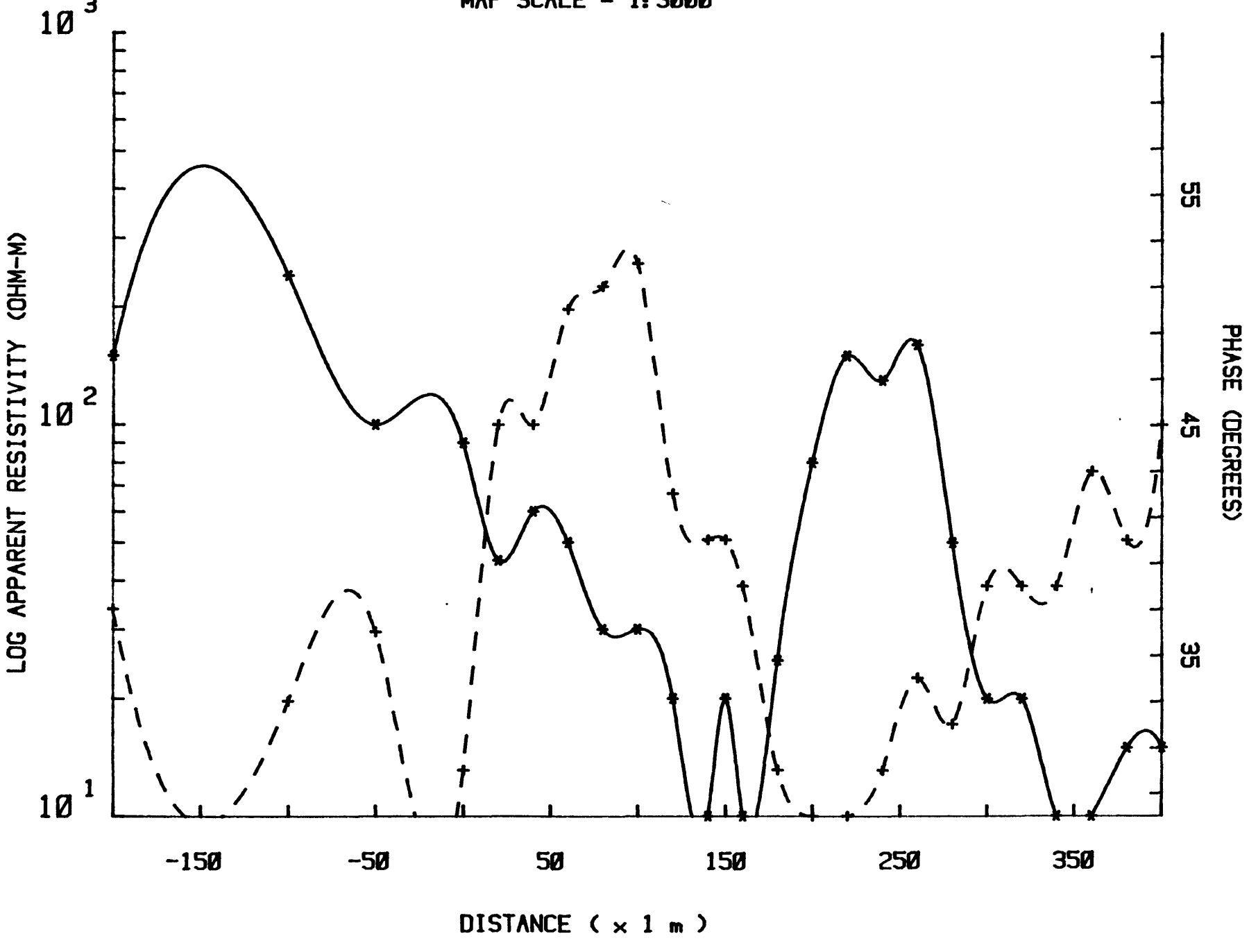
STATION	TILT	%QUAD
-500.0	-22.0	-3.0
-487.5	-25.0	-4.0
-475.0	-25.0	0.0
-462.5	-23.0	0.0
-450.0	-26.0	0.0
-437.5	-25.0	-2.0
-425.0	-20.0	1.0
-412.5	-25.0	-4.0
-400.0	-25.0	-6.0
-387.5	-15.0	-6.0
-375.0	-12.0	1.0
-362.5	-16.0	-2.0
-350.0	-18.0	-3.0
-337.5	-20.0	-6.0
-325.0	-24.0	-5.0
-312.5	-22.0	-6.0
-300.0	-23.0	-8.0
-287.5	-12.0	-6.0
-275.0	-15.0	-8.0
-262.5	-15.0	-14.0
-250.0	-10.0	-10.0
-237.5	-12.0	-10.0
-225.0	-6.0	-9.0
-212.5	-8.0	-6.0
-200.0	-11.0	-5.0
-187.5	-10.0	-6.0
-175.0	-8.0	-12.0
-162.5	-5.0	-28.0
-150.0	-45.0	14.0
-137.5	-35.0	16.0
-125.0	-29.0	4.0
-112.5	-30.0	-3.0
-100.0	-27.0	-7.0
-87.5	-30.0	-8.0
-75.0	-20.0	-4.0
-62.5	-16.0	1.0
-50.0	-17.0	4.0
-37.5	-25.0	0.0
-25.0	-20.0	5.0
-12.5	-18.0	4.0
+0.0	-10.0	10.0
+12.5	-5.0	16.0
+25.0	-6.0	7.0
+37.5	-10.0	4.0
+50.0	-11.0	-4.0
+62.5	-3.0	6.0
+75.0	+3.0	6.0
+87.5	+4.0	4.0
+100.0	+1.0	2.0
+112.5	-5.0	2.0
+125.0	-5.0	2.0
+150.0	+0.0	6.0
+162.5	-8.0	-1.0
+175.0	-10.0	2.0

GETCHELL DIP&QUAD 24.8 LINE = G-1
6/24/84 MULTIPLY STATION * 1
NUMBER OF STATIONS = 84

STATION	TILT	%QUAD
+187.5	-13.0	1.0
+200.0	-10.0	-2.0
+212.5	-3.0	-1.0
+225.0	-5.0	-4.0
+237.5	+1.0	-8.0
+250.0	-6.0	-4.0
+262.5	-5.0	-6.0
+275.0	-10.0	-2.0
+287.5	-10.0	0.0
+300.0	-10.0	3.0
+312.5	-11.0	2.0
+325.0	-10.0	6.0
+337.5	-5.0	5.0
+350.0	-5.0	0.0
+362.5	-7.0	-2.0
+375.0	-9.0	1.0
+387.5	-6.0	1.0
+400.0	-4.0	-4.0
+412.5	-3.0	1.0
+425.0	-2.0	-8.0
+437.5	+0.0	-2.0
+450.0	+1.0	1.0
+462.5	-5.0	-2.0
+475.0	+0.0	0.0
+487.5	+0.0	1.0
+500.0	-1.0	1.0
+512.5	-3.0	1.0
+525.0	-2.0	2.0
+537.5	-1.0	0.0
+550.0	+2.0	-2.0

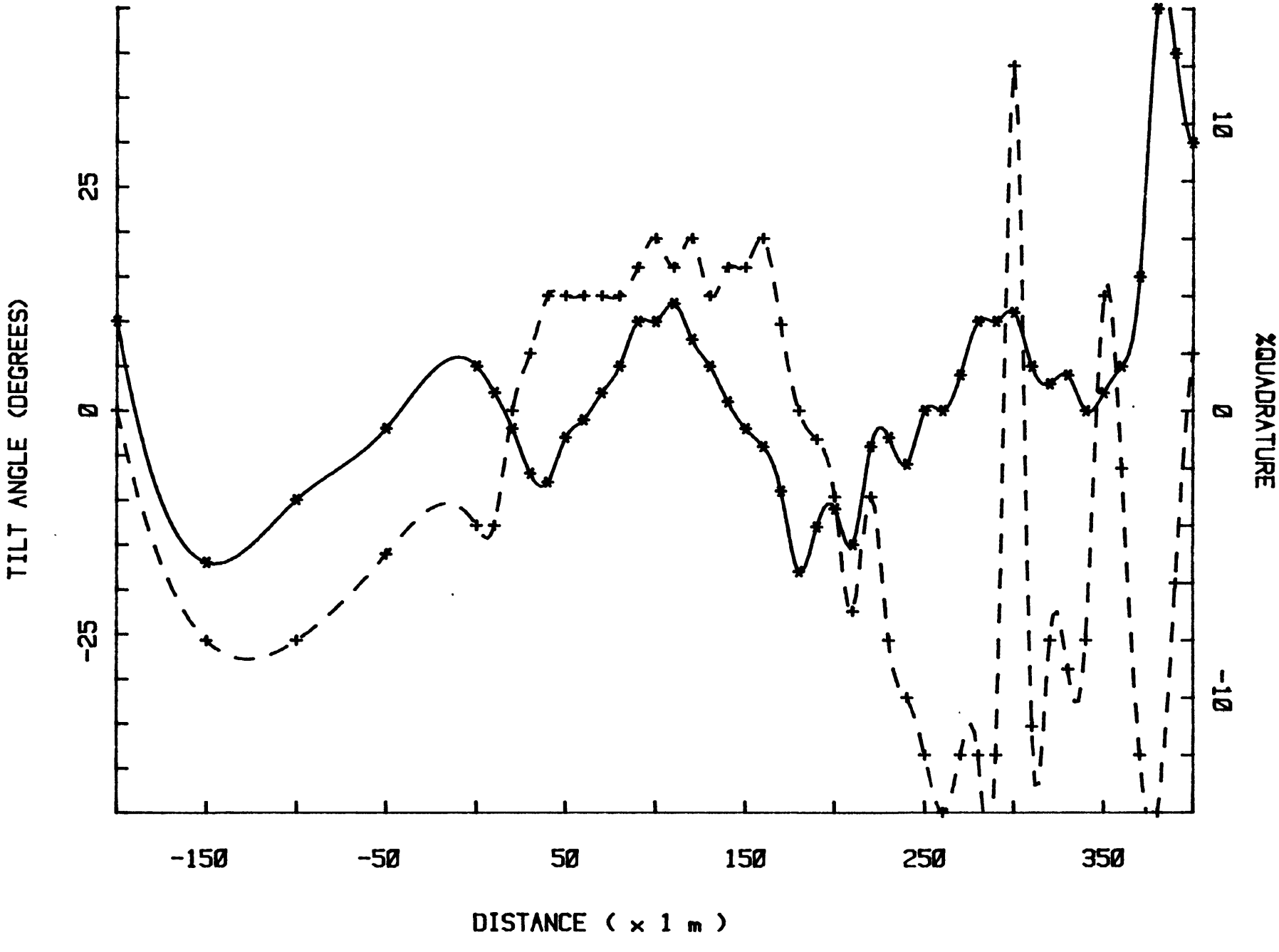


PAGE 2


GETCHELL VLF (24.8) RES&PHASE LINE=G2 6-27-84
APP RESISTIVITY = SOLID LINE AND (*) - PHASE = DASHED LINE AND (+)
MAP SCALE = 1:3000
10 3
10 2
10 1
LOG APPARENT RESISTIVITY (OHM-M)
55
45
35
PHASE (DEGREES)
-150
-50
50
150
250
350
DISTANCE (x 1 m)

GETCHELL RES&PHASE 24.8 LINE = G-2
6/27/84 MULTIPLY STATION * 1
NUMBER OF STATIONS = 25

STATION	RES	PHASE
-200.0	+150.0	37.0
-100.0	+240.0	33.0
-50.0	+100.0	36.0
+0.0	+90.0	30.0
+20.0	+45.0	45.0
+40.0	+60.0	45.0
+60.0	+50.0	50.0
+80.0	+30.0	51.0
+100.0	+30.0	52.0
+120.0	+20.0	42.0
+140.0	+10.0	40.0
+150.0	+20.0	40.0
+160.0	+10.0	38.0
+180.0	+25.0	30.0
+200.0	+80.0	28.0
+220.0	+150.0	28.0
+240.0	+130.0	30.0
+260.0	+160.0	34.0
+280.0	+50.0	32.0
+300.0	+20.0	38.0
+320.0	+20.0	38.0
+340.0	+10.0	38.0
+360.0	+10.0	43.0
+380.0	+15.0	40.0
+400.0	+15.0	45.0

