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a=1000'

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 1

Project Lynch-Redbird Hills Line 1 sp1 w/2 Field date 8-16-66 Data page 1 Comp. date 8-16-66. Comp by Cooley

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10 →	20	20 →		30	30 →			40		
(C) n separation		1	2	1	2	3	1	2	3	4		
(D) I		2	2	2	2	2	2	2	2	2		
(E) Vdc (avg)		115.64	39.96	454.3	64.03	28.2	472.67	178.5	37.83	17.66		
(F) DCcal		0.5815										
(G) Kn x 10^{-3}		.3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D		83.4	139.5	396.5	224	246	413	623.5	228	308		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) =$\sqrt{I^2 - J^2}$		114.0	39.1	441	63.4	27.4	463	173	36.95	16.8		
(L) AC-DC cal.		1.00										
(M) ρ dc/ρ ac=ExL/K		1.013	1.021	1.029	1.012	1.028	1.022	1.25	1.028	1.044		
(N) PFE=(M-1)(10^2)		1.3	2.1	2.9	1.2	2.8	2.2	2.5	2.8	4.4		
(O) MCF=(M-1)(10^5)/H												

Project ______ Line ______ Field date ______ Data page 2 Comp. date ______ Comp by ______

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal	Cal	
(B) Receive	40 →			50	50 →			60		2-3	1-2	
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	2	2	2	2	2	2	2	2		1	1	
(E) Vdc (avg)	156.67	68.6	16.82	8.76						172.18	172	
(F) DCcal	0.5815											
(G) Kn x 10^{-3}	12	30	60	105								
(H) ρ dc=ExFxGx10^3/D	546	598	294	267								
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) =$\sqrt{I^2 - J^2}$	154	66.8	16.4	8.53						172.5	171.5	
(L) AC-DC cal.	1.00											
(M) ρ dc/ρ ac =ExL/K	1.016	1.028	1.024	1.027								
(N) PFE=(M-1)(10^2)	1.6	2.8	2.4	2.7								
(O) MCF=(M-1)(10^5)/H												

? ?

0.581 0.582

1.002 0.998

1.000

INDUCED POLARIZATION - RECEIVER NOTES

PAGE 1

Project: Lynch Redbird Hills Line: 1 sp1 W1/2 Int. Cal ______ Date: 8-16-66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Rec.	0-10	10 →	→ 20	20 →	→	→ 30	30	→	→	→ 40		
Time	1	100	30	1000	100	30	1000	300	30	30		
DC-1		58.5 / 57.5	20.8 / 19.5	227 / 230	33.5 / 31.0	15.4 / 12.8	237 / 237	90 / 88.5	18.5 / 19.4	8.2 / 9.8		
DC-2		58.0 / 57.5	20.6 / 19.0	225 / 228	33.5 / 30.8	15.5 / 12.7	237 / 235	90 / 88.5	18.3 / 19.5	8.2 / 9.6		
Σ		57.5 / 58.0	21.7 / 18.6	225 / 228	33.3 / 31.0	15.5 / 12.8	237 / 235	90 / 88.5	18.5 / 19.3	8.4 / 9.0		
DC-3		58.0 / 58.0	20.9 / 19.0							8.5 / 8.9		
Dc-4		57.3 / 57.9	21.3 / 18.4							8.6 / 8.9		
Σ												
DC-AV		115.64	39.96	454.3	64.03	28.2	472.67	178.5	378.3	17.66		
AC-1		57.5	19.6	222	31.9	13.7	233	87	18.5	8.4		
AC-2		56.5	19.5	219	31.5	13.7	230	86	18.45	8.4		
Σ		114.0	39.1	441	63.4	27.4	463	17.3	36.95	16.8		
S. P.		-9.9		+2.2			-7.8					
AC-N		0.20		0.26			0.26					
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES PAGE ______

Project: ______ Line: ______ Int.Cal ______ Date: ______

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal	Cal	
Rec.	40 →			→ 50	50 →			→ 60		2-3	1-2	
Time	300	100	30	10						300	300	
DC-1	78 78	33.8 35.0	7.5 9.3	4.3 4.4						86.5 86.5	86 86	
DC-2	78 79	33.5 35.3	7.1 9.6	4.2 4.5						86 86	86 86	
Σ	78 79	33.3 35.3	6.8 9.7	4.3 4.55						86 86		
DC-3		33.5 35.0	7.0 9.9	4.35 4.5								
Dc-4		33.3 33.0	7.2 10.0	4.3 4.4								
Σ										172.1~~8~~	172	
DC-AV	156.67	68.6	16.82	8.76								
AC-1	77	33.5	8.2	4.28						86.5	86	
AC-2	77	33.3	8.2	4.25						86.0	85.5	
Σ	154	66.8	16.4	8.53						172.5	171.5	
S. P.	-2.1											
AC-N	0.28											
Pot. Res												

Couldn't read it

INDUCED POLARIZATION SENDER NOTES

Project: Wilcox Line: #1 West Date: 8-16-66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-1000	1000 —	2000	2000 —	3000	→	3000 —	4000	→	→		
Time												
Range												
Current	—	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00		
Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL. 1 AMP.	1-2	2-3
Receive	4000 —	5000	→	→	5000 —	6000	→	→				
Time												
Range												
Current	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00				

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 2

Project Lynch-Red Bird Hills Line 1 sp1 E½ Field date 8-17-66 Data page 3 Comp. date 8-17-66 . Comp by Cooley

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-10	10	→ 20	20		→ 30	30			→ 40		
(C) n separation		1	2	1	2	3	1	2	3	4		
(D) I		2	2	2	2	2	2	2	2	2		
(E) Vdc (avg)		169.33	40.3	114.33	69.2	21.47	140.7	62.28	51.57	19.0		
(F) DCcal		0.577										
(G) Kn x 10-3		3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D		146.3	139.8	99.3	240	186	122	216	447	329		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$		167.5	40.0	113.8	68	21.3	139.6	61	50.8	18.7		
(L) AC-DC cal.		1.0065										
(M) ρ dc/ρ ac=ExL/K		1.017	1.012	1.045	1.023	1.017	1.017	1.028	1.023	1.023		
(N) PFE=(M-1)(10^2)		1.7	1.2	~~4.5~~ 1.3	2.3	1.7	1.2	2.8	2.3	2.3		
(O) MCF=(M-1)(10^5)/H												

Project____ Line____ Field date____ Data page 4 Comp. date____ Comp by____

(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal	cal	
(B) Receive	40			→ 50	50			→ 60		3-4	4-5	
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	2	2	2	2	2	2	2	2		1	1	
(E) Vdc (avg)	39.4	26.95	27.1	12.13	41.48	33.6	38.44	18.26		174.0	172.17	
(F) DCcal	0.577	0.577										
(G) Kn x 10^{-3}	12	30	60	105	30	60	105	168.0				
(H) ρ dc=ExFxGx10^3/D	137	234	469	378	351	580	1168	885				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	39.1	26.5	26.4	11.8	40.9	32.4	37.0	17.5		175	174.5	
(L) AC-DC cal.	1.0065	1.0065										
(M) ρ dc/ρ ac =ExL/K	1.013	1.023	1.032	1.035	1.020	1.044	~~0.993~~	1.049				
(N) PFE=(M-1)(10^2)	1.3	2.3	3.2	3.5	2.0	4.4	~~0.7~~ 14.7	4.9				
(O) MCF=(M-1)(10^5)/H												

?

0.573 0.581

0.577

1.005 1.008

1.0065

INDUCED POLARIZATION SENDER NOTES

Project: Lynch Red Bird Hills Line: #1 EAST Date: 8-17-66

Send	—	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	—	1000–	2000	2000–	3000	→	3000–	4000	———	→		
Time												
Range												
Current	—	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00			

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL 1AMP	3-4	4-5
Receive	4000–	5000	———	→	5000–	6000	———	→				
Time												
Range												
Current	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00				

INDUCED POLARIZATION - RECEIVER NOTES PAGE 3

Project: Lynch Red Bird Hills Line: 1 spl. E ½ Int.Cal ______ Date: 8-17-66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Rec.	0→10	10 →	→ 20	20	→	→ 30	30	→	→	→ 40		
Time		300	30	100	100	30	100	100	100	30		
DC-1		85.5 84.0	21.9 18.4	56.2 58.3	33.3 36.0	9.4 12.0	70.5 70.5	31.3 31.0	26.0 25.7	9.4 9.6		
DC-2		85.5 84.0	22.0 18.3	56.0 58.3	33.3 36.0	9.45 12.0	70.3 70.3	31.3 31.0	26.0 25.5	9.4 9.6		
Σ		85.5 83.5	22.1 18.2	56.0 58.2	33.3 35.9	9.4 12.0	70.1 70.3	31.3 30.8	26.0 25.5	9.25 9.7		
DC-3										9.4 9.65		
Dc-4												
Σ												
DC-AV		169.33	40.3	114.33	69.2	21.47	140.7	62.28	51.57	19.0		
AC-1		84	20.0	57.3	34.0	10.65	70.3	30.5	25.5	9.4		
AC-2		83.5	20.0	56.5	34.0	10.65	69.3	30.5	25.3	9.3		
Σ		167.5	40.0	113.8	68.0	21.30	139.6	61.0	50.8	18.7		
S. P.		+4.6		-29.8			+2.9					
AC-N		0.05		0.06			0.08					
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES

PAGE 4

Project: Lynch Red River Hills Line: 1 sp 1 E 1/2 Int.Cal ______ Date: 8-17-66

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal	Cal	
Rec.	40 →			50	50 →			60		3-4	4-5	
Time	30	30	30	10	30	30	30	30		300	300	
DC-1	20.9 18.5	11.5 15.5	16.2 11.0	7.15 5.0	22.0 19.5	19.5 14.6	18.1 20.3	9.4 8.4		87 87	86.5 86.0	
DC-2	21.1 18.2	11.3 15.5	16.2 10.9	7.2 4.85	22.7 18.5	18.5 15.2	18.1 20.3	9.5 8.8		87 87	86 86	
Σ	21.4 18.0	11.3 15.7	16.2 10.8	7.35 4.75	22.5 18.7	18.3 15.4	18.5 19.8	9.3 9.0				
DC-3	21.4 18.1	11.2 15.8	16.3 10.8	7.4 4.8	22.6 19.4	18.0 15.8	19.0 19.6	9.1 9.7				
Dc-4					~~[illegible]~~	17.2 15.5	18.6 19.9	8.5 9.6				
Σ												
DC-AV	39.4	26.95	27.1	12.13	41.48	33.6	38.44	18.26		174	172.17	
AC-1	19.7	13.3	13.2	5.93	20.6	16.3	18.5	8.8		88	87	
AC-2	19.4	13.2	13.2	5.87	20.3	16.1	18.5	8.7		87	86.5	
Σ	39.1	26.5	26.4	11.80	40.9	32.4	37.0	17.5		175	174.5	
S. P.	+4.7				-3.7							
AC-N	0.10				0.26							
Pot. Res												

INDUCED POLARIZATION SENDER NOTES

Project: Lynch (Redbird Line: 2 Spd - E 1/2 Date:

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time												
Range	140v	120v	140v	210v	120v	140v	250v	220v	130v	140v		
Current	1½A	1½A	1½A	1½A	1½A	1½A	1A	1½A	1½A	1½A		

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal 2-3	cal 2-3	
Receive	40-50	→	→	→	50-60	→	→	→				
Time												
Range	250v	220v	130v	140v						50v	60v	
Current	1A	1½A	1½A	1½A						½A	½A	

