W.A. BOWES & ASSO.
P O Box 160, Steamboat Spgs.
Colorado 80477

SEMIQUANTITATIVE SPECTROGRAPHIC ANALYSIS

INSTRUMENT: WADSWORTH MOUNTED, JARRELL-ASH, 1.5 METER, DC ARC EMISSION SPECTROGRAPH

FILM NO. 7-7

DATE 12-11-70

Fe, Mg, Ca, & Ti reported in %, all other elements reported in ppm

No.	Office No.	Field No.	Au	Ag	Cu	Pb	Zn	Mo	Fe	W	Ni	Co	Cr	Cd	As	Sb	Mn	V	Bi	Sn	Zr	B	Ba	Be	La	Nb	Sc	Sr	Y	Ca	Mg	Ti	Na	K
1	Reference	6-2	N	N	15	50	N	N	2.	N	5	N	N	N	N	N	300	50	N	N	300	10	2000	3	100	L	N	1000	N	1.5	.6	.4	3.	4.
2	09144	Rock 0N+0W	N	1	700	30	N	7	.7	L	50	N	300	N	300	N	150	150	N	N	70	20	1500	2	N	L	N	500	N	1.5	.2	.2	L	L
3	09145	Rock 2E+300S	N	5	150	20	N	L	.5	70	10	N	300	N	1000	N	150	100	N	N	200	20	1000	2	100	L	5	300	N	.3	.05	.5	.2	.5
4	09146	Soil 4E+300S	N	N	100	30	L	L	2.	L	100	N	300	N	300	N	300	500	N	N	200	30	2000	3	20	L	10	1000	50	5.	.7	.4	.5	.7
5	09147	Rock 2E+600S	N	1	200	20	200	7	2.	100	150	N	300	N	1000	N	100	700	N	N	200	20	1500	3	N	L	5	1000	70	3.	.1	.1	N	N
6	09148	Soil 4E+600S	N	2	70	40	L	5	2.	N	50	10	200	N	200	N	500	500	N	N	200	30	2000	3	L	L	10	700	30	3.	.7	.3	.7	2.
7	09149	Soil 2E+900S	N	L	100	30	L	5	2.	50	100	N	300	N	300	N	300	1500	N	N	200	20	5000	5	20	L	10	1000	100	3.	.7	.3	.5	2.
8	09150	Soil 4E+900S	N	L	40	40	N	5	3.	N	30	10	200	N	N	N	500	300	N	N	500	30	2000	5	20	L	20	500	30	2.	.7	.5	.7	2.
9	09151	Rock 2E+300N	N	1	400	20	N	10	2.	N	100	N	300	N	700	N	70	700	N	N	200	20	2000	2	50	L	N	1000	60	2.	.1	.1	N	N
10	09152	Rock 4E+300N	N	1	150	30	N	50	2.	N	20	N	300	N	1000	N	100	2000	N	N	100	20	2000	2	20	L	N	1000	N	1.	.2	.1	1.	.7
11	09153	Soil 2E-600N	N	L	50	30	N	N	3.	N	50	20	300	N	200	N	700	100	N	N	300	20	2000	5	20	L	20	500	30	1.5	1.	.5	1.	2.
