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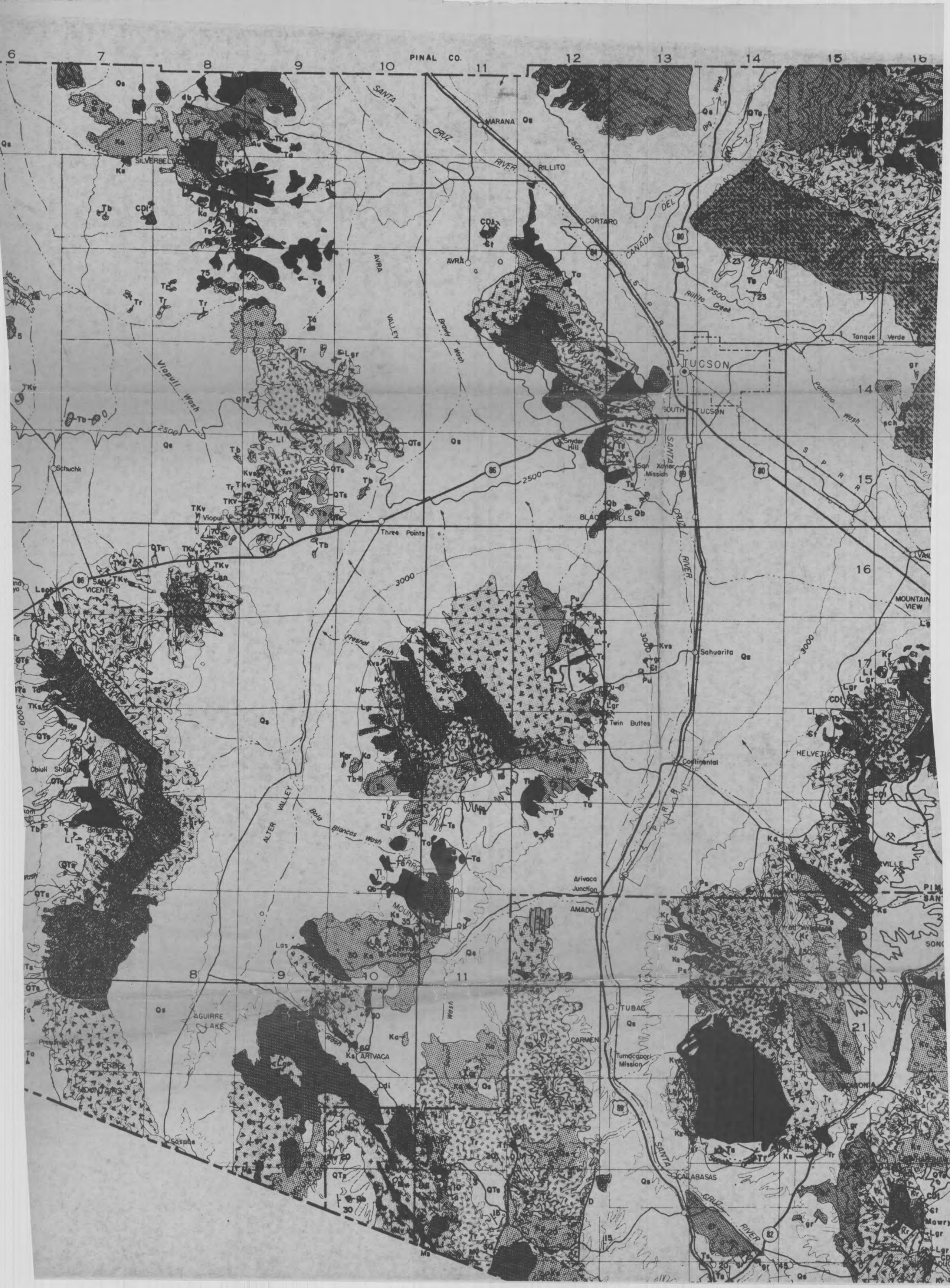

PINAL CO.
SILVERBELL
MARANA
RILLITO
CORTARO
AVRA
AVRA VALLEY
SANTA CRUZ RIVER
CANADA DEL ORO
Big Wash
Rillito Creek
Tanque Verde
TUCSON
SOUTH TUCSON
Pantano Wash
Snyder Hill
San Xavier Mission
BLACK HILLS
Viopuli Wash
Viopuli
Schuchk
Three Points
SAN VICENTE
Fresnal Wash
Sahuarita
Twin Buttes
Continental
HELVETIA
MOUNTAIN VIEW
Chiuli Shaik
ALTER VALLEY
Bola Blancas Wash
Arivaca Junction
AMADO
AGUIRRE LAKE
ARIVACA
CARMEN
TUBAC
Tumacacori Mission
CALABASAS
Mowry
Gaspe

HEINRICHS GEOEX B-236-68 LINE 1 SPD 1 LOOKING NORTH DATE 4-23-68 A = 750 FEET

N	45W	37.5	30	22.5	15	8 / 7.5	0W/E	8 / 7.5	15	22.5	30	37.5	45E	SURFACE	RHO/2PI
1	X	X	X	X27	X32	X45 / 45		X38 / 37	X56	X63	X	X	X	X	
2	X	X	X	X40	X43	X47	X46 / 47	X44	X60	X61	X	X	X		
3	X	X	X68	X48	X52	X43		X57	X52	X59	X58	X	X	X	
4	X	X	X	X71	X51	X45	X	X69	X52	X55	X	X	X		
5	X	X	X	X70	X42	X	X	X69	X49	X	X	X	X		
6	X	X	X	X	X55	X	X	X	X63	X	X	X	X		

N	45W	37	30	22	15	8	0W/E	8	15	22	30	37	45E	SURFACE	PFE
1	X	X	X	X.6	X1.1	X.3 / .3		X.9 / 1.3 1.1	X.2	X.8	X	X	X	X	
2	X	X	X	X1.1	X1.5	X1.5	X1.2 / 2.0 1.6	X1.6	X1.1	X1.1	X	X	X		
3	X	X	X1.5	X.9	X1.4	X.2		X1.5	X2.0	X2.5	X1.0	X	X	X	
4	X	X	X	X1.2	X1.5	X1.7	X	X1.0	X2.0	X1.3	X	X	X		
5	X	X	X	X1.6	X.9	X	X	X	X1.0	X1.8	X	X	X	X	
6	X	X	X	X	X2.1	X	X	X	X1.9	X	X	X	X		

0	0
2	-4
-5	0
-6	12
-4	15
4	14
3	16

N	45W	37	30	22	15	8	0W/E	8	15	22	30	37	45E	SURFACE	MCF
1	X	X	X	X22	X34	X7 / 7		X23 / 34 29	X4	X12	X	X	X	X	
2	X	X	X	X27	X34	X33	X26 / 43 35	X36	X19	X18	X	X	X		
3	X	X	X22	X18	X28	X6		X26	X39	X41	X17	X	X	X	
4	X	X	X	X17	X28	X39	X	X14	X38	X23	X	X	X		
5	X	X	X	X23	X20	X	X	X14	X38	X	X	X	X		
6	X	X	X	X	X37	X	X	X	X30	X	X	X	X		

Silver Hill Area

Geo — Sur — —
Geochemical Surveys

087139

HEINRICHS GEOEX B-236-68 LINE 2 SPD 1 LOOKING NORTH DATE 4-23-68 A= 250 FEET

0871372

RHO/2PI

N	15W	12.5	10	8	5	3	0W/E	3	5	8	10	12.5	15E
1	X	X	X	X33	X22	X29→35	X81→78	X56	X43	X	X	X	X
2	X	X	X	X30	X34	X25	X32→35	X56	X44	X67	X	X	X
3	X	X	X28	X35	X41	X30	X28	X42	X58	X57	X	X	X
4	X	X	X	X36	X43	X48	X	X24	X54	X50	X	X	X
5	X	X	X	X43	X50	X	X	X32	X45	X	X	X	X
6	X	X	X	X	X49	X	X	X	X30	X	X	X	X

PFE

N	15W	12	10	8	5	3	0W/E	3	5	8	10	12	15E
1	X	X	X	X.8	X.3	X.2→1.7	X.7→1.1	X.6	X.6	X	X	X	X
2	X	X	X	X.3	X.5	X1.2	X1.2→.6	X1.4	X.6	X1.3	X	X	X
3	X	X	X.3	X.5	X.6	X.3	X.9	X.9	X0.0	X.6	X	X	X
4	X	X	X	X.7	X1.0	X-.5	X	X.4	X.4	X.0	X	X	X
5	X	X	X	X.6	X1.0	X	X	X1.1	X1.4	X	X	X	X
6	X	X	X	X	X.8	X	X	X	X.5	X	X	X	X
						0	0						
						-5	-2						
						-6	-4						
						-1	-9						
						-7	-11						
						-6	-7						
						-2	-8						

MCF

N	15W	12	10	8	5	3	0W/E	3	5	8	10	12	15E
1	X	X	X	X26	X13	X6→47	X8→14	X11	X14	X	X	X	X
2	X	X	X	X10	X14	X49	X36→18	X25	X13	X19	X	X	X
3	X	X	X11	X15	X15	X10	X30	X20	X-1	X11	X	X	X
4	X	X	X	X20	X22	X-10	X	X16	X8	X0	X	X	X
5	X	X	X	X15	X21	X	X	X35	X32	X	X	X	X
6	X	X	X	X	X17	X	X	X	X16	X	X	X	X

Silver Hill Area

Geochemical Surveys - -

Look N a = 250'

PAGE

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES (250)

PROJECT [236-68] 4-23-68

LINE 2 HALF W SP. 1 DATE

SEND	45	34	45	23	34	45	12	23	34	45
RECEIVE	0-2.5W	2.5-5W	—	5-7.5W	—	—	7.5-10W	—	—	—
RANGE	300	300	100	300	100	100	300	100	100	100
DC 1	209 208	140 145	461 466	119 120	341 330	345 370	264 261	500 516	320 345	303 271
DC 2	209 208	140 145	461 466	119 120	341 330	345 370	264 261	500 516	320 345	305 271
DC 3	209 208	140 145	461 466	119 120	341 330	345 370	264 261	500 516	320 345	303 271
DC 4										
DC 5										
DC 6										
DC 7										
DC 8										
DC AVG.										
AC 1	206.	140.	46.0	119.	33.1	35.6	260.	50.5	33.0	28.9
AC 2	206.	140.	46.0	119.	33.1	35.6	260.	50.5	33.0	28.9
AC AVG.										
S.P.	-4.7	-0.9	—	+4.7	—	—	-6.1	—	—	—
AC NOISE	<.1	<.1	—	<.1	—	—	<.1	—	—	—
POT RES.	0.9	2.8		1.4	—	—	2.3	—	—	—

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 236-68 4-23-68
LINE 2 HALF W SP. 1 DATE

PAGE

SEND	12	23	34	45	12	23	34	45	CAL	CAL
RECEIVE	10-12.5 W	—	—	—	12.5-15 W	—	—	—	2A/34	2A/12
RANGE	100	30	30	30	30	30	30	30		
DC 1	596 601	239 234	236 229	170 176	232 220	106 136	136 126	110 102		
DC 2	596 601	239 234	236 229	170 176	232 220	106 136	136 126	110 102		
DC 3	596 601	239 234	236 229	170 176	232 220	106 136	136 126	110 102		
DC 4										
DC 5										
DC 6									202	201
DC 7									201	201
DC 8									202	201
DC AVG.									201	201
AC 1	59.6	23.5	23.0	17.1	22.5	12.0	13.0	10.5		
AC 2	59.6	23.5	23.0	17.1	22.5	12.0	13.0	10.5	201	201
AC AVG.									201	201
S.P.	+0.5	—	—	—	+4.1					
AC NOISE	2.1	—	—		2.1					
POT RES.	2.7	—	—	—	2.5					

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PAGE

PROJECT 236-68 4-23-68

LINE 2 HALF W SP. 1 DATE

SEND	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
RECEIVE	0-250 W	250-500 W	→	500-750 W	→		750-1000 W	→		
RANGE	Hi	→		→	Hi		→			
VOLTAGE	100	160	190	380	220	450	460	420	330	450
CURRENT	2.0	3.0	4.0	4.0	4.0	9.0	6.0	4.5	6.0	9.0
SEND	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	CAL	CAL
RECEIVE	1000-1250 W	→		→	1250-1500 W	→		→	3-4	1-2
RANGE	Hi	→		→	Hi	→		→	Hi	Hi
VOLTAGE	460	470	450	450	460	470	450	450	140	170
CURRENT	6.0	5.0	8.0	9.0	6.0	5.0	8.0	9.0	2.0	2.0

FREQUENCIES .0542 .0142

SENDER NO. 6649-S

OPERATOR McCoy

RECEIVER NO. 15674-R

OPERATOR King

COMMENTS:

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 236-68 4-23-68
LINE 2 HALF E SP. DATE

PAGE

SEND	12	23	12	34	23	12	45	34	23	12
RECEIVE	0-2.5E	2.5-5E	—	5-7.5E	—	—	7.5-10E	—	—	—
RANGE	300	300	100	300	100	30	300	100	30	30
DC 1	235235	220214	960400	228224	535585	215240	234232	590600	235220	961951
DC 2	235235	220214	960400	228224	535585	215240	234232	590600	235220	961951
DC 3	235235	220214	960400	228224	535585	215240	234232	590600	235220	961951
DC 4										
DC 5										
DC 6										
DC 7										
DC 8										
DC AVG.										
AC 1	234.	215.	42.4	22.4.	55.1	22.5	231	59.0	22.5	9.50
AC 2	234.	215.	42.4	22.4.	55.1	22.5	231	59.0	22.5	9.50
AC AVG.										
S.P.	-2.4	-2.3	—	-5.1	—	—	-1.5	—	—	
AC NOISE	<1	<1	—	<1	—	—	<1	—	—	—
POT RES.	1.7	2.4	—	1.6	—	—	2.2	—	—	—

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 236-68 4-23-68
LINE 2 HALF E SP. 1 DATE

PAGE

SEND	45	34	23	12	45	34	23	12	CAL	CAL
RECEIVE	10-12.5E	—	—	—	12.5-15E	—	—	—	2A/23	2A/45
RANGE	300	100	30	10	100	30	10	10		
DC 1	134/134	471/471	144/146	760/710	470/450	211/188	870/840	460/390		
DC 2	134/134	471/471	144/146	760/710	470/450	211/188	870/840	460/390		
DC 3	134/134	471/471	144/146	760/710	470/450	211/188	870/840	460/390		
DC 4										
DC 5										
DC 6									202	201
DC 7									201	202
DC 8									202	201
DC AVG.	134								201	202
AC 1	132.	47.0	14.4	7.25	45.6	19.9	8.41	4.22		
AC 2	132.	47.0	14.4	7.25	45.6	19.9	8.41	4.22	201	201
AC AVG.									201	201
S.P.	+3.8	—	—	—	-1.0	—	—	—		
AC NOISE	<.1	—	—	—	<.1	—	—	—		
POT RES.	2.8	—	—	—	1.6	—	—	—		

PAGE

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 236-68 4-23-68

LINE 2 HALF E SP. 1 DATE

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-250E	250-500E →		500-750E →			750-1000E		→	
RANGE	Hi →						Hi →			
VOLTAGE	460		300	260	270	460	200	220	370	460
CURRENT	6.0	2.0	4.0	3.0	3.0	6.0	4.0	4.0	4.0	6.0
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	CAL	CAL
RECEIVE	1000-1250E		→		1250-1500E		→		2-3	4-5
RANGE	Hi →				Hi →				Hi	Hi
VOLTAGE	300	330	370	460	300	330	460	460	230	100
CURRENT	6.0	6.0	4.0	6.0	6.0	6.0	5.0	6.0	2.0	2.0

FREQUENCIES .15 Hz 1.0 Hz

SENDER NO. 6649-2

OPERATOR McCoy

RECEIVER NO. 15679-R

OPERATOR King

COMMENTS:

