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HEINRICHS
GEOEX
GEOPHYSICAL ENGINEERS
TUCSON, ARIZONA

INDUCED POLARIZATION SURVEY

CUPRITE MINE AREA

Pima County, Arizona

FOR

NATIVE MINERALS LIMITED

July 1964

by
HEINRICHS GEOEXPLORATION COMPANY
P. O. Box 5671 Tucson, Arizona

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INTRODUCTION

On July 23, 24, 25 and 27, 1964 Heinrichs Geoexploration Company conducted a resistivity and induced polarization survey over the Cuprite Mine area for Native Minerals Limited. The Cuprite Mine is located in Sec. 28, T 17 S, R 16 E, Pima County, Arizona. A total of three I. P. lines were run including one spread of 500 ft. dipoles (Line 1) and two spreads of 100 ft. dipoles (Lines 2 and 3). The locations of the three lines are shown on the location map of the area.

The purpose of the survey was to map the subsurface geologic structure and to test for sulfide mineralization in the area. The two spreads of 100 ft. dipoles were placed by Native Minerals Limited and the one spread of 500 ft. dipoles was placed by Heinrichs Geoexploration Co. The latter line was placed to take advantage of topography and to obtain the maximum possible coverage in the north-south trending fault zone. The two spreads of 100 ft. dipoles were apparently located to correlate with past and present drill results and to examine a small but detailed zone near the drill holes and reported past production areas.

CONCLUSIONS AND RECOMMENDATIONS

The I. P. results obtained on Line 1 (500 ft. dipoles) although showing slight anomalism, represents a sulfide concentration that is either in relatively small and discontinuous pods or veinlets and/or in weak, marginal or sub-marginal disseminated concentrations. The anomaly located 100 ft. southwest of the center point is weak and quite small in aerial extent. The anomaly on the southwestern end of the line is presently open-ended. In addition the I. P. data also indicates a possible geologic feature at a point 150 ft. southwest of the center point, although this is not particularly evident in the resistivity data.

Both Lines 2 and 3 (100 ft. dipoles) show almost no sulfide mineralization with the exception that there is a very slight increase near the north-south fault zone.

Thus the I. P. results to date do not indicate any significant sulfide concentrations in the areas tested to a depth of approximately 750 ft. under and about 500 ft. out from Line 1 and similarly to a depth of approximately 200 ft. under and about 150 ft. out from Lines 2 and 3. Although Lines 2 and 3 include little or no mineralization it must be kept in mind that the maximum depth of penetration of these two lines is only one-third to one-fourth that of Line 1. This is borne out by the data, in which the picture at depth on the 100 ft. dipoles correlates quite well with the near surface information on the 500 ft. dipoles. It is possible that with 500 ft. dipoles run over Lines 2 and 3, sulfide mineralization might be encountered at depth.

If interest in the area continues it is recommended that Line 1 be extended to the southwest to examine the open-ended anomaly at the end of the line. Also a program of regional geophysics and geochemistry might be run to test out the general area for further targets. In this regard, regional magnetics should be particularly useful because of the association of magnetite with copper mineralization in the known area of interest.

Respectfully submitted,

HEINRICHS GEOEXPLORATION CO.

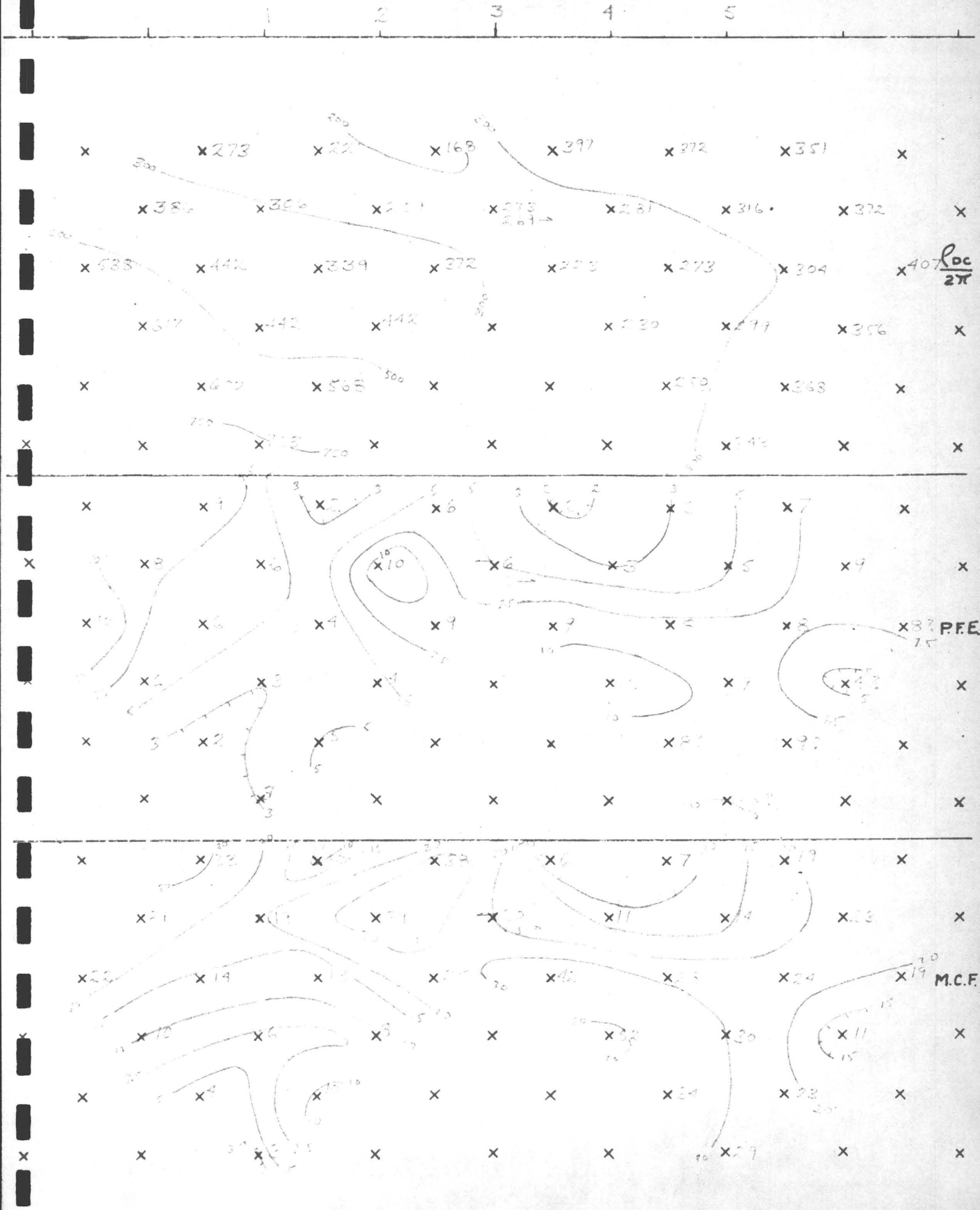
John P. Matthews, Jr.
Geophysicist

Walter E. Heinrichs, Jr.
President & General Manager

Registered Professional Engineer (Mining)
CERTIFICATE EXPIRES
WALTER E. HEINRICHS, JR.
DEC. 31, 1964
ARIZONA, U.S.A.