12	09154	Rock 4E-600N	N	1	100	30	N	70	1.	N	10	N	300	N	700	L	50	500	N	N	200	10	1500	2	L	L	10	1000	N	2.	.15	.4	.7	L
13	09155	Soil 2E+900N	N	N	60	40	N	L	4.	N	30	20	200	N	N	N	500	100	N	N	300	30	1500	3	20	L	20	700	30	1.5	1.	.7	1.	3.
14	09156	Soil 4E-900N	N	N	60	40	N	L	4.	N	30	20	200	N	L	N	700	150	N	N	300	30	1500	3	50	L	20	700	50	3.	1.5	.7	1.5	3.
15	09157	Rock 2E+0	N	.5	150	20	N	10	2.	N	20	N	300	N	3000	200	70	500	N	N	200	10	1000	2	N	L	N	700	30	1.	.1	.2	L	N
16	09158	Rock 4E+0	N	.5	300	20	N	60	2.	L	10	N	300	N	300	L	70	700	N	N	200	10	1000	2	N	L	N	700	20	.7	.1	.3	.5	N
17	09159	Soil 2W+0	N	L	500	30	200	L	3.	N	30	10	150	N	1000	500	200	700	N	N	200	30	3000	2	N	L	5	1000	20	10.	.7	.2	.5	1.
18	09160	Rock 4W+0	N	.5	300	30	300	10	15.	700	20	N	200	N	150	1000	200	200	N	N	100	30	1000	3	N	L	5	1500	N	.3	.05	.1	L	N
19	09161	Rock 6W+0	N	N	10	10	N	N	.3	N	5	N	N	N	N	N	300	100	N	N	50	10	300	N	N	N	N	1000	N	G 20.	3.	.1	N	N
20	09162	Soil 2W+300N	N	N	100	30	200	5	5.	N	20	20	150	N	700	200	500	100	N	N	70	50	1500	2	N	L	10	700	10	1.5	1.5	.3	1.	3.
21	09163	Rock 4W+300N	N	L	60	20	N	L	3.	N	30	N	200	N	300	100	100	1000	N	N	50	10	1500	2	N	L	N	300	20	2.	.3	.2	N	.5
22	09164	Rock 6W+300N	N	L	50	20	200	N	.7	N	30	N	200	N	N	500	70	50	N	N	50	10	1500	2	N	L	N	200	N	.2	.1	.2	N	N
23	09165	Soil 2W+600N	N	N	50	30	N	L	1.5	N	30	10	200	N	500	100	300	100	N	N	70	30	2000	2	L	L	5	1000	10	1.5	.5	.3	.5	.7
24	09166	Soil 4W+600N	N	N	70	20	L	L	2.	N	30	20	100	N	200	N	500	70	N	N	100	30	1500	3	20	L	10	700	20	1.5	.7	.3	1.	3.
	Lower Detection Limit →		10	0.5	5	10	200	5	0.05%	50	5	5	5	20	200	100	10	10	10	10	10	10	10	2	20	10	5	100	10	0.05%	0.02%	0.001%	.2%	.5%