HEINRICHS GEOEX B-236-68 LINE 2 SPD 1 LOOKING NORTH DATE 4-23-68 A= 250 FEET

2.000	3.000	4.000	4.000	4.000	9.000	6.000	4.500	6.000	9.000	I	6.000	5.000	8.000	9.000	6.000	5.000	8.000	9.000	2.000	
209	140	461	119	341	345	264	500	320	305	DC	596	239	236	170	232	106	136	110	201	LEFT
208	145	466	120	330	370	261	516	345	271		601	234	229	176	220	136	126	102	202	SIDE
																			/	
																			201	
																			201	
208.5	142.5	46.35	119.5	33.55	35.75	262.5	50.80	33.25	28.80	DCA	59.85	23.65	23.25	17.30	22.60	12.10	13.10	10.60	201.2	
206.0	140.0	46.00	119.0	33.10	35.60	260.0	50.50	33.00	28.90	AC1	59.60	23.50	23.00	17.10	22.50	12.00	13.00	10.50	201.0	
206.0	140.0	46.00	119.0	33.10	35.60	260.0	50.50	33.00	28.90	AC2	59.60	23.50	23.00	17.10	22.50	12.00	13.00	10.50	201.0	
206.0	140.0	46.00	119.0	33.10	35.60	260.0	50.50	33.00	28.90	ACA	59.60	23.50	23.00	17.10	22.50	12.00	13.00	10.50	201.0	
77.70	35.40	34.55	22.27	25.01	29.61	32.61	33.66	41.30	47.70	RHO	29.74	35.25	43.32	50.14	28.07	36.07	42.72	49.16	.994	DC CAL
1.1	1.7	.6	.3	1.2	.3	.8	.5	.6	-.5	PFE	.3	.5	1.0	1.0	.3	.7	.6	.8	.999	AC CAL
14	47	18	13	49	10	26	14	15	-10	MCF	10	15	22	21	11	20	15	17		

6.000	2.000	4.000	3.000	3.000	6.000	4.000	4.000	4.000	6.000	I	6.000	6.000	4.000	6.000	6.000	6.000	5.000	6.000	2.000	
235	220	460	228	535	215	234	590	235	961	DC	134	471	144	760	47	211	87	46	202	RIGHT
235	214	400	224	585	240	232	600	220	951		134	471	146	710	45	188	84	39	201	SIDE
																			202	
																			201	
235.0	217.0	43.00	226.0	56.00	22.75	233.0	59.50	22.75	9.560	DCA	134.0	47.10	14.50	7.350	46.00	19.95	8.550	4.250	201.5	
234.0	215.0	42.40	224.0	55.10	22.50	231.0	59.00	22.50	9.500	AC1	132.0	47.00	14.40	7.250	45.60	19.90	8.410	4.220	201.0	
234.0	215.0	42.40	224.0	55.10	22.50	231.0	59.00	22.50	9.500	AC2	132.0	47.00	14.40	7.250	45.60	19.90	8.410	4.220	201.0	
234.0	215.0	42.40	224.0	55.10	22.50	231.0	59.00	22.50	9.500	ACA	132.0	47.00	14.40	7.250	45.60	19.90	8.410	4.220	201.0	
29.16	80.77	32.01	56.08	55.58	28.23	43.36	44.29	42.34	23.72	RHO	66.[illegible]0	58.44	53.97	31.92	57.07	49.50	44.55	29.53	.993	DC CAL
.2	.7	1.2	.6	1.4	.9	.6	.6	.9	.4	PFE	1.3	-.0	.4	1.1	.6	.0	1.4	.5	.998	AC CAL
6	8	36	11	25	30	14	13	20	16	MCF	19	-1	8	35	11	0	32	16		

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES 750'

PROJECT 236-68 4-22-68

LINE 1 HALF W SP. 1 DATE

PAGE

SEND	45	34	45	23	34	45	12	23	34	45
RECEIVE	0-7.5W	7.5-15W	—	15-22.5W	—	—	22.5-30W	—	—	—
RANGE	300	300	100	100	100	30	100	30	30	10
DC 1	110 100	114 122	340 280	870 834	330 299	106 124	729 720	284 295	131 145	526 668
DC 2	100 100	116 122	340 281	870 834	330 298	106 124	729 720	284 295	130 145	524 668
DC 3		117 123	340 282	870 834	330 296	106 124	729 720	284 295	130 145	526 668
DC 4										526 668
DC 5										
DC 6										
DC 7										
DC 8										
DC AVG.	200.0	238.2	62.1	170.4	62.8	23.0	144.5	57.9	27.5	11.93
AC 1	99.0	119.	30.5	84.5	31.0	11.5	72.0	28.6	13.6	5.88
AC 2	99.0	119.	30.5	84.5	31.0	11.5	72.0	28.6	13.6	5.88
AC AVG.	198.0	238.0	61.0	169.0	62.0	23.0	144.0	57.2	27.2	11.76
S.P.	+2.3	-7.4	—	-1.4	—	—	+1.5			
AC NOISE	<.1	<.1	—	<.1	—	—	<.1			
POT RES.	1.4	1.4	—	2.7	—	—	2.3			

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 236-68 4-22-68
LINE 1 HALF W SP. 1 DATE

PAGE

SEND	12	23	34	45	12	23	34	45	CAL	CAL
RECEIVE	30-37	SW			37.54	SW			24/34	24/12
RANGE	30	30	10	10	30	30	10	3	300	200
DC 1	276 266	116 142	716 658	361 286	281 265	116 102	578 491	255 272		
DC 2	276 260	116 142	715 655	370 271	282 265	118 103	581 490	258 270		
DC 3	278 258	115 142	721 650	375 271	282 265	118 102	580 490	259 269		15/100
DC 4			721 650	371 270		118 102	580 490	261 266		Δ
DC 5								261 266	200	200
DC 6									200	200
DC 7									200	200
DC 8									200	200
DC AVG.	Δ 53.6	25.5	13.72	6.44	54.7	22.0	10.70	5.28	200	Δ
AC 1	26.6	12.8	6.78	3.20	27.0	10.9	5.28	2.60	400	400
AC 2	26.6	12.8	6.78		27.0	10.9	5.28	2.59	201	200
AC AVG.	53.2	25.6	13.56	6.40	54.0	21.8	10.56	5.19	201	200
S.P.	+8.3				-1.3				402	400
AC NOISE	<.1				<.1				200.5	
POT RES.	12.6				2.3					

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PAGE

PROJECT 236 - 68 4-22-68

LINE 1 HALF W SP. 1 DATE

SEND	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
RECEIVE	1-75W	75-150W →		150-2250W →			2250-3000W →			
RANGE	Hi	→			→	Hi	→			
VOLTAGE	480	440	460	370	440	460	310	370	440	460
CURRENT	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
SEND	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	CAL	CAL
RECEIVE	3000-3750W →				3750-4500W →				3-4	1-2
RANGE	Hi	→			Hi	→			Hi	Hi
VOLTAGE	310	370	440	460	480	440	440	460	190	100
CURRENT	6.0	6.0	6.0	6.0	9.0	7.0	6.0	6.0	2.0	2.0

FREQUENCIES .05 Hz 3.0 Hz

SENDER NO. 6699 S

OPERATOR McCoy

RECEIVER NO. 15679 R

OPERATOR King

COMMENTS:

CHANGE FREQUENCY @ 1500-2250 W, to .05 Hz & 1.0 Hz.

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 236-68 4-22-68
LINE 1 HALF E SP. 1 DATE

PAGE

SEND	12	23	12	34	23	12	45	34	23	12
RECEIVE	0-7.5E	7.5-15E	—	15-22.5E	—	—	22.5-30E	—	—	—
RANGE	300	300	100	300	100	30	300	100	30	10
DC 1	120 119	101 101	306 310	149 150	290 300	141 165	165 174	360 448	144 134	931 900
DC 2	120 119	101 101	306 310	149 150	290 300	142 165	165 174	360 448	142 135	950 890
DC 3			306 310	149 150	290 300	142 165	165 174	360 448	144 134	958 880
DC 4						142 165			144 135	961 872
DC 5										
DC 6										
DC 7										
DC 8										
DC AVG.	239	202	61.1	299	59.0	30.7	329	80.8	27.79	18.40
AC 1	119.	100.	30.4	149.	29.0	15.1	168.	39.9	13.6	9.10
AC 2	119.	100.	30.4	149.	29.0	15.1	168.	39.9	13.6	9.10
AC AVG.	238	200	60.8	298	58.0	30.2	326	79.8	27.2	18.20
S.P.	-3.8	+3.8	—	+12.3	—	—	+3.2	—	—	—
AC NOISE	<.1	<.1	—	<.1	—	—	<.1	—	—	—
POT RES.	1.1	1.5	—	2.5	—	—	2.4	—	—	—

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT 236-68 A-22-68
LINE 1 HALF E SP. 1 DATE

PAGE

SEND	45	34	23	12	45	34	23	12	CAL	CAL
RECEIVE	30-37.5E				37.5-45E				2A/23	2A/45
RANGE	100	30	10	10	30	10	10	10		
DC 1	902410	150168	840810	670730	146165	777686	464470	458441		
DC 2	902410	150168	830811	674730	146164	780680	460470	451449		
DC 3	902410	150168	820821	680729	149164	778681	460465	456441		
DC 4			810830	675729	147164	780679	462471	454441		
DC 5										
DC 6									201	201
DC 7									201	200
DC 8									201	201
DC AVG.	81.2	31.8	16.39	14.05	31.1	14.60	9.30	8.98	201	200
AC 1	40.1	15.5	8.02	6.95	15.4	7.20	4.56	4.40	402	401
AC 2	40.1	15.5	8.03	6.95	15.4	7.20	4.56	4.40	201.	200.
AC AVG.	80.2	31.0	16.05	13.90	30.8	14.40	9.12	8.80	201.	200.
S.P.	-0.7				+2.1				402	400
AC NOISE	<.1				<.1					
POT RES.	1.4				1.0					

PAGE

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 236-68 4-22-68

LINE 1 HALF 4 SP. 1 DATE

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-75E	75-150E	→	150-2250E	→		2250-3000E	→		
RANGE	Hi	→		→	Hi	→				
VOLTAGE	310	370	310	440	380	300	460	440	360	300
CURRENT	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	CAL	CAL
RECEIVE	3000-3750E	→		→	3750-4500E	→		→	2-3	4-5
RANGE	Hi	→		→	Hi	→		→	Hi	Hi
VOLTAGE	460	440	430	410	460	440	460	460	180	170
CURRENT	6.0	6.0	8.0	8.0	6.0	6.0	8.5	9.0	2.0	2.0

FREQUENCIES .15 Hz 1.0 Hz

SENDER NO. 6649-5

OPERATOR McCoy

RECEIVER NO. 15394-12

OPERATOR King

COMMENTS:

HEINRICHS GEOEX 8-236-68 LINE 1 SPD 1 LOOKING NORTH DATE 4-23-68 A = 750 FEET

6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	I	6.000	6.000	6.000	6.000	9.000	7.000	6.000	6.000	2.000	
100	114	340	870	330	106	725	284	131	525	DC	276	116	716	361	281	116	578	258	200	LEFT
100	122	280	834	299	124	720	295	145	668		260	142	658	280	265	102	491	272	200	SIDE
	116	340		330				130	524		276	116	715	370	282	118	581	258	200	
	122	281		298				145	668		260	142	655	271	265	103	490	270	200	
	117	340		330				130	526		278	115	721	375	282	118	580	259		
	123	282		296				145	668		258	142	650	271	265	102	490	269		
									526				721	371		118	580	261		
									668				650	270		102	490	266		
																		261		
																		266		
100.00	119.1	31.04	85.20	31.40	11.50	72.25	28.95	13.76	5.966	DCA	26.82	12.88	6.861	3.219	27.34	11.00	5.351	2.642	200.0	
99.00	119.0	30.50	84.50	31.00	11.50	72.00	28.60	13.60	5.880	AC1	26.60	12.80	6.780	3.200	27.00	10.90	5.280	2.600	201.0	
99.00	119.0	30.50	84.50	31.00	11.50	72.00	28.60	13.60	5.880	AC2	26.60	12.80	6.780	3.200	27.00	10.90	5.280	2.590	200.0	
99.00	119.0	30.50	84.50	31.00	11.50	72.00	28.60	13.60	5.880	ACA	26.60	12.80	6.780	3.200	27.00	10.90	5.280	2.595	200.5	
37.50	44.66	46.56	31.95	47.10	43.12	27.09	43.42	51.60	44.75	RHO	40.23	48.30	51.46	42.25	68.35	70.71	70.24	55.49	1.000	DC CAL
1.3	.3	2.0	1.1	1.5	.2	.6	1.5	1.4	1.7	PFE	1.1	.9	1.5	.9	1.5	1.2	1.6	2.1	1.002	AC CAL
34	7	43	34	33	6	22	34	28	39	MCF	27	18	28	20	22	17	23	37		

6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	I	6.000	6.000	7.000	8.000	6.000	6.000	7.500	9.000	2.000	
120	101	306	149	290	141	165	360	144	931	DC	402	150	840	670	146	771	464	458	201	RIGHT
119	101	310	150	300	165	174	448	134	900		410	168	810	730	165	686	470	441	201	SIDE
					142			142	950				830	674	146	780	460	451	/	
					165			135	890				811	730	164	680	470	449	201	
					142			144	958				820	680	149	778	460	456	200	
					165			134	880				821	729	164	681	465	441		
					142			144	961				810	675	147	780	462	454		
					165			135	872				830	729	164	679	471	441		
119.5	101.0	30.80	149.5	29.50	15.34	169.5	40.40	13.89	9.201	DCA	40.60	15.90	8.196	7.025	15.57	7.300	4.649	4.488	200.7	
119.0	100.0	30.40	149.0	29.00	15.10	168.0	39.90	13.60	9.100	AC1	40.10	15.50	8.020	6.950	15.40	7.200	4.560	4.400	200.5	
119.0	100.0	30.40	149.0	29.00	15.10	168.0	39.90	13.60	9.100	AC2	40.10	15.50	8.030	6.950	15.40	7.200	4.560	4.400	200.5	
119.0	100.0	30.40	149.0	29.00	15.10	168.0	39.90	13.60	9.100	ACA	40.10	15.50	8.025	6.950	15.40	7.200	4.560	4.400	200.5	
44.65	37.73	46.03	55.85	44.08	57.32	63.33	60.37	51.90	68.75	RHO	60.67	59.40	52.49	68.89	58.17	54.55	48.64	62.60	.996	DC CAL
.3	.9	1.2	.2	1.6	1.5	.8	1.1	2.0	1.0	PFE	1.1	2.5	2.0	1.0	1.0	1.3	1.8	1.9	.999	AC CAL
7	23	26	4	36	26	12	19	39	14	MCF	18	41	38	14	17	23	38	30		

0871374

PINAL CO.
SANTA CRUZ RIVER
MARANA
RILLITO
CORTARO
CANADA DEL ORO
AVRA VALLEY
AVRA
TUCSON
SOUTH TUCSON
Rillito Creek
Pantano Wash
Big Wash
Brawley Wash
Viopulli Wash
Snyder Hill
San Xavier Mission
Schuchk
Viopuli
Three Points
SAN VICENTE
Sahuarita
Fresnal Wash
Twin Buttes
Continental
HELVETIA
Chiuli Shaik
Pitoikom
Bolo Blancas Wash
ALTER VALLEY
FERRO
MOUNT
Arivaca Junction
AMADO
AGUIRRE LAKE
TUBAC
ARIVACA
CARMEN
Tumacacori Mission
CALABASAS
NOGALES
Pozo Verde Mountains
Saspe

Mary G Mine

Geology of the Mary G. Mine Area
Pima Co Ariz

Robert E Davis - 1955
U of A MS Thesis

p16 faulting predominately NE & NW
some E-W faulting - mineralization is
more conspicous in this set of faults

p17 2 volcanic flows
qtz latite is either
red-tan, porphyritic

p 23 propylitic alt. - Andesite porphyry - gray-green
epidote - green color.

p27 2 parallel dikes - Andesite porphyry
N-S - 1000' E Mary G.
med gray purely porphyritic
propylitic alt.