INDUCED POLARIZATION - RECEIVER NOTES

PAGE ______

Project: LYNCH / REDBIRD Line: 2 Sp 1 E½ Int.Cal ______ Date: 8-22-66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		~~100~~
Time	100	300	100	300	30	10	300	30	10	10		100
DC-1	44.4 44.4	130 129	25.8 26.2 28.8 28.4	83 81	11.3 10.5 13.8 12.6	480 386	216 218	9.2 9.2 10.2 10.5	585 730 705 480	405 190 440 165	415 680	50.0 50.0
DC-2	44.4 44.4	130 129	26.0 26.2 27.8 29.0	83 82	11.4 10.8 13.6 12.9	422 418	216 218	9.6 10.3 10.6 9.5	605 585	540 170 270 315	430 720	50.0 50.0
Σ												
DC-3	44.2 44.4	130 129	26.0 26.2 27.0 29.0	83 82	11.2 10.8 12.6 13.2	370 400	216 218	10.4 10.0 10.1 9.9	615 505	495 090 195 120	460 380	
Dc-4	44.4 44.4		26.0 25.0 28.6 29.8	83 82	11.0 10.5 12.9 13.1	390 392		10.1 8.6 10.6 11.0	662 500	495 390 175 440	490 660	
Σ												
DC-AV	88.8	259	54.4	164.7	24.0	7.92	~~434~~	19.96	12.09	7.48		
AC-1	44.2	126	26.5	81.0	12.2	4.40	214	10.1	5.25	2.68		50
AC-2	44.2	126	26.5	81	12.2	4.40	214	10.1	5.25	2.68		50
Σ	88.4	252	53.0	162	24.4	8.80	428	20.2	10.50	5.36		
S. P.	-9.8	-6.7		-2.7			-3.6					
AC-N	±.05	.06		.14			.12					
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES

PAGE ______

Project: LYNCH (REDBIRD) Line: 2 Sp 1 E½ Int.Cal ______ Date: 8-22-66

cal	Send	4-5	3-4	2-3	1-2	4-5	3-4
	Rec.	30-40	———	———	———>	40-50	———
400	Time	300	30	30	10	300	30
49.6 49.6	DC-1	224 208 214 229	9.6 9.1 10.4 9.9	5.78 545 4.78 290	346 314 342 186	81 82 84 84	12.0 15.6 10.5 11.0
49.6 49.6	DC-2	209 210 229 214	10.4 9.9 10.9 10.9	5.82 625 5.12 546	295 280 286 245	81 79 85 86	12.5 11.9 8.8 6.7
	Σ						
	DC-3	211 225 227 229	10.4 9.8 10.1 11.1	3.65 493 6.90 668	400 320 298 328	81 80 86 85	11.9 11.8 10.9 7.5
	Dc-4	224 224 214 214	8.9 10.1 11.5 9.0	578 442 418 482	320 208 258 328	81 80 86 85	12.9 13.4 ~~11.6~~ 12.9
	Σ						21.88
	DC-AV	438	20.36	10.64	5.89	165.7	~~22.59~~
50.1	AC-1	217	10.1	5.26	2.68	82	10.6
50.1	AC-2	217	10.1	5.26	2.68	82	10.6
	Σ	434	20.2	10.52	5.36	164	21.2
	S. P.	-4.1				-10A	———
	AC-N	.05					
	Pot. Res						

cal	Send	2-3	1-2	4-5	3-4	2-3	1-2
	Rec.	———	———>	50-60	———	———	———>
400	Time	30	10				
49.6 49.6	DC-1	10.4 9.1 89 8.8	4.18 8.58 4.40 10.95				
49.6 49.6	DC-2	96 8.7 93 8.6	6.55 10.80 4.25 13.25				
	Σ						
	DC-3	10.8 9.2 8.0 8.3	9.00 14.60 5.60 13.54				
	Dc-4	9.2 8.7 8.5 8.1	7.90 14.30 6.40				
	Σ						
	DC-AV	17.99	12.29				
50.1	AC-1	8.9	5.06				
50.1	AC-2	8.9	5.06				
	Σ	17.80	10.12				
	S. P.	———>					
	AC-N						
	Pot. Res						

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

Project Lynch (Red Bird) Line 2 Sp 1 F½ Field date________ Data page________ Comp. date_______. Comp by_______

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4
(B) Receive	0-1	1-2	→	2-3		→	3-4	→		→	4-5	→
(C) n separation												
(D) I	1.5	→				→	1	1.5	1.5	1.5	1	1.5
(E) Vdc (avg)	88.8	259	54.4	164.7	24.0?	8.80 (crossed out: 7.92?)	438	20.36	10.64	5.89	165.7	21.8
(F) DCcal	.504	→										
(G) Kn x 10-3	3	3	12	3	12	30	3	12	30	60	12	30
(H) ρ dc=ExFxGx10^3/D	90	261	219	166	97	89	662	82	107	119	1002	219
(I) Vac Σ	88.4	252	53.0	162	24.4	8.80	434	20.2	10.52	5.76	164	21.2
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.010	→										
(M) ρ dc/ρ ac=ExL/K												
(N) PFE=(M-1)(10^2)	1.5	3.8	3.7	2.7	-0.7?	—	1.9	1.8	2.0	11.0?	2.0	3.9
(O) MCF=(M-1)(10^5)/H	17	15	17	16	-7	—	3	22	19	.92?	2	18

Project______________ Line__________ Field date________ Data page________ Comp. date_______ Comp by_______

(A) Send	2-3	1-2				<A1						
(B) Receive	→											
(C) n separation												
(D) I	1.5	1.5				500						
(E) Vdc (avg)	17.99	12.29				99.2						
(F) DCcal	→					.504						
(G) Kn x 10^{-3}	60	105										
(H) ρ dc=ExFxGx10^3/D	363	434										
(I) Vac Σ	17.8	10.12				100.2						
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	→					1.010						
(M) ρdc/ρac =ExL/K	2.1	22.7?										
(N) PFE=(M-1)(10^2)	2.1	22.7?										
(O) MCF=(M-1)(10^5)/H	6	52?										

INDUCED POLARIZATION SENDER NOTES

Project: Red Bird Line: #2 West Date: 8

Send	—	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	—	1000 —	2000	2000 —	3000 —	→	3000 —	4000 —		→		
Time												
Range												
Current	—	2.00	1.4	2.00	2.00	1.4	2.00	2.00	2.00	1.4		

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAC LAMP	2-3	1-2
Receive	4000 —	5000		→	5000 —	6000		→				
Time												
Range												
Current	2.00	2.00	2.00	1.4	2.00	2.00	2.00	1.4				

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: Lynch Red Bird Hills Line: 2 sp1 W½ Int.Cal ________ Date: 8-19-66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Rec.	0-10	10 →	20	20 →		30	30 →			40		
Time		100	100	300	100	30	1000	300	30	30		
DC-1		51.8 52.0	37.9 33.0	246 245	26.3 29.7	15.4 17.3	287 287	85 85	12.6 13.4	8.2 8.5		
DC-2		50.8 52.3	38.3 32.8	248 246	26.0 29.5	15.5 17.2	287 285	84 85	12.5 13.3	8.0 8.8		
Σ		50.1 52.5	38.1 33.0	247 246	26.0 29.3	16.0 17.0	285 285	84 85	12.7 12.7	7.9 9.1		
DC-3		49.8 53.5	38.0 32.5		26.0 29.5	16.2 17.0			13.3 12.7			
Dc-4		49.2 53.0	38.0 32.8			16.0 17.1						
Σ												
DC-AV		103	70.88	492.67	55.58	32.94	573	169.3	25.8	16.83		
AC-1		50.8	34.8	242	27.3	16.1	282	83	12.8	8.0		
AC-2		50.3	35.0	240	27.0	16.1	279	83	12.7	8.0		
Σ		101.1	69.8	487	54.3	32.2	561	166	25.5	16.0		
S. P.		+24.7		-10.4			+21.4					
AC-N		0.11		0.16			0.15					
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES

PAGE ______

Project: ______ Line: ______ Int.Cal ______ Date: ______

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal	Cal	
Rec.	40 →			→ 50	50 →			→ 60		2-3	1-2	
Time	100	100	10	10	30	30	3					
DC-1	62.0 65.2	24.2 21.3	4.5 4.1	3.3 6.3 5.7 3.0 5.3	23.0 23.5	10.2 9.3				88 89	88 88	
DC-2	62.2 65.0	24.0 21.0	4.35 4.19	2.7 5.3 5.9 2.6 6.7	22.5 23.1	9.8 8.8				88 89	87 86	
Σ	61.8 65.0	24.0 21.0	4.4 3.9	2.7 7.3 3.2 7.4	22.4 23.4	10.4 8.7					88 88	
DC-3	61.5 65.3		4.45 4.1	3.5 6.6 3.8 5.5	22.6 23.2	9.5 9.5					88 88	
Dc-4	61.3 65.0		4.5 4.0	3.6 3.0	22.6 22.8	10.4 9.6					88 88	
Σ												
DC-AV	126.86	45.17	8.5	6.28	45.82	19.24				177	176	
AC-1	62.8	22.5	4.13	2.95	22.2	9.4	2.05?			88	88	
AC-2	62.0	22.2	4.12	2.95	22.2	9.4				88	88	
Σ	124.8	44.7	8.25	5.90	44.4	18.8				176	176	
S. P.	-16.1				-14.7							
AC-N	0.14				0.16							
Pot. Res				?								

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 1

Project Lynch Red Bird Hills Line 2 spl W½ Field date 8-19-66 Data page 1 Comp. date 8-20-66. Comp by cooley

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10 →	20	20 →		30	30 →			40		
(C) n separation		1	2	1	2	3	1	2	3	4		
(D) I		2	1.4	2	2	1.4	2	2	2	1.4		
(E) Vdc (avg)		103	70.88	492.67	55.58	32.94	573	169.3	~~25.8~~ 25.9	16.67		
(F) DCcal		0.5665										
(G) Kn x 10^{-3}		3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D		87.5	344.2	418.6	188.9	399.6	486.9	575.5	219.7	408.6		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$		101.1	69.8	482	54.3	32.2	561	16.6	25.5	16.0		
(L) AC-DC cal.		0.9974										
(M) ρ dc/ρac=ExL/K		1.016	1.013	1.019	1.021	1.020	1.019	1.017	1.009	1.049		
(N) PFE=(M-1)(10^2)		1.6	1.3	1.9	2.1	2.0	1.9	1.7	~~0.9~~ 1.2	~~4.9~~ 3.8		
(O) MCF=(M-1)(10^5)/H												

Project ______ Line ______ Field date ______ Data page 2 Comp. date ______ Comp by ______

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal	Cal	
(B) Receive	40 →			50	50 →			60		2-3	1-2	
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	2	2	2	1.4	2	2	2	1.4		1	1	
(E) Vdc (avg)	126.86	45.17	8.5	6.28	45.82	19.24				177	176	
(F) DCcal	0.5665											
(G) Kn x 10^{-3}	12	30	60	105	30	60						
(H) ρ dc=ExFxGx10^3/D	431.2	383.8	144.5	266.8	389.4	327						
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	124.8	44.7	8.25	5.90	44.4	18.8				176	176	
(L) AC-DC cal.	0.9974											
(M) ρdc/ρac =ExL/K	1.014	1.0079	1.028	1.060	1.029	1.021						
(N) PFE=(M-1)(10^2)	1.4	0.8	2.8	6.0 ?	2.9	2.1						
(O) MCF=(M-1)(10^5)/H												

?