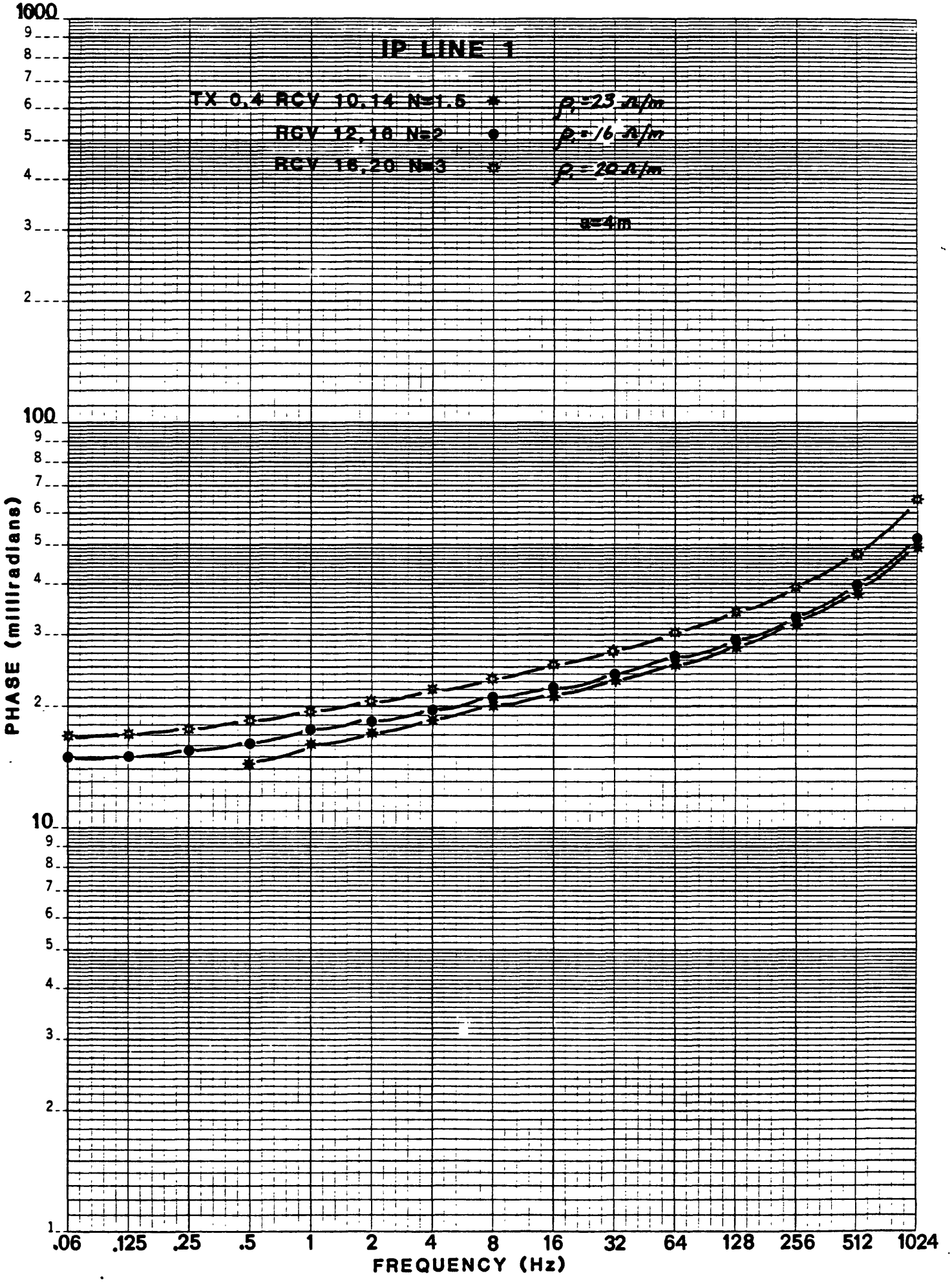

GETCHELL VLF (24.8) DIP&QUAD LINE=G2 6-27-84
TILT ANGLE = SOLID LINE AND (*) - %QUADRATURE = DASHED LINE AND (+)
MAP SCALE = 1:3000
TILT ANGLE (DEGREES)
25
0
-25
%QUADRATURE
10
0
-10
-150
-50
50
150
250
350
DISTANCE (x 1 m)

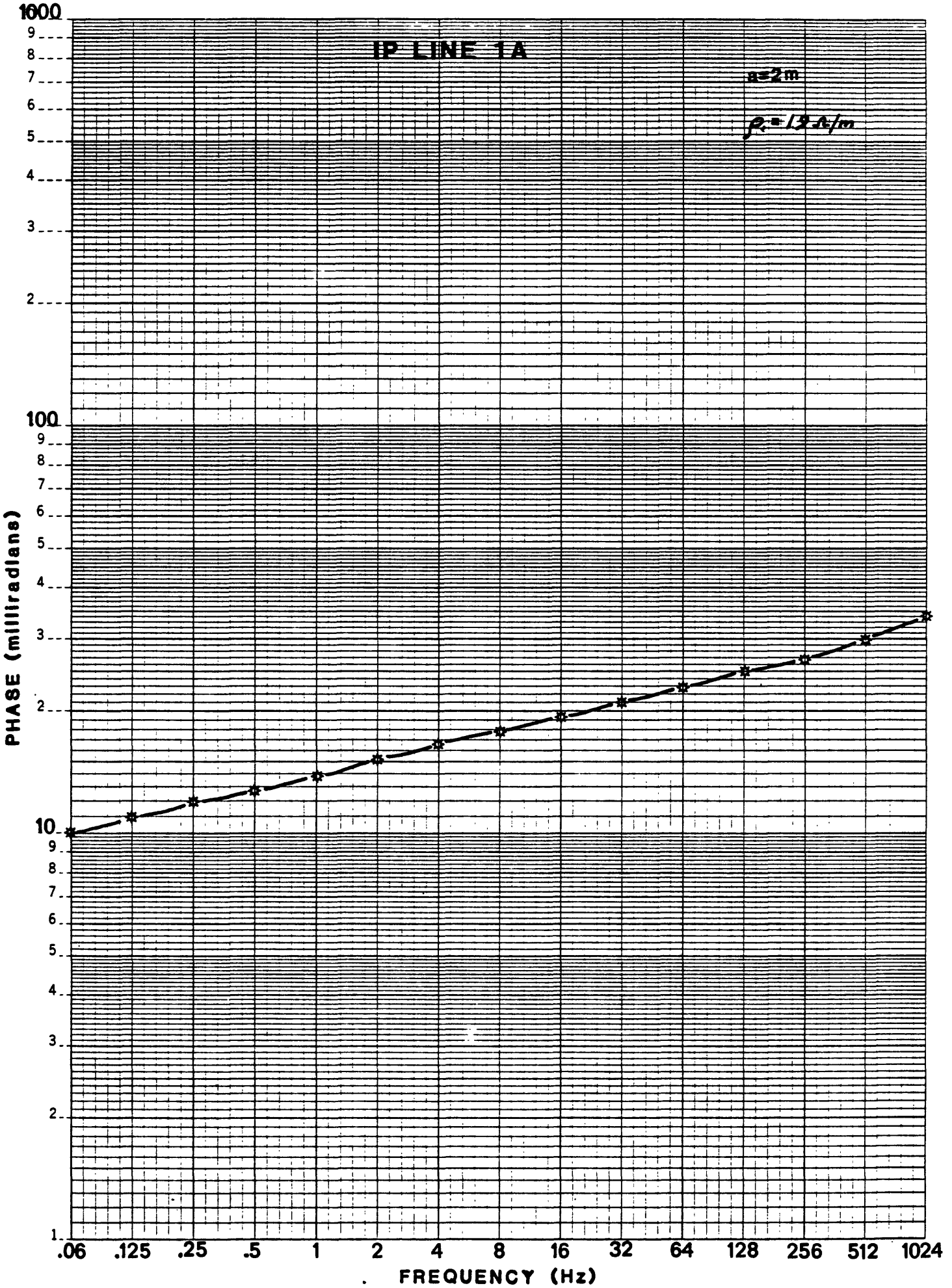
GETCHELL DIP&QUAD 24.8 LINE = G-2
6/27/84 MULTIPLY STATION * 1
NUMBER OF STATIONS = 45

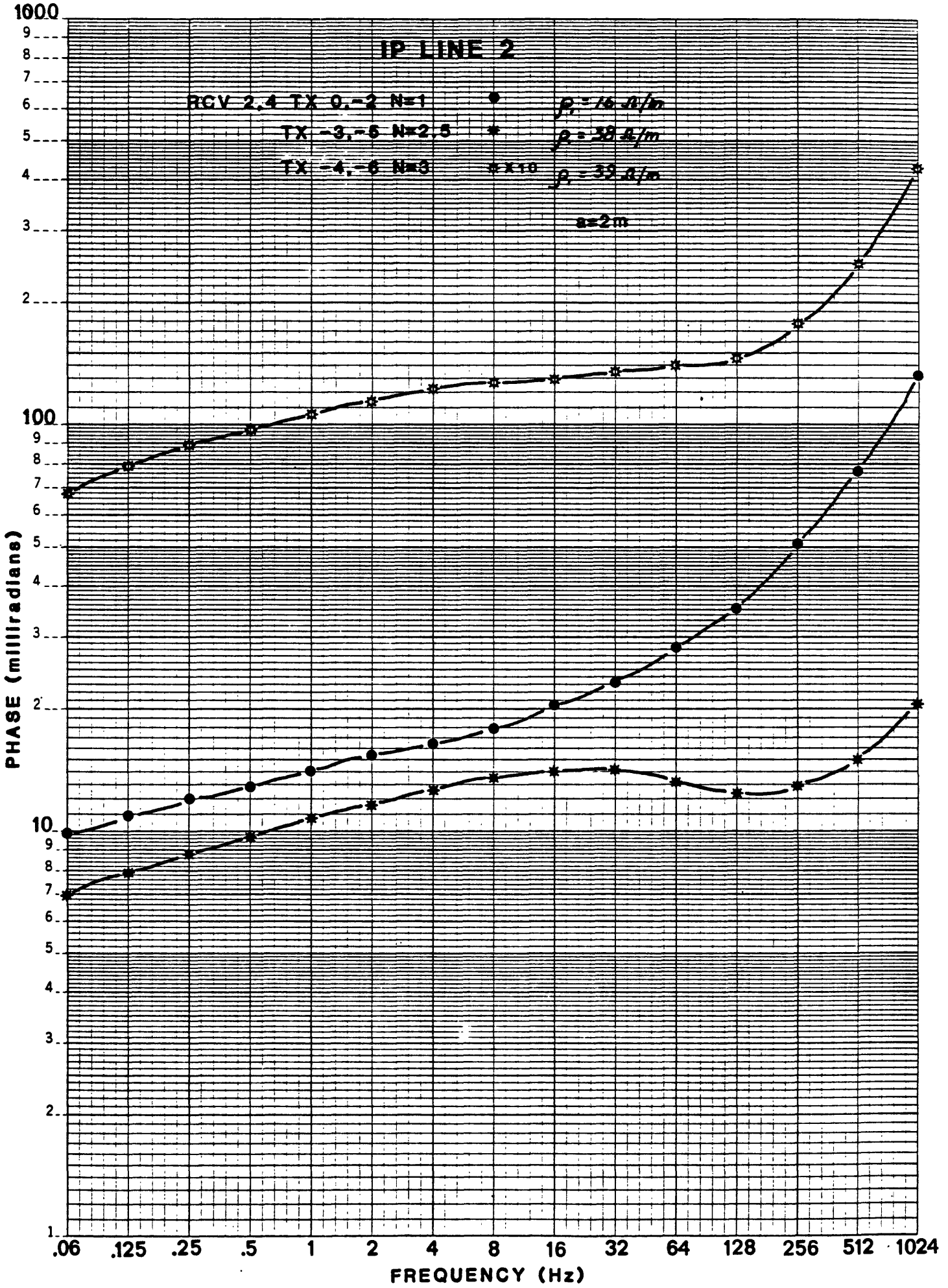
STATION	TILT	%QUAD
-200.0	+10.0	0.0
-150.0	-17.0	-8.0
-100.0	-10.0	-8.0
-50.0	-2.0	-5.0
+0.0	+5.0	-4.0
+10.0	+2.0	-4.0
+20.0	-2.0	0.0
+30.0	-7.0	2.0
+40.0	-8.0	4.0
+50.0	-3.0	4.0
+60.0	-1.0	4.0
+70.0	+2.0	4.0
+80.0	+5.0	4.0
+90.0	+10.0	5.0
+100.0	+10.0	6.0
+110.0	+12.0	5.0
+120.0	+8.0	6.0
+130.0	+5.0	4.0
+140.0	+1.0	5.0
+150.0	-2.0	5.0
+160.0	-4.0	6.0
+170.0	-9.0	3.0
+180.0	-18.0	0.0
+190.0	-13.0	-1.0
+200.0	-11.0	-3.0
+210.0	-15.0	-7.0
+220.0	-4.0	-3.0
+230.0	-3.0	-8.0
+240.0	-6.0	-10.0
+250.0	+0.0	-12.0
+260.0	+0.0	-14.0
+270.0	+4.0	-12.0
+280.0	+10.0	-12.0
+290.0	+10.0	-12.0
+300.0	+11.0	12.0
+310.0	+5.0	-11.0
+320.0	+3.0	-8.0
+330.0	+4.0	-9.0
+340.0	+0.0	-8.0
+350.0	+2.0	4.0
+360.0	+5.0	-2.0
+370.0	+15.0	-12.0
+380.0	+45.0	-14.0
+390.0	+40.0	-6.0
+400.0	+30.0	2.0