N = Not detected. L = Detected, but below limit of determination. G = Greater than value shown.

REMARKS: Job #31, Newmont C20 - Iron Point Project (Reno, Nev.)

IRON POINT

CODED BY

ANALYST T. Hancock

W.A. BOWES & ASSO.
PO Box 160, Steamboat Spgs.
Colorado 80477.

SEMIQUANTITATIVE SPECTROGRAPHIC ANALYSIS

INSTRUMENT: WADSWORTH MOUNTED, JARRELL-ASH, 1.5 METER, DC ARC EMISSION SPECTROGRAPH

Fe, Mg, Ca, & Ti reported in %, all other elements reported in ppm

FILM NO. 87

DATE 12-12-70

Plate No.	Office No.	Field No.	Au	Ag	Cu	Pb	Zn	Mo	Fe	W	Ni	Co	Cr	Cd	As	Sb	Mn	V	Bi	Sn	Zr	B	Ba	Be	La	Nb	Sc	Sr	Y	Ca	Mg	Ti	Na	K
1	Reference	G-2	N	N	15	50	N	N	2.	N	5	N	N	N	N	N	300	50	N	N	200	10	2000	3	100	L	N	1000	N	1.5	.5	.3	3.	4.
2	09169	Rock 6W+600N	N	N	50	20	L	7	5.	100	50	N	150	N	300	300	50	200	N	N	200	50	1000	5	N	L	10	100	N	.2	.4	.3	N	3.
3	09168	Rock 2W+900N	N	L	50	20	N	N	1.5	100	5	N	200	N	700	300	150	30	N	N	200	10	1500	2	N	L	N	100	N	.3	.1	.3	N	N
4	09169	Soil 4W+900N	N	N	50	30	200	L	3.	70	50	20	200	N	200	200	500	200	N	N	200	30	1500	5	N	L	10	300	10	1.	.5	.4	1.	2.
5	09170	Soil 6W+900N	N	N	70	30	200	L	3.	N	50	20	150	N	N	N	500	300	N	N	300	30	1500	5	N	L	10	500	20	1.	.6	.4	1.	2.
6	09171	Soil 2W+300S	N	N	100	30	200	L	3.	N	50	10	150	N	300	N	500	200	N	N	200	30	1500	5	N	L	10	700	30	7.	.7	.3	1.	2.
7	09172	Rock 4W+300S	N	L	50	10	N	5	3.	50	5	N	200	N	200	200	100	150	N	N	200	30	1000	3	N	L	N	200	N	1.	.1	.3	N	N
8	09173	Soil 6W+300S	N	N	70	30	200	N	3.	100	30	20	100	N	300	200	300	70	N	N	200	30	3000	3	N	L	10	500	10	2.	1.	.3	1.	4.
9	09174	Rock 2W+600S	N	L	100	10	N	7	1.	N	50	N	200	N	700	100	100	700	N	N	100	20	1000	2	N	L	N	300	10	.3	.05	.05	N	N
10	09175	Rock 4W+600S	N	N	300	10	N	10	7.	70	20	N	150	N	200	1000	50	500	N	N	100	30	1000	L	N	L	5	500	N	.07	.15	.2	.3	N
11	09176	Soil 6W+600S	N	N	50	30	L	L	3.	N	30	20	150	N	L	N	700	100	N	N	300	30	1500	5	N	L	10	500	20	2.	1.	.4	1.5	3.
12	09177	Soil 2W+900S	N	N	30	30	N	N	1.	L	10	N	200	N	200	L	50	50	N	N	100	10	1500	2	N	L	N	500	N	.4	.1	.05	1.	2.
13	09178	Soil 4W+900S	N	N	40	30	L	L	3.	N	20	20	100	N	N	N	700	100	N	N	100	30	1500	2	N	L	5	500	N	1.5	.7	.3	1.5	3.
14	09179	Rock 6W+900S	N	N	50	30	300	L	4.	N	30	20	100	N	L	N	700	150	N	N	200	30	1500	5	N	L	10	700	20	1.5	.7	.4	1.	2.
15	09180	Soil 300N+0W	N	N	100	20	N	L	3.	L	10	N	200	N	150	L	20	700	N	N	70	30	1000	2	N	L	5	200	N	.1	.2	.3	L	L
16	09181	Soil 600N+0W	N	N	60	30	L	L	4.	N	30	20	200	N	300	N	700	100	N	N	200	30	1500	3	N	L	20	500	30	2.	1.	.5	1.5	3.
17	09182	Rock 900N+0W	N	N	40	30	L	L	3.	N	20	20	100	N	200	N	700	100	N	N	200	30	1500	3	N	L	10	700	20	5.	.7	.3	1.	2.
18	09183	Soil 300S+0W	N	.5	30	20	N	N	1.	N	10	N	300	N	200	N	70	300	N	N	50	10	1000	2	N	L	N	200	N	.3	.3	.1	L	.5
19	09184	Rock 600S+0W	N	L	70	30	L	L	3.	N	10	10	100	N	200	N	500	300	N	N	200	30	1500	3	N	L	10	700	20	5.	1.	.3	1.	2.
20	09185	Rock 900S+0W	N	N	60	20	N	L	3.	N	10	N	300	N	1000	N	50	2000	N	N	50	20	1500	2	N	L	N	1000	20	1.	.2	.1	N	1.
21	09185 Dup.	Rock 900S+0W	N	N	60	20	N	L	2.	N	10	N	200	N	1000	N	50	2000	N	N	30	20	1500	2	N	L	N	1000	20	1.	.2	.1	N	.5
22			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
23																																		
24																																		
Lower Detection Limit →			10	0.5	5	10	200	5	0.05%	50	5	5	5	20	200	100	10	10	10	10	10	10	10	2	20	10	5	100	10	0.05%	0.02%	0.001%	.2	.5

N = Not detected. L = Detected, but below limit of determination. G = Greater than value shown.