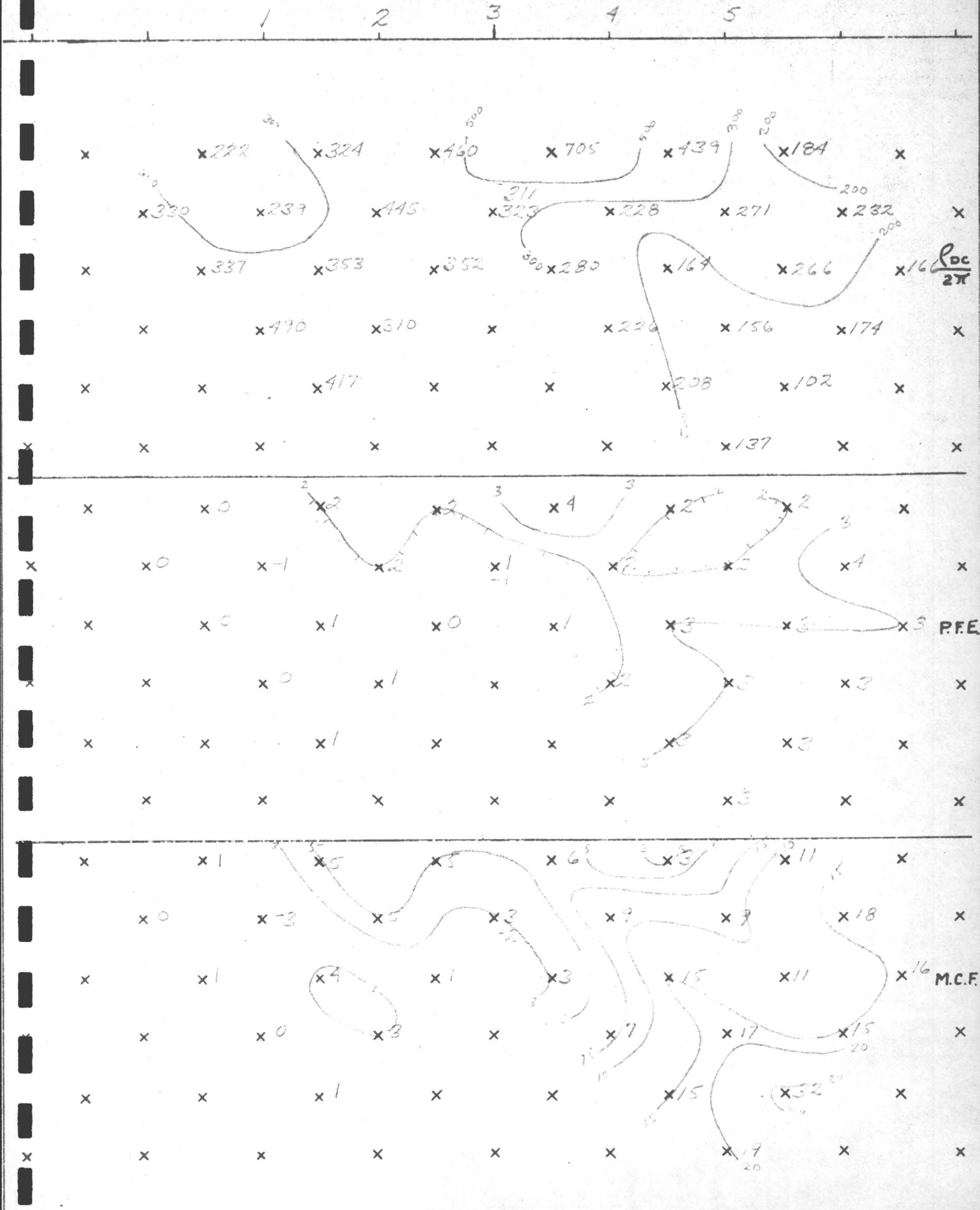
July 30, 1964
P. O. Box 5671
Tucson, Arizona

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NW



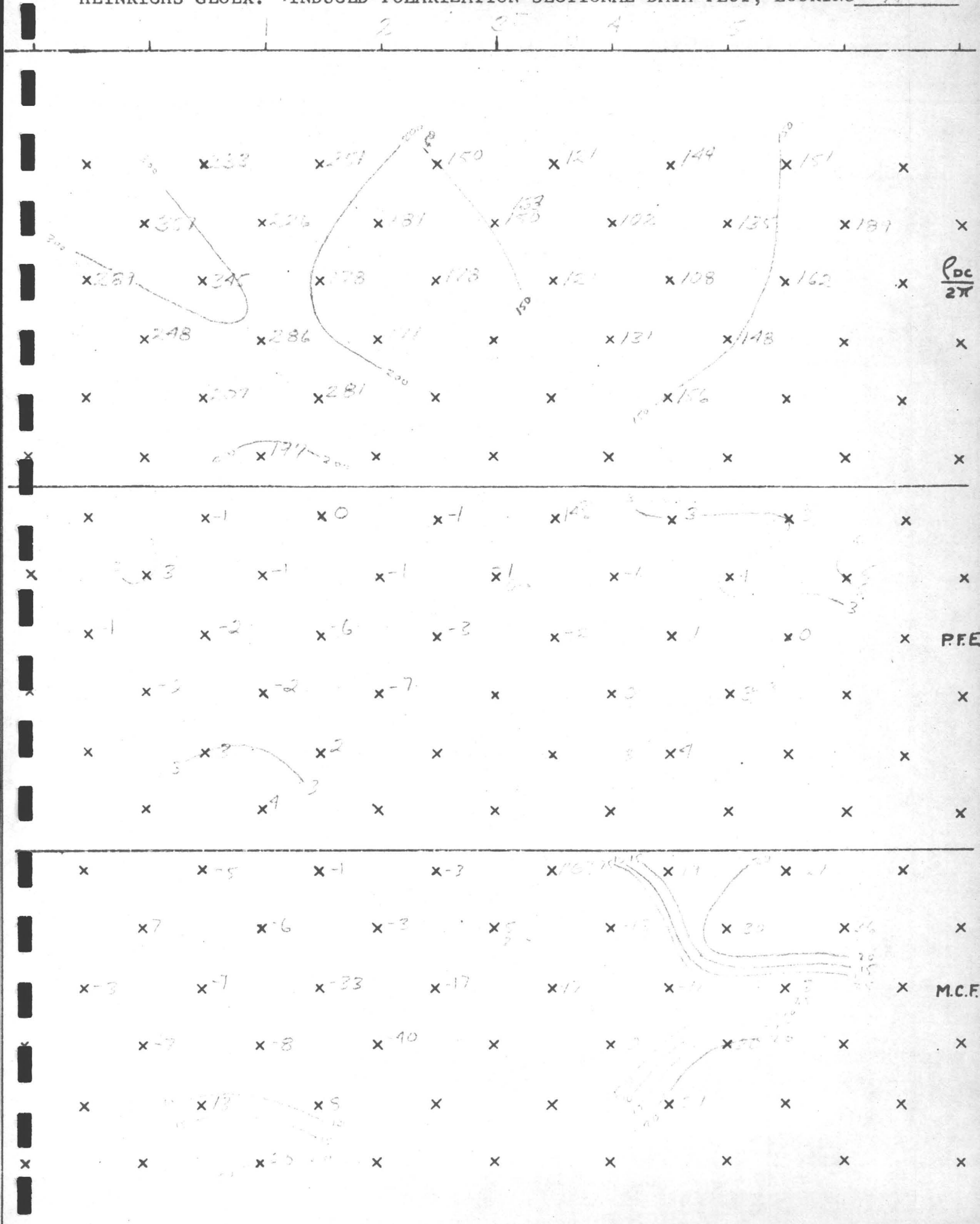
AREA Native Minerals LINE 1 a = 500' SCALE: 1" = 500' DATE: 7-25-64