0.5649 0.5682

0.5665

0.9944 1.000

0.9974

INDUCED POLARIZATION SENDER NOTES

Project: Red Bird Line: #1 Spread 2 WEST Date: 8/18/66

Send	—	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	—	1000-	2000	2000-	3000	→	3000-	4000	→	→		
Time												
Range												
Current	—	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4		

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL LAMP.	2-3	1-2
Receive	4000-	5000	→	→	5000-	6000						
Time												
Range												
Current	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4				

INDUCED POLARIZATION - RECEIVER NOTES PAGE 3

Project: Lynch Red Bird Hills Line: 1 sp 2 W 1/2 Int.Cal ______ Date: 8-18-66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Rec.	0-10	10 →	20	20 →		30	30 →			40		
Time		300	700	1000	100	10	1000	100	30	3		
DC-1		228 225	20.0 28.5	372 372	38 38	6.5 7.0	412 412	81.8 81.8	11.0 9.5	1.95 2.25		
DC-2		226 221	21.3 29.5	372 368	37.2 38	7.0 6.6	412 412	81.5 82.0	10.8 9.2	1.9 2.8		
Σ		230 222	24.0 30.5	368 368	37.2 37.9	6.9 6.6	410 412	80.0 82	10.7 9.5			
DC-3		227 219	22.0 30.0		37.7 37.0	6.7 6.8		80 82	10.6 9.4	1.9 2.45		
Dc-4									11.4 8.9	1.95 2.4		
Σ												
DC-AV		449.3	51.45	740	75.25	13.53	823.8	162.8	20.2	4.40		
AC-1		218	24.8	360	36.3	6.5	400	78.3	9.8	2.12		
AC-2		217	24.7	357	36.3	6.5	398	78.1	9.7	2.10		
Σ		435	49.5	717	72.6	13.0	798	156.4	19.5	4.22		
S. P.		-8.0		-13.9			-5.3					
AC-N		0.24		0.30			0.18					
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES PAGE 4

Project: Lynch Red Bird Hills Line: 1 sp2 w/2 Int.Cal ______ Date: 8-18-66

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal	Cal	
Rec.	40 →			→ 50	50 →			→ 60		2-3	1-2	
Time	100	30	10	1	30	30	3			300	300	
DC-1	49.8 49.8	17.2 16.1	1.65 3.20		14.5 13.6	6.5 6.5	1.45			87.5 87.5	87 87	
DC-2	49.8 50.0	17.6 16.3	1.75 3.1	[illegible]	14.3 14.6	6.4 6.2				87 87	87 87	
Σ	50.0 50.0	17.5 16.2	1.9 3.3		14.5 14.7	6.5 6.5						
DC-3	49.8 49.8	17.4 16.2	1.9 3.5		14.2 14.6	6.7 6.8						
Dc-4	49.8 50.0	17.4 16.2	1.95 3.35			[illegible]						
Σ			5,008									
DC-AV	99.96	33.62	~~5.12~~		28.75	13.02				174.25	174	
AC-1	48.3	16.3	2.4	0.61	14.2	6.6	1.12			88	88	
AC-2	48.3	16.3	2.37		14.1	6.5	1.10			88	88	
Σ	96.6	32.6	4.77		28.3	13.1	2.22			176	176	
S. P.	+29.6				-20.1							
AC-N	0.18				0.16							
Pot. Res												

to much lightning

?

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 7

Project Lynch Red Bird Hills Line 1 spz W½ Field date 8-18-66 Data page 3 Comp. date ______ . Comp by ______

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10 →	20	20 →		30	30 →			40		
(C) n separation		1	2	1	2	3	1	2	3	4		
(D) I		1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4		
(E) Vdc (avg)		449.3	51.45	740	75.25	13.53	823.8	162.8	20.2	4.4		
(F) DCcal.		0.5745										
(G) Kn x 10-3		3	12	3	12	30	3	12	30	60 ✓		
(H) ρ dc=ExFxGx10³/D		552	253	910	370	167	1013	803	246	108		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$		435	49.5	717	72.6	13	798	156.4	19.5	4.22		
(L) AC-DC cal.		1.0115										
(M) ρ dc/ρ ac=ExL/K		1.031	1.051	1.043	1.048	1.052	1.042	1.051	1.048	1.054		
(N) PFE=(M-1)(10²)		3.1	5.1	4.3	4.8	5.2	4.2	5.1	4.8	5.4		
(O) MCF=(M-1)(10⁵)/H												

Project ______ Line ______ Field date ______ Data page 4 Comp. date ______ Comp by ______

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal	Cal	
(B) Receive	40 →			50	50 →			60		2-3	1-2	
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4		1	1	
(E) Vdc (avg)	99.96	33.62	5.12		28.75	13.02				174.25	174	
(F) DCcal	0.5745											
(G) Kn x 10^{-3}	12	30	60	105	30	60	105	168				
(H) ρ dc=ExFxGx10³/D	490	414	125		353	320						
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	96.6	32.6	4.77		28.3	13.1	2.22			176	176	
(L) AC-DC cal.	1.0115											
(M) ρ dc/ρ ac =ExL/K	1.042	1.042	1.085		0.987	1.008						
(N) PFE=(M-1)(10²)	4.2	4.2	8.5		-.13 (2.3)	0.8						
(O) MCF=(M-1)(10⁵)/H												

?

0.574 0.575

1.011 1.012

INDUCED POLARIZATION SENDER NOTES

Project: Red Bird Line: #1 SPREAD 2 EAST Date: 8/18/66

Send	–	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	–	1000 –	2000	2000 –	3000	→	3000 –	4000	→	→		
Time												
Range												
Current	–	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4		
Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL. LAMP		
Receive	4000 –	5000	→	→	5000 –	6000	→	→			3-4	4-5
Time												
Range												
Current	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4				

INDUCED POLARIZATION - RECEIVER NOTES

PAGE 1

Project: Lynch Red Bird Hills Line: 1 sp 2 E 1/2 Int.Cal ______ Date: 8-18-66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Rec.	0-10	10 →	20	20 →		30	30 →			40		
Time		100	100	30	30	10	30	10	10	3		
DC-1		65.0 63.0	24.7 26.0	18.9 15.7	9.0 12.1	7.1 6.08	9.8 10.4	2.4 2.35	2.48 3.45	2.08 2.30		
DC-2		65.0 63.0	25.2 25.8	18.8 15.6	9.0 12.0	7.1 6.02	9.9 10.1	2.45 2.45	2.45 3.45	2.07 2.28		
Σ		65.0 63.0	25.2 25.8	18.8 15.6	9.1 12.0	7.12 6.1	10.2 9.8	2.40 2.50	2.45 3.45	2.08 2.27		
DC-3			25.5 25.5			7.1 6.13	10.4 9.7	2.35 2.45		1.90 2.30		
Dc-4										1.88 2.57		
Σ										(4.31)		
DC-AV		128.3	50.9	34.4	21.1	13.18	20.1	4.81	5.91	4.34		
AC-1		63.3	24.7	16.8	10.25	6.33	9.6	2.33	2.78	2.04		
AC-2		62.8	24.7	16.75	10.25	6.33	9.55	2.30	2.78	2.02		
Σ		126.1	49.4	33.55	20.50	12.66	19.15	4.63	5.56	4.06		
S. P.		-21.4		-1.4			+5.1					
AC-N		0.08		0.11			0.12					
Pot. Res										9.0		

5.93
5.90
5.90
5.90
5.90

INDUCED POLARIZATION - RECEIVER NOTES

PAGE 2

Project: Lynch Red Bird Hills Line: 1 spz E½ Int.Cal ______ Date: 8-18-66

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		Cal	Cal	
Rec.	40 →			50	50 →			60		3-4	4-5	
Time	3	3	3	3						300	300	
DC-1	1.77 2.13	8.8 7.8	1.3 1.32	0.96 1.01	1.97 1.99	1.97	2.62 2.57 2.69	2.62 2.69		88 88	87.5 88.0	
DC-2	1.70 2.20	0.87 0.79	1.25 1.44	0.98 1.07	2.05 1.97	2.05	2.59 2.61 2.63	2.61 2.70		88 88	87.5 88.0	
Σ	1.64 2.27	0.84 0.84	1.15 1.46	0.90 1.10	2.00 1.96	2.00	2.70 2.56	2.68			87.5 88.0	
DC-3	1.56 2.27	0.78 0.85	1.17 1.53	0.86 1.16	2.02 1.93	2.02	2.68					
Dc-4	1.60 2.27	0.76 0.86	1.03 1.65	0.77 1.23	2.00	2.00						
Σ	3.86	1.64	2.63	1.988								
DC-AV	~~3.88~~	1.634	~~2.66~~	2.008						176	175.5	
AC-1	1.85	0.78	1.21	0.92						90.0	89.5	
AC-2	1.82	0.77	1.20	0.92						89.0	89.0	
Σ	3.67	1.55	2.41	1.84						179.0	178.5	
S. P.	+3.2											
AC-N	0.15											
Pot. Res												
	7.0	7.6	11.0	9.9								

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 1

Project Lynch Red Bird Hills Line 1 sp 2 E½ Field date 8-18-66 Data page 1 Comp. date 8-19-66. Comp by Cooley

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-10	10 →	20	20 →		→ 30	30 →			→ 40		
(C) n separation		1	2	1	2	3	1	2	3	4		
(D) I		1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4		
(E) Vdc (avg)		128	50.9	34.4	21.1	13.18	20.1	4.81	5.91	4.34		
(F) DCcal		0.569										
(G) Kn x 10^{-3}		3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D		156	248	41.9	102.9	160.7	24.5	23.5	72	105.8		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$		126.1	49.4	33.55	20.5	12.66	19.15	4.63	5.56	4.06		
(L) AC-DC cal.		1.017										
(M) ρ dc/ρ ac=ExL/K		1.037	1.047	1.043	1.047	1.059	1.067	1.057	1.081	1.087		
(N) PFE=(M-1)(10^2)		3.7	4.7	4.3	4.7	5.9	6.7	5.7	8.1	8.7		
(O) MCF=(M-1)(10^5)/H												

Project ______ Line ______ Field date ______ Data page 2 Comp. date ______ Comp by ______

(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		Cal	Cal	
(B) Receive	40 →			→ 50	50 →			→ 60		3-4	4-5	
(C) n separation	2	3	4	5	3	4	5	6		1	1	
(D) I	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4		1	1	
(E) Vdc (avg)	3.88	1.634	2.66	2.008						176	175.5	
(F) DCcal	0.569											
(G) Kn x 10^{-3}	12	30	60	105	30	60	105	168				
(H) ρ dc=ExFxGx10^3/D	18.9	19.9	64.9	85.7								
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	3.67	1.55	2.41	1.84						179	178.5	
(L) AC-DC cal.	1.017											
(M) ρ dc/ρ ac =ExL/K	1.075	1.077	1.122	1.1098								
(N) PFE=(M-1)(10^2)	7.5	7.7	12.7	10.98								
(O) MCF=(M-1)(10^5)/H												

0.5682 0.5678
0.5690
1.017 1.017

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

Project LYNCH (Redbird) Line 2 Sp2 W½ Field date 8-26-66 Data page________ Comp. date 8-27-66. Comp by R.P.

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10-20	→	20-30		→	30-40			→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1	→								→		
(E) Vdc (avg)	23.06	82.3	16.73	199.1	26.07	7.37	654	36.09	6.99	2.25		
(F) DCcal	.504											
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	35	124	101	301	158	111	989	218	106	68		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	22.8	81.0	16.5	197.0	25.8	7.20	644	36.10	6.96	2.22		
(L) AC-DC cal.	1.004											
(M) ρ dc/ρac=ExL/K	1.015	1.020	1.018	1.015	1.015	1.028	1.020	1.004	1.008	1.018		
(N) PFE=(M-1)(10^2)	1.5	2.0	1.8	1.5	1.5	2.8	2.0	0.4	0.8	1.8		
(O) MCF=(M-1)(10^5)/H	43	16	18	5.0	9.5	25	2.0	1.8	7.5	26		
S.P.	+7.3	-19.4		+0.1			+9.5					

Project____________ Line________ Field date________ Data page________ Comp. date________ Comp by________

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		cal.		
(B) Receive	40-50			→	50-60			→		0-10		
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	1	→						→		.50		
(E) Vdc (avg)	162	12.83	2.82	.942	68.0	6.59	1.77	—		99.2		
(F) DCcal												
(G) Kn x 10^{-3}	12	30	60	105	30	60	105	168				
(H) ρ dc=ExFxGx10^3/D	980	193	85	50	1028	199	94	54				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	160	12.6	2.82	.956	67.6	6.52	1.72	.640		99.6		
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K	1.017	1.022	1.004	.989	1.010	1.015	1.033					
(N) PFE=(M-1)(10^2)	1.7	2.2	0.4	-1.1	1.0	1.5	3.3					
(O) MCF=(M-1)(10^5)/H	1.7	11	4.7	-22	1.0	7.5	35					
S.P.	+4.2				-6.0							

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

Project LYNCH (Redbird) Line 2 SD 2 E½ Field date 8-26-66 Data page________ Comp. date 8-27-66. Comp by R.P.