p29 Latite congl.
qtz latite porphyry fragments
rounded qtzite
weathers to rounded knobs
rounded cobbles & blocks of qtzite on surface
weathered out
exposed well 2000 S-SE of mine
p30 - between two flows
arkose matrix
p31 qtzite dark gray to black

p33 faults
NE, NW, EW

EW - little movement
qtz carbonate mineralization & oxidation
of andesite porphyry wall brick red
most common in this set of faults

High angle Normal faults
post andesite
fault ages not clear - prob NE & NW sometime

p44 ore deposits
silver, some lead, minor copper & Mercury

ore zone in andesite porphyry - red
main fault N 10 E 45° dip W
X faults from N 40° E to N 60° W - usual dip North
mineralization at intersections
silver sulfide ore - stringers veins - few inches to 2' wide
pinch & swell rapidly

ore - fine to coarse galena
gangue - milky qtz.
all partially oxidized

cinnabar - scales & xtals in qtz cavities

silver in galena

Dispersion patterns as a possible guide to ore deposits in the Cerro Colorado District, Pima County Arizona
M.A. Chaffee - 1964
U of A MS Thesis

p5 Qtz latite Porhyry
light - drk gray - redstain
p6 qtz eyes

p8 Andesite Porphyry Flow Rx
rounded hills

p9 3 phases
normal
Agglomerate - breccia
mafic
gray-greenish gray to tan
propylitized

p11 epidote & chlorite present - pyrite in one specimen

agglomerate more than breccia
breccia-angular fragments to subangular
to several inches long

p13 mafic - more hornblende - 40-50%

p13 Andesite porphyry dikes
N 60°-80° E preferred orientation
steep dip
p14 more qtz than flow rx

p15 Rhyolite Dikes
intrude all rock types
1-5' wide
narrow white ridges
NE trend

nearly white in field, positive relief
flow folds red, green black bands - thin

p16 Sedimentary R/
latite congl (Davis 1955)
Conglomerate I (Jones 1957)

qtzite float - indicates area
20-40% light to dk gray qtzite

p19 Structure
Dominant pattern
N60°-90° E - major
N45° W - minor

dips vertical to very steep

All mineralization in region assoc
with veins

p24 Silver Hill Area - N slope - flow-dike contact
- principal veins N60° E & dip 25° SE
altered & bleached andesite porphyry flow rk
- main qtz 1-6" wide
tetrahedrite, sphalerite galena, malachite
azurite & yellow to red to dk brown
Fe & Mn oxides - primary sulfides
within 30' of surface

p25 1700' SE another incline - entirely in andesite flow
principal qtz vein strikes N & dips 30° W
vein 4-12" - qtz vuggy
primary minerals - small amts galena & sphalerite
deep brick-red gossan in deeper workings
malachite present all over - Mn & Fe oxides

p26 cetrol present may indicate some cinnabar recovery

Mary C Mine

veins assoc - faults or fractures in
andesite porphyry country rock
West one at intersection of above
Main zone N10°E & dip 45° W
Iron rich dark red andesite porphyry near
veins underground.
galena, tetrahedrite, anglesite, cerrusite
malachite & cinnabar

p27 Liberty Mine Area
near contact andesite porphyry flow
N & andesite porphyry dike
other shafts & pits along same contact
no mineral or qtz seen on dump

p27 Relation of deposits to Regional Structure
N & N 60°-90° E

p28 Hg & Ag in tetrahedrite
cinnabar seen in gossans in small amts

p37 ore deposits prob. epithermal

Geology of the Ruby Star Ranch Area
Twin Buttes Mining District, Pima County, Arizona
Saw Clarence Thacpaw, 1960
U of A MS Thesis

Geology of the Cerro Colorado Mining
District Pima County Arizona
R. D. Jones 1957
U of A MS Thesis

p19 Qtz latite Porphyry
porphyritic rx - rhyolite to qtz latite porph. in
northern part of area
field appearance is that of rhyolite porph.
prob. different phases of same material

p23 Qtz porphyry
dike rock & sills - qtz eyes
few feet to 500'
white to light gray color

p24 Rhyolite
intruded into ss. in north. part of area

Felsite
dike fine grained light color rock
near Rancho Seco buildings

Qtz Diorite
restricted to extreme NW part of Thesis area

p29 Qtz diorite
light gray - fresh
yellowish - greenish gray - weathered - to spheroidal blocks

Granodiorite
dikes intrude qtz diorite - also Qtz latite porph
no qtz visible in hand specimen - looks like Monzonite
pale to grayish red - fresh & weathered

*Host rock apparently warm at time of intrusion as no chilled borders.

p30 Andesite Porphyry
most abundant of in Cerro Colo Dist
as flows
~~sills~~ intrudes SS & qtz latite
hand specimens light to dark to greenish gray
fresh surface brownish to greenish gray
bleached white where hydrothermal alt.

p33 Flow Breccia & Agglomerate
both are made up of andesite porph.

p38 ~~Faults~~ Structural Geology
Four structural trends
E-W - dominant (dikes, sill influenced & Mineralization
NW - faults veins dikes
NE - dikes veins faults
NNW dikes veins faults bedding & flow structure
tight synclinal fold - axis trends N10-20° W
in sed of in N parts of district.

p 33-34 Faults

E-W faults

N. Boundary faults

trend N 80°-90° E - zone
north side of area
topo truncated by it - structures
which intersect it seem to be terminated
by it. Brecciation & Fe staining
are common near fault zone &
increase in intensity near it
Photos - traceable for 3 miles for sure
and more with less certainty
nearly east west at north edge
of area but seems to swing more
toward W-NW west of this area

South Boundary Fault

nearly parallel to N Boundary fault
in a wash at S boundary of Mapped area
not as much fracturing as N fault

other smaller E-W faults - dip N & S 60-80°

NW Faults

almost Vertical dips

NE Faults

mostly S. part of area - mostly shears
filled with qtz - NW corner area also
has dikes along them
this trend also shows SW of area

N-S faults
due N to N 20° W
dips < 80°
recurrent movement - shattering & slickensides
on dikes & sills intruded along this trend

Thrust faulting
only at Block Princess Mine - Breccia
area - N 85° W dip 20-40° S -

p54 Economic Geol.
many small mines, one major - Cerro Colorado
or Hentzdman Mine

Principal Mineralization
E-W & NE shears & faults
No sulfides at surface but show up
50-70' deep

Ariz Bureau of Mines Rpt
Cerro Colo. Mine
lodes follow two directions
N 65° E & N 30° W
veins 5-20" - tetrahedrite & cerargyrite
surface structure
N- 60-65° E & N 85° W
surface mineralization hematite stain &
drusy qtz.

r
Mary G Mine
2 shafts with drifts on 135' & 170' levels
are at intersection of mineralized fault
N 10° E & dip 45° W - x faults N 40° E to N 60° W
galena

EXPLANATION

QUATERNARY

- Qal — Alluvium
- Qc — Conglomerate

TERTIARY (?)

- Tb — Basalt
- Ttc — Tuffaceous conglomerate
- Taw, Tag, Tav, Tac — Ash flow complex
  Taw, welded tuff; Tag, perlitic glass; Tac, crystal tuff; Tav, rhyolite vitrophyre
- Tlt — Lithic tuff
- Tr — Rhyolite
- Tlp — Latite porphyry
- Tap — Andesite porphyry

CRETACEOUS (?)

- Ks — Sedimentary rock

PRECAMBRIAN (?)

- P€g — Granite

Contact, dashed where approximately located

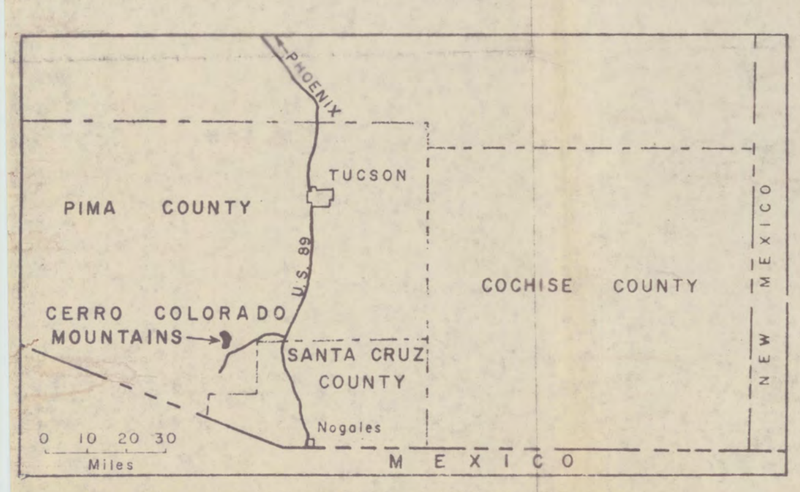
Fault, showing dip; dashed where approximately located; dotted where concealed; U, upthrown side; D, downthrown side

Gravity slide block; barbs on side of slide mass

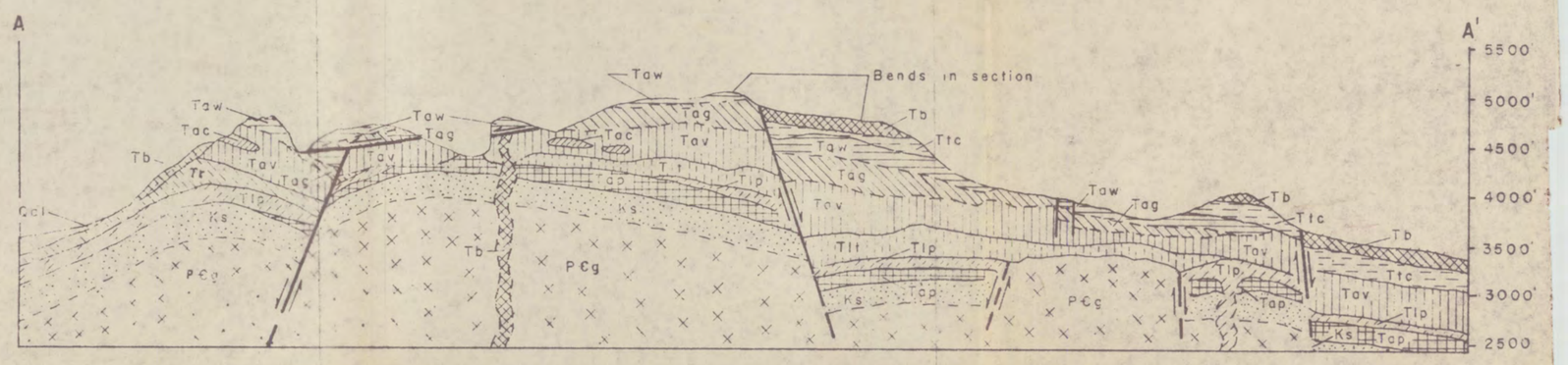
27 — Dip and strike of beds

Anticlinal axis, showing direction of plunge

Volcanic vent

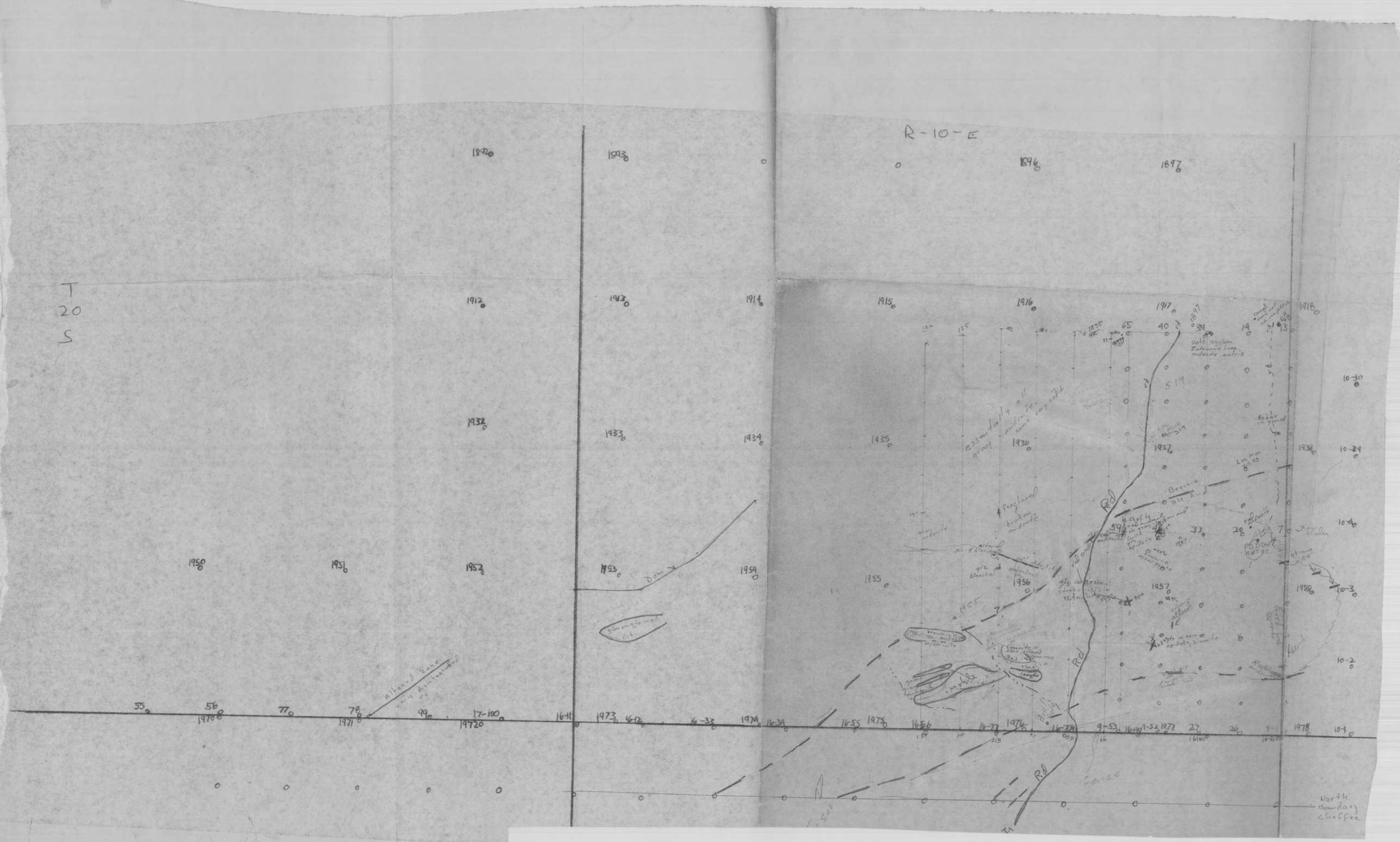


INDEX MAP OF SOUTHEASTERN ARIZONA



5000 0 5000
Scale in feet

GEOLOGIC MAP OF THE CERRO COLORADO MOUNTAINS
PIMA COUNTY, ARIZONA



R E Kay
326-2845

Structures of the
Cerro Colorado Mining District
R. D. Jones
1957

LEGEND

IGNEOUS ROCKS

- Andesite Flow Breccia & Agglomerate
- Andesite Porphyry
- "Black Princess Breccia"
- Quartz Porphyry
- Rhyolite
- Felsite
- Quartz Latite Porphyry
- Granodiorite
- Quartz Diorite

SEDIMENTARY ROCKS

- Conglomerate I
- Conglomerate II
- Limestone
- Sandstone

FAULTS

Definite — Inferred

VEINS

Definite — Inferred

CONTACTS

DIP & STRIKE

DRAINAGE

ROADS

BUILDINGS

PROSPECT — MINE

NOTE - Scattered outcrops indicated by colored slash marks

1/14080

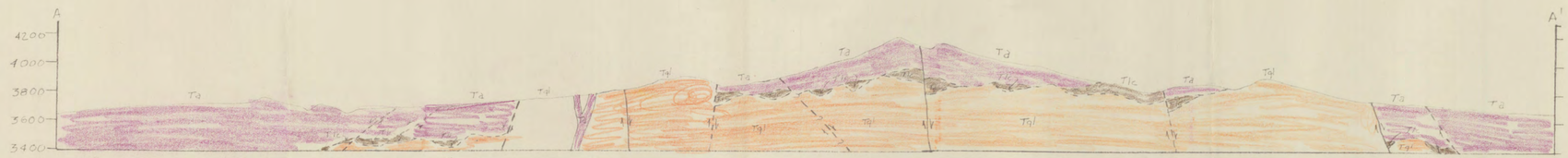
0 1/8 1/4 1/2 1 MILE

Field Copy

GEOLOGY BY R D JONES 1957
M.S. Thesis

Geologic Map of the Cerro Colorado Mining District

GEOLOGY BY ROBERT E DAVIS
1948-49



ANDESITE AND ANDESITE PORPHYRY

LATITE CONGLOMERATE

QUARTZ LATITE PORPHYRY

FAULT
(DASHED WHERE APPROXIMATE)