REMARKS: Job #31 – 020 [illegible] Project – [illegible] ([illegible])

IRON POINT

CODED BY

ANALYST [signature]

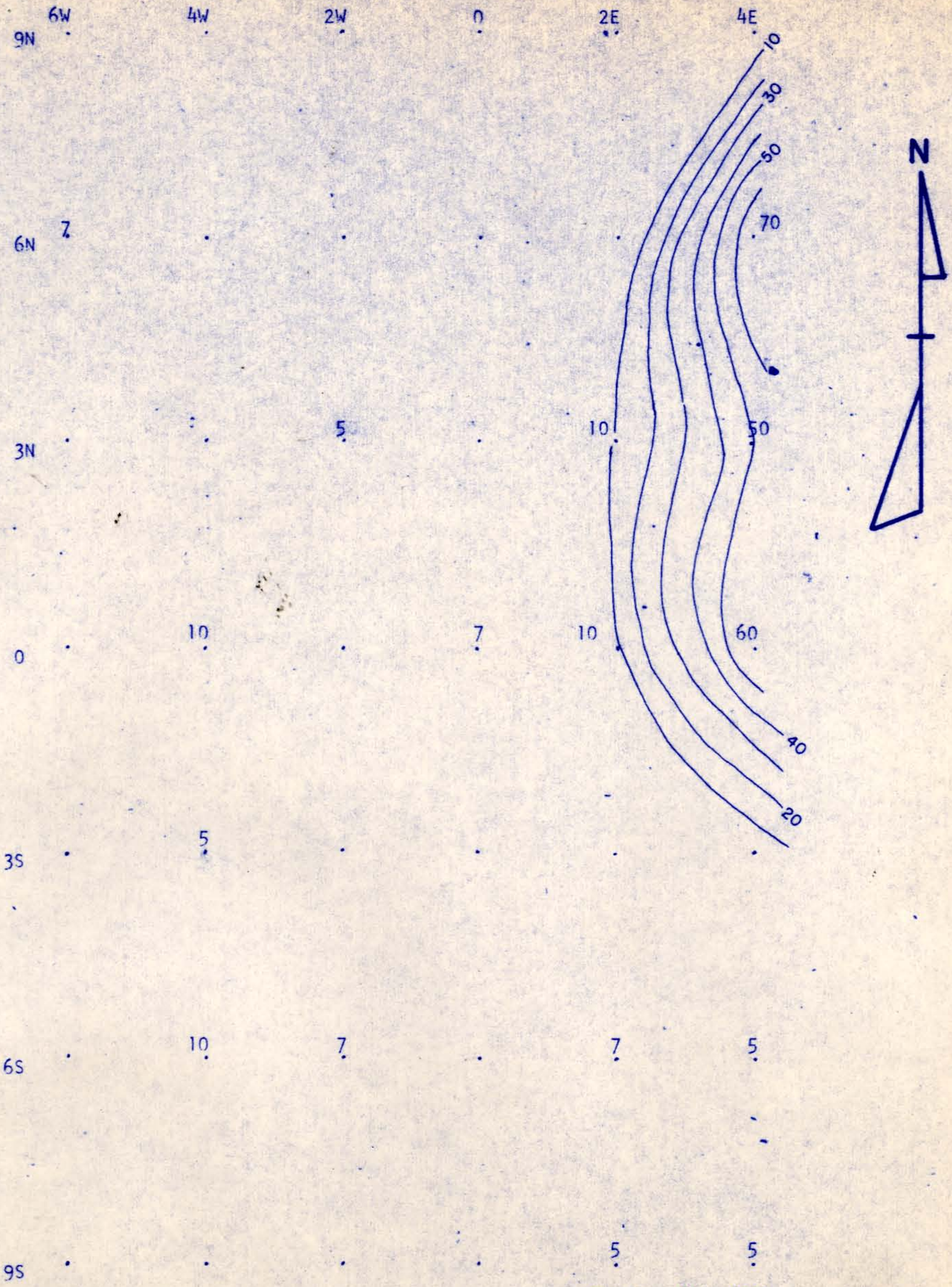
Hg Values

NAMEX Job # 31 SENT 12/15/

		Film # 7-7 Sample #	PPM		Film # 8-7 Sample #	PPM		Film # Sample #	PPM
00	1	09144	2.0	1	6W 6N 09167	.8	1		
2E+3S	2	09145	1.3	2	2W 9N 09168	50.0	2		
4E-3S	3	09146	1.0	3	4W 9N 09169	1.6	3		
2E-6S	4	09147	5.0	4	6W 9N 09170	.8	4		
4E-6S	5	09148	.8	5	2W-3S 09171	2.0	5		
2E-9S	6	09149	.4	6	4W-3S 09172	30.0	6		
4E-9S	7	09150	.4	7	6W 3S 09173	1.2	7		
2E 3N	8	09151	20.0	8	2W 6S 09174	4.0	8		
4E 3N	9	09152	.6	9	4W 6S 09175	60.0	9		
2E 6N	10	09153	3.2	10	6W 6S 09176	4.0	10		
4E 6N	11	09154	17.0	11	2W 9S 09177	3.2	11		
2E 9N	12	09155	1.2	12	4W 9S 09178	1.6	12		
4E 9N	13	09156	.8	13	6W 9S 09179	1.2	13		
2E-0	14	09157	4.0	14	3N 0W 09180	2.4	14		
4E-0	15	09158	<2.0	15	6N 09181	2.4	15		
2W-0	16	09159	<2.0	16	9N 09182	2.0	16		
4W-0	17	09160	<2.0	17	3S 09183	30.0	17		
6W-0	18	09161	.8	18	6S 09184	1.2	18		
2W-3N	19	09162	2.4	19	9S 09185	Missing	19		
4W-3N	20	09163	<.8	20			20		
6W-3N	21	09164	<.8	21			21		
2W-6N	22	09165	<.0	22			22		
4W-6N	23	09166	.8	23			23		