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	6-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1	→	→	→	→	→	→	→	→	→		
(E) Vdc (avg)	83.33	23.94	16.9	15.75	3.73	5.61	11.12	2.87	1.113	2.45		
(F) DCcal	.510											
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	127	36	103	24	23	86	17	18	17	75		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	81.4	23.3	16.4	15.0	3.61	5.32	10.42	2.76	1.068	2.32		
(L) AC-DC cal.	1.010											
(M) ρ dc/ρac=ExL/K	1.034	1.038	1.041	1.060	1.044	1.065	1.078	1.050	1.053	1.067		
(N) PFE=(M-1)(10^2)	3.4	3.8	4.1	6.0	4.4	6.5	7.8	5.0	5.3	6.7		
(O) MCF=(M-1)(10^5)/H	26	106	40	250	191	76	459	278	312	89		
S.P.	+6.7	+14.7		-3.5		[illegible]	-4.9					

Project____________ Line__________ Field date________ Data page________ Comp. date_______ Comp by_______

(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal		
(B) Receive	40-50	→	→	→	50-60	→	→	→		0-10		
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	1	→	→	→	→	→	→	→		.50		
(E) Vdc (avg)	1.91	.931	—	1.264	.581	—	—	.660		98.0		
(F) DCcal												
(G) Kn x 10^{-3}	12	30	60	105	30	60	105	168				
(H) ρ dc=ExFxGx10^3/D	12	14	—13	68	8.9	—11	—12	57				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	1.85	.930	.432	1.172	.548	.368	.232	.608		99.0		
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K	1.043	1.011		1.089	1.071			1.096				
(N) PFE=(M-1)(10^2)	4.3	1.1		8.9	7.1			9.6				
(O) MCF=(M-1)(10^5)/H	358	79		131	798			168				
S.P.	-21.1				+7.1							

INDUCED POLARIZATION - RECEIVER NOTES

PAGE ______

Project: LYNCH (REDBIRD) Line: 2 SP2 E½ Int.Cal ______ Date: ______

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	100	30	30	30	3	10	10	3	1	3		
DC-1	41.5 41.8	12.9 10.95	8.4 8.5	7.95 7.80	1.76 194 1.96 181	264 260 297 301	5.50 5.72 5.60 5.37	1.39 151 1.49 136	510 412 658 722	1.15 123 1.29 117		
DC-2	41.4 41.8	13.1 10.75	8.4 8.5	7.95 7.80	1.78 192 1.92 183	262 260 299 300	5.58 5.74 5.50 5.36	1.39 154 1.50 129	460 402 630 760	1.21 129 1.22 111		
Σ												
DC-3	41.5 41.9	13.4 10.45	8.4 8.5	7.95 7.80	1.78 190 1.91 182	262 296	5.62 5.78 5.50 5.36	1.34 156 1.52 127	468 376 682 762	131 134 116 108		
Dc-4	41.5 42.0	13.5 10.35	8.4 8.5	7.95 7.80	1.86 193 1.84 181	265 300	5.66 5.80 5.42 5.34	1.41 161 1.43 121	422 320 622 795	132 136 117 106		
Σ												
DC-AV	83.33	23.94	16.9	15.75	3.73	5.61	11.12	2.87	1.113	2.45		
AC-1	40.7	11.65	8.2	7.5	1.80	2.66	5.21	1.38	.534	1.16		
AC-2	40.7	11.65	8.2	7.5	1.81	2.66	5.21	1.38	.534	1.16		
Σ	81.4	23.30	16.4	15.0	3.61	5.32	10.42	2.76	1.068	2.32		
S. P.	+6.7	+14.7	+16.3	-3.5			-4.9					
AC-N	.11	.08		.07			.08					
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES PAGE ______

Project: LYNCH/Redbird/ Line: 2 Sp 2 E½ Int.Cal ______ Date: ______

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		Cal.		
Rec.	40-50			→	50-60			→		0-10		
Time	3	1	1	3	1	1		1		100		
DC-1	1.05 1.17 .84 .66	478 562 356 428	315.	592 363 698 968	320 362 228 235	~~400~~		400 456 228 212		49.0 49.0		
DC-2	1.17 1.31 .71 .158	705 638 232 290		518 588 762 658	336 382 238 192			412 462 262 150		49.0 49.0		
Σ												
DC-3	1.33 .97 .63 .99	425 265 530 690		460 520 780 744	324 434 228 136			440 500 228 168				
Dc-4	1.13 1.06 .82 .91	500 365 444 626		428 468 860 860	364 454 222 124			444 512 196 162				
Σ												
DC-AV	1.91	.931		1.264	.581			.660		98.0		
AC-1	.92	.465	.216	.586	.274	.184	.116	.302		49.5		
AC-2	.93	.465	.216	.586	.274			.306		49.5		
Σ	1.85	.930	.432	1.172	.548			.608		99.0		
S. P.	-21.1				+7.1							
AC-N	.11				.09							
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES

PAGE ______

Project: LYNCH (Redbird) Line: 2 Sp 2 W 1/2 Int.Cal ______ Date: ______

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	30	100	30	300	30	10	1000	30	10	3		
DC-1	11.1 12.0	40.8 41.5	8.4 8.1	98 101	13.3 12.7	355 420 395 350	326 328	18.6 18.5 17.6 17.5	342 262 330 404	118 134 93 102		
DC-2	11.1 12.1	40.8 41.5	8.9 9.1 7.9 7.7	98 101	13.4 12.6	365 398 358 322	326 328	18.6 18.8 17.4 17.6	398 304 338 410	114 131 113 89		
Σ												
DC-3	10.9 12.1	40.8 41.5	8.8 8.0	99 100	13.6 12.5	414 362 300 382	326 328	18.8 17.1	324 264 404 398	120 131 109 110		
Dc-4	10.9 12.1	40.8 41.5	8.4 8.3	99 100	13.6 12.4	372 380 374 318	326 328	18.4 17.7	324 310 408 384	112 114 86 135		
Σ												
DC-AV	23.06	82.3	16.73	199.1	26.07	7.37	654	36.09	6.99	2.25		
AC-1	11.4	40.5	8.3	98.5	12.9	3.60	322	18.05	3.48	1.11		
AC-2	11.4	40.5	8.2	98.5	12.9	3.60	322	18.05	3.48	1.11		
Σ	22.8	81.0	16.5	197.0	25.8	7.20	644	36.10	6.96	2.22		
S. P.	+7.3	-19.4		+0.1			+9.5					
AC-N	.06	.14		.30			.10					
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES PAGE ______

Project: LYNCH (Redbird Line: 2 Spz W½ Int.Cal ______ Date: ______

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		cal.		
Rec.	40-50	→			50-60	→				0-10		
Time	300	30	3	1	100	10	3			100		
DC-1	81 81	6.3 6.6	1.75 129 0.95 153	440 440 402 430	34.4 33.6	302 344 324 324	.79 052 170 120			49.6 49.6		
DC-2	81 F1	6.2 6.6	1.94 139 ,94 132	350 520 700 360	34.4 33.6	356 356 316 302	121 70 042 115			49.6 49.6		
Σ												
DC-3	81 81	6.3 6.5	1.27 152 1.64 130	420 665 540 200	34.4 33.6	338 358 322 288	111 104 074 75					
Dc-4	81 81	6.3 6.5	135 169 147 132	370 580 642 450	34.4 33.6	322 358 318 324	065 102 120 86					
Σ												
DC-AV	162	12.83	2.82	.942	68.0	6.59	1.77			99.2		
AC-1	80	6.3	1.41	.478	33.8	3.26	0.86	.320		49.8		
AC-2	80	6.3	1.41	.478	33.8	3.26	0.86			49.8		
Σ	160	12.6	2.82	.956	67.6	6.52	1.72			99.6		
S. P.	+4.2				-6.0							
AC-N	.07				.09							
Pot. Res												

INDUCED POLARIZATION SENDER NOTES

Project: Lynch (Redbird Line: 2 Spd 2 - W½ Date:

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→
Time										
Range	160v	190v	160v	190v	190v	160v	260v	190v	190v	160v
Current	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A

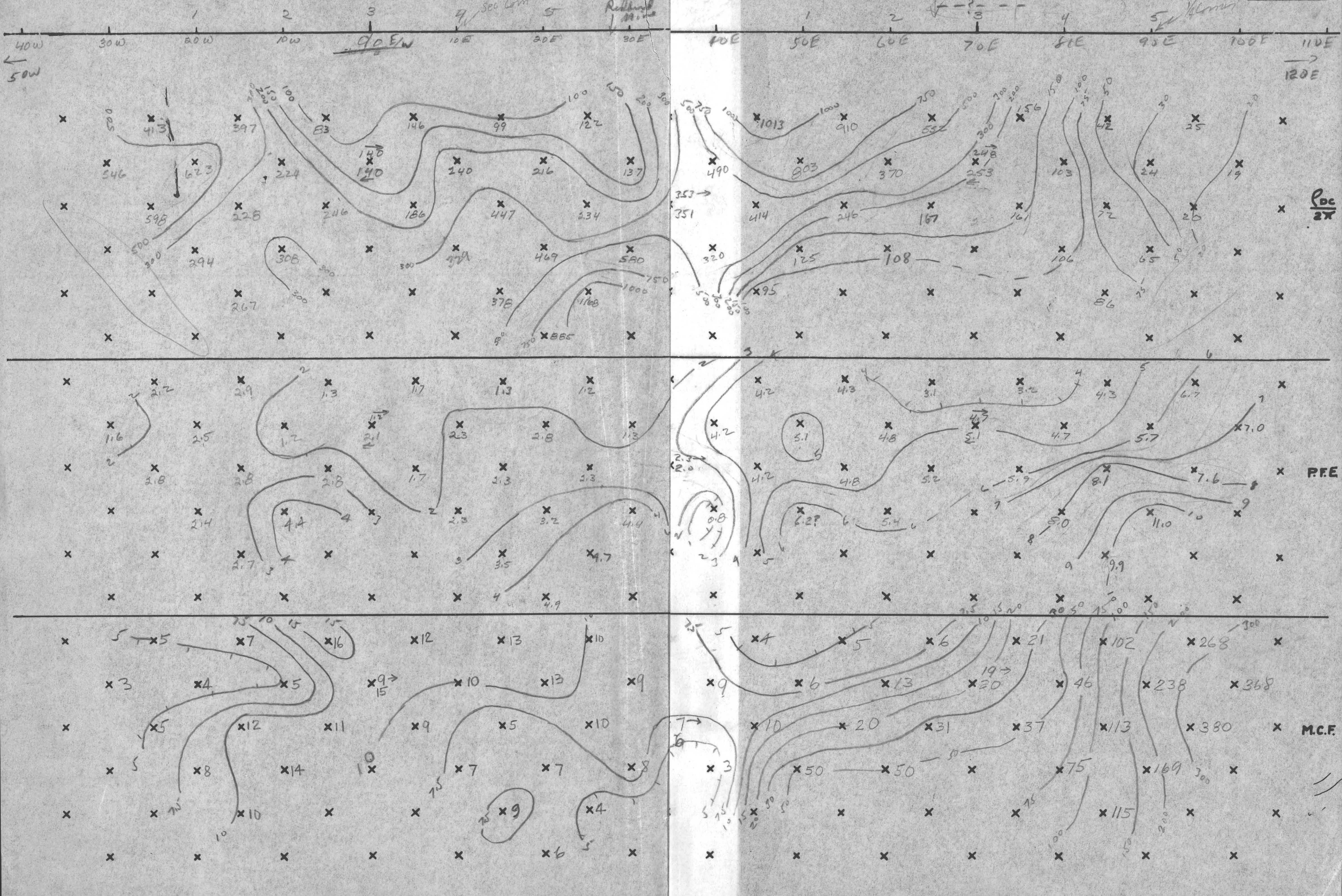
Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		Cal 3-4
Receive	40-50	→	→	→	50-60	→	→	→		
Time										
Range	260v	190v	190v	160v	260v	190v	190v	160v		90v
Current	1A	1A	1A	1A	1A	1A	1A	1A		½A