PROBABLE FAULT

MINERALIZED VEIN

X
PROSPECT PIT

GEOLOGIC MAP AND SECTION OF THE MARY G MINE AREA, PIMA COUNTY, ARIZONA

500 300 0 500 1000

N MN
14°

GEOCHEMICAL SURVEYS

Data Sheet

Subject Mercury

Prospect Sierrita - Sec. 17 Drill

Date 1-24,25-68

County Pima State Arizona

Form No. 147 Drill Samples

Sample No.	Hg/PPB			Sample No.	Hg/PPB				
68	1690			155	90				
87	2,225 ✓			61A	185 ✓				
124	3,862			62A	50				
125	1,565			63A	70				
126	1,315			64A	NS				
127	269			65A	1025 ✓				
128	1,225			90A	555 ✓				
129	2,700								
130	NS								
131	NS								
132	1,800								
133	NS								
134	1,170								
135	5125								
136	1185								
137	6200								
138	NS								
139	NS								
140	NS								
141	NS								
142	NS								
143	NS								
144	NS								
145	595								
146	160								
147	1525								
148	NS								
149	485								
150	1115								
151	70								
152	140								
153	105								
154	341								

GEOCHEMICAL SURVEYS

Data Sheet

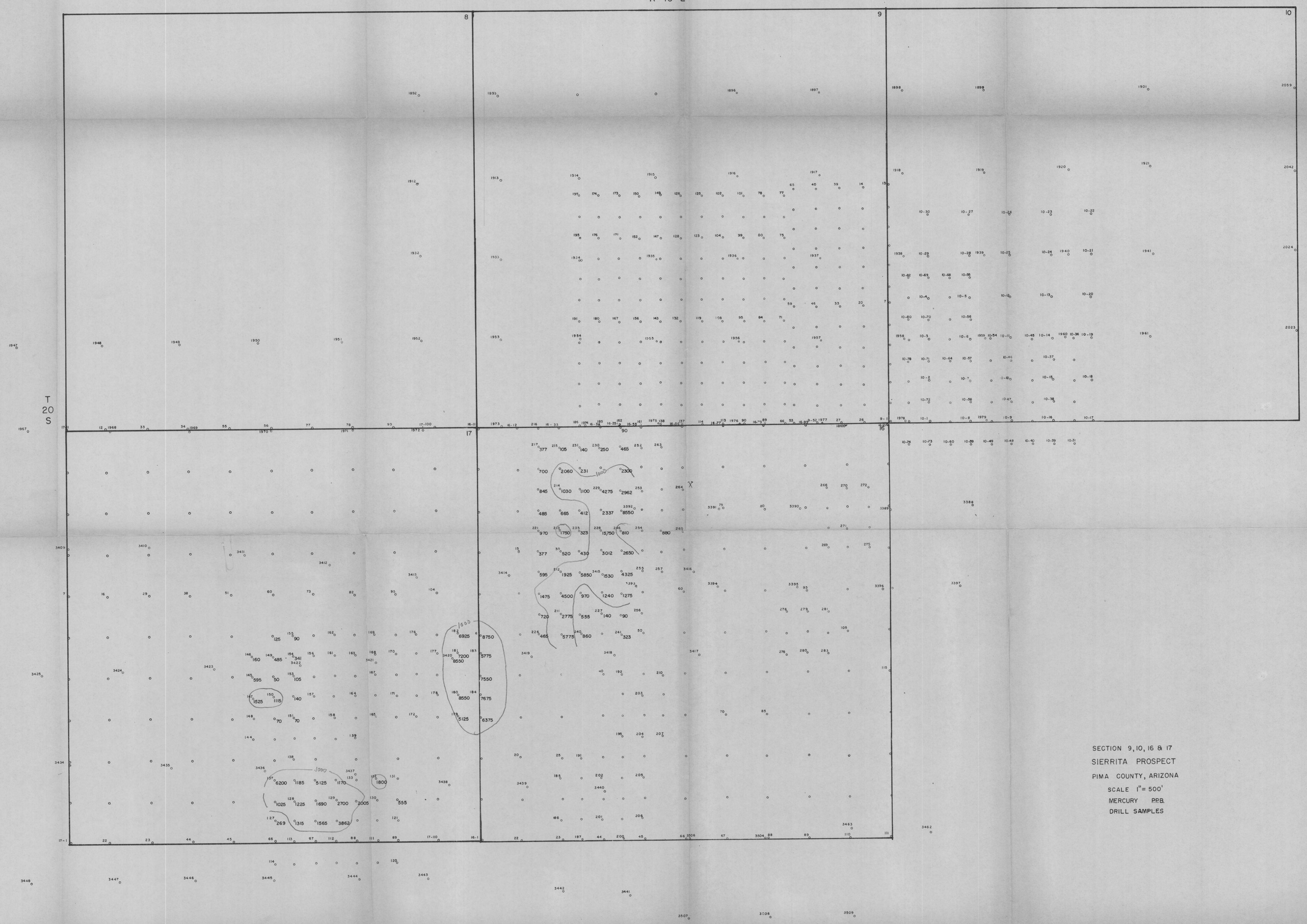
Subject Mercury Prospect Drill Sierrita - Sec. 16

Date 1/25/68 County Pima State Arizona

Form No. 147 Drill Samples.

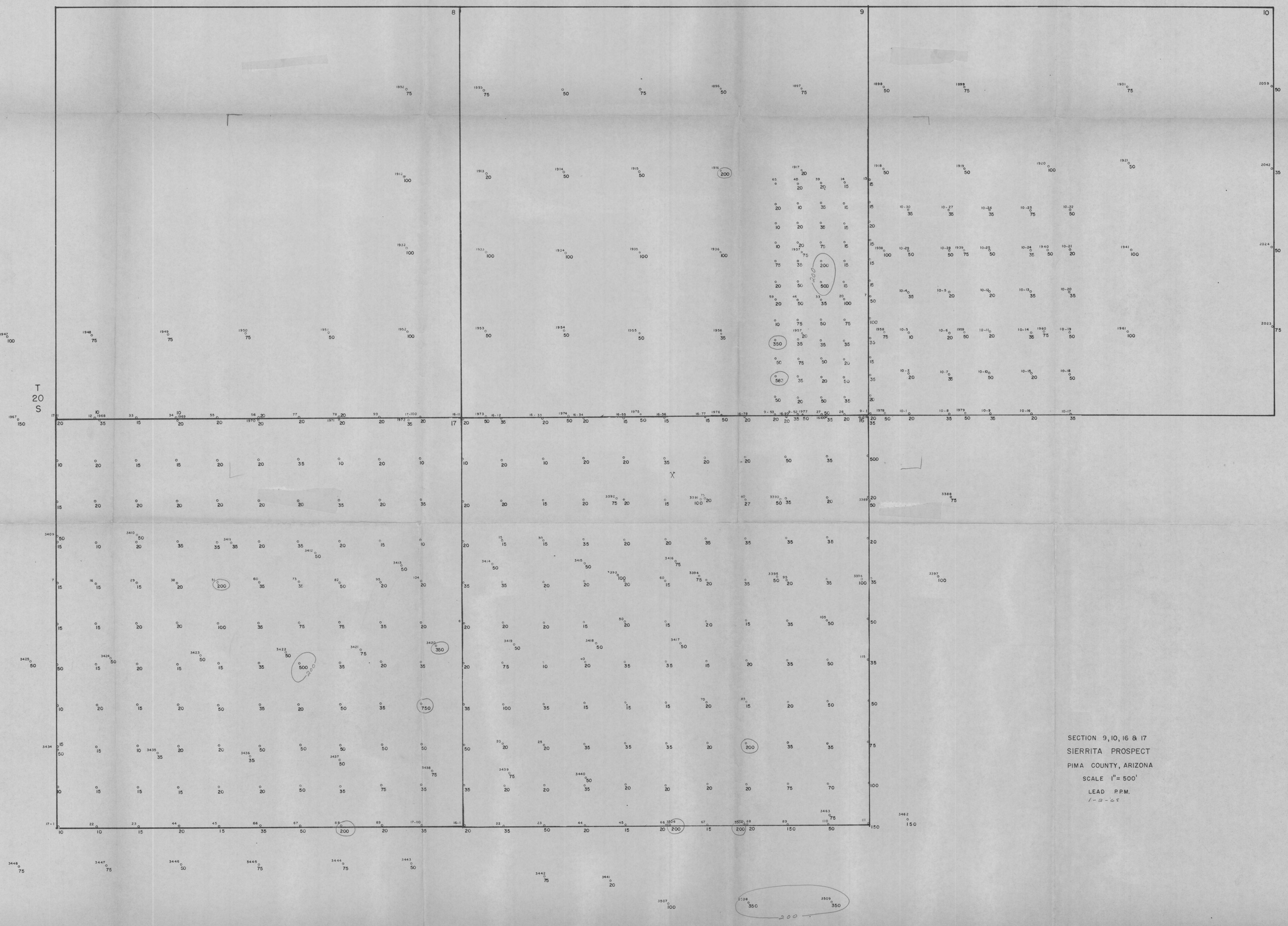
mple No.	Hg/PPB			Sample No.	Hg/PPB				
179	5,125			237	5,850				
180	8,550			238	970				
181	7,200			239	555				
182	6,925			240	860				
183	5,775			241	323				
184	7,675			242	90				
				243	1,275				
211	2,775			244	4,325				
212	1,925			245	2,650				
213	1,750			246	810				
214	1,030			247	8,550				
215	105			248	2,962				
216	NS			249	2,300				
217	377			250	465				
218	700			251	90				
219	845								
220	485			4A	6,375				
221	970			5A	7,550				
222	377			6A	8750				
223	595			28A	5775				
224	1,475			29A	4500				
225	720			30A	520				
226	465			31A	665				
227	140			32A	2,060				
228	15,750			36A	2337				
229	4,275			37A	3012				
230	250			38A	1,240				
231	140								
232	231			239	980				
233	1100								
234	412			341.5A	1,530				
235	323			342A	8,550 ✓				
236	430								

R-10-E



SECTION 9, 10, 16 & 17
SIERRITA PROSPECT
PIMA COUNTY, ARIZONA
SCALE 1" = 500'
MERCURY P.P.B.
DRILL SAMPLES

R-10-E



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SIERRITA PROSPECT
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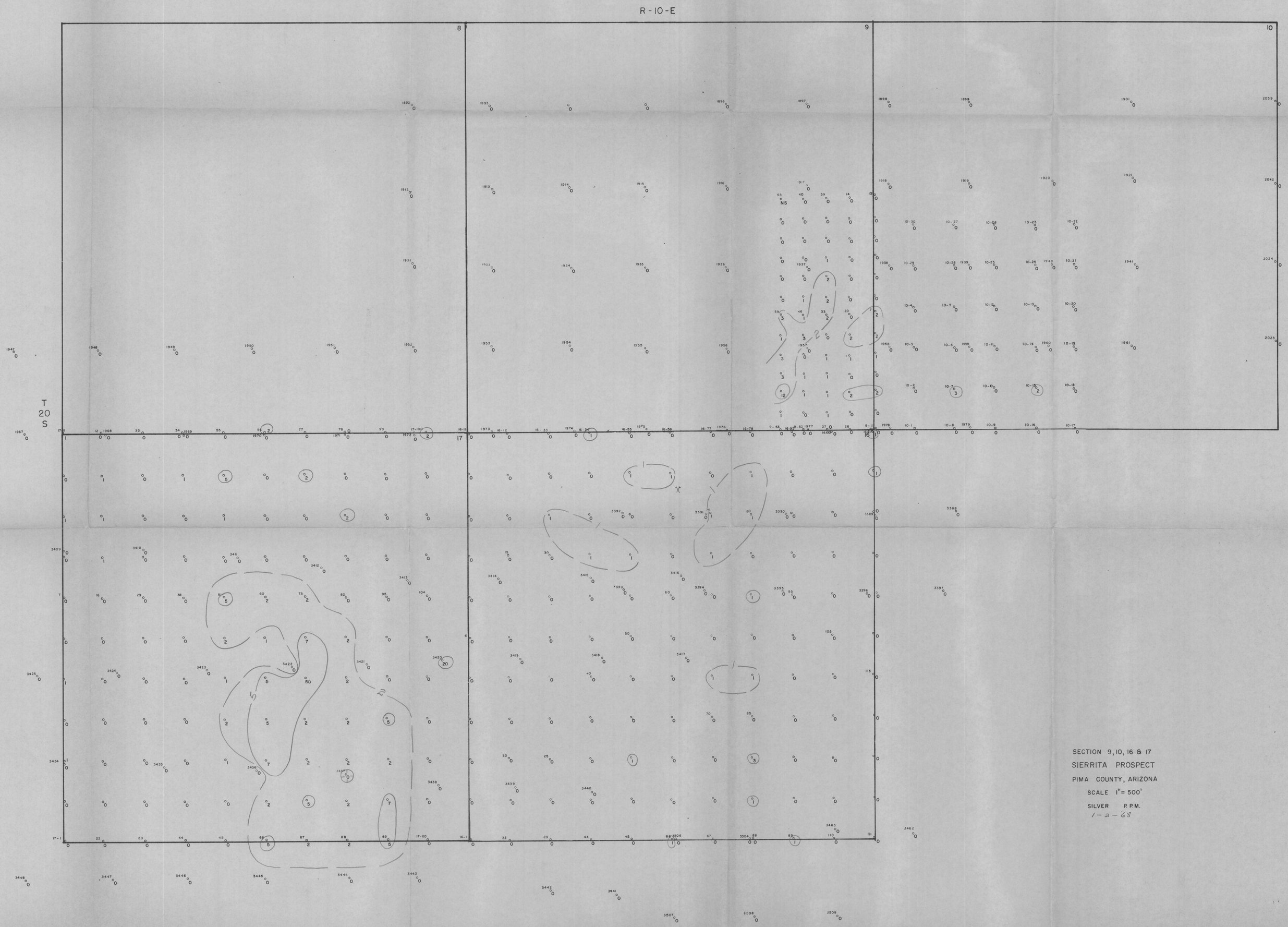
LEAD P.P.M.
1-12-68