SIP DATA

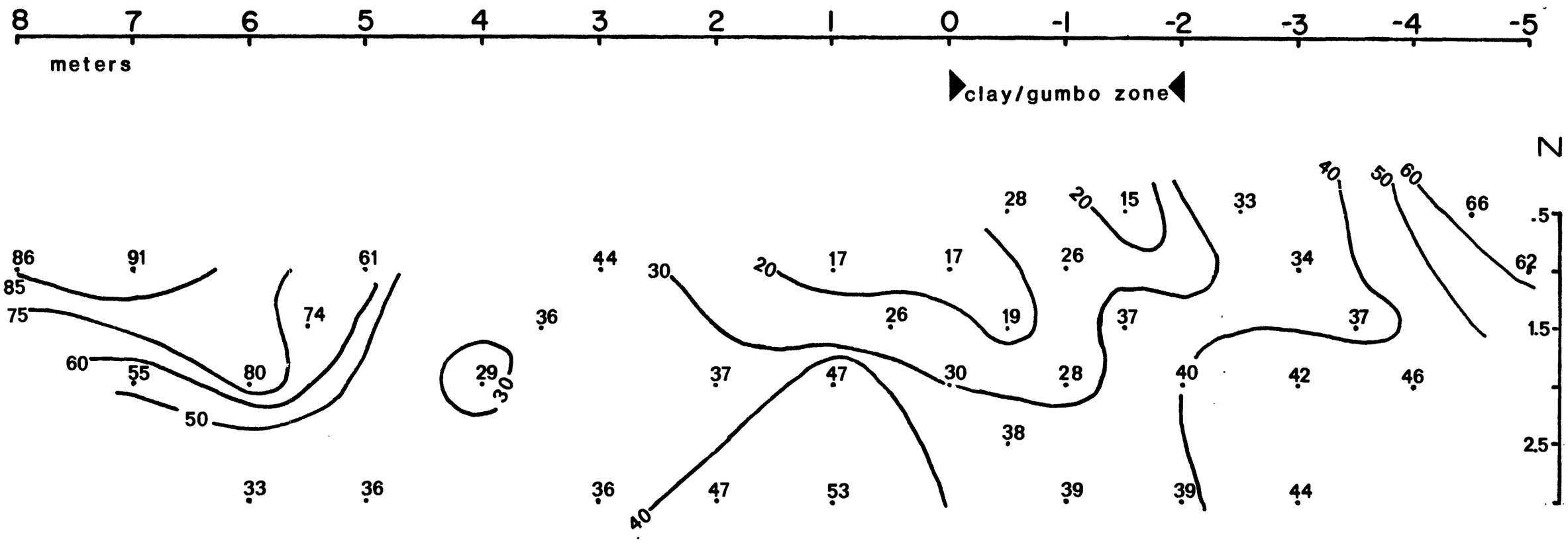
IP LINES 1, 1A and 2


IP LINE 1
TX 0,4 RCV 10,14 N=1.5 *
RCV 12,16 N=2 ●
RCV 16,20 N=3 ✲
ρ1=23 Ω/m
ρ2=16 Ω/m
ρ3=20 Ω/m
a=4m
PHASE (milliradians)
1000
100
10
1
.06
.125
.25
.5
1
2
4
8
16
32
64
128
256
512
1024
FREQUENCY (Hz)


IP LINE 1A
a=2m
ρ_a = 13 Ω/m
PHASE (milliradians)
1000
100
10
1
.06
.125
.25
.5
1
2
4
8
16
32
64
128
256
512
1024
FREQUENCY (Hz)


IP LINE 2
RCV 2,4 TX 0,-2 N=1
TX -3,-5 N=2,5
TX -4,-6 N=3
*x10
ρ1 = 16 Ω/m
ρ2 = 38 Ω/m
ρ3 = 35 Ω/m
a=2m
PHASE (milliradians)
FREQUENCY (Hz)
1000
100
10
1
.06
.125
.25
.5
1
2
4
8
16
32
64
128
256
512
1024

IP LINE 2



APPARENT RESISTIVITY PSEUDO-SECTION
VALUES IN ohm-meters
a=2 meter DIPOLE-DIPOLE ARRAY

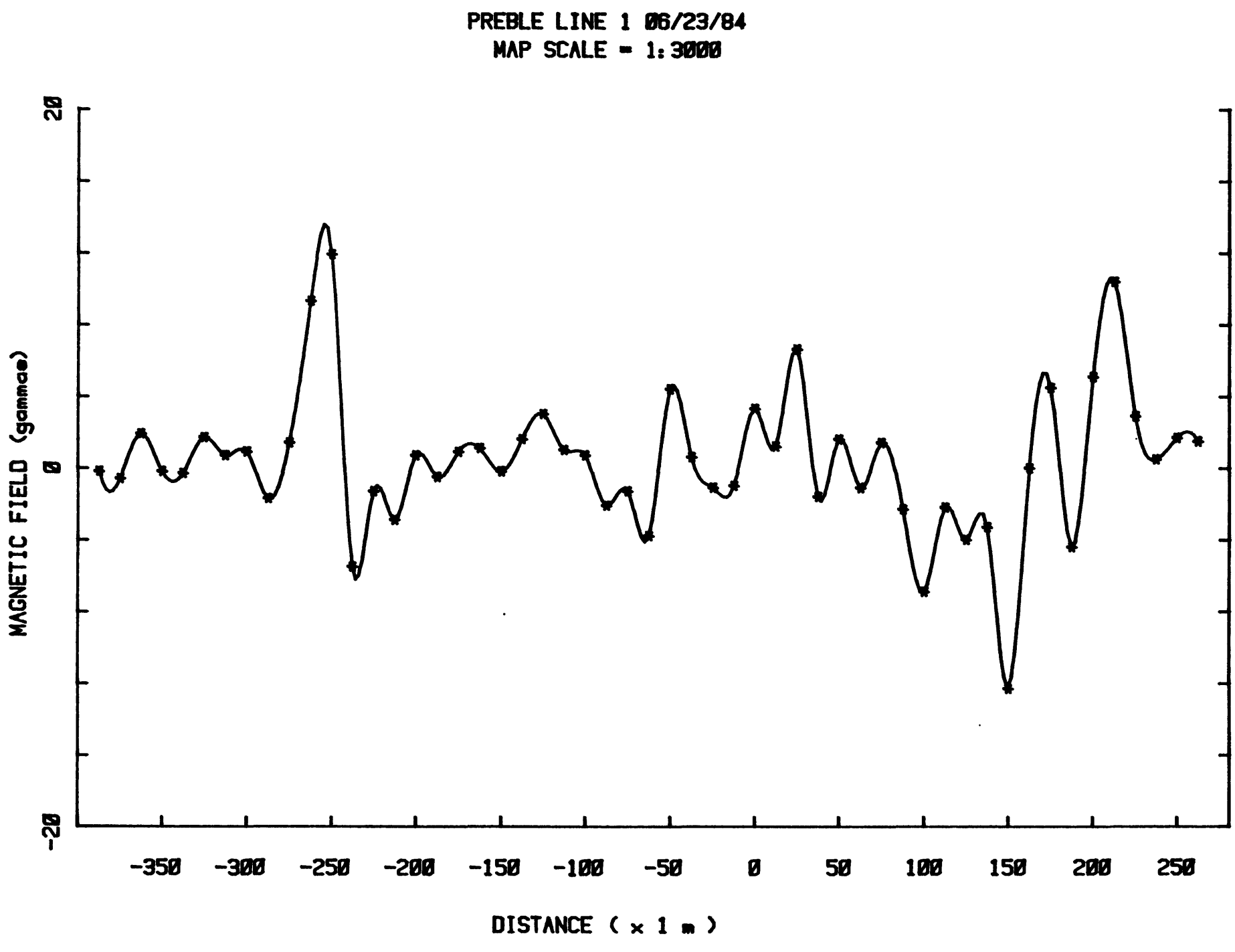
APPENDIX B

Geophysical data in the PREBLE deposit area

Data Type	Plot	Line	Description
Magnetic Data		Line P1	
Magnetic Data		Line P2	
Magnetic Data		Line P3	
Magnetic Data		Line 777	
HLEM Data	(2 sheets)	Line P1	(125 m coil spacing)
HLEM Data		Line P1	(200 m coil spacing)
VLF Data		Line P1	(Apparent resistivity and phase angle, 24.8 KHz, Seattle)
VLF Data		Line P1	(Tilt angle (Dip) and % Quadrature, 24.8 KHz, Seattle)
VLF Data		Line P1	(Apparent resistivity and phase angle, 24.0 KHz, Cuttler, Maine)
VLF Data		Line P1	(Tilt angle (Dip) and % Quadrature, 24.0 KHz, Cuttler, Maine)

MAGNETIC DATA

Lines P1, P2, P3 and 777


PREBLE LINE 1 06/23/84
MAP SCALE = 1:3000
MAGNETIC FIELD (gammas)
20
0
-20
-350
-300
-250
-200
-150
-100
-50
0
50
100
150
200
250
DISTANCE (x 1 m)