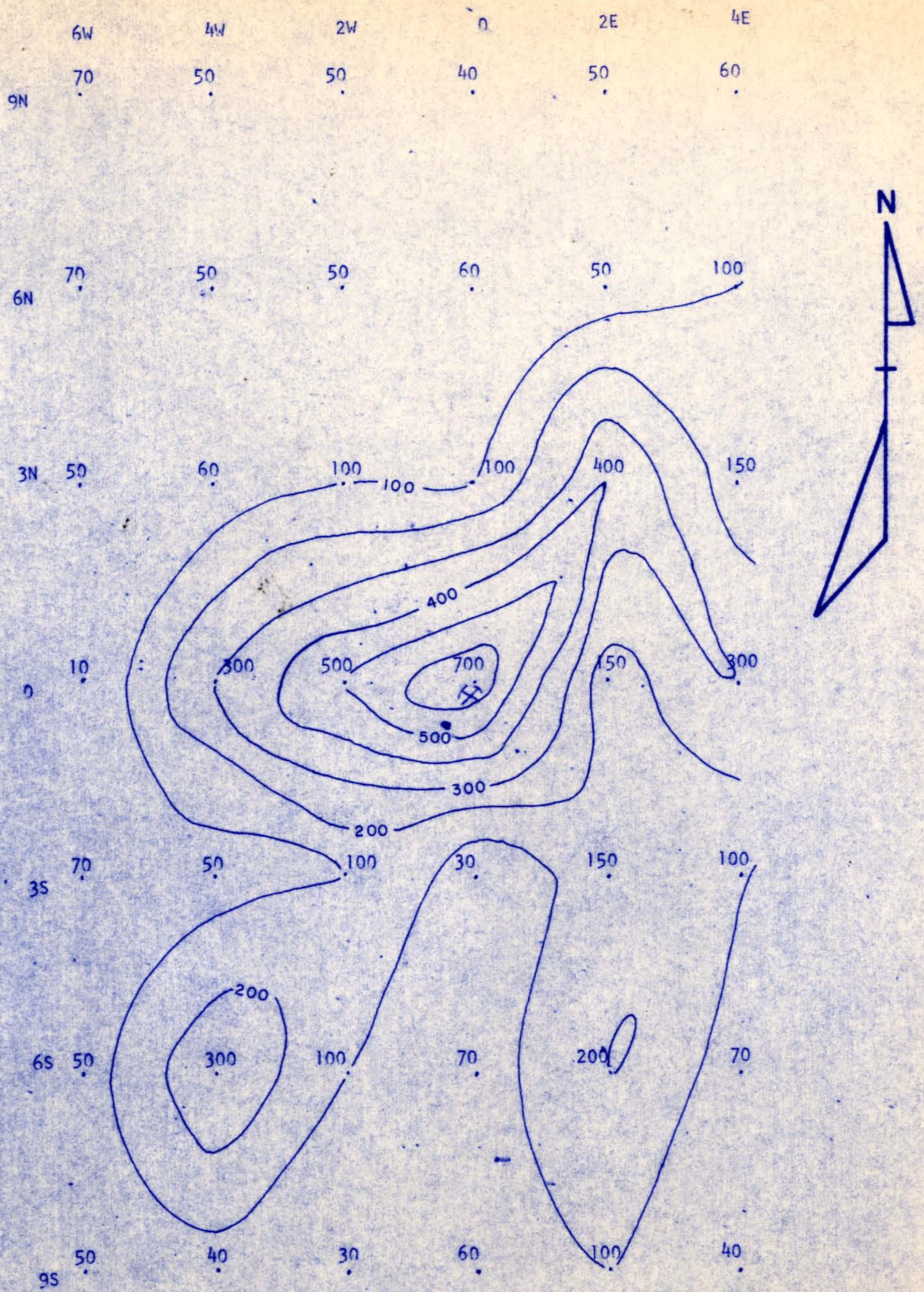
IRON POINT

DISTRIBUTION OF MOLYBDENUM VALUES, IRON POINT PROSPECT, HUMBOLDT COUNTY, NEVADA.



Scale: 1" = 200'
Contour Interval = 10 PPM
Dr. by L.C.G., Tr. by R.A.C.
North American Exploration, Inc.
January 1, 1971

DISTRIBUTION OF COPPER VALUES, IRON POINT PROSPECT, HUMBOLDT COUNTY, NEVADA.



Scale: 1" = 200'
Contour Interval = 100 PPM
Dr. by L.C.G., Tr. by R.A.C.
North American Exploration, Inc.
January 1, 1971

November 1970

Iron Point (044): A series of forty-two rock and soil samples have been taken on the existing grid over the Iron Point Prospect. Samples were taken at 200-foot intervals along east-west lines, with a spacing between lines of 300 feet. These samples have been sent to W. A. Bowes for emission spectrograph analysis. A property map is being researched and will be forwarded when completed. No additional work is outlined for this area until the geochemical results are returned and studied.

DECEMBRE 1970

Iron Point (044): A property map has been constructed showing various land holders in the area of the Iron Point prospect. Eighteen claims were staked, by location monuments only, to the east of the Purcell group on the basis of results from geochemical sampling. It is recommended that the open portion of Section 12 and the east 1/2 of Section 14 be claimed at once.

Results of 42 samples taken from a grid centered about the present mine in the north-central claim of the Purcell group have been plotted for vanadium, mercury, copper, and molybdenum. Copper values show a maximum of 700 ppm at the mine site; contours of anomalous values are open to the east. Contours of vanadium values also show a pattern open to the east and south with maximum values of 2000 ppm vanadium occurring on the borders of the sample area. Mercury values form a pattern open to the east and have a maximum of 60 ppm in the southwest quadrant of the sample area. Molybdenum values from 10 to 70 ppm occur on the eastern edge of the sample area.