SECTION 9, 10, 16 & 17
SIERRITA PROSPECT
PIMA COUNTY, ARIZONA
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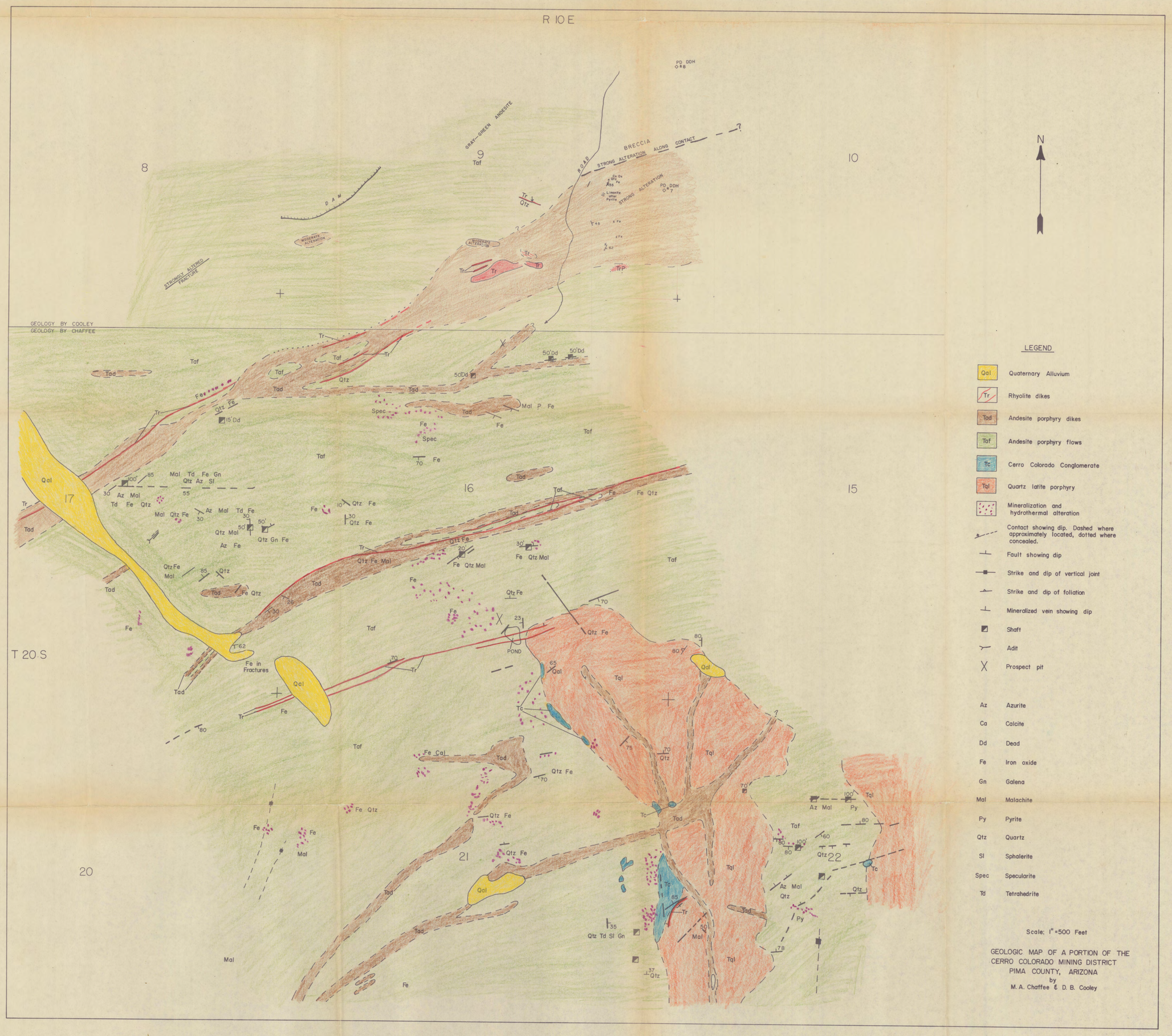
SILVER P.P.M.
1-2-68


R 10 E
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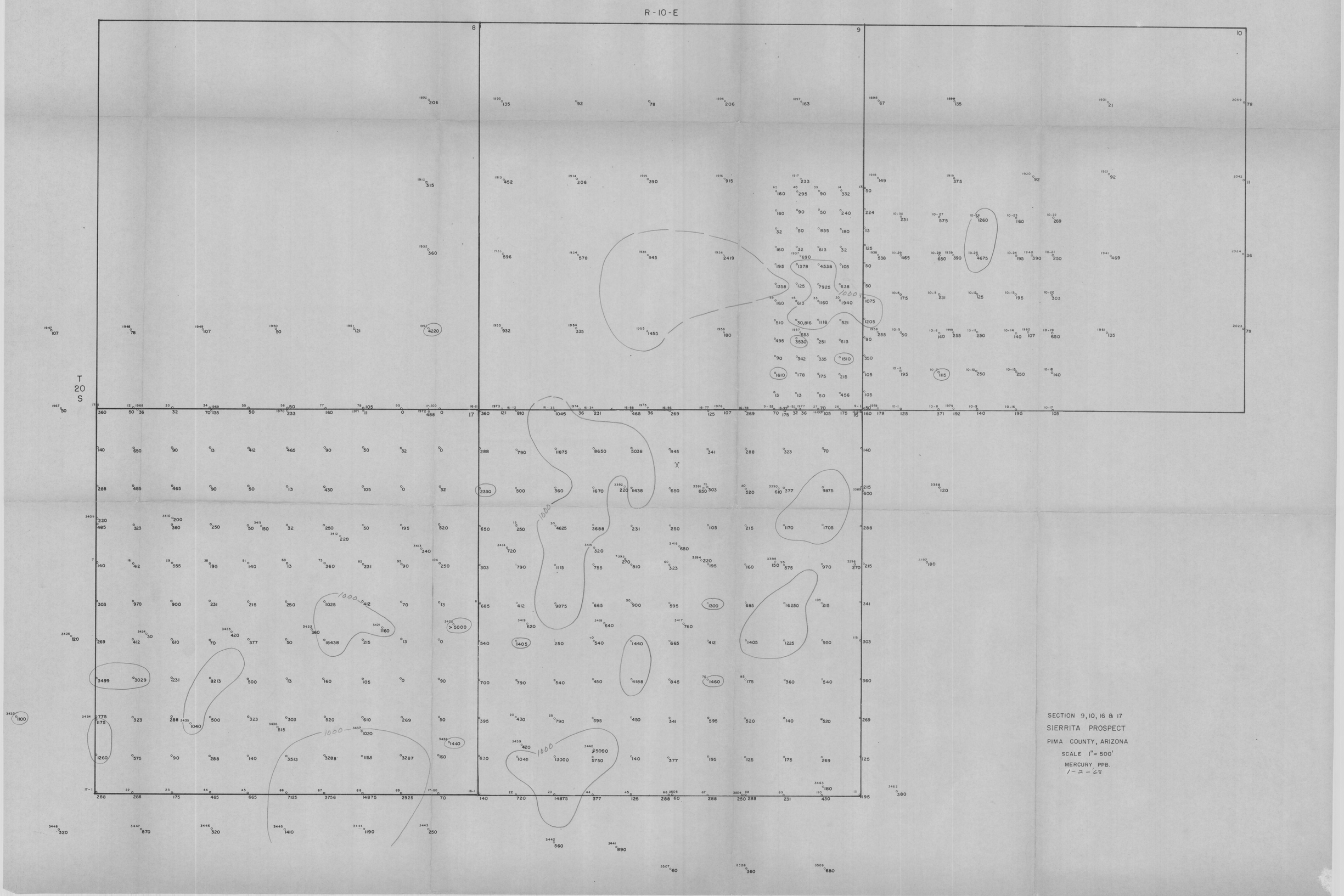
GEOLOGY BY COOLEY
GEOLOGY BY CHAFFEE
GRAY-GREEN ANDESITE
DAM
MODERATE ALTERATION
STRONGLY ALTERED FRACTURE
ROAD
BRECCIA
STRONG ALTERATION ALONG CONTACT
STRONG ALTERATION
PD DDH 8
PD DDH 7
POND
Fe in Fractures
LEGEND
Qal Quaternary Alluvium
Tr Rhyolite dikes
Tad Andesite porphyry dikes
Taf Andesite porphyry flows
Tc Cerro Colorado Conglomerate
Tql Quartz latite porphyry
Mineralization and hydrothermal alteration
Contact showing dip. Dashed where approximately located, dotted where concealed.
Fault showing dip
Strike and dip of vertical joint
Strike and dip of foliation
Mineralized vein showing dip
Shaft
Adit
Prospect pit
Az Azurite
Ca Calcite
Dd Dead
Fe Iron oxide
Gn Galena
Mal Malachite
Py Pyrite
Qtz Quartz
Sl Sphalerite
Spec Specularite
Td Tetrahedrite
Scale: 1" = 500 Feet
GEOLOGIC MAP OF A PORTION OF THE CERRO COLORADO MINING DISTRICT PIMA COUNTY, ARIZONA
by
M. A. Chaffee & D. B. Cooley



SECTION 9, 10, 16 & 17
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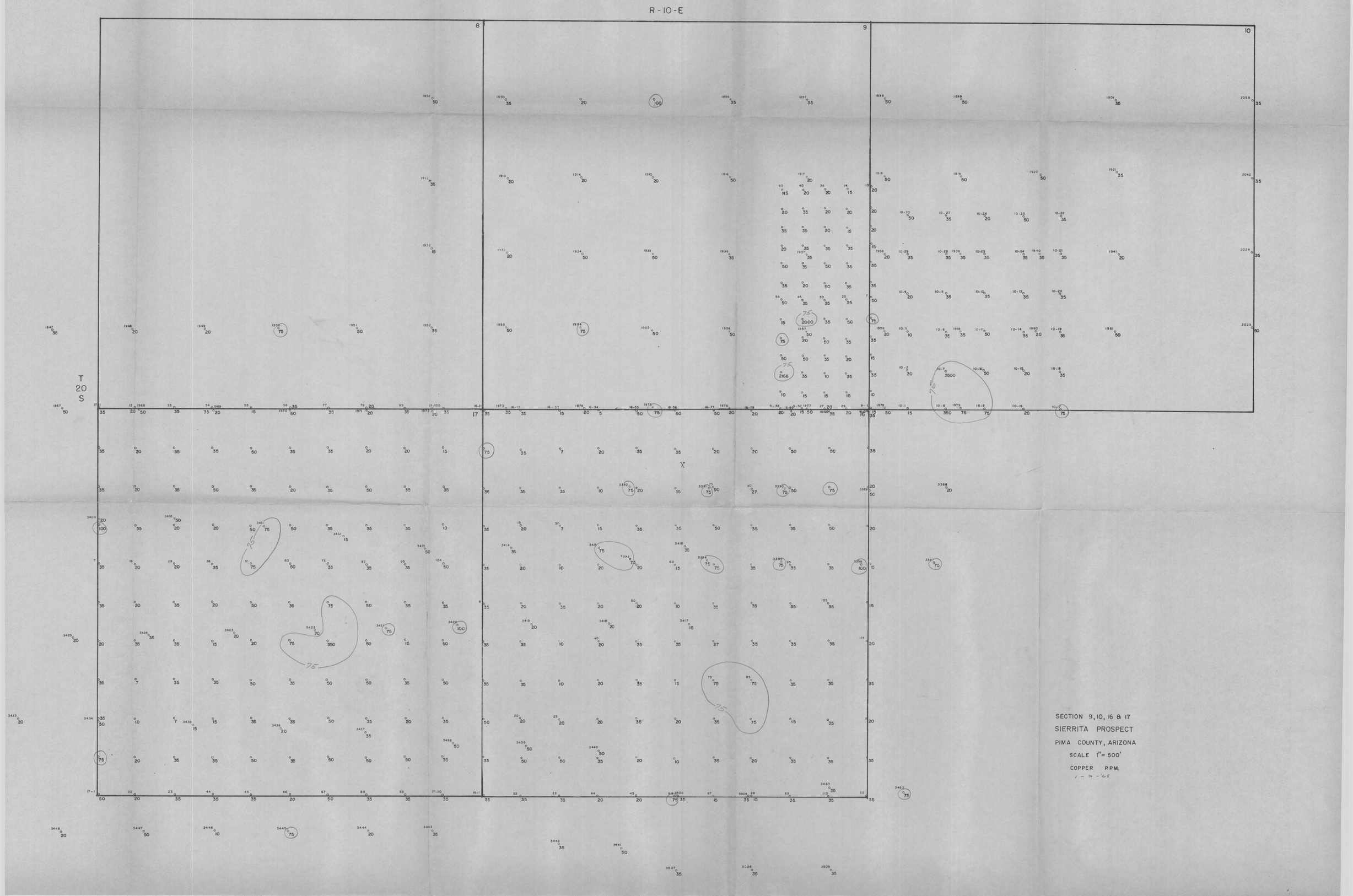
MERCURY PPB.
1-2-68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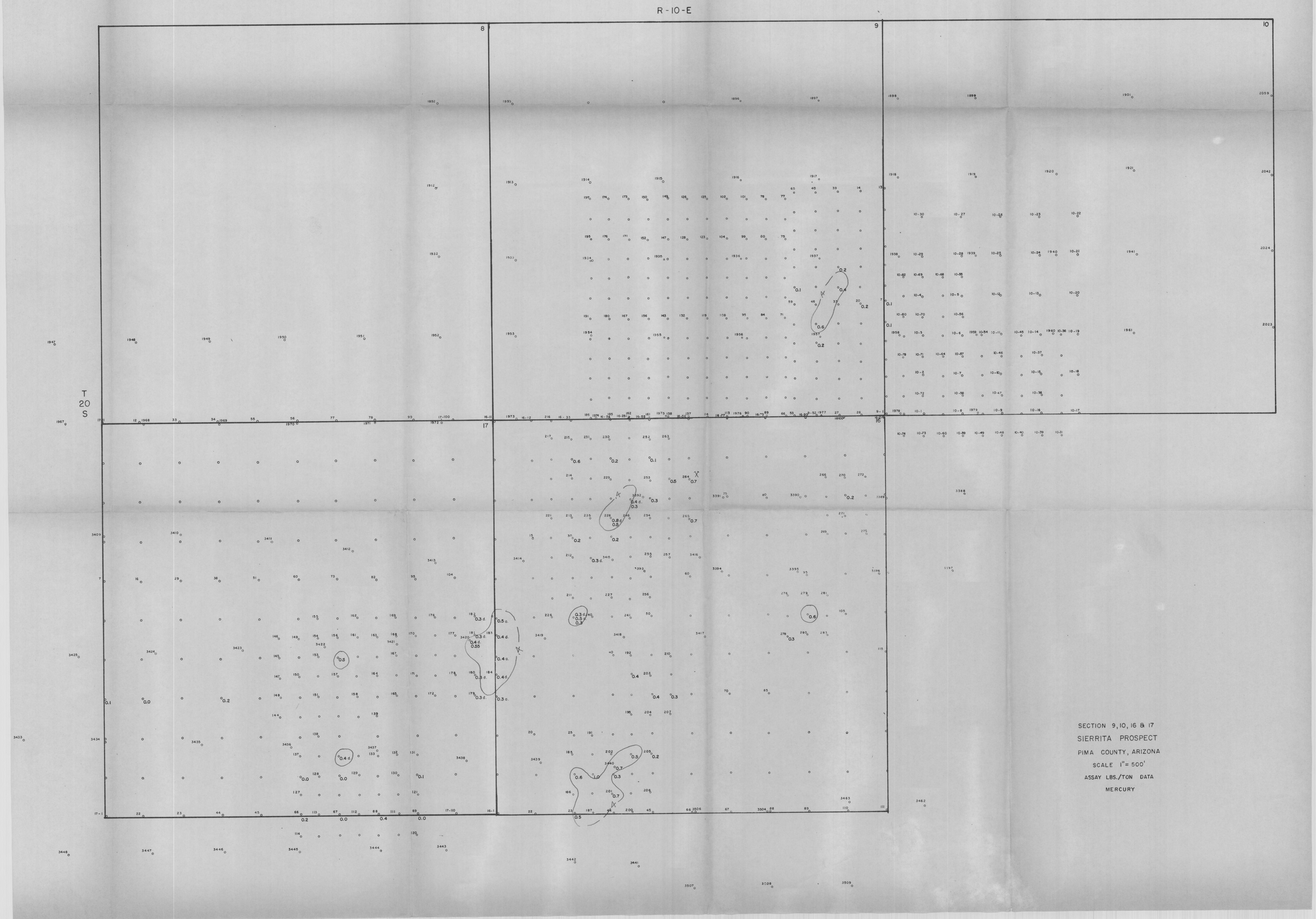
SECTION 9, 10, 16 & 17
SIERRITA PROSPECT
PIMA COUNTY, ARIZONA
SCALE 1" = 500'
COPPER P.P.M.
1-3-68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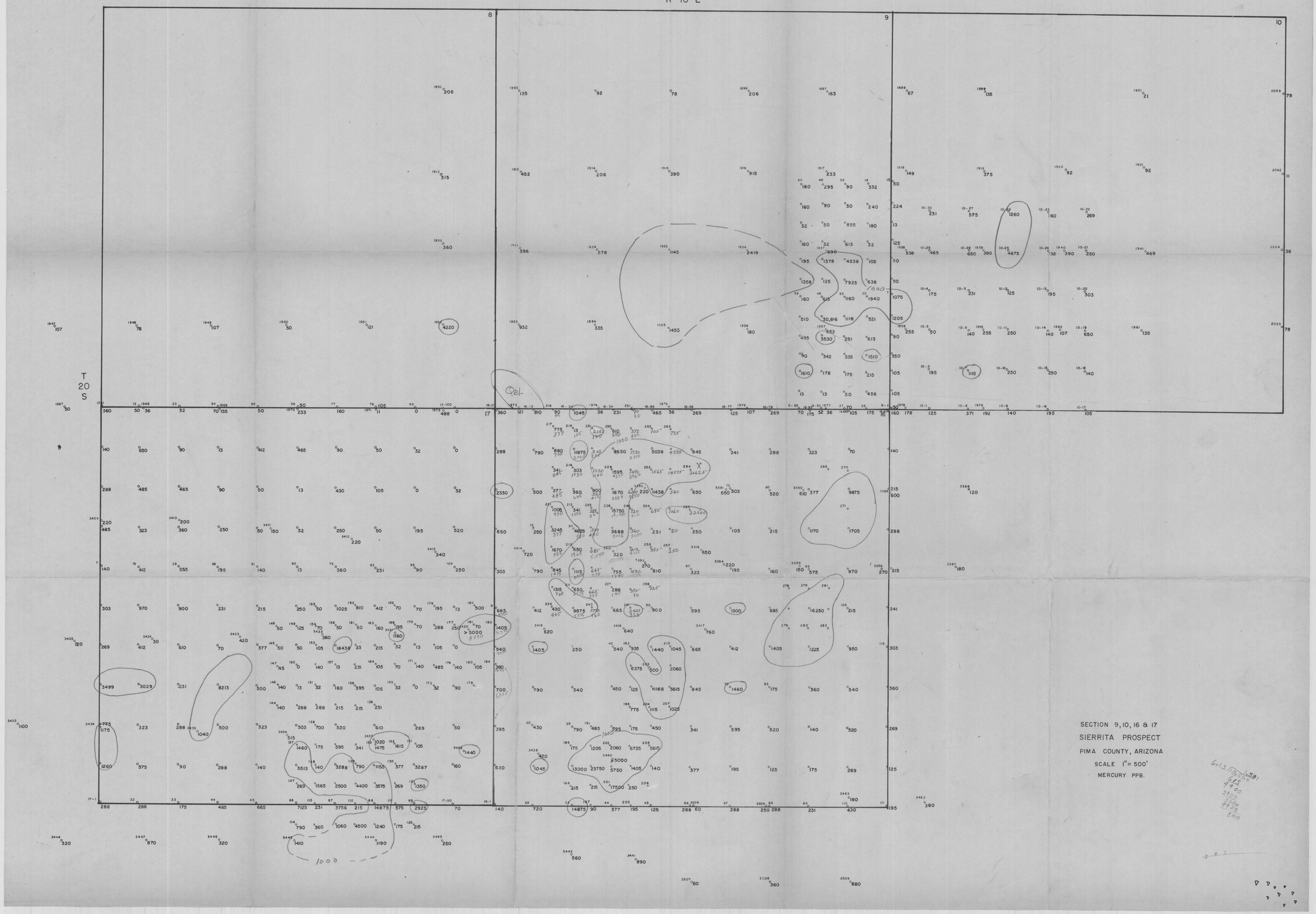
SECTION 9, 10, 16 & 17
SIERRITA PROSPECT
PIMA COUNTY, ARIZONA
SCALE 1" = 500'
ASSAY LBS./TON DATA
MERCURY