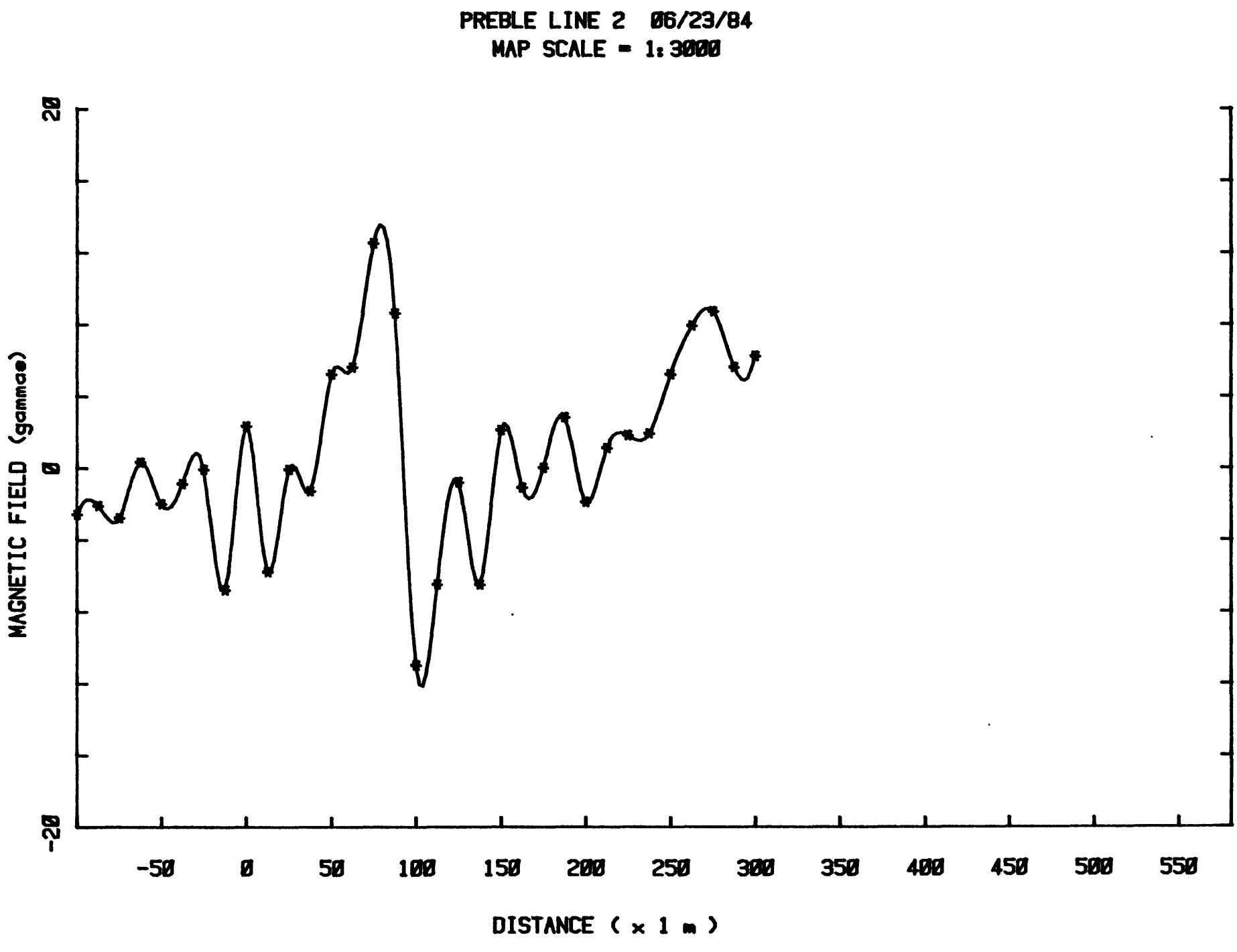
PREBLE 08/23/84 LINE = 1
MULTIPLY STATION * 1 REFERENCE VALUE = 0
NUMBER OF BASE STATIONS = 0 NUMBER OF STATIONS = 53

BASE STATION READINGS

N	TIME	MAG

TRAVERSE READINGS

STATION	TIME	MAG
-387.5	10:20	53999.80
-375.0	10:20	53999.40
-362.5	10:19	54001.90
-350.0	10:18	53999.80
-337.5	10:18	53999.70
-325.0	10:17	54001.70
-312.5	10:16	54000.70
-300.0	10:16	54000.90
-287.5	10:15	53998.30
-275.0	10:15	54001.40
-262.5	10:14	54009.30
-250.0	10:13	54011.90
-237.5	10:13	53994.50
-225.0	10:12	53998.70
-212.5	10:12	53997.10
-200.0	10:11	54000.70
-187.5	10:11	53999.50
-175.0	10:10	54000.90
-162.5	10:10	54001.10
-150.0	10:10	53999.80
-137.5	10: 9	54001.60
-125.0	10: 9	54003.00
-112.5	10: 8	54001.00
-100.0	10: 8	54000.70
-87.5	10: 7	53997.90
-75.0	9:51	53998.70
-62.5	9:51	53996.20
-50.0	9:50	54004.40
-37.5	9:49	54000.60
-25.0	9:41	53998.90
-12.5	9:41	53999.00
+0.0	11:34	54003.30
+12.5	11:34	54001.20
+25.0	11:33	54006.60
+37.5	11:33	53998.40
+50.0	11:33	54001.60
+62.5	11:32	53998.90
+75.0	11:32	54001.40
+87.5	11:31	53997.70
+100.0	11:31	53993.10
+112.5	11:30	53997.80
+125.0	11:29	53996.00
+137.5	11:29	53996.70
+150.0	11:28	53987.70
+162.5	11:28	54000.00
+175.0	11:27	54004.50
+187.5	11:27	53995.60
+200.0	11:26	54005.10
+212.5	11:26	54010.40
+225.0	11:25	54002.90
+237.5	11:25	54000.50
+250.0	11:25	54001.70
+262.5	11:24	54001.50


PREBLE LINE 2 06/23/84
MAP SCALE = 1:3000
MAGNETIC FIELD (gammas)
20
0
-20
-50
0
50
100
150
200
250
300
350
400
450
500
550
DISTANCE (x 1 m)

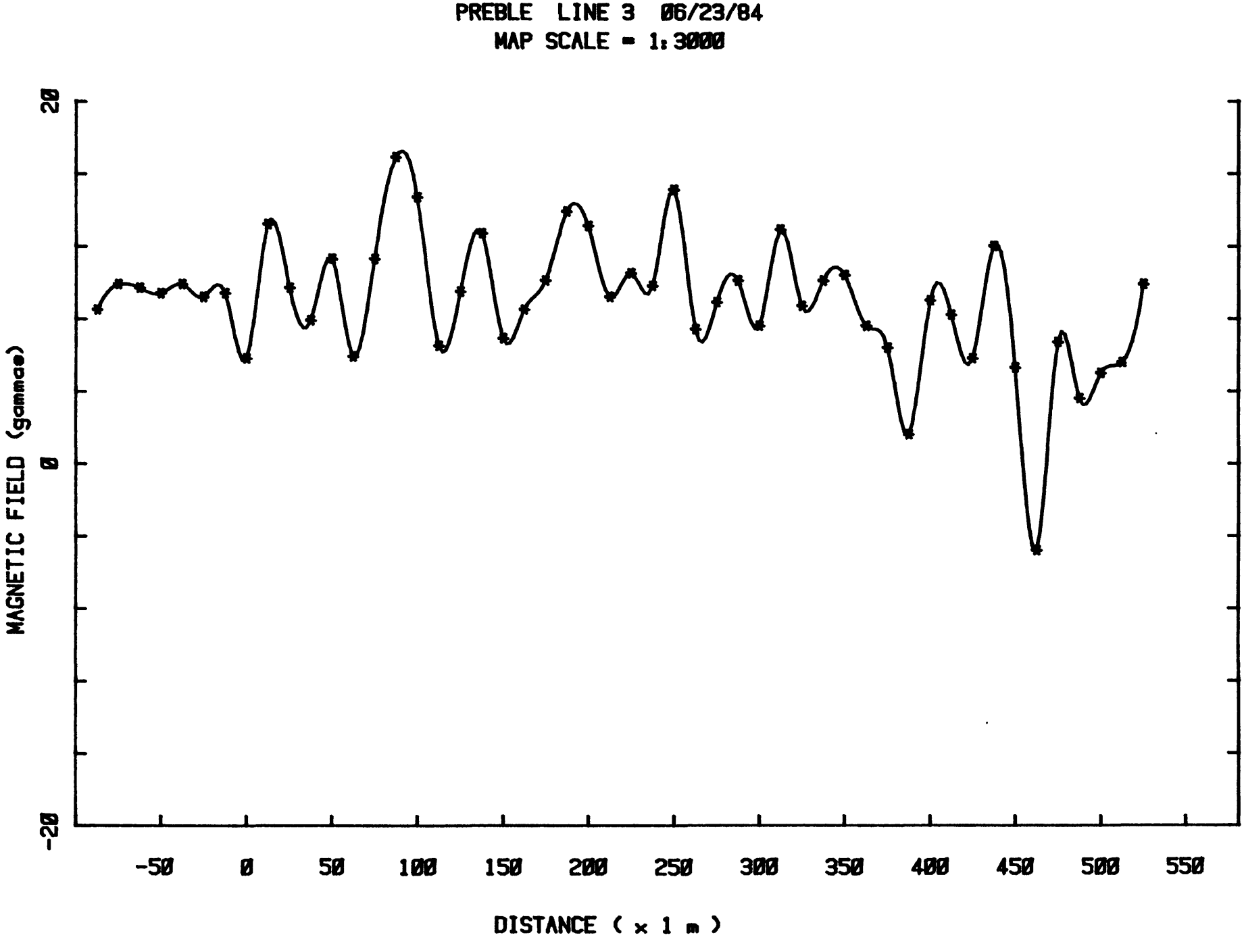
PREBBLE 06/23/84 LINE = 2
MULTIPLY STATION * 1 REFERENCE VALUE = 000000
NUMBER OF BASE STATIONS = 0 NUMBER OF STATIONS = 33

BASE STATION READINGS

N	TIME	MAG

TRAVERSE READINGS

STATION	TIME	MAG
-100.0	0: 0	53997.40
-87.5	0: 0	53997.90
-75.0	0: 0	53997.20
-62.5	0: 0	54000.30
-50.0	0: 0	53998.00
-37.5	0: 0	53999.10
-25.0	0: 0	53999.90
-12.5	0: 0	53993.20
+0.0	0: 0	54002.30
+12.5	0: 0	53994.20
+25.0	0: 0	53999.90
+37.5	0: 0	53998.70
+50.0	0: 0	54005.20
+62.5	0: 0	54005.60
+75.0	0: 0	54012.50
+87.5	0: 0	54008.60
+100.0	0: 0	53989.00
+112.5	0: 0	53993.50
+125.0	0: 0	53999.20
+137.5	0: 0	53993.50
+150.0	0: 0	54002.10
+162.5	0: 0	53998.90
+175.0	0: 0	54000.00
+187.5	0: 0	54002.80
+200.0	0: 0	53998.10
+212.5	0: 0	54001.10
+225.0	0: 0	54001.80
+237.5	0: 0	54001.90
+250.0	0: 0	54005.20
+262.5	0: 0	54007.90
+275.0	0: 0	54008.70
+287.5	0: 0	54005.60
+300.0	0: 0	54006.20


PREBLE LINE 3 06/23/84
MAP SCALE = 1:3000
MAGNETIC FIELD (gammas)
20
0
-20
-50
0
50
100
150
200
250
300
350
400
450
500
550
DISTANCE (x 1 m)

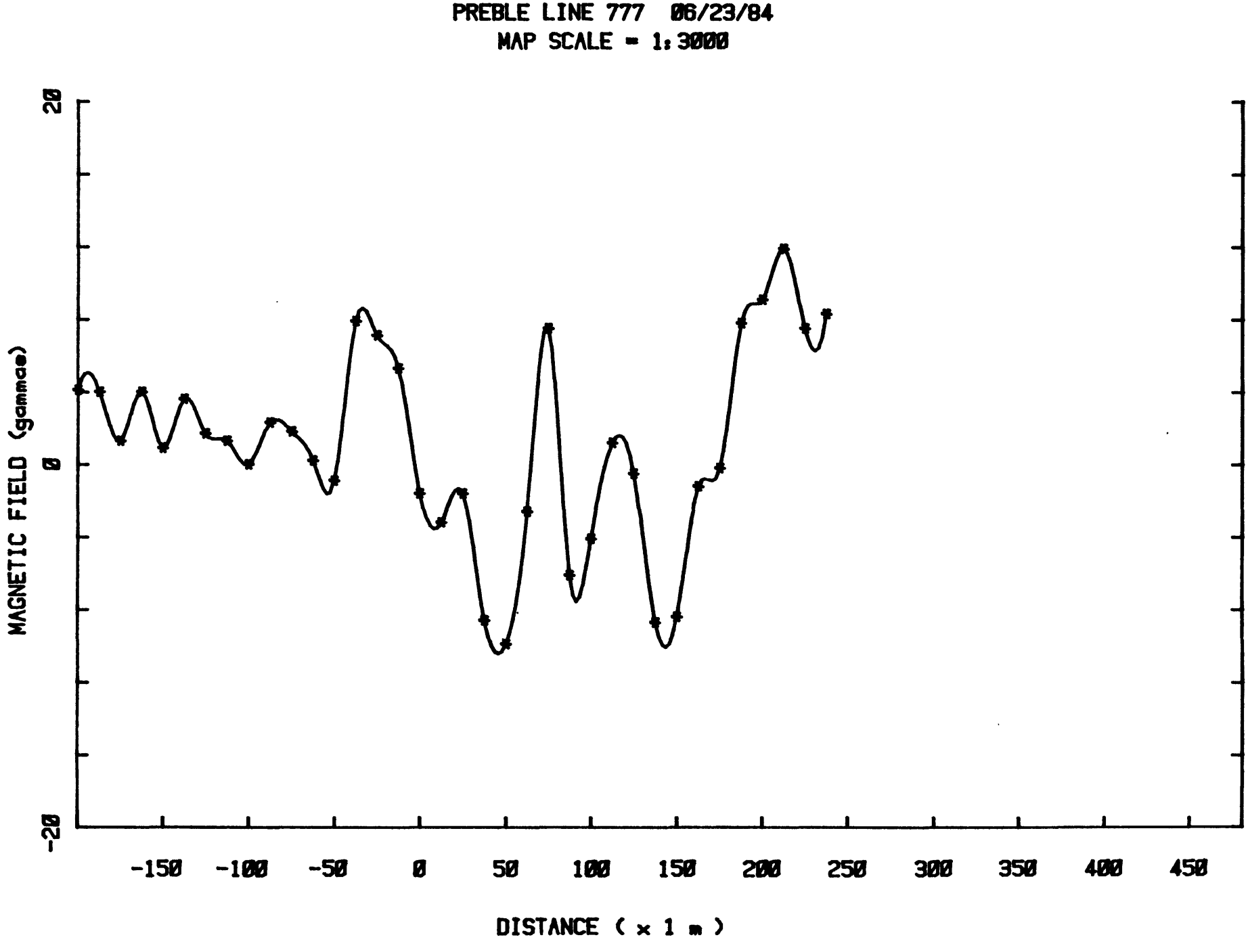
PREBLE 06/23/84 LINE = 3
MULTIPLY STATION * 1 REFERENCE VALUE = 54000
NUMBER OF BASE STATIONS = 0 NUMBER OF STATIONS = 50