INDUCED POLARIZATION SENDER NOTES

Project: Lynch/Redbird Line: 2 Spd 2 - E 1/2 Date:

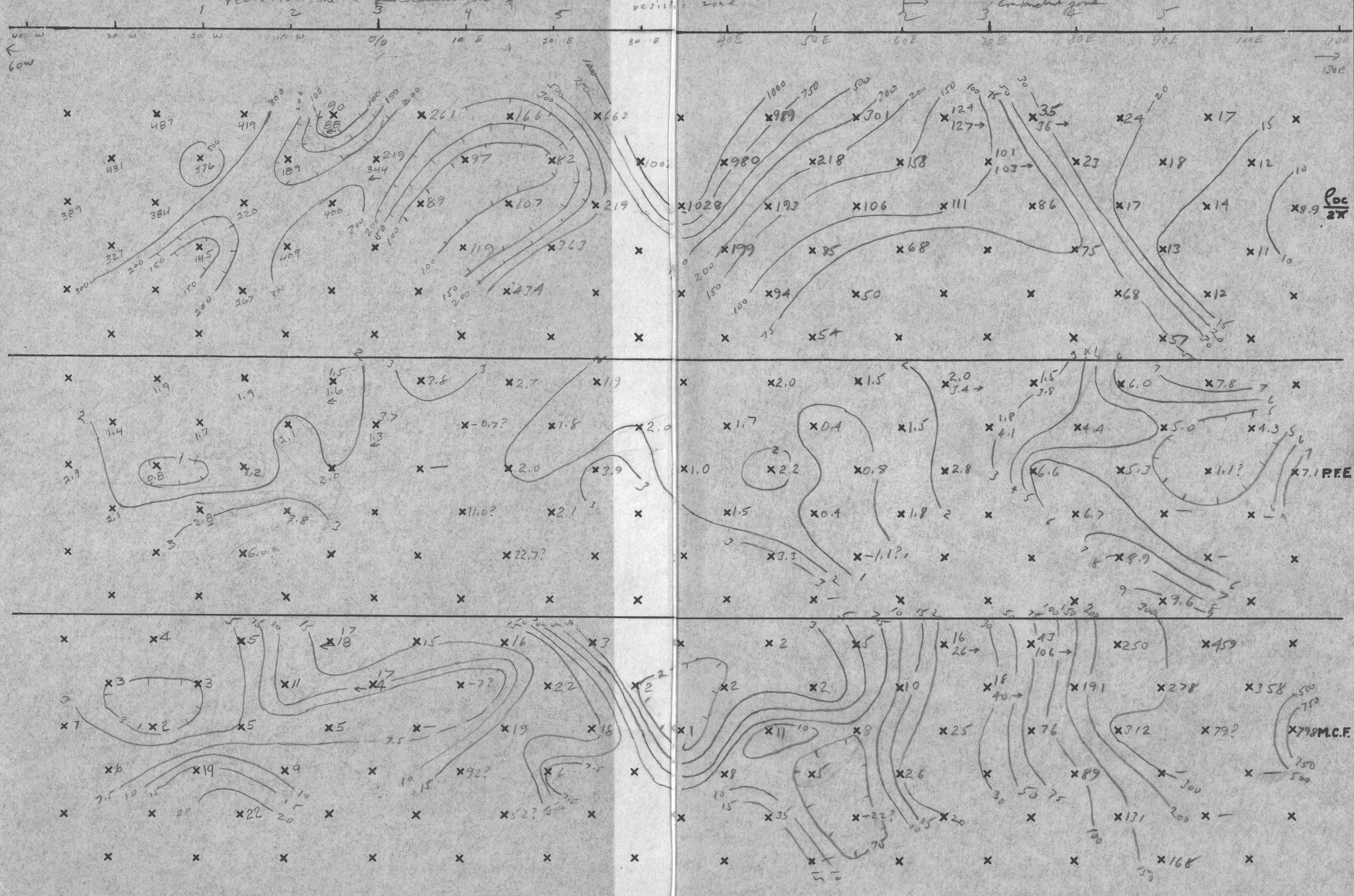
Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time												
Range	260V	190V	260V	190V	190	260V	160V	190V	190V	260V		
Current	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A		
Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		Cal 2-3		
Receive	40-50	→	→	→	50-60	→	→	→				
Time												
Range	160V	190V	190V	260V	160V	190V	190V	190V	260V	100V		
Current	1A	1A	1A	1A	1A	1A	1A	1A	1A	½A		

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING ____ HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N



AREA Lych-Red Bird Hills LINE 1501 a = 1000' SCALE: 1" = 1000 DATE: Lych Red Bird Hills LINE 1502 a = 1000' SCALE: 1" = 1000' DATE: 8-18-66

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING

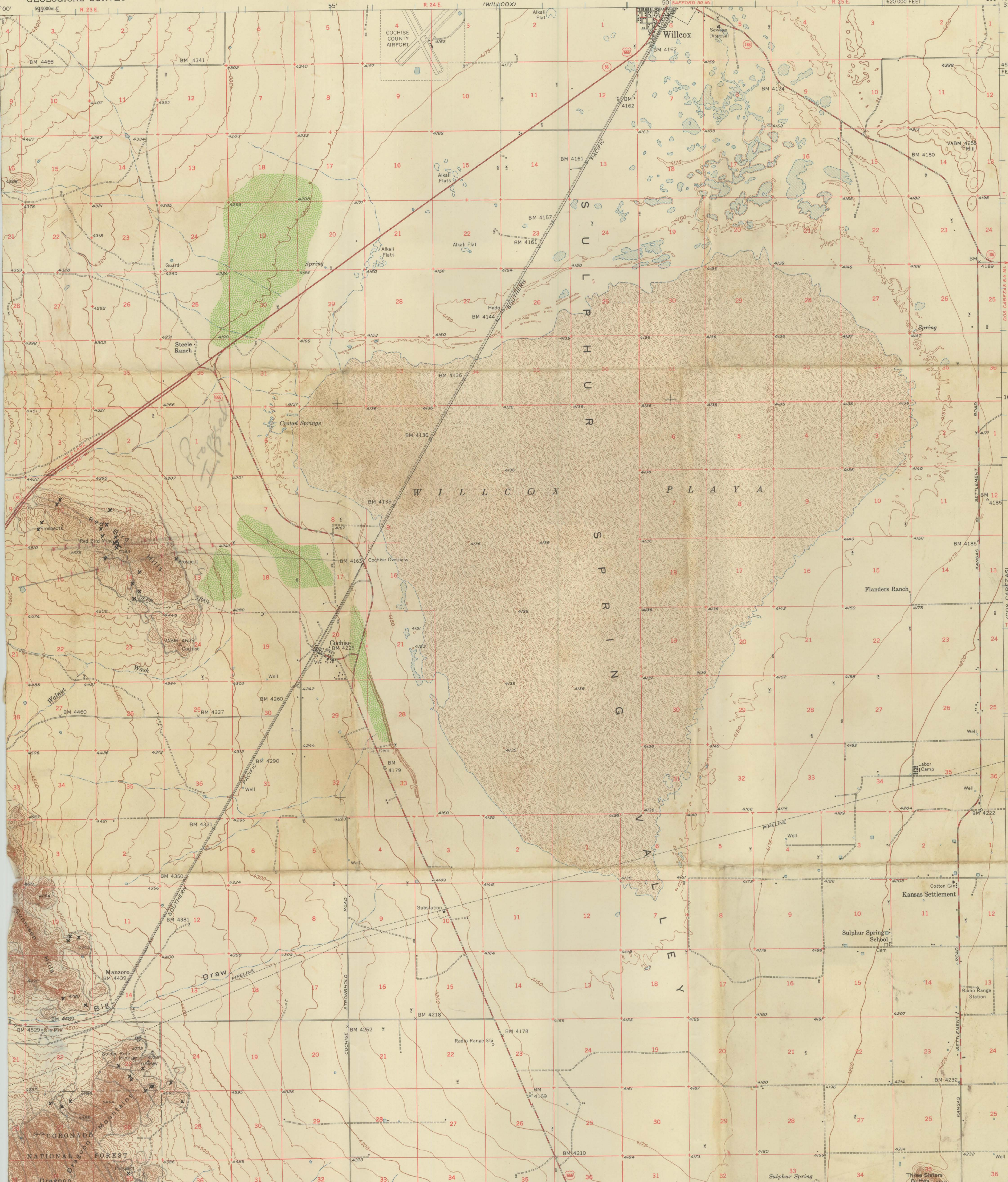


AREA Lynch Red Bud Hills LINE 2 a = 1000' SCALE: 1" = 1000 DATE: LINE a = ' SCALE: DATE:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

COCHISE QUADRANGLE
ARIZONA–COCHISE CO.
15 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by planetable surveys 1940–1941
Culture revised 1958

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, east zone
1000-meter Universal Transverse Mercator grid ticks,
zone 12, shown in blue

SCALE 1:62500

CONTOUR INTERVAL 25 FEET
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1958

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
U. S. Route — State Route

PIMA BLUEPRINT CO.
4655 E. BROADWAY
Phone EA 7-3421
TUCSON, ARIZONA

QUADRANGLE LOCATION

INTERIOR—GEOLOGICAL SURVEY, WASH D C—1959

FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 2, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

COCHISE, ARIZ.
N3200—W10945/15

1958

INDUCED POLARIZATION SURVEY

RED BIRD AREA, COCHISE COUNTY, ARIZONA

For

North American Mines, Inc.

September 1966

By

Heinrichs Geoexploration Company
P. O. Box 5671 Tucson, Arizona
85703

TABLE OF CONTENTS

INTRODUCTION

At the request of Mr. H. G. Lynch acting in behalf of North American Mines, Inc., Heinrichs Geoexploration Company conducted and completed an induced polarization survey over parts of the Red Bird Area, Cochise County, Arizona during the interim August 22 to August 26, 1966.

Two lines were surveyed, each consisting of two spreads, giving a total surface coverage of 36,000 feet of which 27,000 feet is "3n" subsurface plotted data. The lines were oriented approximately E-W and on a 1000 foot dipole spacing.

The data was taken with the dual frequency induced polarization technique on a dipole-dipole electrode configuration. Sending frequencies used were 0.05 and 3.0 cycles per second.

The purpose of the survey was to locate any large sulfide zones in the vicinity of the Red Bird Mine down to about 1200 feet below surface.

Data are presented on sectional data sheets, one for each line with resistivity, percent frequency effect (PFE) and metallic conduction factor (MCF) contoured in section and self potential (SP) in profile form. An induced polarization location and interpretation plan is also included.

Geoex personnel involved in the field work were Don Cooley and Ron Palmer, geophysical crew chiefs; Mike Critchley, Mike Fraker, and Charles Brackney, technical assistants. Report and interpretation by the Tucson Geoex staff under the supervision of Chris S. Ludwig, Senior Geophysicist.

CONCLUSIONS, RECOMMENDATIONS, AND INTERPRETATION

No definite zones of sulfide anomalism were encountered even over the Red Bird workings. The only possible indication of sulfide is a questionable anomaly near 70E, Line 1 and 60E, Line 2 apparently related to an electrical interface perhaps along strike of a prospect (see plan).

The Red Bird Mine is also apparently related to an electrical interface but with no associated polarization. The self potentials show a very minor low near the Red Bird possibly due to minor near surface oxidizing sulfides or perhaps due solely to artificial effects from metal trash near the mine, or topographic effects.

The resistivities show several zones of different electrical conductivity that can be correlated from line to line as shown on the plan. These zones likely correspond to different geologic rock types.

The very low resistivities on the east end of both lines is interpreted as caused by saline water in the alluvium due to proximity of the Willcox Playa. These low resistivities in turn cause an inductive coupling interference which appears as a false high polarization effect making it difficult to isolate any valid effects in this area.

Except for the minor low near the Red Bird, the self potentials show no significant variation other than typical background effects not related to sulfides in quantity.