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N

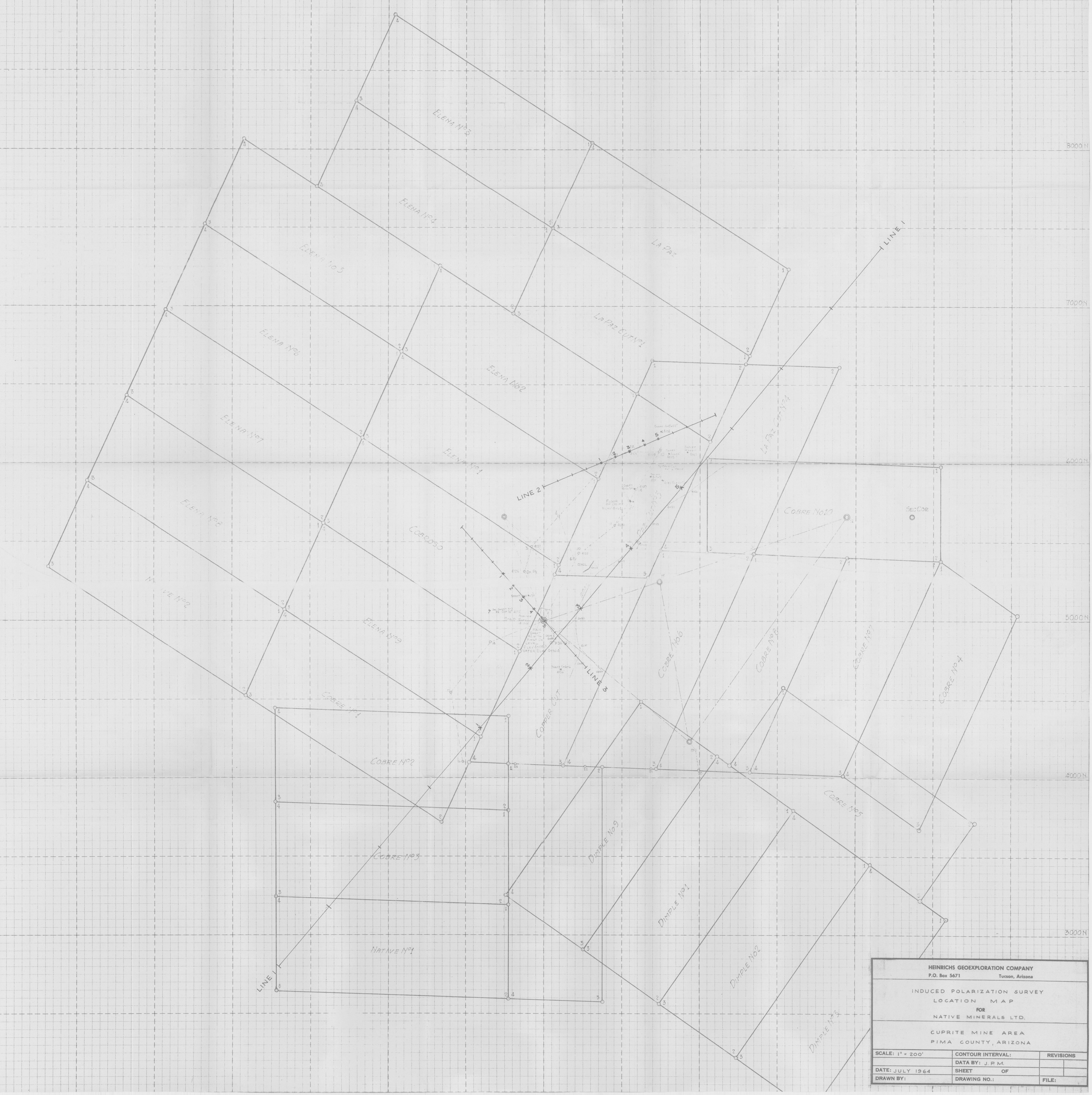


AREA Native Maverick LINE 2 a = 100' SCALE: 1" = 100' DATE: 7-26-69

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N



AREA Native Minerals LINE 3 a = 100' SCALE: 1"=100' DATE: 7-29-64



HEINRICHS GEOEXPLORATION COMPANY
P.O. Box 5671 Tucson, Arizona

INDUCED POLARIZATION SURVEY
LOCATION MAP
FOR
NATIVE MINERALS LTD.

CUPRITE MINE AREA
PIMA COUNTY, ARIZONA

SCALE: 1" = 200'	CONTOUR INTERVAL:	REVISIONS
	DATA BY: J. P. M.	
DATE: JULY 1964	SHEET OF	
DRAWN BY:	DRAWING NO.:	FILE:

INDUCED POLARIZATION SENDER NOTES

Project: Native Min. Line: 2 E 2 Date: 7-25-64

Send	2/3	1/2	3/4	2/3	1/2	4/5	3/4	2/3	1/2	4/5	3/4	2/3
Receive												
Time												
Range	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Current	800	800	700	800	800	800	700	800	800	800	700	800
Send	1/2	4/5	3/4	2/3	1/2		CAL					
Receive												
Time												
Range	1.5	1.5	1.50	1.5	1.5		1.5					
Current	800	800	700	800	800		300					

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Native Minerals Line: 2 100 NE ½ Int.Cal Date: 7-25-69

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Rec.	1-2N	→	2-3N	→	→	3-4N	→	→	→	4-5N	→	→
Time												
DC-1	940 940	106 104	500 500	74.0 75.0	36.0 36.8	24.0 23.8	77.0 77.0	21.3 21.4	14.7 14.6	75 76	30 30.5	10.0 10.3
DC-2	940 940	104 105	500 500	74.0 75.0	36.0 36.8	24.0 23.8	77.0 77.0	21.3 21.4	14.7 14.6	75 76	30 30.5	10.0 10.3
Σ	1880	210 209	1000	149 149	72.8 72.8		154		29.3	151 151	60.5	
DC-3	940 940	105 105	500 500	74.0 74.8	36.0 36.8	24.0 23.8	77 77	21.3 21.4	14.7 14.6	75 76	30 30.5	10.0 10.3
Dc-4		105 104		74.0 74.8							30. 30.5	
Σ	1880	210 209	1000	148.8 148.8	728	478	154	42.7	29.3	151	60.5	
DC-AV	1880	209.5	1000	148.9	72.8	478	154	42.7	29.3	151	60.5	20.3
A[illegible]	890	102	485	71.8	35.5	234	74.0	20.5	14.2	71.4	29.0	9.7
AC-2	890	102	485	71.8	35.6	234	74.1	20.5	14.2	71.3	29.0	9.8
Σ	1780	204	970	143.6	71.1	468	148.1	41.0	28.4	142.7	58.0	19.5
S. P.	+10.9	→	-4.8	→	→	+3.2	→	→	→	+1.6	→	→
AC-N	.04	→	.05	→	→	.1	→	→	→	.03	→	→
I.C.	49.3	→	49.3	→	→	49.5	→	→	→	49.2	→	→

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Nation Minna Line: 2 500' N½ Int.Cal Date: 7-25-64

Send	1-2	4-5	3-4	2-3	1-2		CAL					
Rec.	4-5 N	5-6 N	—	—	—							
Time												
DC-1	7.0 8.5	21.7 21.5	9.8 10.0	3.90 3.65	2.95 3.90		14.5 14.8					
DC-2	7.0 8.5	21.7 21.5	9.8 10.0	3.65 3.94	3.40 2.96		14.5 14.7					
Σ	15.5	43.2 "	19.8 "	7.55 7.59	6.35 6.36		29.3					
DC-3	7.0 8.5	21.7 21.5	9.8 10	4.0 3.6	2.95 3.40							
Dc-4												
Σ		43.2	19.8	7.6	6.35		29.2					
DC-AV	15.5	43.2	19.8	7.58	6.35		29.25					
AC-1	7.4	20.7	9.5	3.62	3.05		14.4					
AC-2	7.4	20.7	9.5	3.62	3.05		14.4					
Σ	14.8	41.4	19.0	7.24	6.10		28.8					
S. P.	+1.6	+11.1	—	—	—							
AC-N	.03	.03	—	—	—							
I.C.	49.2	49.3	—	—	—							

HEINRICHS GEOEXPLORATION COMPANY

E½ INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 3

Project Native Minerals Line 2 100' Field date 7-25-64 Data page _____ Comp. date 7-26 . Comp by J.P.M.

(A) Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
(B) Receive	1-2E	→	2-3E	→	→	3-4	→	→	→	4-5	→	→
(C) ~~n separation~~												
(D) I	800	800	700	800	800	800	700	800	800	800	700	800
(E) Vdc (avg)	1880	209.5	1000	148.5	72.8	478	154	42.7	29.3	151	60.5	20.3
(F) DCcal	1.026											
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3	.3	1.2	3	6	1.2	3	6
(H) ρ dc=ExFxGx10^3/D	705	323	439	228	280	184	271	164	226	232	266	156
(I) Vac Σ	1780	204	970	143.6	71.1	468	148.1	41.0	28.4	142.7	58.0	19.5
(J) AC noise x 2	—	—	—	—	—	—	—	—	—	—	—	—
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—	—	—	—	—	—	—	—	—	—	—	—
(L) AC-DC cal.	.985											
(M) ρ dc/ρac=ExL/K	1.040	1.011	1.015	1.020	1.009	1.021	1.024	1.025	1.016	1.042	1.028	1.026
(N) PFE=(M-1)(10^2)	4.0	1.1	1.5	2.0	.9	2.1	2.4	2.5	1.6	4.2	2.8	2.6
(O) MCF=(M-1)(10^5)/H	6	3	3	9	3	11	9	15	7	18	11	17

Project _____ Line _____ Field date _____ Data page _____ Comp. date _____ Comp by _____

(A) Send	1-2	4-5	3-4	2-3	1-2		CAL.					
(B) Receive	4-5	5-6	→	→	→		3-4					
(C) ~~n separation~~												
(D) I	800	800	700	800	800		300					
(E) Vdc (avg)	15.5	43.2	19.8	7.58	6.35		29.25					
(F) DCcal	1.026						1.026					
(G) Kn x 10^{-3}	10.5	3	6	10.5	16.8		.					
(H) ρ dc=ExFxGx10^3/D	208	166	174	102	137							
(I) Vac Σ	14.8	41.4	19.0	7.24	6.10		28.8					
(J) AC noise x 2	—	—	—	—	—							
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	—	—	—	—	—							
(L) AC-DC cal.	.985						.985					
(M) ρdc/ρac =ExL/K	1.031	1.027	1.026	1.032	1.026							
(N) PFE=(M-1)(10^2)	3.1	2.7	2.6	3.2	2.6							
(O) MCF=(M-1)(10^5)/H	15	16	15	32	19							

705 | 4000

8 | 80 000

INDUCED POLARIZATION SENDER NOTES

Project: Native Min. Line: 2W2 Date: 7-25-64

Send	3/4	4/5	2/3	3/4	4/5	1/2	2/3	3/4	4/5	1/2	2/3	3/4
Receive												
Time												
Range	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Current	700	800	800	700	800	800	800	700	800	800	800	700
Send	4/5	1/2	2/3	3/4	4/5		CAL					
Receive												
Time												
Range	1.5						1.5					
Current	800						300					

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Native Minerals Line: 2 100'(N)2 Int.Cal _____ Date: 7-25-84