BASE STATION READINGS

N	TIME	MAG

TRAVERSE READINGS

STATION	TIME	MAG
-87.5	16:36	54008.50
-75.0	16:37	54009.90
-62.5	16:37	54009.70
-50.0	16:37	54009.40
-37.5	16:38	54009.90
-25.0	16:39	54009.20
-12.5	16:40	54009.40
+0.0	16:40	54005.80
+12.5	16:41	54013.20
+25.0	16:41	54009.70
+37.5	16:42	54007.90
+50.0	16:42	54011.30
+62.5	16:43	54005.90
+75.0	16:43	54011.30
+87.5	16:44	54016.90
+100.0	16:45	54014.70
+112.5	16:45	54006.50
+125.0	16:46	54009.50
+137.5	16:46	54012.70
+150.0	16:47	54006.90
+162.5	16:47	54008.50
+175.0	16:48	54010.10
+187.5	16:48	54013.90
+200.0	16:49	54013.10
+212.5	16:49	54009.20
+225.0	16:50	54010.50
+237.5	16:52	54009.80
+250.0	16:52	54015.10
+262.5	16:53	54007.40
+275.0	16:53	54008.90
+287.5	16:54	54010.10
+300.0	16:55	54007.60
+312.5	16:55	54012.90
+325.0	16:56	54008.70
+337.5	16:58	54010.10
+350.0	16:59	54010.40
+362.5	16:59	54007.60
+375.0	17: 0	54006.40
+387.5	17: 0	54001.60
+400.0	17: 1	54009.00
+412.5	17: 1	54008.20
+425.0	17: 2	54005.80
+437.5	17: 3	54012.00
+450.0	17: 3	54005.30
+462.5	17: 4	53995.20
+475.0	17: 4	54006.70
+487.5	17: 5	54003.60
+500.0	17: 5	54005.00
+512.5	17: 7	54005.60
+525.0	17: 8	54009.90


PREBLE LINE 777 06/23/84
MAP SCALE = 1:3000
MAGNETIC FIELD (gammas)
20
0
-20
-150
-100
-50
0
50
100
150
200
250
300
350
400
450
DISTANCE (x 1 m)

PREBLE 06/23/84 LINE = 777
MULTIPLY STATION * 1 REFERENCE VALUE = 54000
NUMBER OF BASE STATIONS = 0 NUMBER OF STATIONS = 36

BASE STATION READINGS

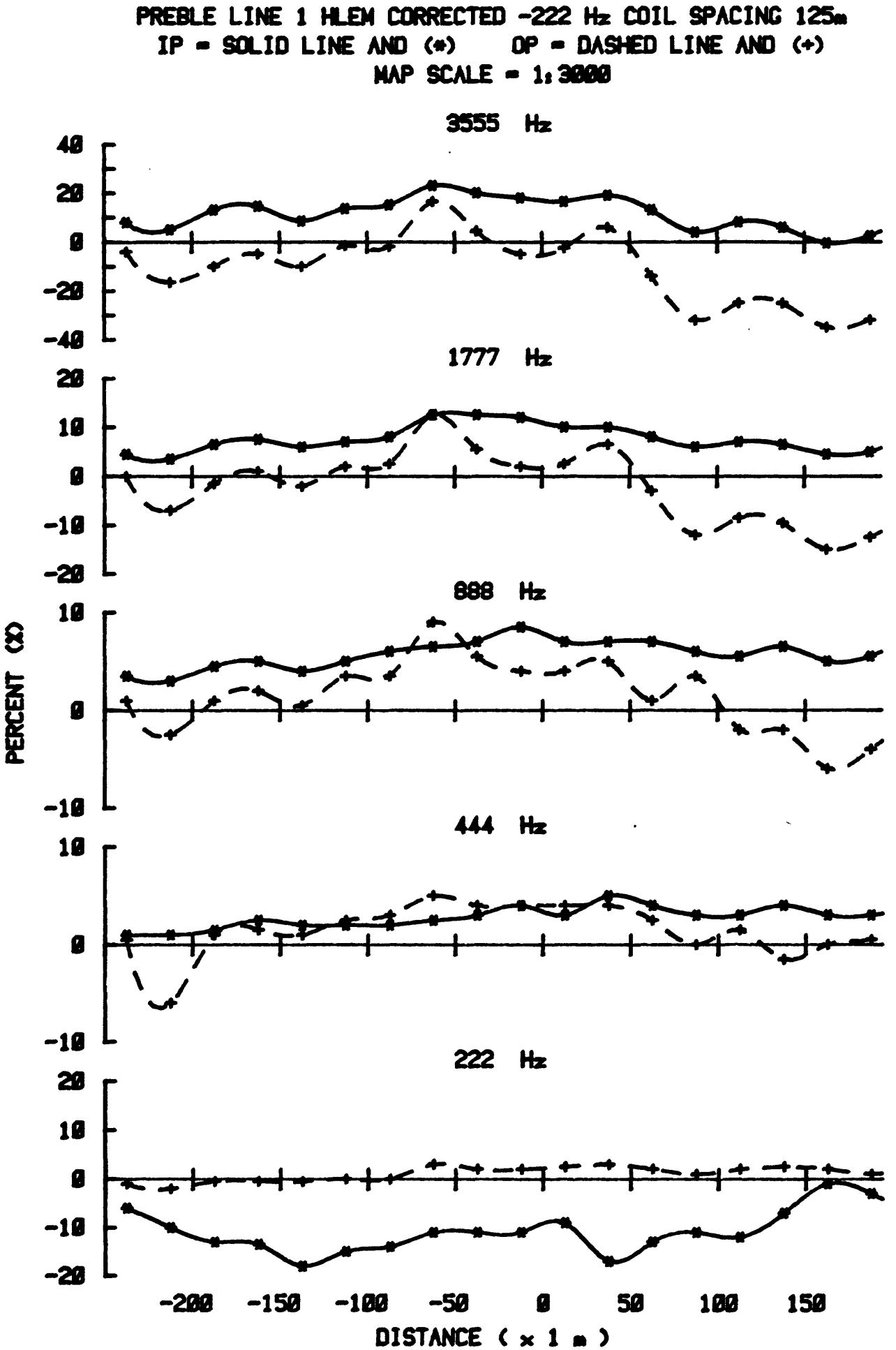
N	TIME	MAG

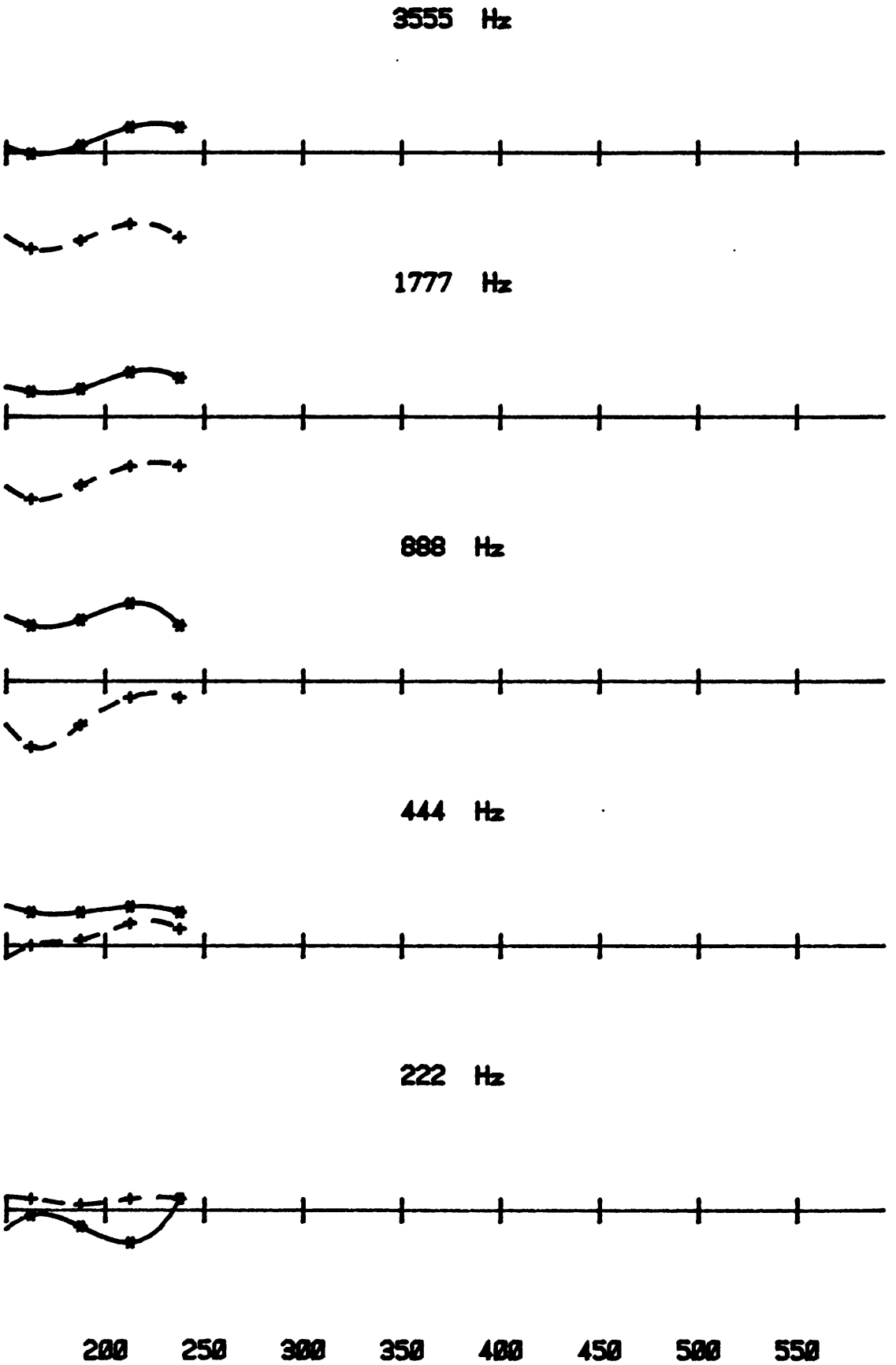
TRAVERSE READINGS

STATION	TIME	MAG
-200.0	10:45	54004.10
-187.5	10:46	54004.00
-175.0	10:46	54001.30
-162.5	10:46	54004.00
-150.0	10:47	54000.90
-137.5	10:48	54003.60
-125.0	10:48	54001.70
-112.5	10:49	54001.30
-100.0	10:49	54000.00
-87.5	10:50	54002.30
-75.0	10:51	54001.80
-62.5	10:51	54000.20
-50.0	10:52	53999.10
-37.5	10:52	54007.90
-25.0	10:53	54007.10
-12.5	10:54	54005.30
+0.0	10:55	53998.40
+12.5	10:55	53996.80
+25.0	10:56	53998.40
+37.5	10:59	53991.40
+50.0	10:59	53990.10
+62.5	11: 6	53997.40
+75.0	11: 7	54007.50
+87.5	11: 8	53993.90
+100.0	11: 9	53995.90
+112.5	11:10	54001.20
+125.0	11:12	53999.50
+137.5	11:13	53991.30
+150.0	11:14	53991.60
+162.5	11:15	53998.80
+175.0	11:15	53999.80
+187.5	11:17	54007.80
+200.0	11:18	54009.10
+212.5	11:18	54011.90
+225.0	11:19	54007.50
+237.5	11:19	54008.30