The questionable anomaly down strike of the prospect is not definite or strong enough to warrant drilling. However, this area should be inspected geologically for any sulfide possibility with depth and if encouraging, further I.P. could be run north and south of the present work, centered along the projected strike if visible.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

APPROVED: E. Grover Heinrichs

E. Grover Heinrichs
Vice President

September 27, 1966
P. O. Box 5671
Tucson, Arizona

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BASIS OF THE INDUCED POLARIZATION METHOD

The induced polarization method is based on the electrical properties exhibited by electronic or metallic conductors imbedded in an ionic or electrolytic conducting matrix. These properties are noticed in that the potential across a block of this dual conduction mode material will increase with time, approaching a constant value, when a constant current is made to flow through the block. This phenomenon occurs because at the boundaries between the two conductor types, electrolytic ions have to give up or take on electrons thereby requiring an additional force (overvoltage) over that which would be needed with only one mode of conduction; showing up as a building of potential across the block with time as more ions are backed up. This potential approaches a constant value when an equilibrium is established between the ions backed up at the boundaries and the flow across the boundaries. Therefore from the preceeding discussion, it is seen that the gross effect is quite similar to the charging of a leaky capacitor and for most applications, it is proper to use this mode as a guide. These capacitive-like properties are normally measured by three different techniques.

In the time domain (pulse) method, a steady direct current is imposed across the block for a few seconds and abruptly terminated so that the capacitive-like decay (discharge) curve can be measured or recorded. Usually, the voltage decay curve is integrated with respect to time to give the area under the decay curve in units of volt-seconds. The more area determined, the more capacitance or polarization the block exhibits.

In the frequency domain method, the percentage difference between the impedance (AC resistance) offered to a lower and a higher frequency is measured. A capacitor offers a lower impedance to a higher frequency than it does to a lower frequency, therefore the percentage difference between the impedances will increase with increased polarization.

A third technique is to measure the phase angle or delay between an introduced current wave-form and the received voltage wave across the block. This phase delay also increases as polarization increases.

Almost all metallic lustered sulfides such as for example; pyrite, chalcopyrite, chalcocite, bornite and molybdenite are electronic conductors and the rocks and ground water, with which they permeate or are permeated, are ionic conductors, therefore if an electric current is made to flow through a sulfide deposit, it will polarize and can be detected by the three methods described above.

This induced polarization property is not entirely unique with sulfides since magnetite, graphite and some clays will exhibit it; however, with sufficient geological and geophysical data, effects due to sulfides can generally be interpreted apart from non-sulfide anomalism. The type of sulfide however, say pyrite, as distinct from chalcopyrite, cannot yet be distinguished with present induced polarization techniques since all types give quite similar types of problems.

The I. P. technique was developed primarily for porphyry type deposits and is perhaps the only reliable means of detecting hidden disseminated sulfides. However, the I. P. method works just as well or perhaps better on semi-massive to massive sulfides, contrary to some of the earlier thinking, for it gives increased response with increased volume percentage of sulfide.

FIELD TECHNIQUES AND INTERPRETATION

For routine exploration, we prefer and use the dual frequency system because of its greater simplicity of instrumentation, operation and greater accuracy as well as simplicity of interpretation. However, all three methods give basically the same results and the choice is either a matter of opinion or highly technical reasons and therefore should be left to the individual application and the geophysicist's discretion.

The two frequencies we most commonly use are 0.05 and 3.0 cycles per second, respectively or so called "D.C." and "A.C." modes. Other frequencies are available with our equipment and are occasionally used when desired. The usual frequency range used is from about 0.01 cps. to 10 cps. The lower frequency limit is due to naturally existing time varying Telluric (earth) currents and electrode polarization. The upper limit is determined by electro-magnetic coupling effects which increase rapidly with increasing frequency.

In our standard reconnaissance field practice, five equally spaced co-linear current electrodes are placed in the ground by burying aluminum foil in pits wetted with brine. Observations are made in accordance with a symmetrical dipole-dipole configuration where the distance between the receiver or potential electrodes is kept equal to the distance between adjacent electrode pairs. Generally the receiving dipole is separated by one to six dipole units ("n" separation) from the sending dipole. Figures 1 and 2 indicate this configuration and resulting data plotting positions. A precisely controlled square wave current is sent through a sending dipole at 0.05 and 3.0 cycles per second from which, at the receiving dipole, a "D.C." and an "A.C." voltage are measured, respectively. By knowing the geometry involved (the dipole length or spacing and the separation distance between the two receiving-sending dipole pairs), along with the two voltages, an apparent "D.C." and an "A.C." resistivity can be calculated. From these apparent resistivities, their percentage difference is determined, thus giving the Percent Frequency Effect (PFE). A third quantity proportional to PFE and inversely proportional to "D.C." resistivity, called Metallic Conduction Factor (MCF) is computed in order to somewhat normalize PFE for variations in ground conductivity purely as a technical interpretational aid. Formulas for these various quantities are given on Figure 3.

Selection of electrode spacings is determined by the objectives to be reached in a given survey. This spacing will range from very small (50 feet or less) for very detailed and shallow surveys, up to 1,000 feet, or occasionally more, for broad and deep reconnaissance work. Other factors involved in the selection of spacing are concerned with the anticipated physical geometry of any possibly existing mineral occurrence. This includes consideration of such size, shape and position factors as expected depth of burial to the top of the deposit, the dimensions of the deposit itself, its orientation, strike and dip, etc., as well as its expected electrical properties.

In general, the greater the dipole spacing and "n" separation, the greater the depth penetration and the less the resolution. A rule of thumb used in practice is that, with a good contrast of electrical properties, using the symmetrical - co-linear dipole-dipole system, and having data from 1 through 6 in "n" separations, two times the dipole length is the maximum depth of detectable penetration, and 0.2 times the dipole length is about the minimum depth of detectable penetration for a body having two or three of its dimensions large in relation to the dipole spacing. However, a body having two or three of its dimensions less than the dipole spacing, and buried more than one spacing probably will not be detectable. A zone, regardless of orientation, having a dimension less than 0.1 the dipole spacing will not likely be detectable. Also, zones differing by less than about 30% in electrical conductivity will not be very easily resolved by resistivity measurements, but may still be detected if a polarization contrast exists.

To illustrate the above in more concrete terms, consider a dipole spacing of 1,000 feet for the following: An overburden of more than 2,000 feet would likely not allow enough current penetration into bedrock to detect even a large and highly mineralized zone in the bedrock. Also, a sulfide zone lying completely within 200 feet of the surface generally would not be detected. A spherical or elongated cylindrical body whose top is more than about 1,000 feet below surface and whose diameter is much less than 1,000 feet would be just out of the range of detectability. A Dike-like or sill-like zone whose width is less than 100 feet probably would not be detected regardless of how it lies relative to the spread.

So far, only the maximum and minimum limits of detection and resolution relative to the various geological and geometrical configurations have been discussed, thus omitting optimum conditions. Generally, we attempt to make the dipole spacing one to two times the expected depth to the target in order to obtain a good electrical response. Of course, where it is suspected that the zone has a good depth extent, say two or more dipole spacings, as is typical of most porphyry type copper deposits, a spacing considerably more than two times the expected depth to sub-outcrop can be used to obtain broader and more rapid coverage, as long as we do not exceed the zone's width. Because of these factors, we usually use 500 to 1,000 foot dipole spacings in prospecting for porphyry-type deposits.

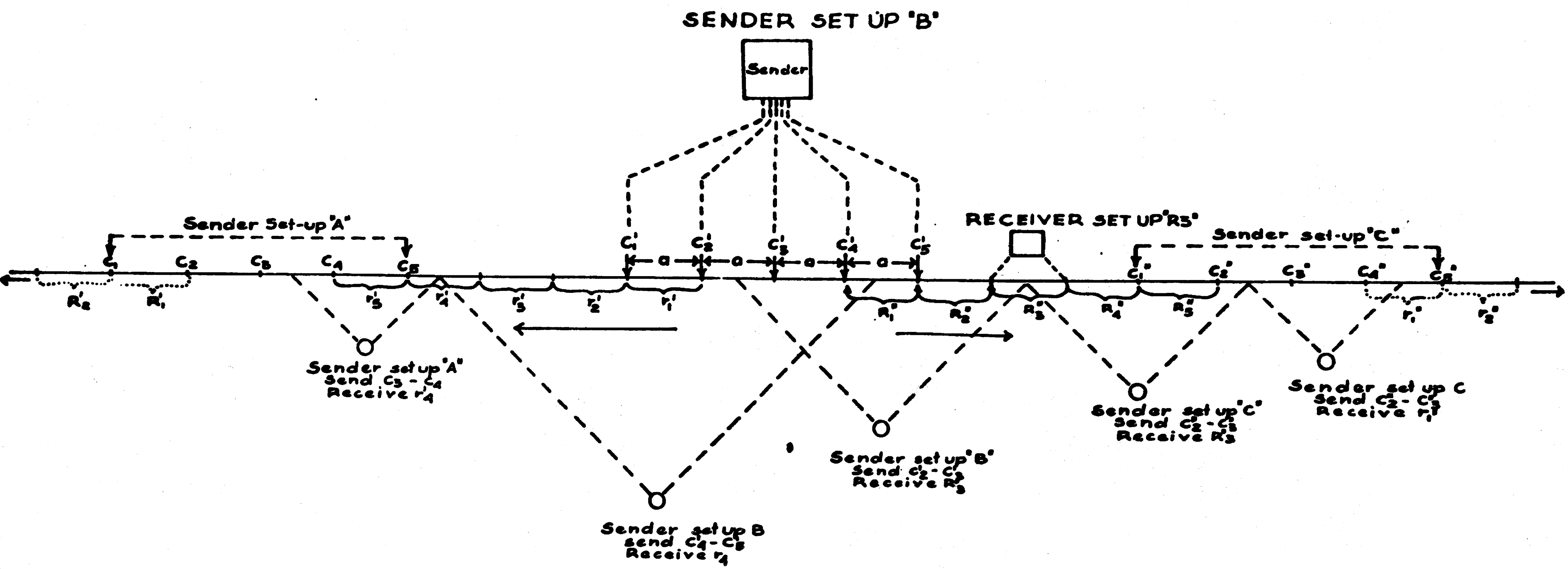
The field data are interpreted after plotting the PFE, MCF and resistivity as in Figures 1 and 2. These values are then contoured, the resistivity and metallic conduction factor logarithmically (because of the usual large variations in magnitude) and the percent frequency effect on a constant interval. This two dimensional method of plotting gives an additional leverage over the standard profile methods in that easily recognizable patterns are associated with various subsurface geometrical configurations and that lateral variations can be separated from vertical effects.

It should be realized that there is no definite relation between the vertical scale on these plots and actual subsurface depth. The data point values are a complexly weighted average of the electrical contrast distribution in the vicinity of the sending-receiving dipole pair and contain depth as well as lateral information. About all that can be said is that by increasing the dipole length and the dipole separation ("n" separation) more volume of ground is being affected and therefore more depth penetration.

There are cases where the depth to a subsurface feature can be determined fairly precisely as in the two horizontal layer situation. The field data is compared with theoretical type curves for various resistivity contrasts between the top and bottom layer and various thickness of the top layer until a close match is found. This enables the depth to the bottom layer in the field to be determined as well as the true resistivity of both layers. A major limitation to this interpretational technique is that only a few simple geometric cases related to a relatively few number of layers have been theoretically developed. However, extremely valuable information can still be derived in alluvial and lake bed applications for depth to bedrock and ground water purposes, etc.

In interpreting PFE's, values of 0 to 4 percent are usually considered background, 4 to 8% marginally anomalous and 8 to 40 plus definitely anomalous, but they must be considered in light of the associated resistivity. Very low resistivities give an increased background frequency effect due to an electromagnetic inductive coupling interference phenomenon that must be corrected for. The MCF tends to correct any high resistivity increased background frequency effects but tends to amplify the electro-magnetic frequency effects making a correction imperative.