R-10-E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SECTION 9, 10, 16 & 17
SIERRITA PROSPECT
PIMA COUNTY, ARIZONA
SCALE 1" = 500'
MERCURY PPB.

HEINRICHS

GEOEX

GEOPHYSICAL ENGINEERS

TUCSON, ARIZONA

INDUCED POLARIZATION, RESISTIVITY AND SELF POTENTIAL SURVEY SILVER HILL AREA PIMA COUNTY, ARIZONA

For

Geochemical Surveys

May - 1968

By

Heinrichs Geoexploration Company
P. O. Box 5671 Tucson, Arizona 85703
Phone: 623-0578 Area Code: 602

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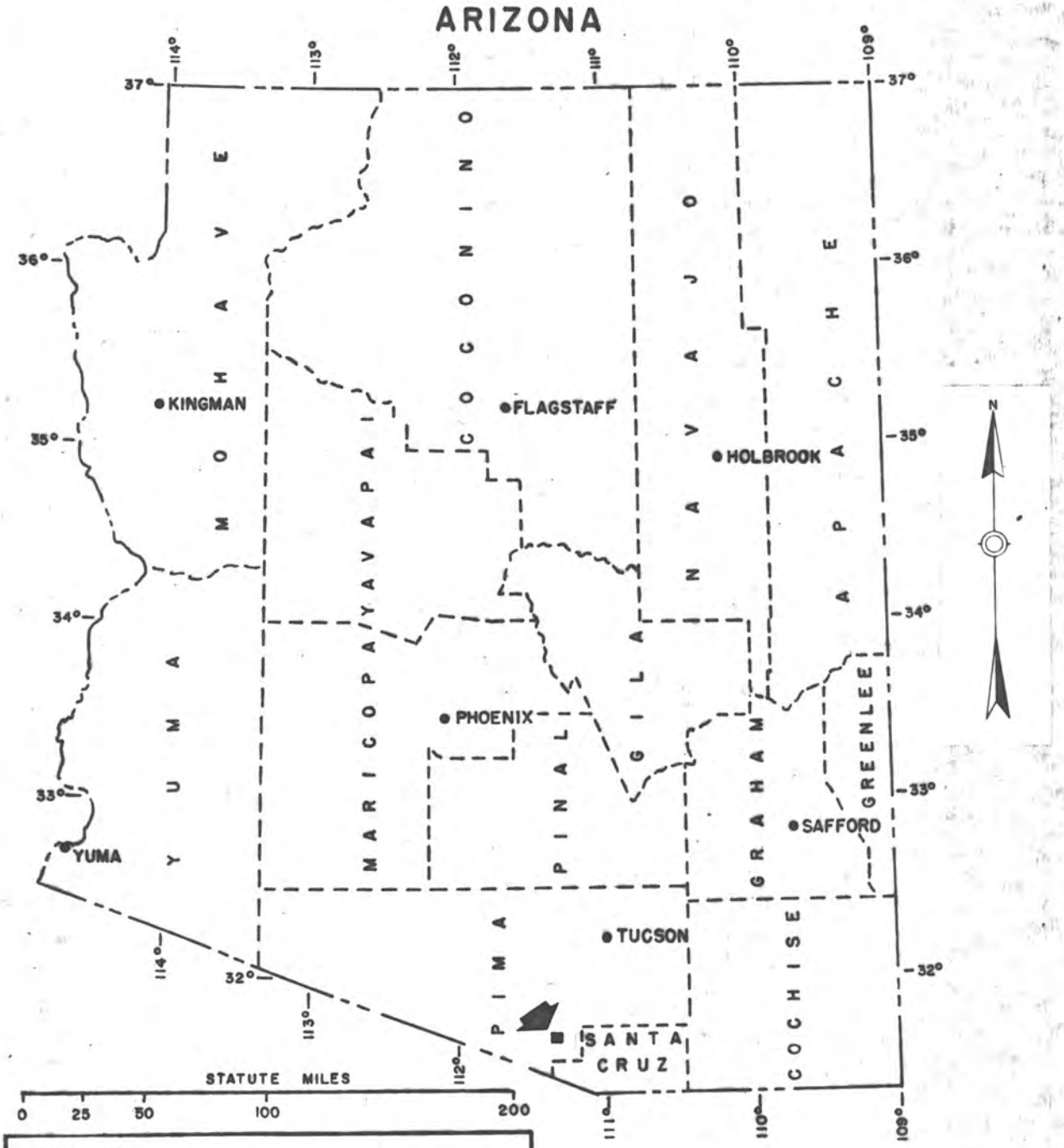
CONCLUSIONS, RECOMMENDATIONS AND INTERPRETATION	1
PHOTO CENTER INDEX	
IN MAP POCKET: (Total: 4 pieces)	
Induced Polarization Location Plan	
Sectional Data Sheets	
Line 1 (a=750')	
Line 2 (a=250')	

GENERAL LOCATION OF
SILVER HILL AREA
for
GEOCHEMICAL SURVEYS
ARIZONA



HEINRICHS
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GEOPHYSICAL ENGINEERS
BOX 5671 TUCSON, ARIZONA 85703
PH: 602/623-0578 CABLE: GEOEX, TUCSON
SYDNEY VANCOUVER

INTRODUCTION

At the request of Mr. W. R. Ransone of Geochemical Surveys, Heinrichs Geoexploration Company conducted and completed an induced polarization test over a strong geochemical mercury anomaly in the Silver Hill Area, Pima County, Arizona. The field work was surveyed during the interim April 18 and April 24, 1968.

Line 1 and 2 were both oriented east-west with a common center. Line 1 utilized an electrode spacing of 750 feet and Line 2 a 250 foot spacing. The dual frequency system was used on a collinear dipole-dipole array on frequencies of 0.15 and 1.0 Hz.

The data are presented on sectional data sheets, one for each line. The line locations are shown on an overlay to a portion of Mr. Cooley's geology map to show the location of the survey with respect to the zones of alteration, breccia contact and the old workings and geochemical mercury anomalism. Also included is an overlay to the U.S.G.S. Arivaca Quadrangle, showing the aerial photograph centers we flew on February 2, 1968.

Heinrichs personnel involved in the field work were J. King, geophysical crew chief, D. McCoy and D. Carlson, technical assistants. Report and interpretation by Chris S. Ludwig, Senior Geophysicist with the assistance of the Geoex staff.

CONCLUSIONS, RECOMMENDATIONS AND INTERPRETATION

Neither line shows any polarization response above background. This implies that no significant zones of sulfide occur in the vicinity of the lines down to about 1,000 feet on Line 1 and 300 feet on Line 2. However, it is possible that minor narrow sulfide veins could be missed with the I.P. but they would

probably have to aggregate in width considerably less than one-tenth of the dipole spacing or be very low in sulfide content.

The resistivity on Line 1 is rather uniform both with depth and laterally. The near surface resistivity decreases somewhat to the west probably due to increased alluvial thickness. The self potentials are quite flat and suggest a lack of significant quantities of oxidizing sulfides within several hundred feet of the surface, in accordance with the I.P. information.

Line 2 electrically sampled the central part of Line 1 in more detail (but less depth penetration) and shows an electrical interface in the resistivity near 1.25W which is possibly related to the breccia contact or perhaps a structure associated with the prospect pits near center. The more detailed self potential information on this line still shows only minor background variations of no significance.

The lack of sulfide indications in this vicinity is discouraging but the area is still interesting on the basis of the strong geochemical response, particularly in mercury. Drilling is recommended on the stronger geochemical anomalism to determine the vertical distribution of the mercury. Geochemical or even ore quantities of mercury would not necessarily respond to I.P. unless associated with pyrite or other polarizable minerals.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

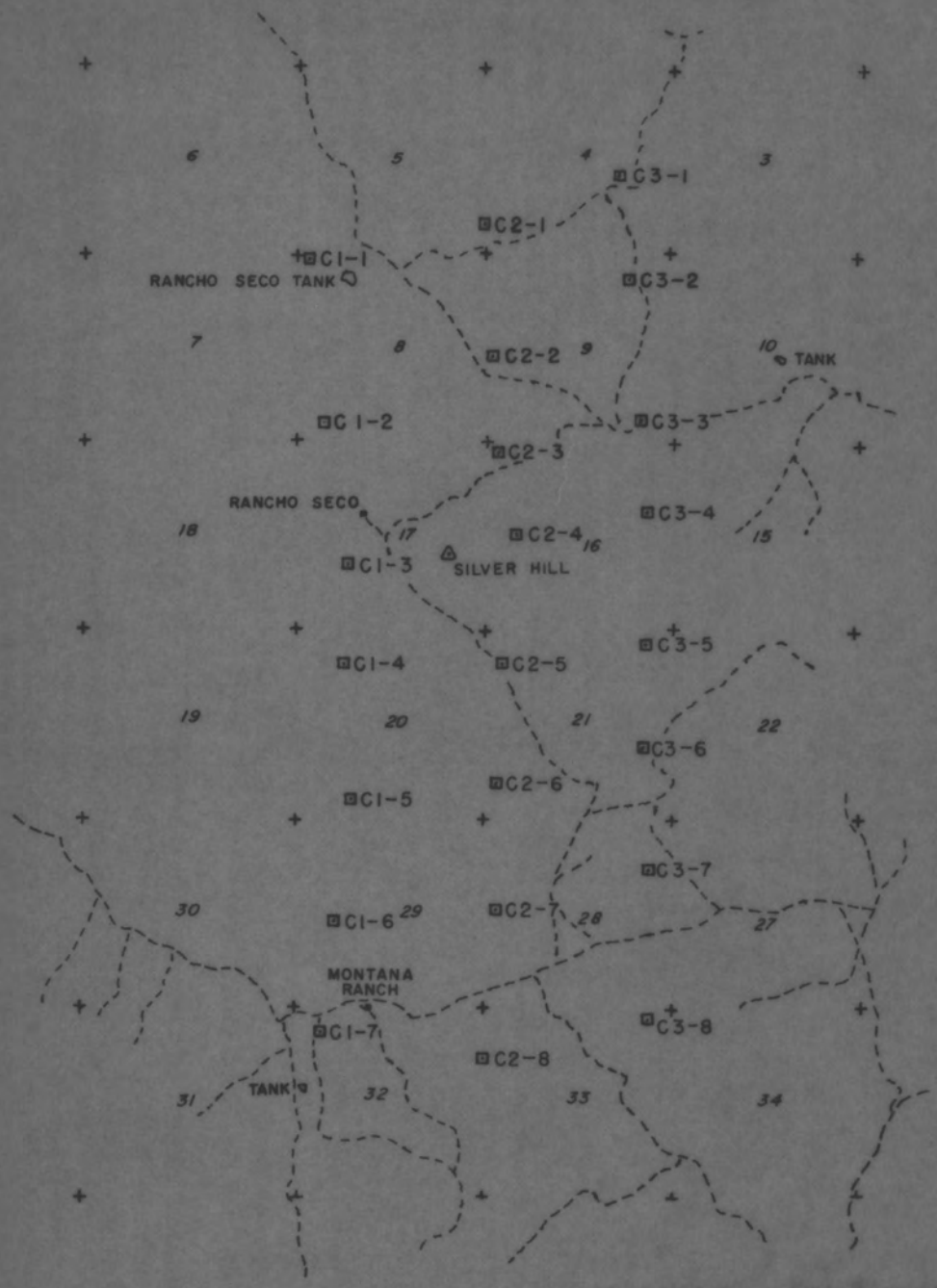
Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