HLEM DATA

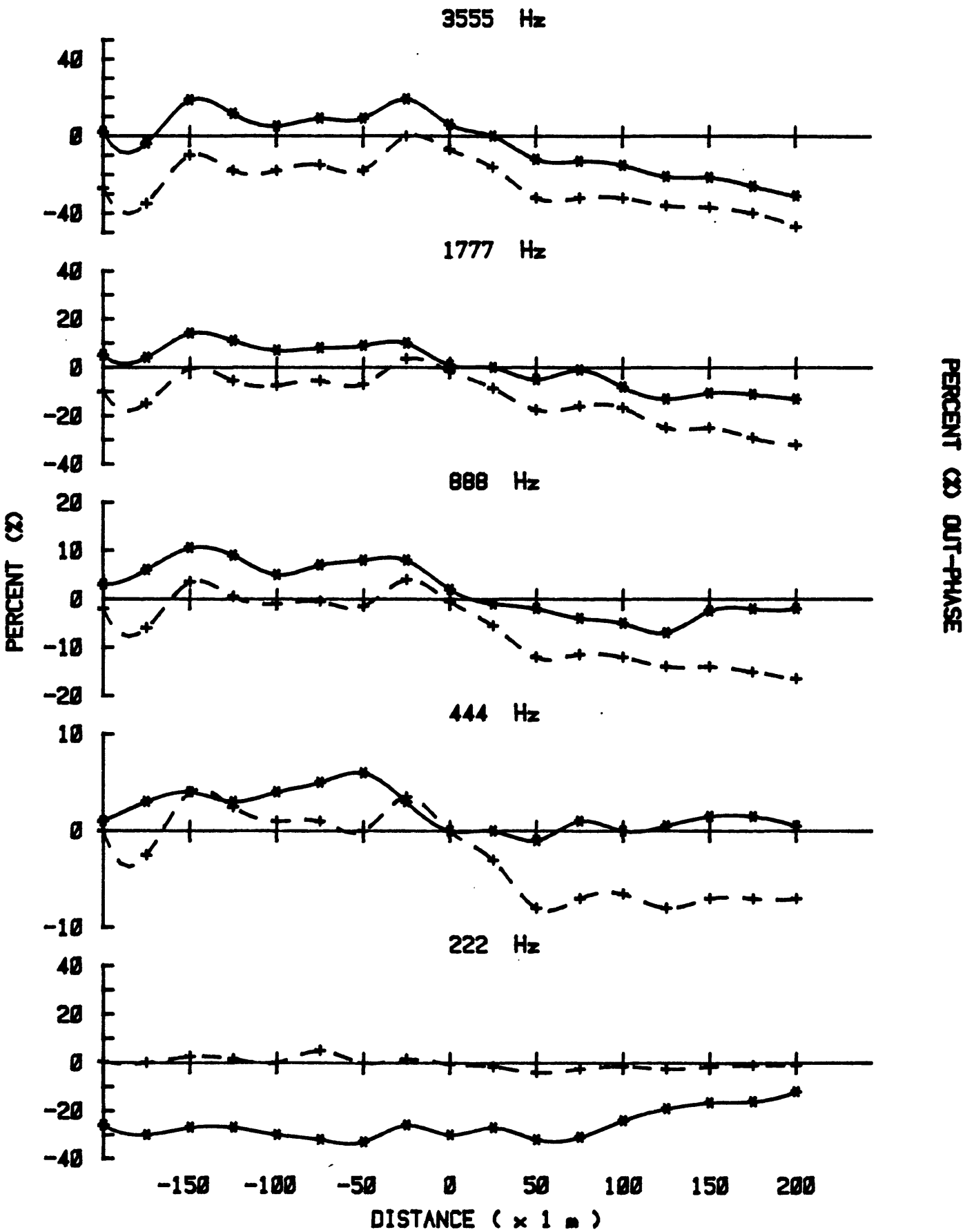
Line P1


PREBLE LINE 1 HLEM CORRECTED -222 Hz COIL SPACING 125m
IP = SOLID LINE AND (*) OP = DASHED LINE AND (+)
MAP SCALE = 1:3000
3555 Hz
1777 Hz
888 Hz
444 Hz
222 Hz
PERCENT (%)
DISTANCE (x 1 m)
-200 -150 -100 -50 0 50 100 150


3555 Hz
1777 Hz
888 Hz
444 Hz
222 Hz
PERCENT (%) OUT-PHASE
200
250
300
350
400
450
500
550

CORRECTED SLINGRAM DATA
FREBLE LINE 1 COIL SPACING 125m LINE = 1 06/25/84
COIL SPACING = 125m MULTIPLY STATION * 1
NUMBER OF FREQUENCIES = 5 NUMBER OF STATIONS = 20

	FREQUENCY 222		FREQUENCY 444		FREQUENCY 888		FREQUENCY 1777		FREQUENCY 3555	
STATION	IP	OP	IP	OP	IP	OP	IP	OP	IP	OP
-237.5	-6.0	-1.0	+1.0	+.5	+3.5	+1.0	+4.5	+0.0	+8.0	-4.0
-212.5	-10.0	-2.0	+1.0	-6.0	+3.0	-2.5	+3.5	-7.0	+5.0	-16.5
-187.5	-13.0	-.5	+1.5	+1.0	+4.5	+1.0	+6.5	-1.5	+13.0	-10.0
-162.5	-13.5	-.5	+2.5	+1.5	+5.0	+2.0	+7.5	+1.0	+14.5	-5.0
-137.5	-18.0	-.5	+2.0	+1.0	+4.0	+.5	+6.0	-2.0	+8.5	-10.0
-87.5	-14.0	+0.0	+2.0	+3.0	+6.0	+3.5	+8.0	+2.5	+15.0	-2.0
-62.5	-11.0	+3.0	+2.5	+5.0	+6.5	+9.0	+12.5	+12.5	+23.0	+16.5
-37.5	-11.0	+2.0	+3.0	+4.0	+7.0	+5.5	+12.5	+5.5	+20.0	+4.5
-12.5	-11.0	+2.0	+4.0	+4.0	+8.5	+4.0	+12.0	+2.0	+18.0	-5.0
+12.5	-9.0	+2.5	+3.0	+4.0	+7.0	+4.0	+10.0	+2.5	+16.5	-2.5
+37.5	-17.0	+3.0	+5.0	+4.0	+7.0	+5.0	+10.0	+6.5	+19.0	+6.0
+62.5	-13.0	+2.0	+4.0	+2.5	+7.0	+1.0	+8.0	-3.0	+13.0	-14.0
+87.5	-11.0	+1.0	+3.0	+0.0	+6.0	+3.5	+6.0	-12.0	+4.0	-32.0
+112.5	-15.0	+0.0	+2.0	+2.5	+5.0	+3.5	+7.0	+2.0	+13.5	-1.5
+112.5	-12.0	+2.0	+3.0	+1.5	+5.5	-2.0	+7.0	-8.5	+8.0	-25.0
+137.5	-7.0	+2.5	+4.0	-1.5	+6.5	-2.0	+6.5	-9.5	+6.0	-25.0
+162.5	-1.0	+2.0	+3.0	+0.0	+5.0	-6.0	+4.5	-15.0	-.5	-35.0
+187.5	-3.0	+1.0	+3.0	+.5	+5.5	-4.0	+5.0	-12.5	+2.5	-32.0
+212.5	-6.0	+2.0	+3.5	+2.0	+7.0	-1.5	+8.0	-9.0	+9.0	-26.0
+237.5	+2.0	+2.0	+3.0	+1.5	+5.0	-1.5	+7.0	-9.0	+9.0	-31.0

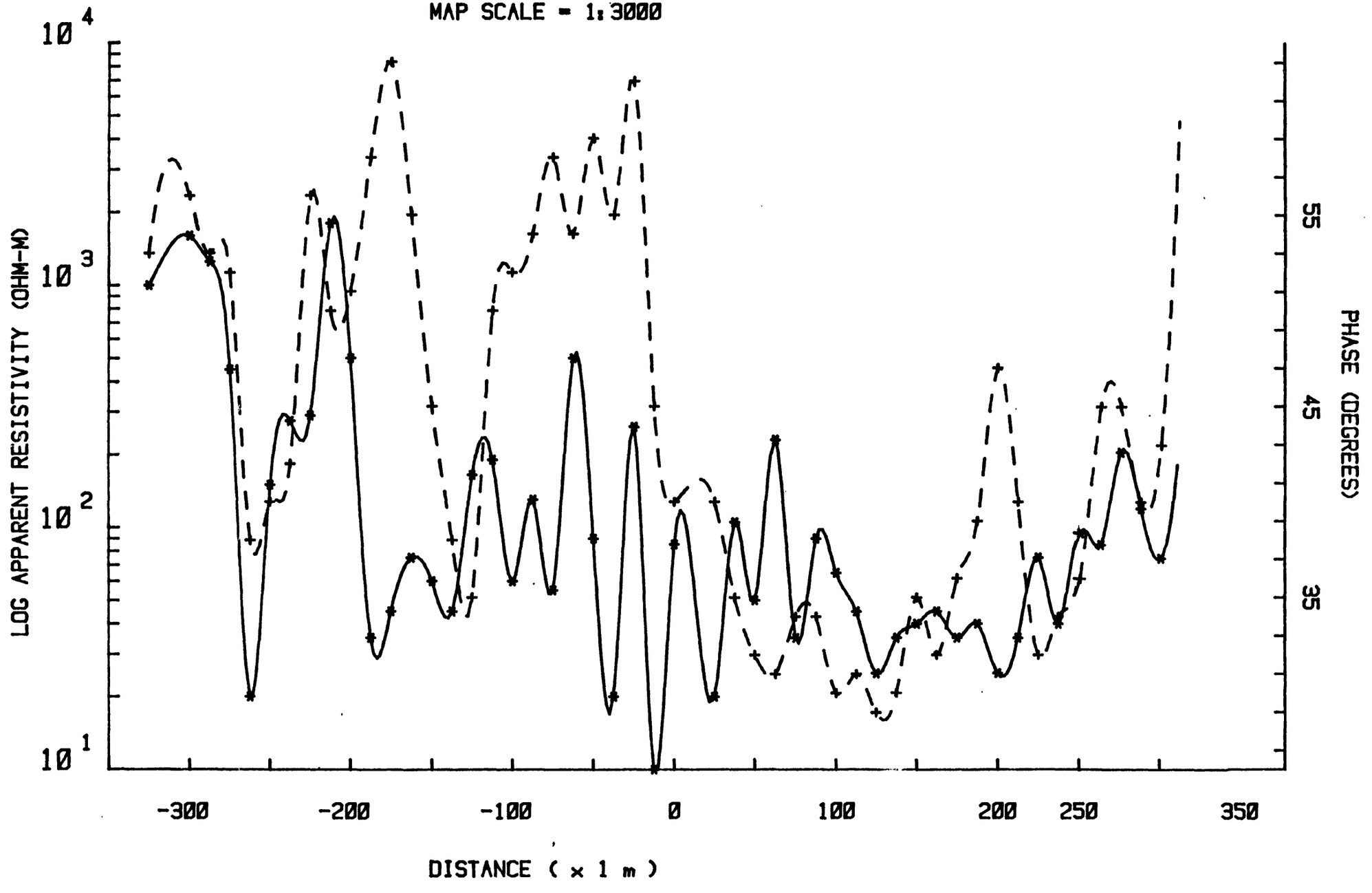

PREBLE LINE 1 HLEM CORRECTED -222 Hz COIL SPACING 200m
IP = SOLID LINE AND (*) OP = DASHED LINE AND (+)
MAP SCALE = 1:3000
3555 Hz
1777 Hz
888 Hz
444 Hz
222 Hz
PERCENT (%)
PERCENT (%) OUT-PHASE
DISTANCE (x 1 m)
-150 -100 -50 0 50 100 150 200