Figure 1



Schematic diagram illustrating the method of obtaining and plotting Dipole-Dipole I. P. data. Diagram shows three separate current electrode spreads along a traverse line. In normal procedure, there are three dipole separations between current electrode spreads. The receiver setups are moved outwards from the ends of each current electrode spread usually until three dipole spacings separate the potential electrode setup from the near end of the spread. Current is "sent" to each possible pair of electrodes for each receiver setup. For instance, in Sender setup "B" when the receiver is receiving at R_1 only $C_3' - C_2'$ and $C_2' - C_1'$ can be "sent" so that data at 1 and 2 dipole separations is obtained respectively. When the receiver is at R_5'; $C_5' - C_4'$, $C_4' - C_3'$, $C_3' - C_2'$, and $C_1' - C_2'$ are sent and data is obtained for 3, 4, 5 and 6 dipole separations respectively. Each sender setup provides 33 data points.

<u>Figure 2</u>

(Data obtained from the three setups of Figure 1)

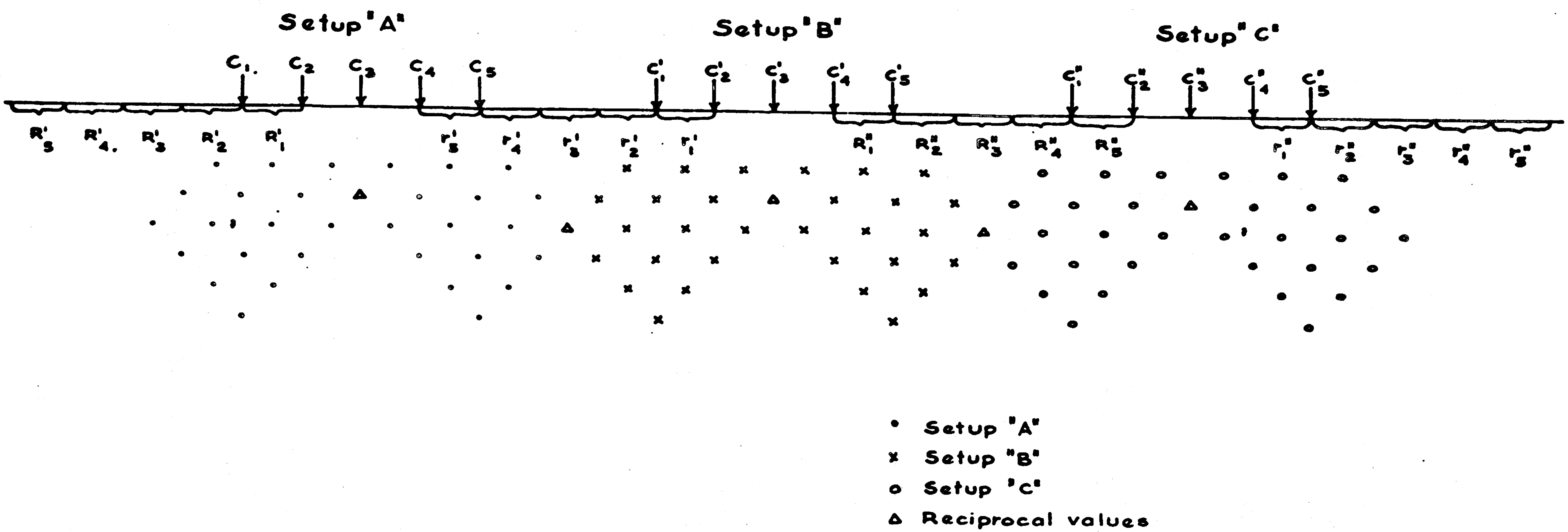


FIGURE 3

$$PFE = \left(\frac{\rho dc}{\rho ac} - 1\right) 100$$

Where PFE is Percent Frequency Effect, ρdc is the apparent resistivity at the lower frequency and ρac is the higher frequency apparent resistivity.

$$\rho = \frac{2\pi V}{I} Kn$$

Where ρ is either ρdc or ρac depending on frequency of the current I which is measured in amperes. The potential V, arising from I, is measured in volts. K_n is the geometric factor given by:

$$Kn = \frac{an(n+1)(n+2)}{2}$$

(Only for dipole-dipole arrays)

Where a is the dipole spacing in feet and n is the number of dipoles separating the sending and receiving dipoles, this gives, for apparent resistivity:

$$\rho = \frac{2\pi V}{I} \left(\frac{an(n+1)(n+2)}{2}\right)$$

from which we see that ρ is in units of ohm-feet. However, the apparent resistivity usually plotted is $\rho/2\pi$ or:

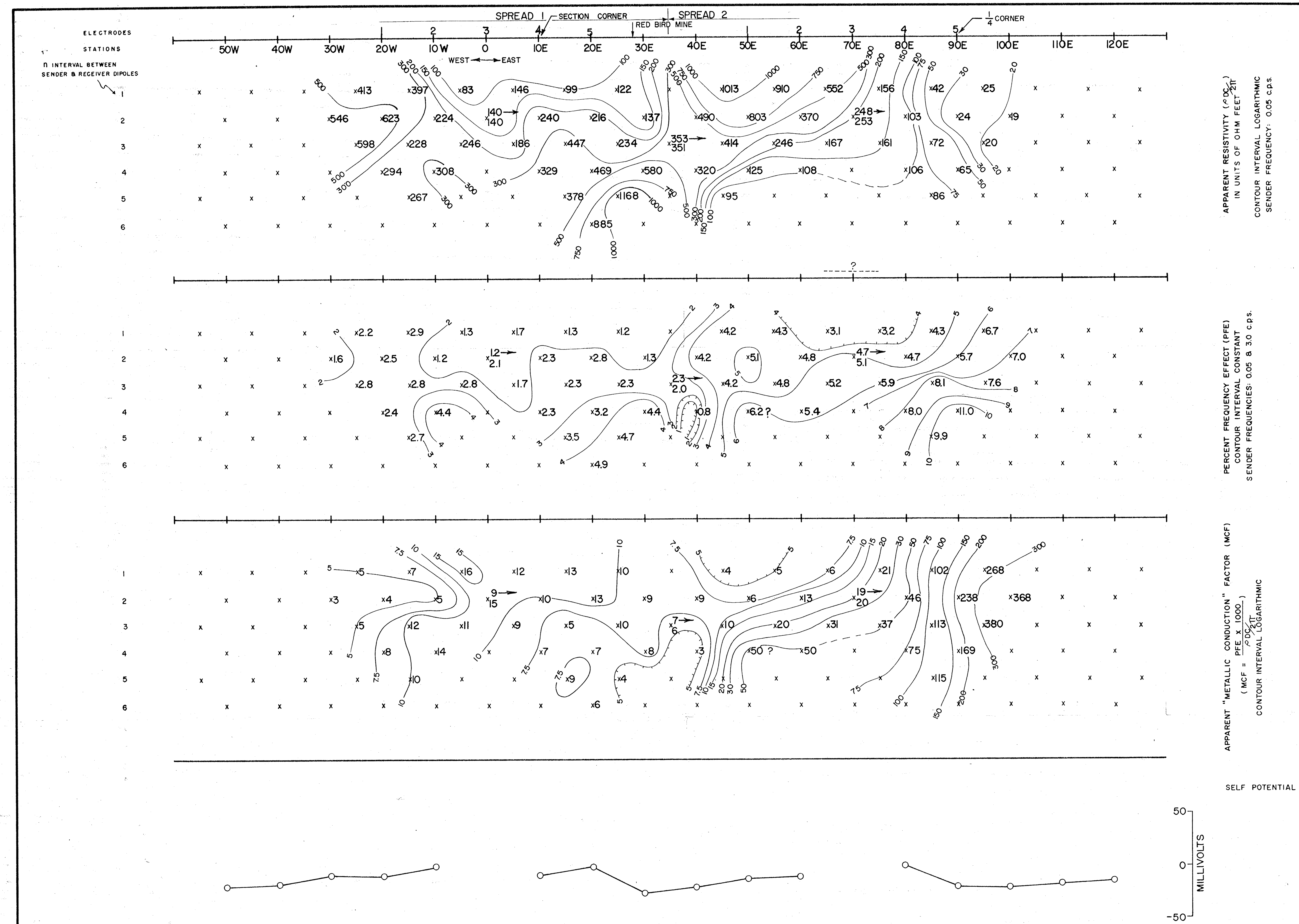
$$\frac{\rho}{2\pi} = \frac{V}{I} Kn = \frac{V}{I} \left(\frac{an(n+1)(n+2)}{2}\right)$$

$$MCF = \frac{PFE}{\rho dc/2\pi} \times 1000$$

Where MCF is the Metallic Conduction Factor and $\rho dc/2\pi$ is apparent "D.C." resistivity.

INDUCTIVE COUPLING INTERFERENCE

If $a(n+1)\sqrt{\frac{f}{\rho/2\pi}}$ is less than 1000 then the inductive coupling false frequency effect will be less than 2.5%. Likewise if less than 1500 the false effect will be less than 5%, and if less than 2000, the false effect will be less than 10%. Frequency f is in cycles per second.



EXPLANATION

ELECTRODE ARRAY: 1000' — n 1000' — 1000'

SENDER DIPOLE RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH

VERY WEAK WEAK MODERATE STRONG

LOOKING NORTH

GEOEX

RED BIRD AREA

SECTIONAL DATA SHEET

LINE NO. 1

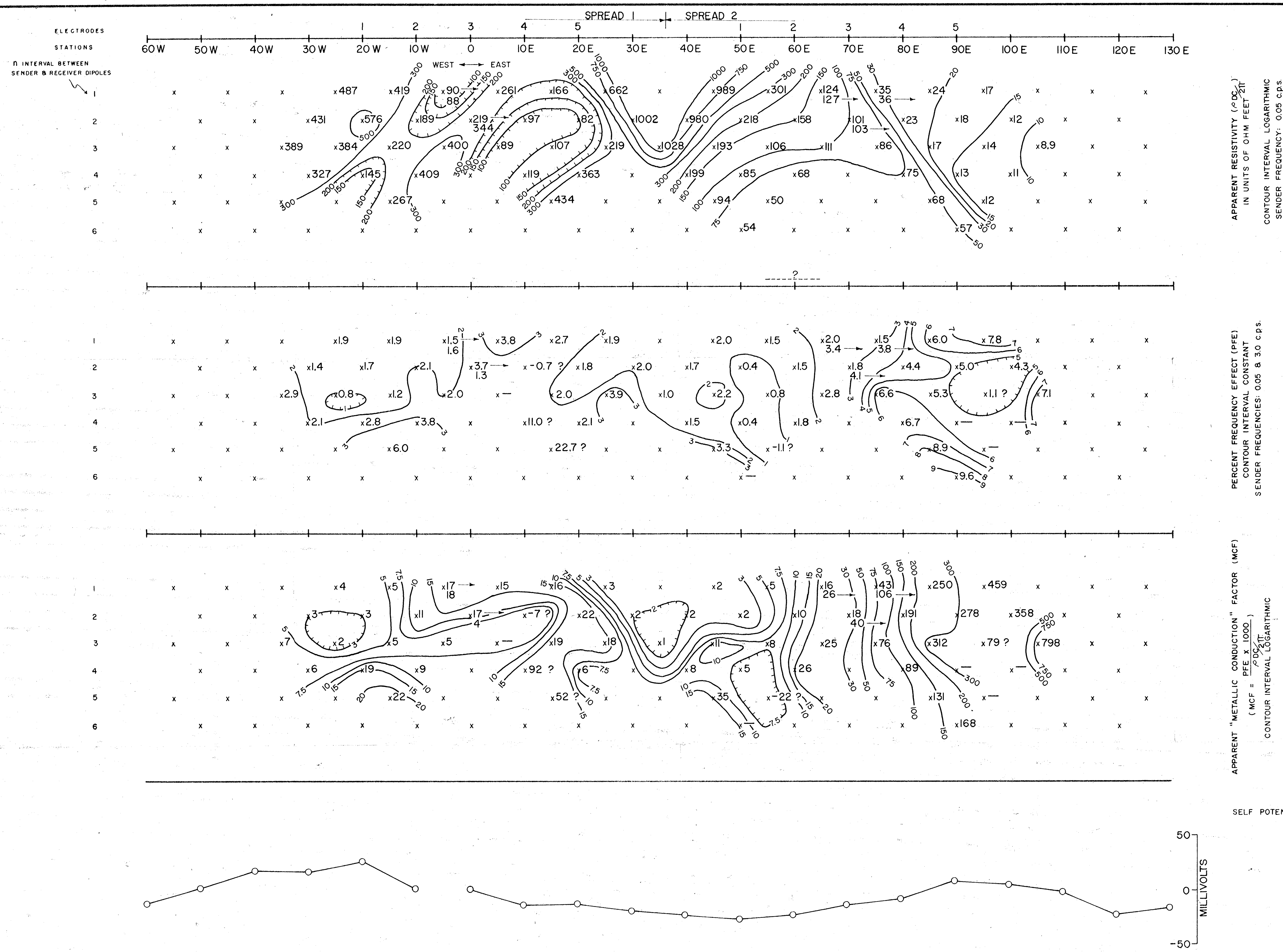
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1000' DATE: AUG. 18, 1966

FOR

NORTH AMERICAN MINES CO.