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SEMIQUANTITATIVE SPECTROGRAPHIC ANALYSIS

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DATE 12-12-70

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Samp No.	Office No.	Field No.	Au	Ag	Cu	Pb	Zn	Mo	Fe	W	Ni	Co	Cr	Cd	As	Sb	Mn	V	Bi	Sn	Zr	B	Ba	Be	La	Nb	Sc	Sr	Y	Ca	Mg	Ti	Na	K
1	Reference	G-2	N	N	15	50	N	N	2.	N	5	N	N	N	N	N	300	50	N	N	200	10	2000	3	100	L	N	1000	N	1.5	.5	.3	3.	4.
2	09167 ✓	Rock 6W+600N	N	N	50	20	L	7	5.	100	50	N	150	N	300	300	50	200	N	N	200	50	1000	5	N	L	10	100	N	.7	.4	.3	N	3.
3	09168 ✓	Rock 2W+900N	N	L	50	20	N	N	1.5	100	5	N	200	N	700	300	150	30	N	N	200	10	1500	2	N	L	N	100	N	.3	1	.3	N	N
4	09169 ✓	Soil 4W+900N	N	N	50	30	200	L	3.	70	50	20	200	N	200	200	500	200	N	N	200	30	1500	5	N	L	10	300	10	1.	.5	.4	1.	2.
5	09170 ✓	Soil 6W+900N	N	N	70	30	200	L	3.	N	50	20	150	N	N	N	500	300	N	N	300	30	1500	5	N	L	10	500	20	1.	.6	.4	1.	2.
6	09171 ✓	Soil 2W+300S	N	N	100	30	200	L	3.	N	50	10	150	N	300	N	500	200	N	N	200	30	1500	5	N	L	10	700	30	2.	.7	.3	1.	2.
7	09172 ✓	Rock 4W+300S	N	L	50	10	N	5	3.	50	5	N	200	N	200	200	100	150	N	N	200	30	1000	3	N	L	N	200	N	1.	.1	.3	N	N
8	09173 ✓	Soil 6W+300S	N	N	70	30	200	N	3.	100	30	20	100	N	300	200	300	70	N	N	200	30	3000	3	N	L	10	500	10	2.	1.	.3	1.	4.
9	09174 ✓	Rock 2W+600S	N	L	100	10	N	7	1.	N	50	N	200	N	700	100	100	700	N	N	100	20	1000	2	N	L	N	300	10	.3	.15	.05	N	N
10	09175 ✓	Rock 4W+600S	N	N	300	10	N	10	7.	70	20	N	150	N	2000	1000	50	500	N	N	100	30	1000	L	N	L	5	500	N	.07	.15	.2	.3	N
11	09176 ✓	Soil 6W+600S	N	N	50	30	L	L	3.	N	30	20	150	N	L	N	700	100	N	N	300	30	1500	5	N	L	10	500	20	2.	1.	.4	1.5	3.
12	09177 ✓	Soil 2W+900S	N	N	30	30	N	N	1.	L	10	N	200	N	200	L	50	50	N	N	100	10	1500	2	N	L	N	500	N	.4	.1	.05	1.	2.
13	09178 ✓	Soil 4W+900S	N	N	40	30	L	L	3.	N	20	20	100	N	N	N	700	100	N	N	100	30	1500	2	N	L	5	500	N	1.5	.7	.3	1.5	3.
14	09179 ✓	Rock 6W+900S	N	N	50	30	300	L	4.	N	30	20	100	N	L	N	700	150	N	N	200	30	1500	5	N	L	10	700	20	1.5	.7	.4	1.	2.
15	09180	Soil 300N+0W	N	N	100	20	N	L	3.	L	10	N	200	N	1500	L	20	700	N	N	70	30	1000	2	N	L	5	200	N	.1	.2	.3	L	L
16	09181	Soil 600N+0W	N	N	60	20	L	L	4.	N	30	20	200	N	300	N	700	100	N	N	200	30	1500	3	N	L	20	500	30	2.	1.	.5	1.5	3.
17	09182	Rock 900N+0W	N	N	40	30	L	L	3.	N	20	20	100	N	200	N	700	100	N	N	200	30	1500	3	N	L	10	700	20	5.	.7	.3	1.	2.
18	09183	Soil 300S+0W	N	.5	30	20	N	N	1.	N	10	N	300	N	200	N	70	300	N	N	50	10	1000	2	N	L	N	200	N	.3	.3	.1	L	.5
19	09184	Rock 600S+0W	N	L	70	30	L	L	3.	N	40	10	100	N	200	N	500	300	N	N	200	30	1500	3	N	L	10	700	20	5.	1.	.3	1.	2.
20	09185	Rock 900S+0W	N	N	60	20	N	L	3.	N	10	N	300	N	1000	N	50	2000	N	N	50	20	1500	2	N	L	N	1000	20	1.	.2	.1	N	1.
21	09185 Dup.	Rock 900S+0W	N	N	60	20	N	L	2.	N	10	N	200	N	1000	N	50	2000	N	N	30	20	1500	2	N	L	N	1000	20	1.	.2	.1	N	.5
22			–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
23																																		
24																																		
Lower Detection Limit →			10	0.5	5	10	200	5	0.05%	50	5	5	5	20	200	100	10	10	10	10	10	10	10	2	20	10	5	100	10	0.05%	0.02%	0.001%	.2%	.5%