CORRECTED SLINGRAM DATA
PREBLE LINE 1 HLEM 600'/200m LINE = P1 6\25\84
COIL SPACING = 200m MULTIPLY STATION * 1
NUMBER OF FREQUENCIES = 5 NUMBER OF STATIONS = 17

	FREQUENCY 222		FREQUENCY 444		FREQUENCY 888		FREQUENCY 1777		FREQUENCY 3555	
STATION	IP	OP	IP	OP	IP	OP	IP	OP	IP	OP
-200.0	-26.0	+.5	+1.0	+0.0	+3.0	-2.0	+5.0	-10.0	+2.0	-27.0
-175.0	-30.0	+0.0	+3.0	-2.5	+6.0	-6.0	+4.0	-15.0	-4.0	-35.0
-150.0	-27.0	+2.5	+4.0	+4.0	+10.5	+3.5	+14.0	-.5	+18.5	-10.0
-125.0	-27.0	+1.5	+3.0	+2.5	+9.0	+.5	+11.0	-5.5	+11.5	-18.0
-100.0	-30.0	+0.0	+4.0	+1.0	+5.0	-1.0	+7.0	-7.5	+5.0	-18.0
-75.0	-32.0	+5.0	+5.0	+1.0	+7.0	-.5	+8.0	-5.5	+9.0	-15.0
-50.0	-33.0	+0.0	+6.0	+0.0	+8.0	-1.5	+9.0	-7.0	+9.0	-18.0
-25.0	-26.0	+1.5	+3.0	+3.5	+8.0	+4.0	+10.0	+3.5	+19.0	-.2
+0.0	-30.0	-.5	+0.0	+0.0	+2.0	-.5	+1.0	-1.5	+6.0	-7.0
+25.0	-27.0	-1.5	+0.0	-3.0	-1.0	-5.5	+0.0	-8.5	+0.0	-16.0
+50.0	-32.0	-4.0	-1.0	-8.0	-2.0	-12.0	-5.0	-17.5	-12.0	-32.0
+75.0	-31.0	-2.5	+1.0	-7.0	-4.0	-11.5	-1.0	-16.0	-13.0	-32.0
+100.0	-24.0	-1.5	+0.0	-6.5	-5.0	-12.0	-8.0	-16.5	-15.0	-32.0
+125.0	-19.0	-2.5	+.5	-8.0	-7.0	-14.0	-13.0	-25.0	-21.0	-36.0
+150.0	-16.5	-1.5	+1.5	-7.0	-2.5	-14.0	-10.5	-25.0	-21.5	-37.0
+175.0	-16.0	-1.0	+1.5	-7.0	-2.0	-15.0	-11.0	-29.0	-26.0	-40.0
+200.0	-12.0	-1.0	+.5	-7.0	-2.0	-16.5	-13.0	-32.0	-31.0	-47.0

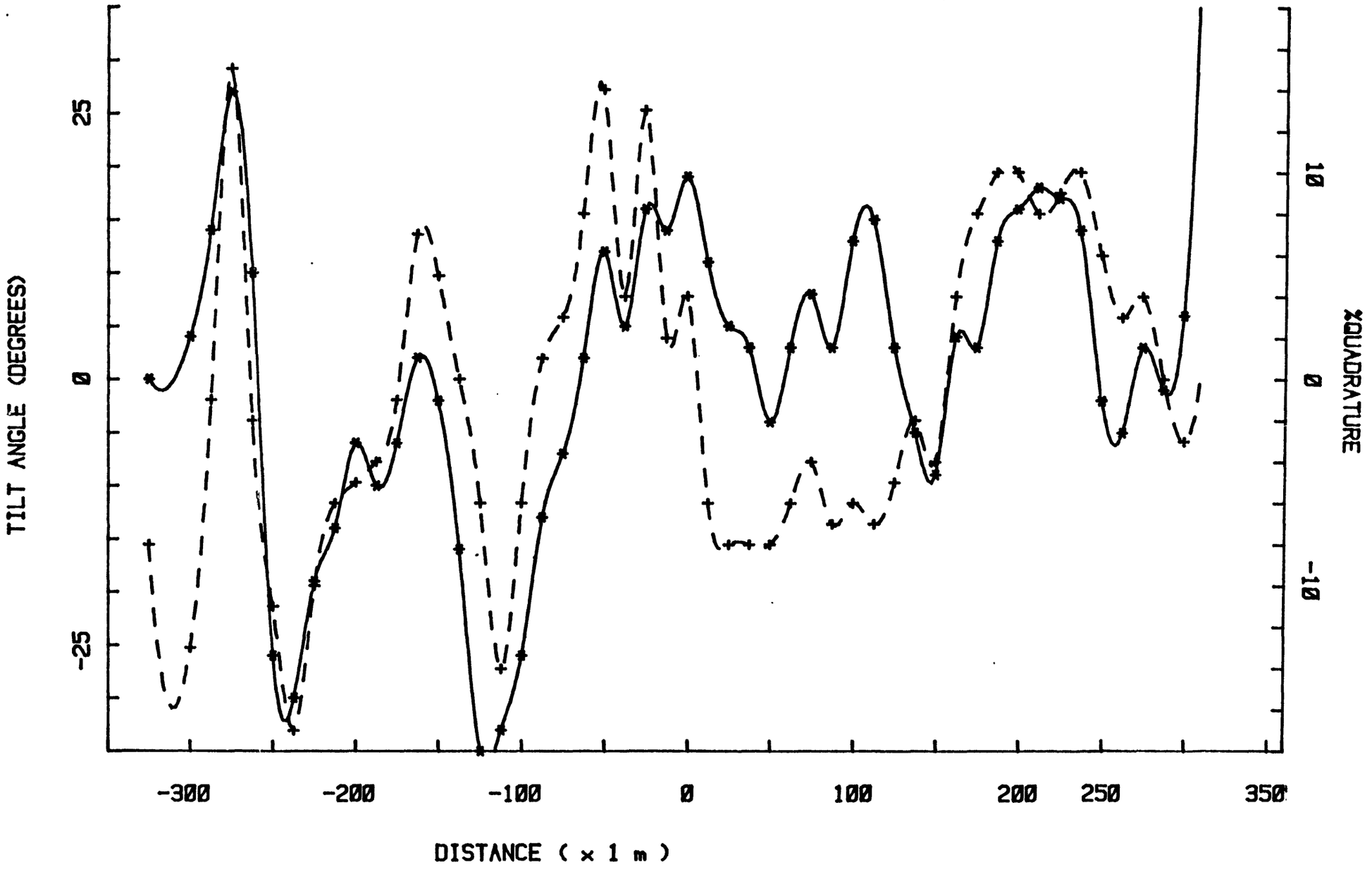
VLF DATA

Line P1


PREBLE 1 VLF (24.8 SEATTLE) R&P LINE = 1 6-21-84
APP RESISTIVITY = SOLID LINE AND (*) - PHASE = DASHED LINE AND (+)
MAP SCALE = 1:3000
LOG APPARENT RESISTIVITY (OHM-M)
10 4
10 3
10 2
10 1
PHASE (DEGREES)
55
45
35
-300
-200
-100
0
100
200
250
350
DISTANCE (x 1 m)

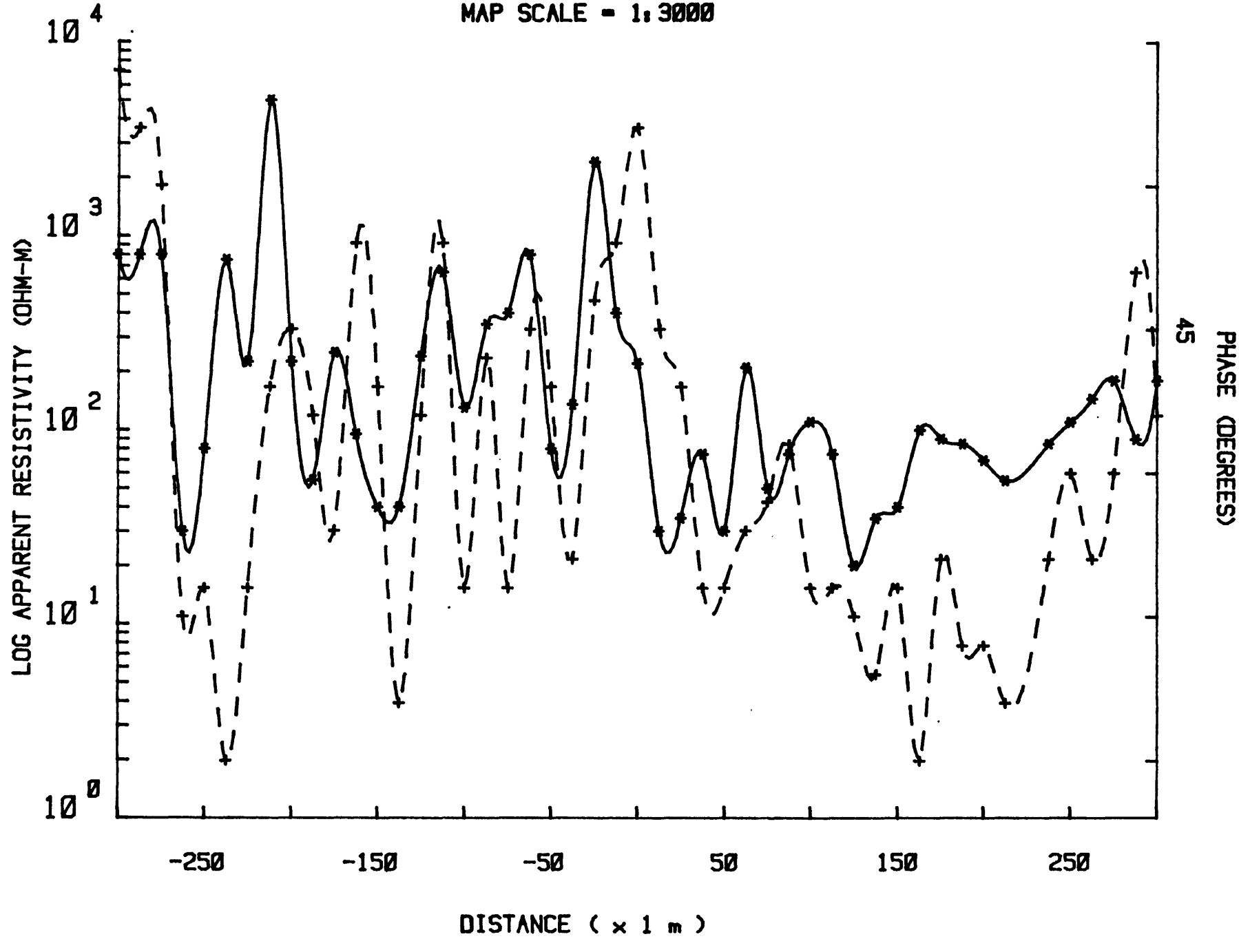
PREBLE 1 VLF (24.8 SEATTLE) R&P LINE = 1
6-21-84 MULTIPLY STATION * 1
NUMBER OF STATIONS = 49