May 7, 1968
Tucson, Arizona

PHOTO CENTER INDEX
SILVER HILL AREA
PIMA COUNTY, ARIZONA
FOR
GEOCHEMICAL SURVEYS
APRIL 1968

OVERLAYS U.S.G.S. ARIVACA QUADRANGLE MAP



T. 20 S. | R. 10 E.
G. & S.R. B. & M.

N

SCALE: 1:62500

LEGEND

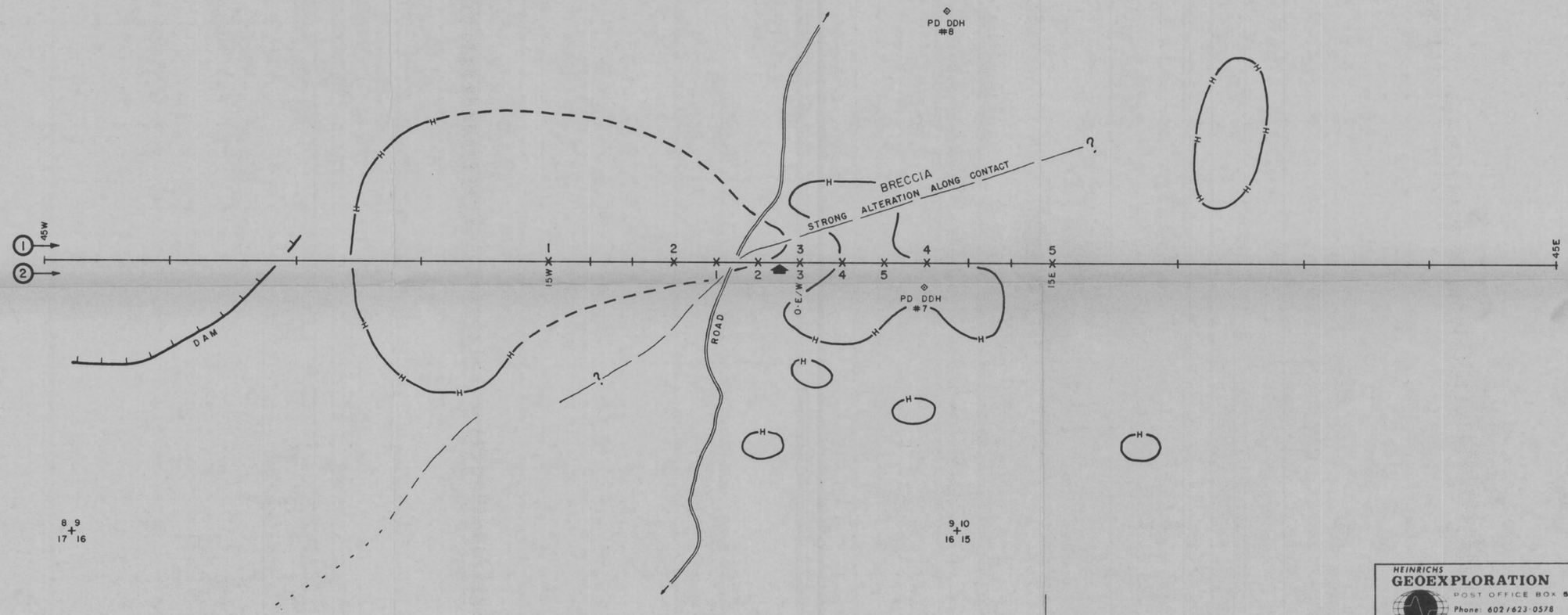
⊡ C2-6 PHOTO CENTERS AS FLOWN ON 2-2-68 AT 1" = 1000' ±

\+ SECTION CORNER

ROADS

HEINRICHS
GEOEXPLORATION COMPANY
POST OFFICE BOX 5671, TUCSON, ARIZONA, 85703
Phone: 602/623-0578 Cable: "GEOEX, Tucson
geophysical engineers
vancouver
sydney

T 20 S, R 10 E
G&SRB&M



NOTE: THIS MAP OVERLAYS "GEOLOGIC MAP OF A PORTION OF THE CERRO COLORADO MINING DISTRICT, PIMA COUNTY, ARIZONA" BY M.A. CHAFFEE & D.B. COOLEY FOR GEOCHEMICAL SURVEYS.

OUTLINE OF GEOCHEMICAL ANOMALY (MERCURY)

I.P. LINE NO. → 2

STATIONS — ELECTRODES

INTERFACE

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vancouver
sydney

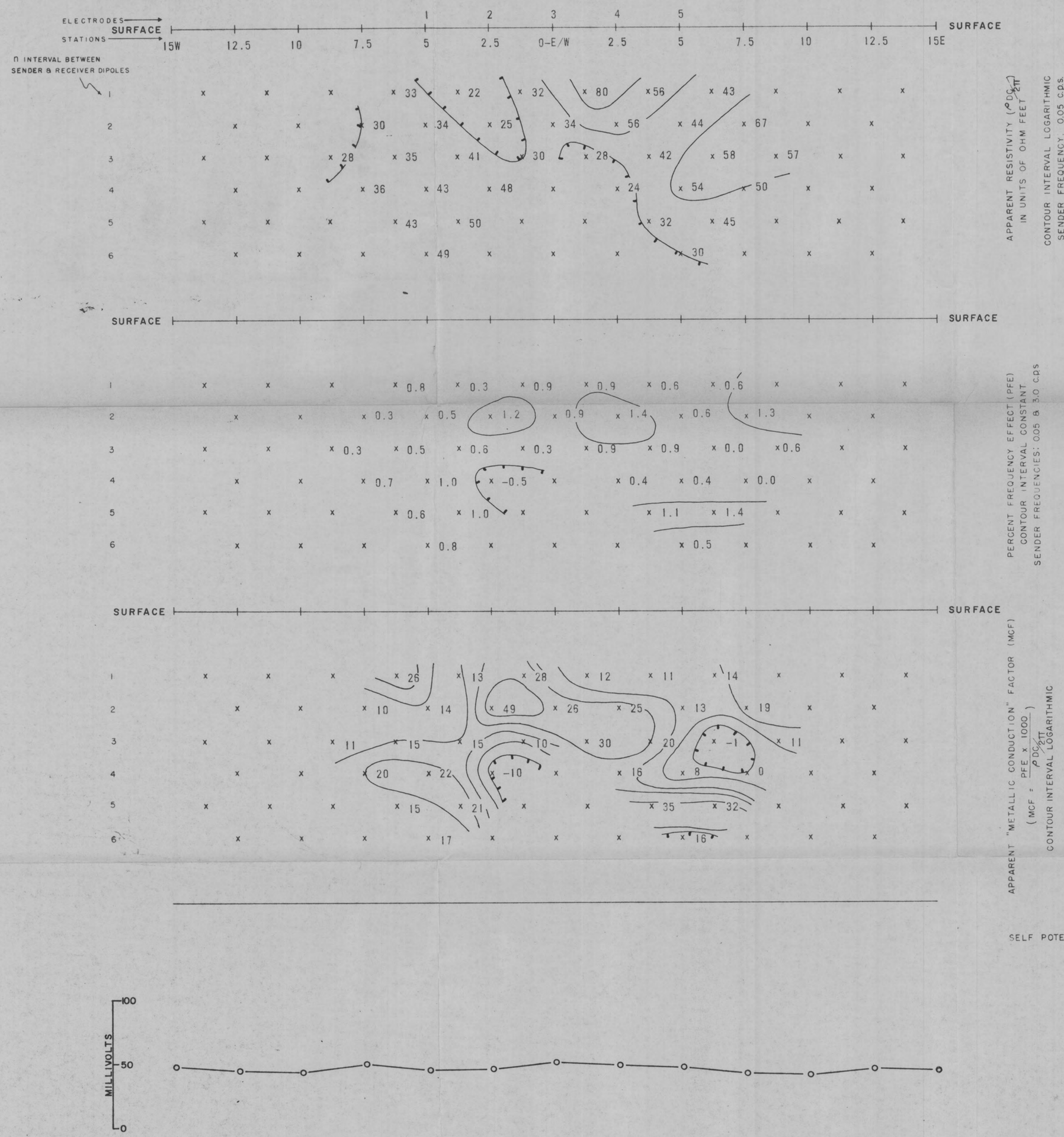
INDUCED POLARIZATION LOCATION AND INTERPRETATION PLAN

SILVER HILL AREA
PIMA COUNTY, ARIZONA

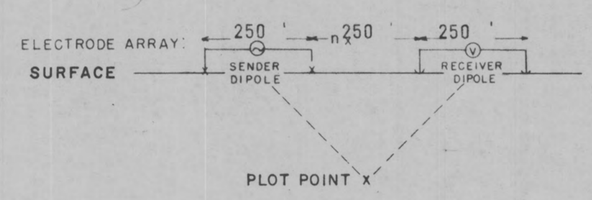
FOR

GEOCHEMICAL SURVEYS

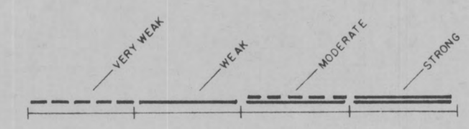
SCALE: 1" = 500' | DRAWN BY: JAY DOWNS | DATE: MAY 1968



EXPLANATION



RELATIVE ANOMALY STRENGTH



LOOKING NORTH

SILVER HILL AREA

SECTIONAL DATA SHEET
LINE NO. 2
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 250' DATE: APR 1968

FOR

GEOCHEMICAL SURVEYS

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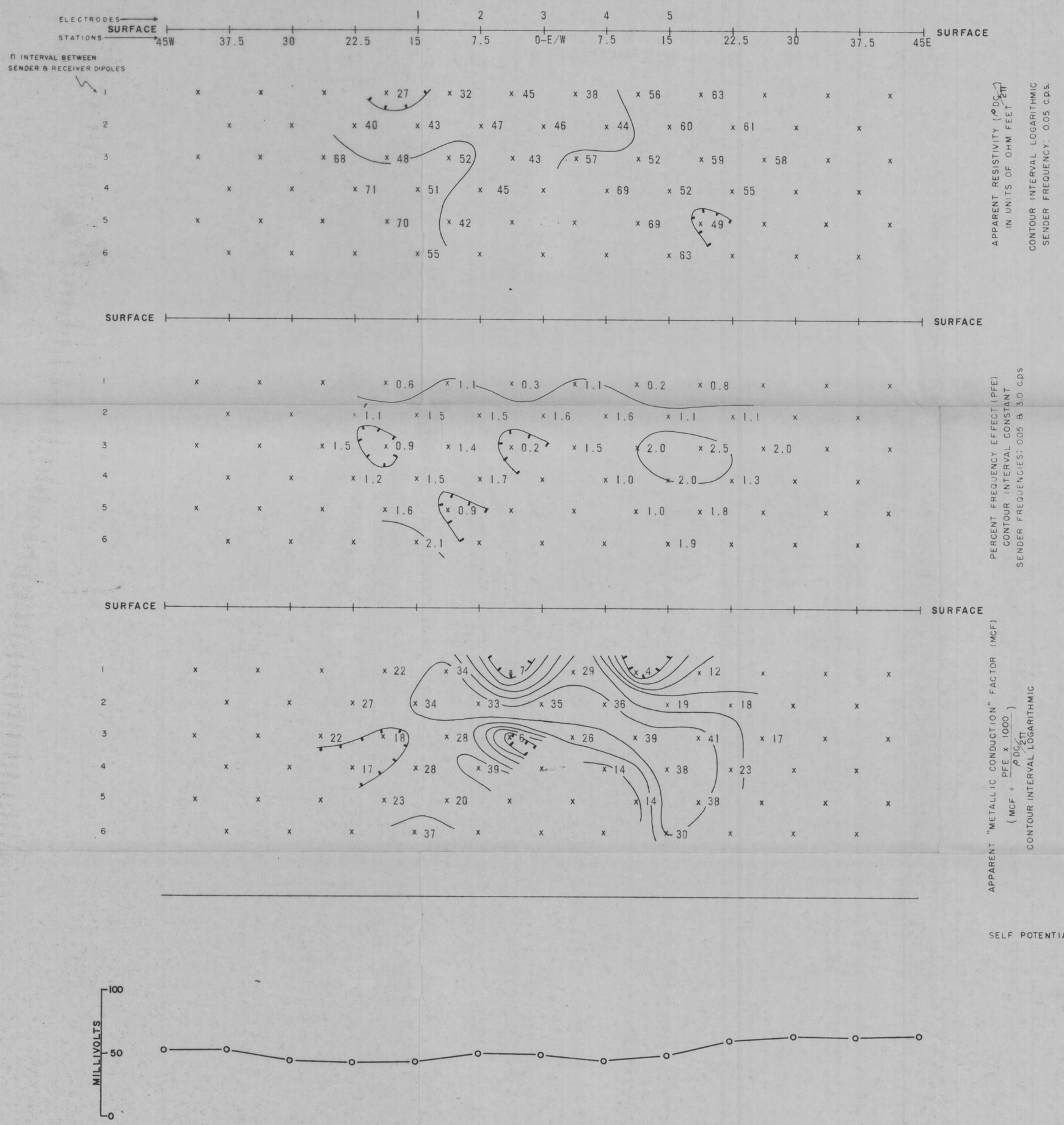
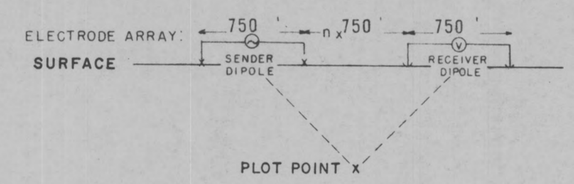
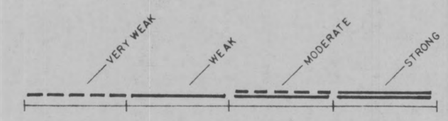
sydney
geophysical engineers



EXPLANATION



RELATIVE ANOMALY STRENGTH



LOOKING NORTH

SILVER HILL AREA

SECTIONAL DATA SHEET
LINE NO. 1
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 750' DATE: APR 1968

FOR

GEOCHEMICAL SURVEYS

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vancouver
sydney

GEOLOGIC EXAMINATION AND EVALUATION

OF THE SILVER HILL PROSPECT

PIMA COUNTY, ARIZONA

For

Geochemical Surveys, Corporation
Dallas, Texas

February 1968

By

Heinrichs Geoexploration Company
P.O. Box 5671 Tucson, Arizona 85703
Phone: 623-0578 Area Code: 602

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CONCLUSIONS AND RECOMMENDATIONS	1
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IN MAP POCKET: (1 piece)

Geologic Map of a Portion of the Cerro Colorado Mining District, Pima County, Arizona

INTRODUCTION

This project in Sections 8, 9, and 10, R10E, T20S, Pima County, Arizona was requested by Mr. Phil Stewart and the field work was completed on February 9, 1968. Detail examination of Sections 16 and 17, R10E, T20S, was curtailed somewhat by a cease and desist order issued by Mr. Walter Bopp, January 9, 1968 and detail was restricted to a short distance south of the boundary between Sections 9 and 16. However, the area was covered in a reconnaissance examination fashion. Our assignment was to examine the geology with respect to the geochemical anomalies within the area, and any related economic potential evidenced.

The geologic mapping was conducted in a manner to attempt to explain or account for the geochemical anomalies as shown on the map supplied to us. A large portion of the area is a green-gray andesite and is largely covered by alluvium but enough outcrops appear within the area that it is safe to say what lies beneath the cover. The rock outcrops, other than the green-gray andesite present in the area, are mostly in the southeast corner of Section 9 as are most of the significant structural features.

CONCLUSIONS AND RECOMMENDATIONS

Altered zones with an easterly trend seem to be associated with the geochemical anomalies in this area. Probably the mineralization is related to fractures within the altered rocks (or vice versa) and occurs in narrow veins with irregular concentrations of economic values which are also probably of small size.

The most evident and near surface place for an economic mineral deposit seems to be near the copper shows in Section 9 which is also near the highest geochemical values. If a single drill hole is contemplated to test this, it probably should be an angle hole inclined to intersect the supposed fracture zone indicated at this location. A better method would be to drill several vertical holes across this zone as it is quite possible the dip may be reversed at depth. Also, mineralization may be located in smaller cross fractures.

Any consideration of drilling in this entire area should take into account the fact that the deposits are likely to be very narrow and economic concentrations quite irregularly spaced.

Before drilling in this or any of the geochemical anomalies, chip samples from the outcrops within the anomalous area, should be taken and assayed.

A better idea of the structure and any possible sulfide mineralization could be obtained by a pair of I.P. lines. These lines should be coincident with one line of 500 foot dipole spacing for a more regional picture and a line with 100 foot dipole spacing for a look at near surface detail and possible small mineral bodies near the surface.

OBSERVATIONS

The rocks in the area appear to be andesites, rhyolites, and a flow breccia. Most of the andesite appears to be altered to some extent. Large areas of rock in Section 8 and 9 especially the northern half are a gray-green andesite which contains more mafic and chloritic minerals and is probably

the nearest to a "normal" andesite in the immediate area. Chaffee (1964) states that in the area he studied he was able to recognize a more mafic phase of the andesites as opposed to a different andesite altogether.