EXPLANATION

ELECTRODE ARRAY: 1000' — n x 1000' — 1000'
SENDER DIPOLE
RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

LOOKING NORTH

RED BIRD AREA

SECTIONAL DATA SHEET

LINE NO. 2

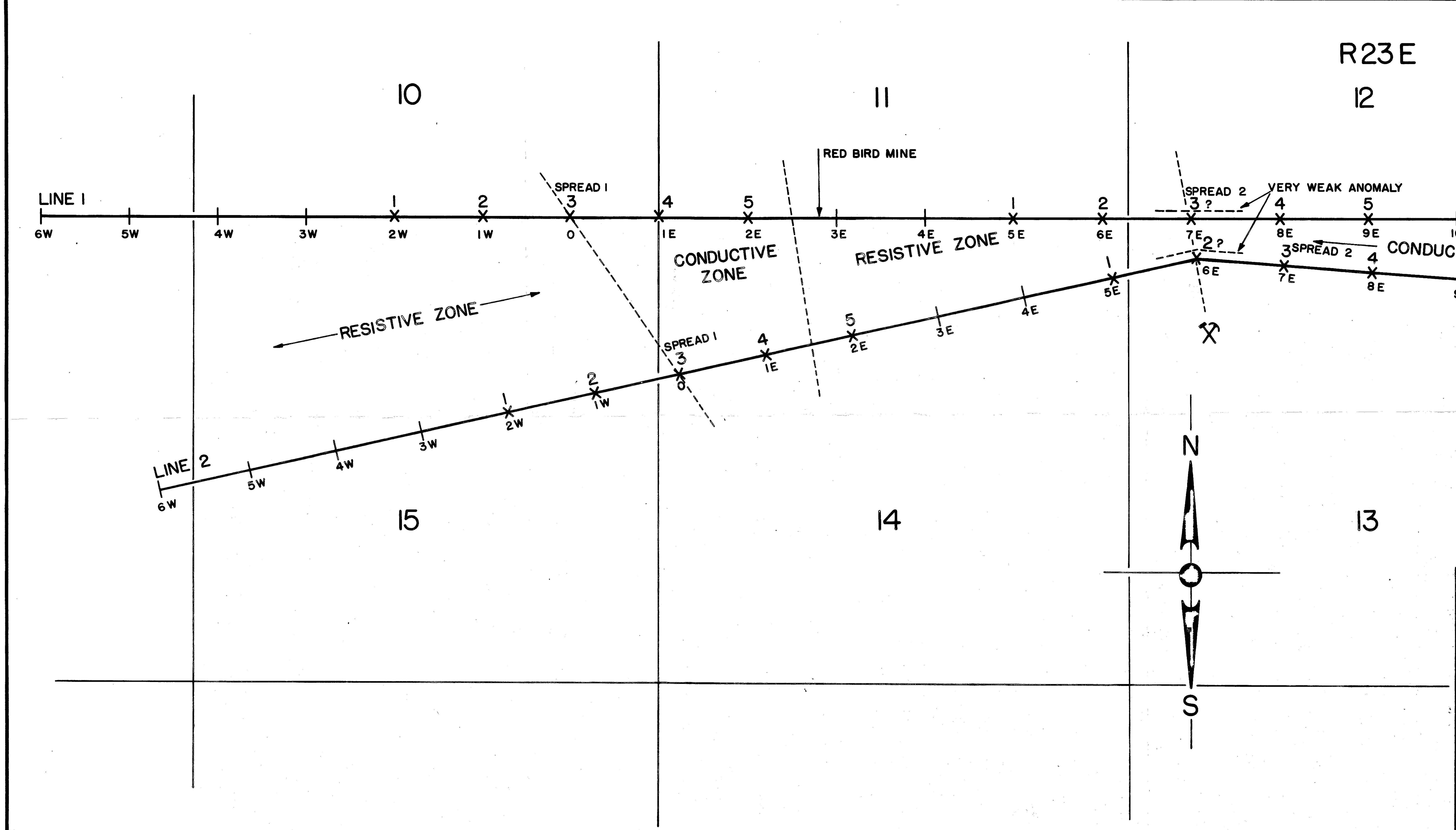
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1000'   DATE: AUG. 18, 1966

FOR

NORTH AMERICAN MINES CO.



HEINRICHS GEOEXPLORATION CO.
POST OFFICE BOX 5671. TUCSON. ARIZONA. 85703

INDUCED POLARIZATION
INTERPRETATION & LOCATION PLAN

FOR

NORTH AMERICAN MINES CO.
RED BIRD AREA
COCHISE COUNTY, ARIZONA

Scale 1" = 1000' | Date AUG. 18, 1966

2 copies

P. O. Box 2431
Tucson, Arizona
July 31, 1966

RECEIVED
AUG 2 1966

Mr. Quincy A. Shaw, Jr
North American Mines, Inc
50 State Street
Boson, Mass 02109

Dear Quinny:

Red Bird Mine
Cochise County, Arizona

I talked with Victor Verity about the Red Bird and he tells me that we have to do the assessment work because we didnot notify Hedderman within the three months period before the assessment work is due. The end of the assessment work year is September 1. I believe that the cheapest and most satisfactory way to do the work is to have Heinrichs run an I. P. line across the south end of Sec. 11 and across the north end of Sec 14, both in an east-west direction. There are 9 claims in the group and I believe that it would cost about $2500.00 to get the work done but we would then know whether or not to drop the claims, or we could use the work to hold them for another nine months.

Hedderman and I went to the mine yesterday and were able to locate it on the U. S. G. S. map of the area according to Township, Range and Section. I am enclosing a sketch map of the location and am placing on it the leases for which Woodsley has applied, marked with a "W". Hedderman, as usual, has no map of the claims and is not at all certain where are the corners so I am unable to place them on the map. The U. S. G. S. map shows the tunnels to be in the SE 1/4 of the SW 1/4 of the SW 1/4 of Section 11, T. 15S R.23E.

The mineralization runs N-S and dips East. There is a wide mineralized zone running south into Sec. 14 which is Federal land and is partly covered by the claims. This N-S zone is covered by state lease in the NE 1/4 of the SW 1/4 of Sec. 11 which is one of the leases for which Woolsley applied.

I do not know if Woolsley received the leases, paid for them, or is still holding them by right of application. But I will talk with Victor about that and maybe he can find out.

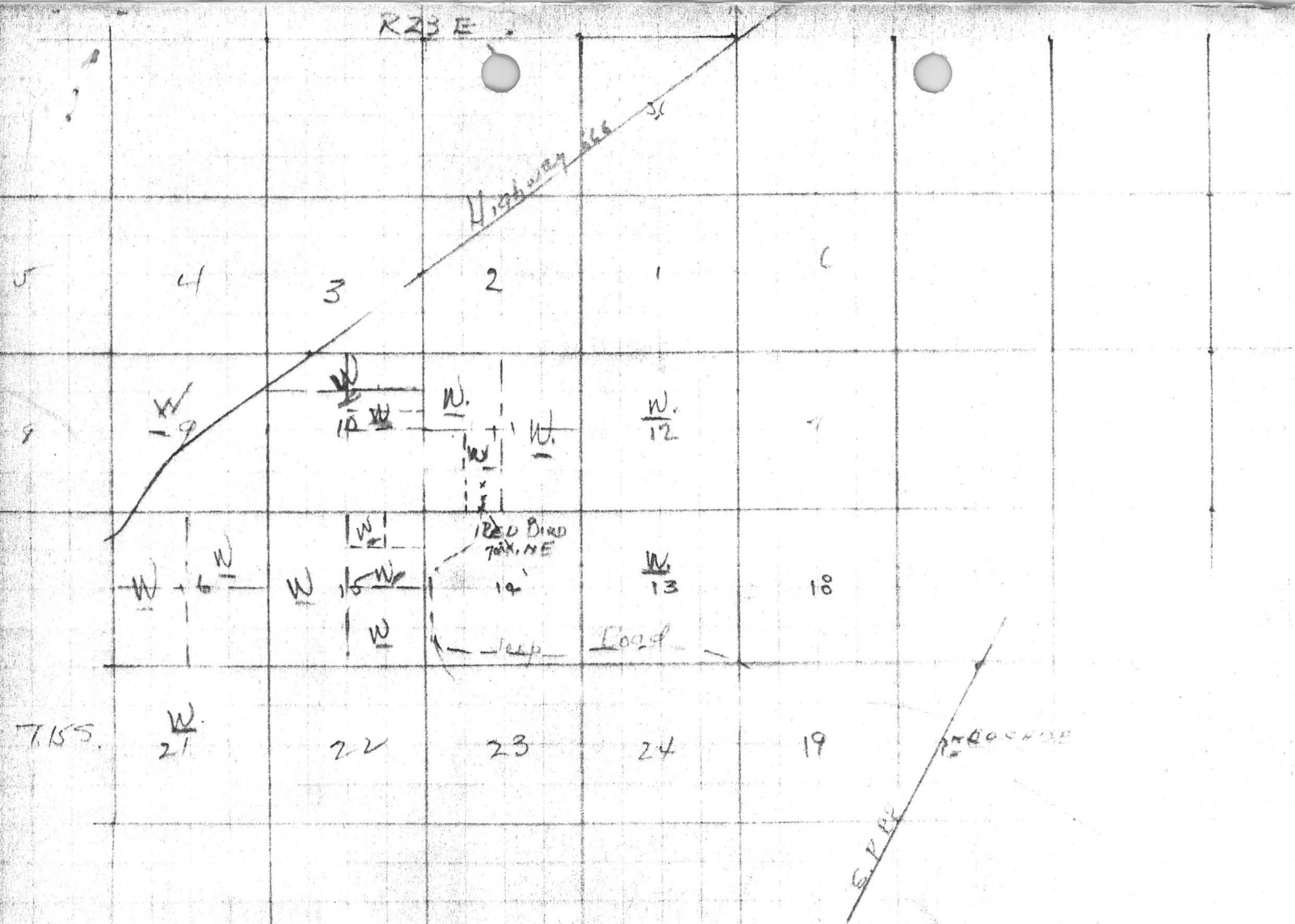
I have an appointment with the Heinrichs man who worked at the Allison for tomorrow. They seem to think that they have something but should have it figured tomorrow. They ran a line across the mountain to the south of the Fourth of July and say that there is nothing in that direction. It is all to the north or under the mine. He did say that the zone was over 2000 feet wide. I should be able to give it to you tomorrow.

The hoist broke down and had to be overhauled. So there is nothing doing at the mine at present.

Sincerely,

H. Grattan Lynch

H.Grattan Lynch


R23E.
Highway 666
36
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12
7
W
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6
W
15 W
W
RED BIRD
TANK NE
14
W.
13
18
Jeep
Road
T15S.
W.
21
22
23
24
19
S.P.R.R.