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Rec.	1-2(N)	→	2-3(N)	→	→	3-4(N)	→	→	→	4-5(N)	→	→
Time												
DC-1	54 51.0	100 109	440 420	128 129	46 46	290 290	78 78	40 40.7	20.8 19.7	110 106	46 42	30.0 26
DC-2	54 51	100 109	440 420	129 128	46 46	290 290	78 78	40. 40.7	20.8 19.7	110 106	46 42	30 26
Σ	105 105		860	252	92	580	156	80.7	40.5	216	88	56
DC-3	54 51	103 100	440 420	107 150	46 46	290 290	78 78	40. 40.7	20.8 19.7	110 106	46 42	30 26
Dc-4				110 147								
Σ	105			257 257		580			40.5	216	88	56
DC-AV	1050	203	860	254.5	92	580	156	80.7	40.5	216	88	56
AC-1	500	100	415	120	45.0	28.5	77.0	39	19.7	106	43.0	27.5
AC-2	504	100	415	122	45.0	282	77.0	39.0	19.7	106	43.0	27.5
Σ	1004	200	830	244	90.0	567	154	78	39.4	212	86	55.0
S. P.	-29.6	→	+22.1	→	→	+8.2	→	→	→	-8.4	→	→
AC-N	.08	→	.05	→	→	.1	→	→	→	.02	→	→
I. C.	49	→	49.2	→	→	49.4	→	→	→	49.3	→	→

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Native Minerals Line: 2 100' Int.Cal Date: 7-25-84

Send	4-5	1-2	2-3	3-4	4-5		CAL					
Rec.	4-5(E)	5-6(W)	→	→	→		2-3					
Time												
DC-1	15.0 18.3						14.6 14.8					
DC-2	15.0 18.4						14.6 14.8					
Σ	33.3 33.4											
DC-3	15.0 18.4						14.6 14.8					
Dc-4	14.9 14.4											
Σ	33.4 33.3						29.4					
DC-AV	33.35						29.4					
AC-1	16.3	24.0					14.4					
AC-2	16.3						14.4					
Σ	32.6						28.8					
S. P.	-8.4											
AC-N	.02											
I. C.	49.3											

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 4

Project Native Minerals Line 2 W² Field date 7-25-64 Data page _____ Comp. date 7-29-64. Comp by J.P.M.

(A) Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
(B) Receive	1-2W	→	2-3W	→	→	3-4W	→	→	→	4-5W	→	→
(C) n separation												
(D) I	700	800	800	700	800	800	800	700	800	800	800	700
(E) Vdc (avg)	1050	203	860	254.5	92	580	156	80.7	40.5	216	88	56
(F) DCcal	1.02											
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3	.3	1.2	3	6	1.2	3	6
(H) ρdc=ExFxGx10^3/D	460	311	324	445	352	222	239	353	310	330	337	490
(I) Vac Σ	1004	200	830	244	90	567	154	78	39.9	212	86	55
(J) AC noise x 2	—	—	—	—	—	—	—	—	—	—	—	—
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—	—	—	—	—	—	—	—	—	—	—	—
(L) AC-DC cal.	.980	1.000										
(M) ρdc/ρac=ExL/K	1.024	.995	1.015	1.022	1.002	1.003	.993	1.013	1.008	0	1.003	.998
(N) PFE=(M-1)(10^2)	2.4	-.5	1.5	2.2	.2	.3	-.7	1.3	.8	0	.3	-.2
(O) MCF=(M-1)(10^5)/H	5	-2	5	5	.6	1	-3	4	3	0	1	-.4

Project _____ Line _____ Field date _____ Data page _____ Comp. date _____ Comp by _____

(A) Send	4-5	1-2	2-3	3-4	4-5		CAL					
(B) Receive	4-5W	→	→	→	→		2-3					
(C) n separation		→	→	→	→							
(D) I	800	→	→	→	→		300					
(E) Vdc (avg)	33.35	→	→	→	→		29.4					
(F) DCcal	1.02	→	→	→	→							
(G) Kn x 10^{-3}	10.5											
(H) ρdc=ExFxGx10^3/D	417											
(I) Vac Σ	32.6						28.8					
(J) AC noise x 2	—											
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	.980						.980					
(M) ρdc/ρac =ExL/K	1.002											
(N) PFE=(M-1)(10^2)	.2											
(O) MCF=(M-1)(10^5)/H	.5											

INDUCED POLARIZATION, SENDER NOTES

Project: Helvitia Line: 1500' SW Date: 7-24-64

Send	3/4	4/5	2/3	3/4	4/5	1/2	2/3	3/4	4/5	1/2	2/3	3/4
Receive												
Time												
Range	1.5	1.5 2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Current	1600	1600	1600	1600	1600	1400	1600	1400	1400	1400	1400	1400
Send	4/5	1/2	2/3	3/4	4/5		CAL					
Receive												
Time												
Range	2.0	2.0	2.0	2.0	2.0		1.5					
Current	1400	1400	1400	1400	1400		1000					

JCED POLARIZATION - RECEIVER NOTES PAGE

Project: Native Minerals Line: 1 500' S½ Int.Cal Date: 7-24-69

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Rec.	5-105	→	10-155	→	→	15-205	→	→	→	20-255	→	→
Time												
DC-1	85.0 87.0	34.0 36.0	113 113	33.2 33.2	19.0 19.2	122 123	40. 38.6	161 14.4	10.0 9.7	43.8 43.0	19.6 19.9	9.8 10.0
DC-2	85.0 87.0	36 34	115 113	33.5 33.0	19.0 19.2	122 123	40. 38.7	143 16.1	10.0 9.8	44.0 42.0	19.7 20.0	10.0 9.8
Σ	172 172	70 70	226 228	66.4 66.5	38.2 38.4	245 245	78.6 78.7	205 30.4	19.7 19.8	86.8 87	39.5 39.7	19.8 19.8
DC-3	85.0 87.0	36.0 34.0	114 113	33.2 33.2	18.8 19.3	122 122	40. 38.5	14.3 16.1	10.0 9.8	42.8 43.7	19.7 20.0	10.0 9.9
Dc-4			114 113	33.2 33.3	19.2 19.0	123 122	40.0 38.5	19.4 16.0	10.0 9.8	42.0 44.0	19.8 20	10.2 9.6
Σ	172	70	227	66.5 66.4	38.1 38.4	244 245	78.5 78.5	30.4 30.4	19.8 19.8	86.5 86	39.7 39.8	19.7 19.8
DC-AV	172	70	227	66.45	38.2	245	78.6	30.4	19.8	86.6	39.7	19.8
AC-1	81.0	33.0	103	30.0	17.4	112	37.0	14.5	9.5	40.0	186	9.6
AC-2	80.0	33.0	103	30.0	17.4	112	37.0	14.5	9.5	39.7	18.6	9.6
Σ	161	66	206	60.0	34.8	224	74.0	29.0	19.0	79.7	37.2	19.2
S. P.	+9.8	→	←	→	+14.3	+1.6	→	→	→	.08	37.2	→
AC-N	.05	→	←	→	.05	.07	→	→	→	+16.1	→	→
I.C	49	→	←	→	49.3	49.3	→	→	→	49.5	→	→

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Native Minerals Line: 1 500' S½ Int.Cal _____ Date: 7-29-64

Send	4-5	1-2	2-3	3-4	4-5		CAL					
Rec.	20-25S	25-30S	→	→	→		2-3					
Time												
DC-1	70 79	24.7 23.6	13.3 14.6	7.5 8.0	6.15 5.85		48.5 48.0					
DC-2	74 72	23.7 24.6	13.0 14.7	7.9 8.0	6.20 5.9		48.5 48.0					
Σ	149 146	48.3 48.3	27.9 27.7	15.5 15.4	12.0 12.1							
DC-3	79 71	23.5 24.8	13.1 14.5	7.5 7.9	5.9 6.2		48.5 48.0					
Dc-4	74 73	23.7 24.7	13.3 14.5	7.4 8.0	6.2 5.8							
Σ	145 147	48.3 48.4	27.6 27.8	15.4 15.4	12.1 120							
DC-AV	145.5	48.3	27.7	15.4	12.05		96.5					
AC-1	69.0	21.4	13.0	7.5	5.9?		48.0					
AC-2	69.0	21.5	13.0	7.5	5.8?		48.0					
Σ	138.0	42.9	26.0	15.0	11.7		96.0					
S. P.	+16.1	.6	→	→	→							
AC-N	.08	.1	→	→	→							
I.C	49.3	49.2	→	→	→							

16 | 2680 250 000

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 1

Project Native Minerals Line 1 500' Field date 7-24-64 Data page _____ Comp. date 7-24-64 Comp by J.P.M.