In the area he mapped, Chaffee recognized andesite dikes, mostly with a northeast trend. I was able to examine only the northern edge of that area in detail and was able to confirm the presence of the different units, but was not quite sure that they are dikes. In the area examined, they seem rather to be areas of alteration than dikes per se.

Chaffee was able to spend much time in petrographic analysis which we have not done, therefore, we do not dispute his interpretation. Moreover, this is an irrelevant point for this project at this time.

Associated with the dikes or altered zones, in places, are dikes of rhyolite. This is a light colored, fine grained dense rock with flow structure in places.

In the northeastern portion of the area what appears to be a flow breccia is present. The matrix appears to be a fine grained andesite and the included fragments contain all types of rocks present in the area but no rhyolite, but does contain a reddish appearing granitic rock. Some of the granitic fragments are fairly rounded but do not seem weathered. The source of these granitic rocks is not known but their presence may be significant as an area of diorite is noted by Jones in his area of study to the immediate east. No sedimentary rock fragments have been seen in the breccia as yet. The contact between the breccia and the altered andesite is a strongly altered and weathered zone that can be seen in several washes and appears to be a fracture, possibly a fault, along which hydrothermal fluids have moved. The contact between the breccia and the gray-green andesite has not been seen and can only be inferred at this time.

Structure

Three different lineations of fractures are present in this area. The main drainages here follow a northwest trend. This is a common direction in this part of the country and in part may be very old. The next most prominent direction, especially in this area of study is N50° - 80°E. The majority of the observed fractures and the dikes or altered areas follow this trend.

The third direction, which may be very important, is predominantly north. These fractures range from approximately N25°W to N25°E. In most of the mines and mineralized areas, fractures of this orientation appear to be associated with the mineralization at the intersection of fractures with other orientations.

General Discussion

The mineralization in this area is all vein-type deposition and as far as is now known, the veins are less than a foot wide and mostly six inches or less. The mineral deposits occur irregularly along these veins, usually at intersections of the veins and fractures. The economic mineralization here is silver with minor lead. Some cinnabar has been noted in the area and a small retort is reported on the southwest flank of Silver Hill.

Within the area just examined several prospect pits with copper oxides and quartz are present near the altered andesite-breccia contact. The quartz is terminated which indicates some free space at time of deposition and a fair amount of limonite and hematite with minor magnetite is

present. In all pits showing mineralization, a north trending fracture with a steep easterly dip is seen. Immediately east of this line of mineral show is a north trending gully which may be a surface reflection of a fracture. All of the mineralization seen to date is in this immediate area and lies on the side of a low ridge and is located within the zone covered by the eastern-most geochemical anomaly in Section 9.

A brief examination of the Liberty Mine Area in Section 16 showed no obvious signs of mineralization other than some iron stain and quartz.

Phelps Dodge has drilled at least two holes in this area. Drill Hole #7 is 125 feet deep and was drilled just about on the line between Sections 9 and 10 within the altered area and in the anomaly. There is no sign of any core left lying around or a sludge pit in the vicinity.

To the south and southeast of this area, fairly large areas of quartz latite are exposed. This is the fine grained equivalent of a quartz monzonite which in this area has been associated with the large copper deposits when it is of the proper age. Rhyolite is a more acidic (more quartz, less basic feldspars) volcanic rock than the quartz latite and comes out of solution later and at somewhat lower temperatures and pressures. It seems likely therefore that the ryholite was extruded later when the melt was more quartz rich, came up along this easterly trend of fractures and altered the andesite at that time. Mercury is very volatile and would stay in the solution to nearly the very end. Therefore, it seems quite possible that the mercury came in at the same time as the alteration along these easterly trending fractures. The quartz float is in these areas of strong alteration and fits the geochemical anomalies fairly well.

Of course, some of the fluids leaked out along cross fractures and so the outlines of the anomaly would not exactly conform to these areas of most intense alteration. Some of the anomalies that do not fit the pattern may have come up along other fractures that cross at depth or the alteration of the andesite may not have been recognized. Under these conditions you would expect the silver and mercury to be associated.

The possibility of the alteration being due to weakening veins eminating from a strong source at considerable depth, seems remote, but it would be checked, as far as any significant sulfide involvement is concerned to approximately 1,000 feet deep by the 500 foot dipole I.P. lines proposed. If any encouragement were obtained by such work it could be then extended both laterally and to greater depth, as indicated.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Donald B Cooley

Donald B. Cooley
Geologist

APPROVED: _____
Walter E. Heinrichs, Jr.
President & General Manager

March 13, 1968
Tucson, Arizona

REFERENCES

Chaffee, M.A., 1964; Dispersion patterns as a possible guide to ore deposits in the Cerro Colorado District, Pima County, Arizona. Univ. of Ariz. unpub. M.S. Thesis.

Davis, R.E., 1955; Geology of the Mary G. Mine area, Pima County, Arizona. Univ. of Ariz. unpub. M.S. Thesis.

Jones, R.D., 1957; Geology of the Cerro Colorado Mining District, Pima County, Arizona. Univ. of Ariz. unpub. M.S. Thesis.

Smith, Russell, 1966; Geology of the Cerro Colorado Mountains, Pima County, Arizona. Arizona Geological Society Digest, v. VIII, p. 131.

GEOLOGIC EXAMINATION AND EVALUATION
OF THE SILVER HILL PROSPECT
PIMA COUNTY, ARIZONA

For

Geochemical Surveys, Corporation
Dallas, Texas

February 1968

By

Heinrichs Geoexploration Company
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The rocks in the area appear to be andesites, rhyolites, and a flow breccia. Most of the andesite appears to be altered to some extent. Large areas of rock in Section 8 and 9 especially the northern half are a gray-green andesite which contains more mafic and chloritic minerals and is probably

the nearest to a "normal" andesite in the immediate area. Chaffee (1964) states that in the area he studied he was able to recognize a more mafic phase of the andesites as opposed to a different andesite altogether.

In the area he mapped, Chaffee recognized andesite dikes, mostly with a northeast trend. I was able to examine only the northern edge of that area in detail and was able to confirm the presence of the different unti
quite sure that they ar
seem rather to be areas

Chaffee was able t
analysis which we have not done, therefore, we do not dispute his interpretation. Moreover, this is an irrelevant point for this project at this time.

Associated with the dikes or altered zones, in places, are dikes of rhyolite. This is a light colored, fine grained dense rock with flow structure in places.

In the northeastern portion of the area what appears to be a flow breccia is present. The matrix appears to be a fine grained andesite and the included fragments contain all types of rocks present in the area but no rhyolite, but does contain a reddish appearing granitic rock. Some of the granitic fragments are fairly rounded but do not seem weathered. The source of these granitic rocks is not known but their presence may be significant as an area of diorite is noted by Jones in his area of study to the immediate east. No sedimentary rock fragments have been seen in the breccia as yet. The contact between the breccia and the altered andesite is a strongly altered and weathered zone that can be seen in several washes and appears to be a fracture, possibly a fault, along which hydrothermal fluids have moved. The contact between the breccia and the gray-green andesite has not been seen and can only be inferred at this time.

Structure

Three different lineations of fractures are present in this area. The main drainages here follow a northwest trend. This is a common direction in this part of the country and in part may be very old. The next most prominent direction, especially in this area of study is N50° - 80°E. The majority of the observed fractures and the dikes or altered areas follow this trend.

The third direction, which may be very important, is predominantly north. These fractures range from approximately N25°W to N25°E. In most of the mines and mineralized areas, fractures of this orientation appear to be associated with the mineralization at the intersection of fractures with other orientations.

General Discussion

The mineralization in this area is all vein-type deposition and as far as is now known, the veins are less than a foot wide and mostly six inches or less. The mineral deposits occur irregularly along these veins, usually at intersections of the veins and fractures. The economic mineralization here is silver with minor lead. Some cinnabar has been noted in the area and a small retort is reported on the southwest flank of Silver Hill.

Within the area just examined several prospect pits with copper oxides and quartz are present near the altered andesite-breccia contact. The quartz is terminated which indicates some free space at time of deposition and a fair amount of limonite and hematite with minor magnetite is

present. In all pits showing mineralization, a north trending fracture with a steep easterly dip is seen. Immediately east of this line of mineral show is a north trending gully which may be a surface reflection of a fracture. All of the mineralization seen to date is in this immediate area and lies on the side of a low ridge and is located within the zone covered by the eastern-most geochemical anomaly in Section 9.

A brief examination of the Liberty Mine Area in Section 16 showed no obvious signs of mineralization other than some iron stain and quartz.

Phelps Dodge has drilled at least two holes in this area. Drill Hole #7 is 125 feet deep and was drilled just about on the line between Sections 9 and 10 within the altered area and in the anomaly. There is no sign of any core left lying around or a sludge pit in the vicinity.

To the south and southeast of this area, fairly large areas of quartz latite are exposed. This is the fine grained equivalent of a quartz monzonite which in this area has been associated with the large copper deposits when it is of the proper age. Rhyolite is a more acidic (more quartz, less basic feldspars) volcanic rock than the quartz latite and comes out of solution later and at somewhat lower temperatures and pressures. It seems likely therefore that the ryholite was extruded later when the melt was more quartz rich, came up along this easterly trend of fractures and altered the andesite at that time. Mercury is very volatile and would stay in the solution to nearly the very end. Therefore, it seems quite possible that the mercury came in at the same time as the alteration along these easterly trending fractures. The quartz float is in these areas of strong alteration and fits the geochemical anomalies fairly well.

Of course, some of the fluids leaked out along cross fractures and so the outlines of the anomaly would not exactly conform to these areas of most intense alteration. Some of the anomalies that do not fit the pattern may have come up along other fractures that cross at depth or the alteration of the andesite may not have been recognized. Under these conditions you would expect the silver and mercury to be associated.

The possibility of the alteration being due to weakening veins eminating from a strong source at considerable depth, seems remote, but it would be checked, as far as any significant sulfide involvement is concerned to approximately 1,000 feet deep by the 500 foot dipole I.P. lines proposed. If any encouragement were obtained by such work it could be then extended both laterally and to greater depth, as indicated.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Donald B. Cooley
Geologist

APPROVED: _____
Walter E. Heinrichs, Jr.
President & General Manager

March 13, 1968
Tucson, Arizona

REFERENCES

Chaffee, M.A., 1964; Dispersion patterns as a possible guide to ore deposits in the Cerro Colorado District, Pima County, Arizona. Univ. of Ariz. unpub. M.S. Thesis.

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INDUCED POLARIZATION, RESISTIVITY AND SELF POTENTIAL SURVEY SILVER HILL AREA PIMA COUNTY, ARIZONA

For

Geochemical Surveys

May - 1968

By

Heinrichs Geoexploration Company
P. O. Box 5671 Tucson, Arizona 85703
Phone: 623-0578 Area Code: 602

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INTRODUCTION

At the request of Mr. W. R. Ransone of Geochemical Surveys, Heinrichs Geoexploration Company conducted and completed an induced polarization test over a strong geochemical mercury anomaly in the Silver Hill Area, Pima County, Arizona. The field work was surveyed during the interim April 18 and April 24, 1968.

Line 1 and 2 were both oriented east-west with a common center. Line 1 utilized an electrode spacing of 750 feet and Line 2 a 250 foot spacing. The dual frequency system was used on a collinear dipole-dipole array on frequencies of 0.15 and 1.0 Hz.

The data are presented on sectional data sheets, one for each line. The line locations are shown on an overlay to a portion of Mr. Cooley's geology map to show the location of the survey with respect to the zones of alteration, breccia contact and the old workings and geochemical mercury anomalism. Also included is an overlay to the U.S.G.S. Arivaca Quadrangle, showing the aerial photograph centers we flew on February 2, 1968.

Heinrichs personnel involved in the field work were J. King, geophysical crew chief, D. McCoy and D. Carlson, technical assistants. Report and interpretation by Chris S. Ludwig, Senior Geophysicist with the assistance of the Geoex staff.

CONCLUSIONS, RECOMMENDATIONS AND INTERPRETATION

Neither line shows any polarization response above background. This implies that no significant zones of sulfide occur in the vicinity of the lines down to about 1,000 feet on Line 1 and 300 feet on Line 2. However, it is possible that minor narrow sulfide veins could be missed with the I.P. but they would

probably have to aggregate in width considerably less than one-tenth of the dipole spacing or be very low in sulfide content.

The resistivity on Line 1 is rather uniform both with depth and laterally. The near surface resistivity decreases somewhat to the west probably due to increased alluvial thickness. The self potentials are quite flat and suggest a lack of significant quantities of oxidizing sulfides within several hundred feet of the surface, in accordance with the I.P. information.

Line 2 electrically sampled the central part of Line 1 in more detail (but less depth penetration) and shows an electrical interface in the resistivity near 1.25W which is possibly related to the breccia contact or perhaps a structure associated with the prospect pits near center. The more detailed self potential information on this line still shows only minor background variations of no significance.

The lack of sulfide indications in this vicinity is discouraging but the area is still interesting on the basis of the strong geochemical response, particularly in mercury. Drilling is recommended on the stronger geochemical anomalism to determine the vertical distribution of the mercury. Geochemical or even ore quantities of mercury would not necessarily respond to I.P. unless associated with pyrite or other polarizable minerals.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Chris S. Ludwig
Senior Geophysicist

May 7, 1968
Tucson, Arizona

March 15, 1968

Mr. Phil Stewart
Geochemical Surveys
P. O. Box 19508
Dallas, Texas 75219

Dear Mr. Stewart:

Enclosed are the original and two copies of the geologic examination of the Silver Hill prospect you requested. I had been holding this information pending a visit to the field with you. I have tried to proceed on the Basis of what seems pertinent to the problem of explaining the geochemical anomalies you have found. I still feel that we ought to visit the area together and I will be ready to go anytime you are; with a little notice.

The history of this area is one of prospectors finds and usually of small bodies. The Cerro Colorado Mine was the exception but still only was exploited by a prospector operating on hope, thank God for prospectors though.

If you have any questions, please let me know. I'm sure most of them will be resolved easily on our field trip.

Very truly yours,

HEINRICHS GEOEXPLORATION COMPANY

Donald B. Cooley
Geologist

INSTRUCTIONS TO DELIVERING EMPLOYEE

☑ Show to whom and date delivered ☐ Show to whom, date, and address where delivered ☐ Deliver ONLY to addressee

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Received the numbered article described below.

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SIGNATURE OR NAME OF ADDRESSEE (*Must always be filled in*)

1 Geochemical Surveys

SIGNATURE OF ADDRESSEE'S AGENT, IF ANY

2 [illegible]

DATE DELIVERED 3-18-68

SHOW WHERE DELIVERED (*only if requested*) P.O. Box 19508

c55—16—71548-9 GPO

February 7, 1968

Mr. Phil Stewart
Geochemical Surveys
P. O. Box 19508
Dallas, Texas 75219

Dear Phil:

At present the claim staking is complete, the photos are flown and being processed and will be ready by Monday morning.

Library research has turned up a few interesting facts.

1. Northwest faulting is most obvious (the major drainages follow this trend.

2. Most of the mines in the area are associated with northerly trending ($\pm$ 30°) fractures (may actually be faults).

3. Ore mineralization is at intersection of fractures trending mostly northwest with the northerly trend.

4. Cinnibar has been recovered from the Mary G Mine and also found in a gossan at depth (100 feet +) in a shaft at Silver Hill. Also mercury is present in tetrahedrite which has been seen in many thin sections from the mines in this area. There used to be a small retort near Silver Hill but I have not seen it.

5. The ore has been found in thin veins of 6 inches or less in width and usually around 150 feet or deeper.

6. The entire area shows some type of alteration more or less everywhere to various degrees. Deep red, highly oxidized rock has been found in some of the workings associated

with the mineralization. Areas in Section 9 show this brick red coloration near the northerly trending fractures which show copper mineralization.

The field geology will be complete this week and I would like a day in the field with you before I completely wrap it up.

Very truly yours,

HEINRICHS GEOEXPLORATION COMPANY

Donald B. Cooley
Project Geologist

DBC:jc
cc: Mr. Ransone