STATION	RES	PHASE
-325.0	+1000.0	53.0
-300.0	+1600.0	56.0
-287.5	+1250.0	53.0
-275.0	+450.0	52.0
-262.5	+20.0	38.0
-250.0	+150.0	40.0
-237.5	+275.0	42.0
-225.0	+290.0	56.0
-212.5	+1800.0	50.0
-200.0	+500.0	51.0
-187.5	+35.0	58.0
-175.0	+45.0	63.0
-162.5	+75.0	55.0
-150.0	+60.0	45.0
-137.5	+45.0	38.0
-125.0	+165.0	35.0
-112.5	+190.0	50.0
-100.0	+60.0	52.0
-87.5	+130.0	54.0
-75.0	+55.0	58.0
-62.5	+500.0	54.0
-50.0	+90.0	59.0
-37.5	+20.0	55.0
-25.0	+260.0	62.0
-12.5	+10.0	45.0
+0.0	+85.0	40.0
+25.0	+20.0	40.0
+37.5	+105.0	35.0
+50.0	+50.0	32.0
+62.5	+230.0	31.0
+75.0	+35.0	34.0
+87.5	+90.0	34.0
+100.0	+65.0	30.0
+112.5	+45.0	31.0
+125.0	+25.0	29.0
+137.5	+35.0	30.0
+150.0	+40.0	35.0
+162.5	+45.0	32.0
+175.0	+35.0	36.0
+187.5	+40.0	39.0
+200.0	+25.0	47.0
+212.5	+35.0	40.0
+225.0	+75.0	32.0
+237.5	+40.0	34.0
+250.0	+95.0	36.0
+262.5	+85.0	45.0
+275.0	+205.0	45.0
+287.5	+120.0	40.0
+300.0	+75.0	43.0


PREBLE VLF (24.8) DIP&QUAD LINE = P1 6-21-84
TILT ANGLE = SOLID LINE AND (*) - %QUADRATURE = DASHED LINE AND (+)
MAP SCALE = 1:3000
TILT ANGLE (DEGREES)
25
0
-25
%QUADRATURE
10
0
-10
-300
-200
-100
0
100
200
250
350
DISTANCE (x 1 m)

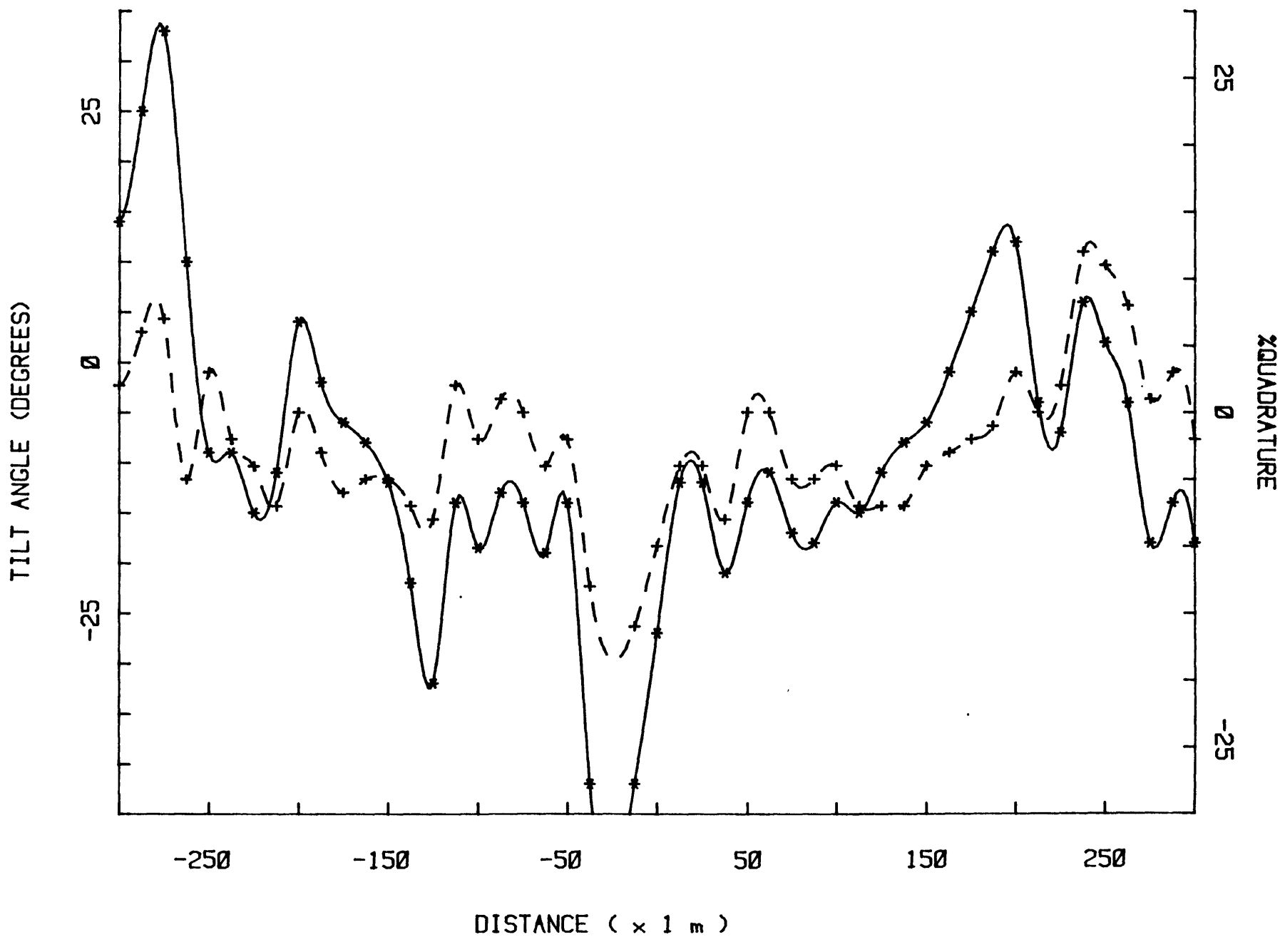
PREBLE VLF (24.8) DIP&QUAD LINE = P1
6-21-84 MULTIPLY STATION * 1
NUMBER OF STATIONS = 50

STATION	TILT	%QUAD
-325.0	+0.0	-8.0
-300.0	+4.0	-13.0
-287.5	+14.0	-1.0
-275.0	+27.0	15.0
-262.5	+10.0	-2.0
-250.0	-26.0	-11.0
-237.5	-30.0	-17.0
-225.0	-19.0	-10.0
-212.5	-14.0	-6.0
-200.0	-6.0	-5.0
-187.5	-10.0	-4.0
-175.0	-6.0	-1.0
-162.5	+2.0	7.0
-150.0	-2.0	5.0
-137.5	-16.0	0.0
-125.0	-35.0	-6.0
-112.5	-33.0	-14.0
-100.0	-26.0	-6.0
-87.5	-13.0	1.0
-75.0	-7.0	3.0
-62.5	+2.0	8.0
-50.0	+12.0	14.0
-37.5	+5.0	4.0
-25.0	+16.0	13.0
-12.5	+14.0	2.0
+0.0	+19.0	4.0
+12.5	+11.0	-6.0
+25.0	+5.0	-8.0
+37.5	+3.0	-8.0
+50.0	-4.0	-8.0
+62.5	+3.0	-6.0
+75.0	+8.0	-4.0
+87.5	+3.0	-7.0
+100.0	+13.0	-6.0
+112.5	+15.0	-7.0
+125.0	+3.0	-5.0
+137.5	-5.0	-2.0
+150.0	-9.0	-4.0
+162.5	+4.0	4.0
+175.0	+3.0	8.0
+187.5	+13.0	10.0
+200.0	+16.0	10.0
+212.5	+18.0	8.0
+225.0	+17.0	9.0
+237.5	+14.0	10.0
+250.0	-2.0	6.0
+262.5	-5.0	3.0
+275.0	+3.0	4.0
+287.5	-1.0	0.0
+300.0	+6.0	-3.0


PREBLE VLF (24.0) RES&PHASE LINE = P1 6-22-84
APP RESISTIVITY = SOLID LINE AND (*) - PHASE = DASHED LINE AND (+)
MAP SCALE = 1:3000
LOG APPARENT RESISTIVITY (OHM-M)
10 4
10 3
10 2
10 1
10 0
PHASE (DEGREES)
45
-250
-150
-50
50
150
250
DISTANCE (x 1 m)

PREBLE VLF (24.0) RES&PHASE LINE = P1
6-22-84 MULTIPLY STATION * 1
NUMBER OF STATIONS = 48

STATION	RES	PHASE
-300.0	+800.0	54.0
-287.5	+800.0	52.0
-275.0	+800.0	50.0
-262.5	+30.0	35.0
-250.0	+80.0	36.0
-237.5	+750.0	30.0
-225.0	+225.0	36.0
-212.5	+5000.0	43.0
-200.0	+225.0	45.0
-187.5	+55.0	42.0
-175.0	+250.0	38.0
-162.5	+95.0	48.0
-150.0	+40.0	43.0
-137.5	+40.0	32.0
-125.0	+240.0	42.0
-112.5	+650.0	48.0
-100.0	+130.0	36.0
-87.5	+350.0	44.0
-75.0	+400.0	36.0
-62.5	+800.0	45.0
-50.0	+80.0	43.0
-37.5	+135.0	37.0
-25.0	+2400.0	46.0
-12.5	+400.0	48.0
+0.0	+220.0	52.0
+12.5	+30.0	45.0
+25.0	+35.0	43.0
+37.5	+75.0	36.0
+50.0	+30.0	36.0
+62.5	+210.0	38.0
+75.0	+50.0	39.0
+87.5	+75.0	41.0
+100.0	+110.0	36.0
+112.5	+75.0	36.0
+125.0	+20.0	35.0
+137.5	+35.0	33.0
+150.0	+40.0	36.0
+162.5	+100.0	30.0
+175.0	+90.0	37.0
+187.5	+85.0	34.0
+200.0	+70.0	34.0
+212.5	+55.0	32.0
+237.5	+85.0	37.0
+250.0	+110.0	40.0
+262.5	+145.0	37.0
+275.0	+180.0	40.0
+287.5	+90.0	47.0
+300.0	+180.0	42.0


PREBLE VLF (24.0) DIP&QUAD LINE = P1 6-22-84
TILT ANGLE = SOLID LINE AND (*) - %QUADRATURE = DASHED LINE AND (+)
MAP SCALE = 1:3000
TILT ANGLE (DEGREES)
25
0
-25
%QUADRATURE
25
0
-25
-250
-150
-50
50
150
250
DISTANCE (x 1 m)

PREBLE VLF DIP&QUAD (24.0) MAIN LINE = P1
6-23-84 MULTIPLY STATION * 1
NUMBER OF STATIONS = 48

STATION	TILT	%QUAD
-300.0	+14.0	2.0
-287.5	+25.0	6.0
-275.0	+33.0	7.0
-262.5	+10.0	-5.0
-250.0	-9.0	3.0
-237.5	-9.0	-2.0
-225.0	-15.0	-4.0
-212.5	-11.0	-7.0
-200.0	+4.0	0.0
-187.5	-2.0	-3.0
-175.0	-6.0	-6.0
-162.5	-8.0	-5.0
-150.0	-12.0	-5.0
-137.5	-22.0	-7.0
-125.0	-32.0	-8.0
-112.5	-14.0	2.0
-100.0	-18.5	-2.0
-87.5	-13.0	1.0
-75.0	-14.0	0.0
-62.5	-19.0	-4.0
-50.0	-14.0	-2.0
-37.5	-42.0	-13.0
-12.5	-42.0	-16.0
+0.0	-27.0	-10.0
+12.5	-12.0	-4.0
+25.0	-12.0	-4.0
+37.5	-21.0	-8.0
+50.0	-14.0	0.0
+62.5	-11.0	0.0
+75.0	-17.0	-5.0
+87.5	-18.0	-5.0
+100.0	-14.0	-4.0
+112.5	-15.0	-7.0
+125.0	-11.0	-7.0
+137.5	-8.0	-7.0
+150.0	-6.0	-4.0
+162.5	-1.0	-3.0
+175.0	+5.0	-2.0
+187.0	+11.0	-1.0
+200.0	+12.0	3.0
+212.5	-4.0	0.0
+225.0	-7.0	2.0
+237.5	+6.0	12.0
+250.0	+2.0	11.0
+262.5	-4.0	8.0
+275.0	-18.0	1.0
+287.5	-14.0	3.0
+300.0	-18.0	-2.0