(A) Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
(B) Receive	5-10S	→	10-15S	→	→	15-20S	→	→	→	20-25S	→	→
(C) ~~n separation~~												
(D) I	1600	1600	1600	1600	1600	1400	1600	1400	1400	1400	1400	1400
(E) Vdc (avg)	172	70	227	66.45	38.2	245	78.6	30.4	19.8	86.6	39.7	19.8
(F) DCcal	1.04											
(G) Kn x 10^{-3}	1.5	6	1.5	6	15	1.5	6	15	30	6	15	30
(H) ρ dc=ExFxGx10^3/D	168	273	221	259	372	273	306	339	442	386	442	442
(I) Vac Σ	161	66	206	60.0	34.8	224	74.0	29.0	19.0	79.7	37.2	19.2
(J) AC noise x 2	—	—	—	—	—	—	—	—	—	—	—	—
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—	—	—	—	—	—	—	—	—	—	—	—
(L) AC-DC cal.	.995											
(M) ρ dc/ρac=ExL/K	1.063	1.055	1.022	1.100	1.092	1.089	1.057	1.043	1.037	1.082	1.061	1.026
(N) PFE=(M-1)(10^2)	6.3	5.5	2.2	10.0	9.2	8.9	5.7	4.3	3.7	8.2	6.1	2.6
(O) MCF=(M-1)(10^5)/H	38	20	10	39	25	33	19	13	8	21	14	6

Project _____ Line _____ Field date _____ Data page _____ Comp. date _____ Comp by _____

(A) Send	4-5	1-2	2-3	3-4	4-5		CAL					
(B) Receive	20-25S	25-30S	→	→	→		2-3					
(C) ~~n separation~~												
(D) I	1400	1400	1400	1400	1400		1000					
(E) Vdc (avg)	145.5	48.3	27.7	15.4	12.05							
(F) DCcal	1.04						1.04					
(G) Kn x 10^{-3}	52.5	15	30	52.5	84		96.5					
(H) ρ dc=ExFxGx10^3/D	568	538	617	600	753							
(I) Vac Σ	138	42.9	26.0	15.0	11.7		96.0					
(J) AC noise x 2	—	—	—	—	—							
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	—	—	—	—	—							
(L) AC-DC cal.	.995											
(M) ρdc/ρac =ExL/K	1.054	1.120	1.060	1.022	1.026							
(N) PFE=(M-1)(10^2)	5.4	12.0	6.0	2.2	2.6							
(O) MCF=(M-1)(10^5)/H	10	22	10	4	3							

168 6000 9000 9001 2600

170 600 2200

INDUCED POLARIZATION SENDER NOTES

Project: Native Min. Line: 1 NE² 500' Date: 7-24-64

Send	2/3	1/2	3/4	2/3	1/2	4/5	3/4	2/3	1/2	4/5	3/4	2/3
Receive												
Time												
Range	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Current	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
Send	1/2	4/5	3/4	2/3	1/2		CAL					
Receive												
Time												
Range	2.0	2.0	2.0	2.0	2.0		2.0					
Current	140	1400	1400	1400	1400		1000					

INDUCED POLARIZATION - RECEIVER NOTES PAGE

1400 Project: Native Minerals Line: 1 500' N½ Int.Cal _____ Date: 7-24-64

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Rec.	5-15N	→	10-15N	→	→	15-20N	←	→	→	20-25	→	→
Time												
DC-1	180 177	30.0 30.6	167 167	31.5 31.5	10.0 10.0	157 158	35.5 35.3	12.7 11.8	53 50	40.0 43.3	13.9 13.4	6.6 6.8
DC-2	180 177	30.2 30.2	167 167	31.5 31.5	10.0 10.0	157 158	35.5 35.4	12.7 11.8	52 50	40.5 43.0	13.9 13.4	6.6 6.8
Σ	357 "	60.6 60.9	334	2	10.0	315 31.5	70.8 70.9	24.5 "	103 102	83.3 83.5	27.3	13.4
DC-3	180 176	30.3 30.2	167 167	31.5 31.5	10.0 10.0	157 158	35 35.8	12.7 11.8	53 50	40.5 43.0	13.9 13.4	6.5 6.9
Dc-4	180 176	30.3 30.2					35.8 35.0	11.8 12.7	50 54	40.6 43.0	13.9 13.4	6.6 6.9
Σ	356 "	60.5 60.5	334	63.0	20.0	315	70.8	24.5	103 104	83.5 83.6	27.3	13.4 13.5
DC-AV	356.5	60.5	334	63.0	20	315	70.8	24.5	10.3	83.5	27.3	13.4
AC[illegible]	175	28.8	163	30.6	9.1	147	33.8	11.4	4.6	39.0	12.7	6.1?
AC-2	174	28.8	163	30.6	9.2	148	34.0	11.4	4.6	38.0	12.7	6.2?
Σ	349	57.6	326	61.2	18.3	295	67.8	22.8	9.2	77.0	25.4	12.3
S. P.	+11.4	→	-3.7	→	→	+12.4	→	→	→	-11.8	→	→
AC-N	.1	→	.1	→	→	.1	→	→	→	.2	→	→
	49.3	→	49.3	→	→	49.3	→	→	→	49.3	→	→

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Native Minerals Line: 1 500' N½ Int.Cal _____ Date: 7-24-84

Send	1-2	4-5	3-4	2-3	1-2		CAL					
Rec.	20-25	25-30	→	→	→							
Time												
DC-1	30 3.9	18 18.5	8.0 8.0	485 4.60	3.1 2.9		48.0 48.0					
DC-2	2.9 3.5	18.0 18.5	8.0 8.0	4.9 4.5	3.1 2.4		48.0 48.0					
Σ	6.4 6.4	36.5		9.45 9.4	5.5 5.5							
DC-3	2.9 3.5	18.2 18.3	8.0 8.0	4.6 4.9	3.2 2.3		48 48					
Dc-4	3.5 2.8	18.2 18.3	8.0 8.0	4.9 4.5	3.2 2.3							
Σ	6.4 6.4	36.5	16	9.5 9.4	5.5 5.5							
DC-AV	6.4	36.5	16.0	9.44			96					
AC[illegible]	3.0?	17.0?	7.7?	4.4?	2.5?		48.0					
AC-2	2.9	16.9	7.7	4.3?	2.5?		48.0					
Σ	5.9?	33.9?	15.4?	8.7?	5.0?		96.0					
S. P.	-11.8	-21.1	→	→	→							
AC-N	.2	.2	→	→	→							
I C	49.3	49.0	→	→	→							

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 2

Project Native Minerals Line 1 - 500' Field date 7-24-64 Data page _____ Comp. date 7-25-64. Comp by J.P.M.

(A) Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
(B) Receive	5-10N	→	10-15N	→	→	15-20	→	→	→	20-25N	→	→
(C) n ~~separation~~												
(D) I	1400	—	—	—	—	—	—	—	—	—	—	—
(E) Vdc (avg)	356.5	60.5	334	63.0	20	315	70.8	24.5	10.3	83.5	27.3	13.4
(F) DCcal	1.09	—	—	—	—	—	—	—	—	—	—	—
(G) Kn x 10^{-3}	1.5	6	1.5	6	15	1.5	6	15	30	6	15	30
(H) ρdc=ExFxGx10^3/D	397	269	372	281	223	351	316	273	230	372	304	299
(I) Vac Σ	349	57.6	326	61.2	18.3	295	67.8	22.8	9.2	77.0	25.4	12.3
(J) AC noise x 2	—	—	—	—	—	—	—	—	—	—	—	—
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—	—	—	—	—	—	—	—	—	—	—	—
(L) AC-DC cal.	1.0	—	—	—	—	—	—	—	—	—	—	—
(M) ρdc/ρac=ExL/K	1.022	1.050	1.025	1.030	1.093	1.068	1.045	1.076	1.120	1.085	1.074	1.090
(N) PFE=(M-1)(10^2)	2.2	5.0	2.5	3.0	9.3	6.8	4.5	7.6	12.0	8.5	7.4	9.0
(O) MCF=(M-1)(10^5)/H	6	19	7	11	42	19	14	28	52	23	24	30

Project _____ Line _____ Field date _____ Data page _____ Comp. date _____ Comp by _____

(A) Send	1-2	4-5	3-4	2-3	1-2		CAL					
(B) Receive	20-25N	25-30N	→	→	→		4-5					
(C) n ~~separation~~												
(D) I	1400	—	—	—	—		1000					
(E) Vdc (avg)	6.4	36.5	16.6	9.44	5.5		96					
(F) DCcal	1.04	—	—	—	—							
(G) Kn x 10^{-3}	52.5	15	30	52.5	84							
(H) ρ dc=ExFxGx10^3/D	250	407	356	368	343							
(I) Vac Σ	5.9 ?	33.9 ?	15.4 ?	8.7 ?	5.0 ?		96.0					
(J) AC noise x 2	—	—	—	—	—							
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	—	—	—	—	—							
(L) AC-DC cal.	1.0	—	—	—	—		1.0					
(M) ρdc/ρac =ExL/K	1.084	1.078	1.039 ?	1.086	1.400							
(N) PFE=(M-1)(10^2)	8.4 ?	7.8 ?	3.9 ?	8.6 ?	10.0 ?							
(O) MCF=(M-1)(10^5)/H	34	19	11	23	29							

INDUCED POLARIZATION SENDER NOTES

Project: Native min Line: 3 E 2 Date: 7-28-64

Send	2/3	1/2	3/4	2/3	1/2	4/5	3/4	2/3	1/2	4/5	3/4	2/3
Receive												
Time												
Range	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Current	1400	1400	2000	1400	1400	2000	2000	1400	1400	2000	2000	1400
Send	1/2	4/5	3/4	2/3	1/2		CAL					
Receive												
Time												
Range	1.5						1.5					
Current	1400						300					

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Native Minerals Line: 3 100' E½ Int.Cal Date: 7-28-64

Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
Rec.	1-2 E	→	2-3 E	→	→	3-4 E	→	→	→	4-5 E	→	→
Time	1000	300	1000	100	100	1000	300	100	100	300	100	30
DC-1	290 263	63.0 90.0	470 470	58.0 58.5	27.0 28.0	511 468	110 110	25.0 24.0	25.5 14.3	154 154	52.5 52.2	14.8 14.8
DC-2	290 260	53 95	470 470	58.0 58.5	27.0 28	511 467	110 110	25.0 24.2	15.5 14.3	154 154	52.5 52.5	14.8 14.8
Σ	552 150	153 148	940 "	116.5	55 55	979 980	220 220	49 49.2	29.8		105 104.7	29.6
DC-3	260 290	57.0 93.0	470 470	58.0 58.5	27.0 28.0	512 468	110 109	25.0 24.2	15.5 14.3	154 154	53.0 53.0	14.9 14.7
Dc-4	260 290	54.0 92					110 109		15.5 14.3		52.5 52.8	14.9 14.7
Σ	550	150 146	940	116.5	55	980	219 219	49.2	29.8	308	105.2	
DC-AV	550	149.2	940	116.5	55	980	219.5		29.8	308	105.2	29.6
AC-1	240.0	74.0	455.0	57.5	27.3	472.0	105	24.5	14.5	146	51.0	14.3
AC-2	240.0	74.0	455.0	57.5	27.3	472.0	105	24.5	14.5	146	51	14.3
Σ	480?	148	910	115.0	54.6	944	210	49.0	29.0	292	102	28.6
S. P.	-58.0	→	-14.4	→	→	+19.0	→	→	→	0	→	→
AC-N	.05	→	.05	→	→	.05	→	→	→	.05	→	→
	49.8	→	49.8	→	→	49.5	→	→	→	49.5	→	→

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Nation Minerals Line: 3 100' Int.Cal Date: 7-25-69

Send	1-2	4-5	3-4	2-3	1-2		CAL					
Rec.	1-5	5-6N										
Time	30											
DC-1	10.0 10.3	73 79					14.8 14.5					
DC-2	10.0 10.3						14.6 14.7					
Σ	20.3 "						29.3 29.2					
DC-3	10.0 10.3						14.5 14.7					
Dc-4							14.5 14.7					
Σ	20.3						29.2					
DC-AV							29.2					
AC-1	9.70	71.0					14.5					
AC-2	9.75						14.5					
Σ	19.45						29.0					
S. P.	0											
AC-N	.05											
	49.5											

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Native Mineral Line 3 E½ Field date 7-28-64 Data page_____ Comp. date 7-29-64. Comp by J.P.M.

(A) Send	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4	2-3
(B) Receive	1-2 E	→	2-3 E	→	→	3-4	→	→	→	4-5	→	→
(C) ~~n separation~~ RNG	1000	300	1000	100	100	1000	300	100	100	300	100	30
(D) I	1400	1400	2000	1400	1400	2000	2000	1400	1400	2000	2000	1400
(E) Vdc (avg)	550?	149.2	940	116.5	55	980	219.5	49.2	29.8	308	105.2	29.6
(F) DCcal	1.027											
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3.0	.3	1.2	3	6	1.2	3	6
(H) ρ dc=ExFxGx10^3/D	121	138	144	102	121	151	135	108	131	189	162	148
(I) Vac Σ	480?	148	910	115.0	54.6	944	210	49.0	29.0	292	102	286
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.994	.994	.994	.974	.974	.994	.994	.974	.974	.994	.974	.994
(M) ρ dc/ρac=ExL/K	1.14	1.002	1.027	.987	.980	1.032	1.040	.978	1.—	1.049	1.005	1.029
(N) PFE=(M-1)(10^2)	14	.2	2.7%	-1.3	-2.0	3.2%	4.0%	-1.2%	0	4.9%	.5%	2.9%
(O) MCF=(M-1)(10^5)/H	116?	2.0	19	-13	-17	+21	+30	-11	0	26	3.0	20.0

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	4-5	3-4	2-3	1-2		CAL.					
(B) Receive	4-5											
(C) n separation	30											
(D) I	1400						300					
(E) Vdc (avg)	20.3						29.2					
(F) DCcal	1.027						1.027					
(G) Kn x 10^{-3}	10.5											
(H) ρ dc=ExFxGx10^3/D	156											
(I) Vac Σ	19.45						29.0					
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.994						.994					
(M) ρdc/ρac =ExL/K	1.038											
(N) PFE=(M-1)(10^2)	3.8%											
(O) MCF=(M-1)(10^5)/H	24.0											

INDUCED POLARIZATION SENDER NOTES

Project: Native Min. Line: 3 W² Date: 7-28-64

Send	3/4	4/5	2/3	3/4	4/5	1/2	2/3	3/4	4/5	1/2	2/3	3/4
Receive												
Time												
Range	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Current	2000	2000	1400	2000	2000	1400	1400	2000	2000	1400	1400	2000
Send	4/5	1/2	2/3	3/4	4/5		CAL					
Receive												
Time												
Range	1.5	1.5	1.5	1.5	1.5		1.5					
Current	2000	1400	1400	2000	2000		300					

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Natin Minerals Line: 3 100' W½ Int.Cal _____ Date: 7-28-69

Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
Rec.	1-2S	→	2-3S	→	→	3-4S	→	→	→	4-5S	→	→
Time	1000	300	1000	300	100	1000	300	100	100	300	100	100
DC-1	505 496	133 110	570 559	148 146	558 598	530 530	125 130	56 60	28.0 28.0	163 243	70 88	40 53.2
DC-2	505 496	135 108	570 570	149 146	551 558	530 530	125 132	55.5 60.0	29.2 26.0	170 230	63 94	40.0 53.2
Σ	1001			294 295	1150 1153	1060	255 257	116 115.5	56 55.2	406 400	158 157	93.2
DC-3	505 495	136 107	570 570	148 146	555 598	528 530	125 133	55.8 60.2	29.2 26.1	197 210	61.5 95.0	40.0 53.2
Dc-4	495 506		570 570	148 146	55.6 59.8	530 530	125 132	60.5 56.0	295 260	196 212	61.0 96.0	40.0 53.2
Σ	1000 1001	293	1140	294 295	1153 1154	1058 1060	258 257	116.0 115.5	55.3 55.5	407 408	156.5 157	93.2
DC-AV	1001	243	1140	299.5	1154	1060	257	115.75	55.5	407	157.1	93.2
AC-1	500	120	568	147	58.5	535	130	605	291	197.	77.5	46.6
AC-2	500	120	568	147	58.6	532	129	602	290	197	77.8	46.3
Σ	1000	240	1136	294	117.1	1067	259	120.7	58.1	394	155.3	92.9
S. P.	+54.0	→	.05	→	→	+1.06	→	→	→	-9.0	→	→
AC-N	.01	→	+1.53	→	→	.05	→	→	→	.05	→	→
I.C.	50	→	49.6			49.6	→	→	→	49.5	→	→

INDUCED POLARIZATION - RECEIVER NOTES PAGE

Project: Native Minerals Line: 3 100' 10½ Int.Cal _____ Date: 7-25-69

Send	4-5	1-2	2-3	3-4	4-5		CAL					
Rec.	4 5 5	5-6 5	→		→							
~~Time~~	30	100	100	30	30		30					
DC-1	27.0 25.2	66.1 65.6	28.0 28.5	19.2 19.2	11.6 11.3		14.7 14.5					
DC-2	27.0 25.1	66.1 65.8	28.0 28.4	19.2 19.2	11.6 11.3		14.5 14.7					
Σ	52.2 52.1	131.7 131.9	56.5 56.4	38.4	22.9							
DC-3	27.0 25.3	66.6 65.7	28.2 28.2	19.2 19.2	11.7 11.2		14.5 14.7					
Dc-4	27.0 25.0	66.0 65.9	28.2 28.2	19.2 19.2	11.7 11.2							
Σ	52.3 52.0	132.3 131.4	56.4		22.9		29.2					
DC-AV	52.1	131.7	56.4	38.4	22.9							
AC-1	25.3	64.7	28.0	18.6	11.0		14.5					
AC-2	25.3	64.7	28.0	18.6	11.0		14.5					
Σ	50.6	129.4	56.0	37.2	22.0		29.0					
S. P.	-9	+180	→		→							
AC-N	.05	.05	→		→							
	49.5	49.2	→		→							

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Native Minerals Line 3 W½ Field date 7-28 Data page_____ Comp. date 7-29-69. Comp by J.P.M.

(A) Send	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3	3-4
(B) Receive	1-2W	→	2-3W	→	→	3-4W	→	→	→	4-5W	→	→
(C) ~~n separation~~ RNG	1000	300	1000	300	100	1000	300	100	100	300	100	100
(D) I	2000	2000	1400	2000	2000	1400	1400	2000	2000	1400	1400	2000
(E) Vdc (avg)	1001	243	1140	294.5	115.4	1060	257	115.75	55.5	407	157.1	93.2
(F) DCcal	1.027											
(G) Kn x 10^{-3}	.3	1.2	.3	1.2	3	.3	1.2	3	6	1.2	3	6
(H) ρdc=ExFxGx10^3/D	150	150	251	181	178	233	226	178	171	357	345	286
(I) Vac Σ	1000	240	1136	294	117.1	1067	259	120.7	58.1	394	155.3	92.9
(J) AC noise x 2	—	—	—	—	—	—	—	—	—	—	—	—
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—	—	—	—	—	—	—	—	—	—	—	—
(L) AC-DC cal.	.994	.994	.994	.994	.974	.994	.994	.974	.974	.994	.979	.974
(M) ρdc/ρac=ExL/K	.995	1.007	.998	.995	.970	.988	.986	.940	.932	1.026	.976	.978
(N) PFE=(M-1)(10^2)	-.5	.7	-.2	-.5	-3.0	-1.2	-1.4	-6.0	-6.8	2.6	-2.4	-2.2
(O) MCF=(M-1)(10^5)/H	-3	+5	-1	-3	-17	-5	-6	-33	-40	7	-7	-8

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	1-2	2-3	3-4	4-5		CAL.					
(B) Receive	4-5W	5-6W	→	→	→		2-3					
(C) ~~n separation~~ RNG	30	100	100	30	30		30					
(D) I	2000	1400	1400	2000	2000		300					
(E) Vdc (avg)	52.1	131.7	56.4	38.4	22.9		29.2					
(F) DCcal	1.027						1.027					
(G) Kn x 10^{-3}	10.5	3	6	10.5	16.8							
(H) ρdc=ExFxGx10^3/D	281	289	248	207	197							
(I) Vac Σ	50.6	129.4	56.0	37.2	22.0		29.0					
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.994	.974	.974	.994	.994		.994					
(M) ρdc/ρac =ExL/K	1.023	.990	.983	1.026	1.094							
(N) PFE=(M-1)(10^2)	2.3	-1.0	-1.7	2.6	4.0							
(O) MCF=(M-1)(10^5)/H	8	-3	-7	13	20							

CREW EXPENSE STATEMENT
STATISTICAL REPORT

PROJECT: Native Minerals
CLIENT: Lansing
AREA:

MONTH: July 64
TYPE WORK: IP

DATE	CREW	HOURS MAN	HOURS CREW	VEHICLES	MILES	EXPENSES MOTEL	MEALS	OTHER	PHONE	REMARKS
Mon. 27	JPM JB DH RP	6 5 5 6	field	6	70					~~250.00~~ fee. N.C. Break Down day.
Tues. 28	JPM RP JB	8½ 6½ 6½	field	6	70					(250.00) charge 200
Wed. 29	JB JPM	½ 8	drafting & Comp.							100.00
Thurs. 30	JPM JH CP	16½ 18 man	"	"						100.00
Fri.										
Sat.										
Sun.										

Reproductions 10 copies report + maps $15.00

Rec'd - 500.00 on acct.

20.00 14.00

400

HEINRICHS GEOEXPLORATION COMPANY, P. O. BOX 5671, TUCSON, ARIZONA

PROJECT: Native Minerals

CLIENT: Lansing

AREA:

CREW EXPENSE STATEMENT

STATISTICAL REPORT

MONTH: July 1964

TYPE WORK: IP

DATE	CREW	HOURS MAN	HOURS CREW	VEHICLES	MILES	EXPENSES MOTEL	MEALS	OTHER	PHONE	REMARKS
Mon.										
Tues.										
Wed.										
Thurs. 23	RP FH	5 5		3	80					Laying out line (100) chge 200
Fri. 24	DH JB RP JPM	8½ 8½ 8½ 9	Field	3 6	70 70					(250.00) " 200
Sat. 25	JPM JB RP	8 7½ 6½	Field	3	75					(250.00) " 200
Sun.										
				40.00	29.50					

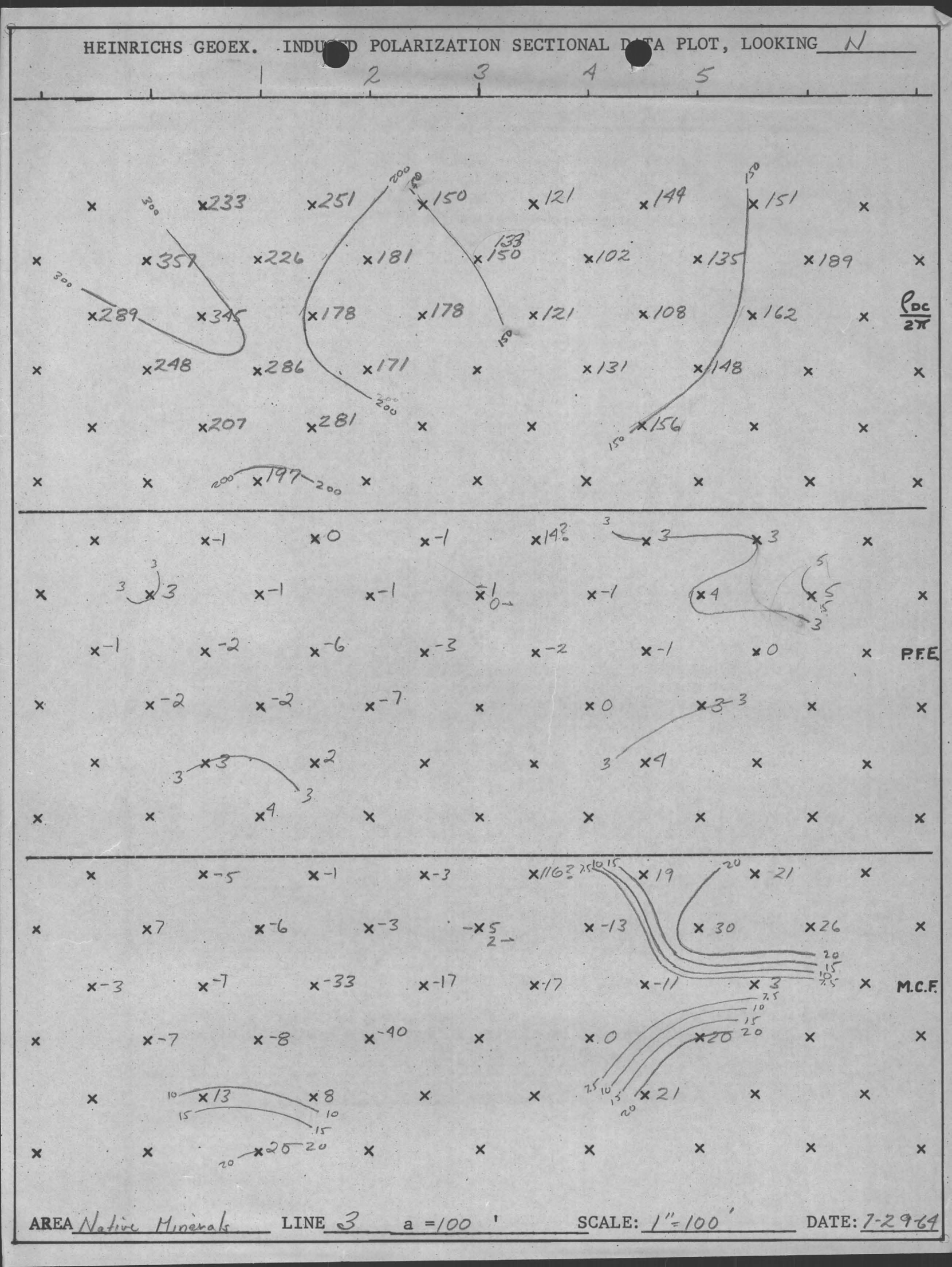
HEINRICHS GEOEXPLORATION COMPANY, P. O. BOX 5671, TUCSON, ARIZONA

60.00 43.50

1000.00
600.00
43.50
15.00
1118.50

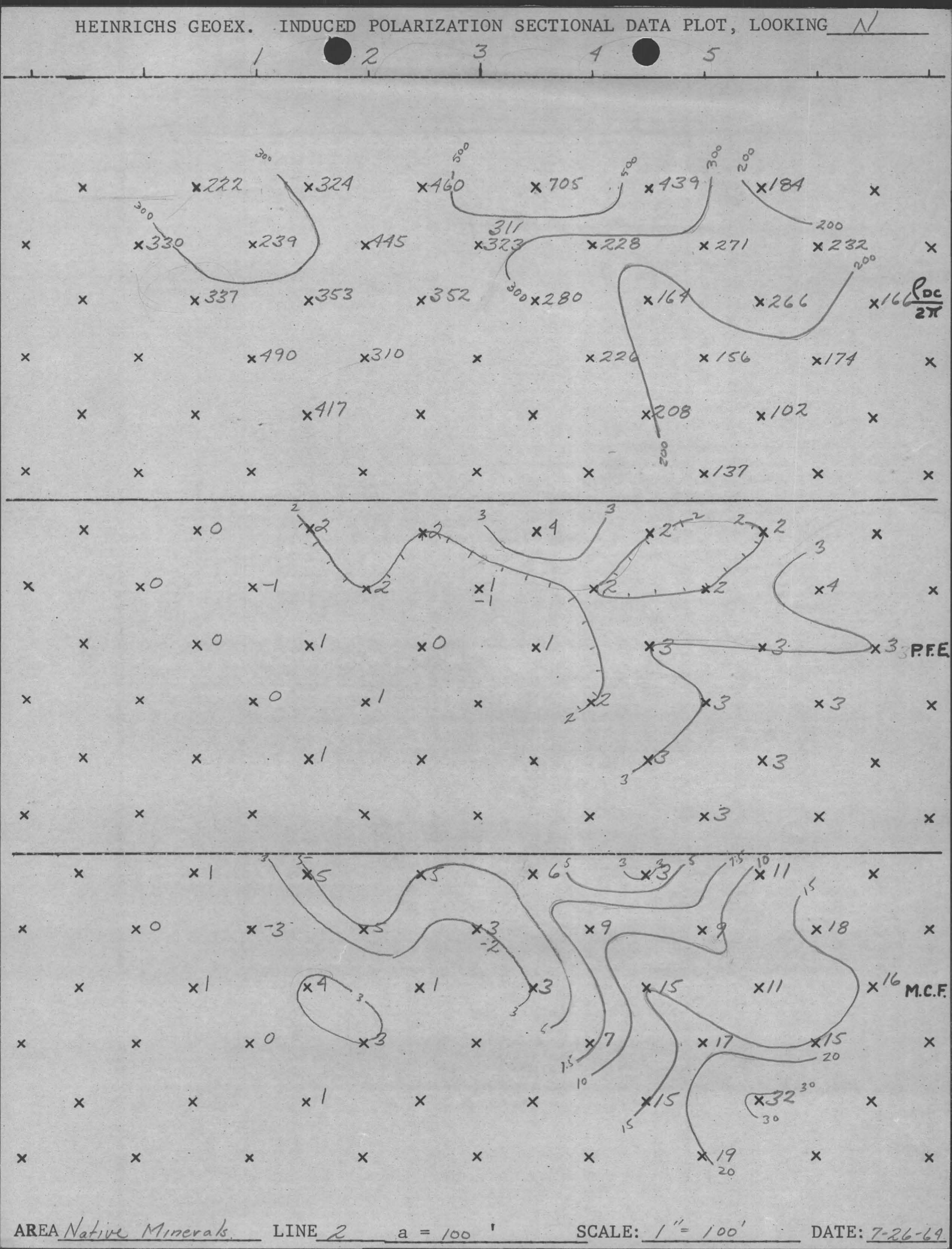
600.00

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N



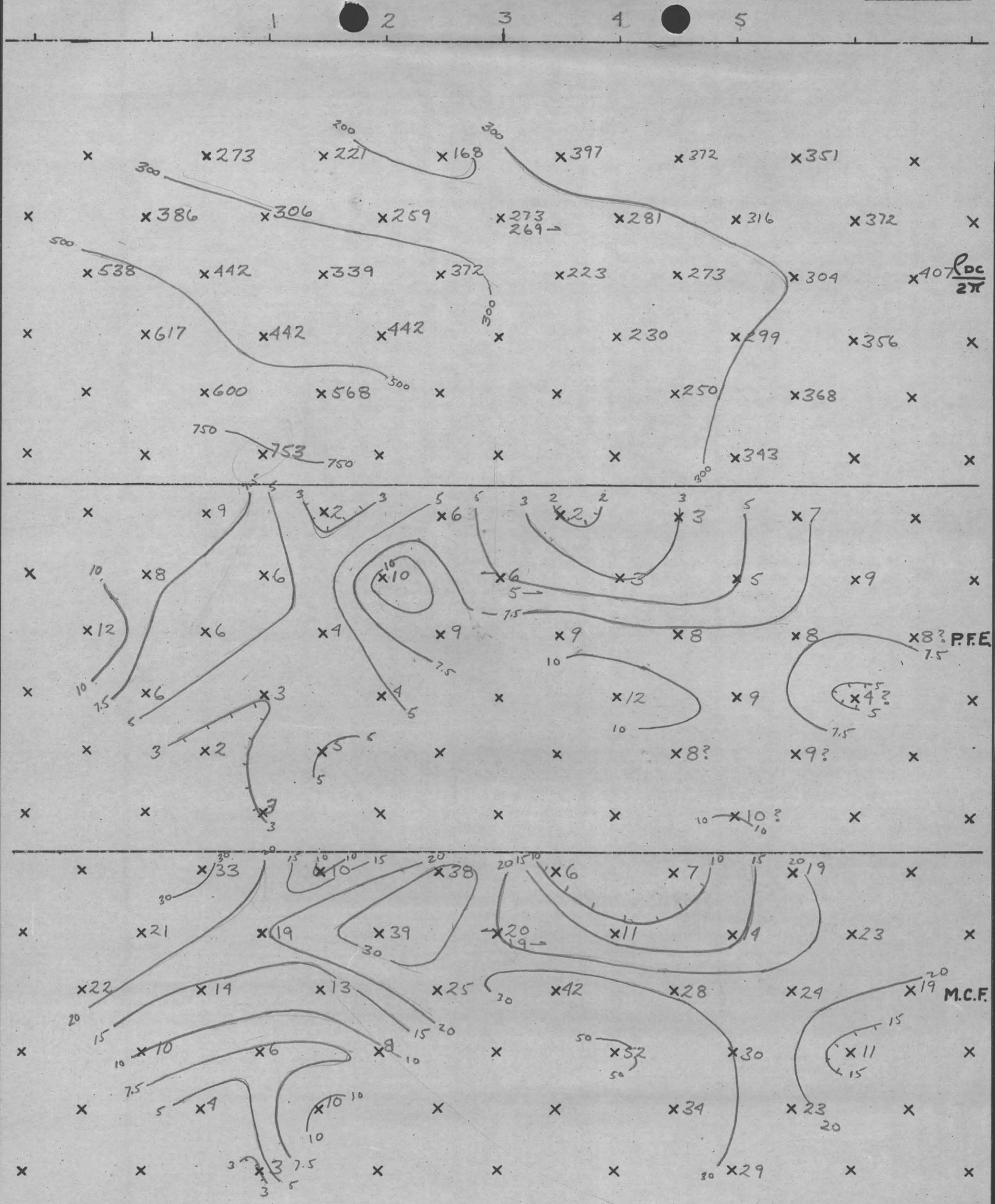
AREA Native Minerals LINE 3 a = 100 ' SCALE: 1" = 100' DATE: 7-29-64

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N



AREA Native Minerals LINE 2 a = 100' SCALE: 1" = 100' DATE: 7-26-69

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NW



AREA Native Minerals LINE 1 a = 500' SCALE: 1" = 500' DATE: 7-25-64

5.00 2 veh, Thur
20.00 2 " Fri.
10.00 1 " Sat.
35.00

280 mi

2 men 4½ = 9
1 men 8½ = 34 hrs.
1 man 6½ = 13
5 = 52 hrs

20 veh 70 ea 140
1 veh 70 70

43

7/25/64

35.00 Veh.
28.00 Milage.
$63.00

Thur = 100.00
Fri = 300.00
Sat = 200.00

Tur - 200.00
= Fri = 200.00
Sat = 200.00

$600.00
250
8.00

Jack McCall -

Jim McCannall

Jim O'Connor.

Draper Dobe.

Geisler

Chas H. McCulloch.

21	22
28	27

T17S
R16E

Jerry Bell
andrada Ls.

7/23/64

7-23-64

Recd from
Bob Lansing for

Native Minerals - $500.00 on acct.

for:
1 - 500' dipole I.P. Setup
2 - 100' " " "

as discussed c̄ Lansing
Grover, Walt, Chris.
estimated job cost - $750 - $1000 -

~~$~~ 10 copies of report.

N.