N = Not detected. L = Detected, but below limit of determination. G = Greater than value shown.

REMARKS: Job #31 – 020 Iron Point project – Nevada (Lower Ore.)

IRON POINT

CODED BY

ANALYST [signature]

W.A. BOWES & ASSO.
PO Box 160, Steamboat Spgs.
Colorado 80477

SEMIQUANTITATIVE SPECTROGRAPHIC ANALYSIS

INSTRUMENT: WADSWORTH MOUNTED, JARRELL-ASH, 1.5 METER, DC ARC EMISSION SPECTROGRAPH

FILM NO. 7-7
DATE 12-11-70

Fe, Mg, Ca, & Ti reported in %, all other elements reported in ppm

Office No.	Field No.	Au	Ag	Cu	Pb	Zn	Mo	Fe	W	Ni	Co	Cr	Cd	As	Sb	Mn	V	Bi	Sn	Zr	B	Ba	Be	La	Nb	Sc	Sr	Y	Ca	Mg	Ti	Na	K
Reference	6-2	N	N	15	50	N	N	2.	N	5	N	N	N	N	N	300	50	N	N	300	10	2000	3	100	L	N	[illegible]	N	1.5	6.	.4	3.	4.
09144	Rock 0N+0W	N	1	700	30	N	7	.7	L	50	N	300	N	300	N	150	150	N	N	70	20	1500	2	N	L	N	500	N	1.5	.2	.2	L	L
09145	Rock 2E+300S	N	5	150	20	N	L	.5	70	10	N	300	N	1000	N	150	100	N	N	200	20	1000	2	100	L	5	300	N	.3	.05	.5	.2	.5
09146	Soil 4E+300S	N	N	100	30	L	L	2.	L	100	N	300	N	300	N	300	500	N	N	200	30	2000	3	20	L	10	1500	50	5.	.7	.4	.5	.7
09147	Rock 2E+600S	N	1	200	30	200	7	2.	100	150	N	300	N	1000	N	100	700	N	N	200	20	1500	3	N	L	5	1500	70	3.	.1	.1	N	N
09148	Soil 4E+600S	N	2	70	40	L	5	2.	N	50	10	200	N	200	N	500	500	N	N	200	30	2000	3	L	L	10	700	30	3.	.7	.3	.7	2.
09149	Soil 2E+900S	N	L	100	30	L	5	2.	50	100	N	300	N	300	N	300	1500	N	N	200	20	5000	5	20	L	10	1000	100	3.	.7	.3	.5	2.
09150	Soil 4E+900S	N	L	40	40	N	5	3.	N	30	10	200	N	N	N	500	300	N	N	500	30	2000	5	20	L	20	500	30	2.	.7	.5	.7	2.
09151	Rock 2E+300N	N	1	400	20	N	10	2.	N	100	N	300	N	700	N	70	700	N	N	200	20	2000	2	50	L	N	1000	60	2.	.1	.1	N	N
09152	Rock 4E+300N	N	1	150	30	N	50	2.	N	20	N	300	N	1000	N	100	2000	N	N	100	20	2000	2	20	L	N	1000	N	1.	.2	.1	1.	.7
091[illegible]	Soil 2E-600N	N	L	50	30	N	N	3.	N	50	20	300	N	200	N	700	100	N	N	300	20	2000	5	20	L	20	500	30	1.5	1.	.5	1.	2.
091[illegible]	Rock 4E-600N	N	1	100	30	N	70	1.	N	10	N	300	N	700	L	50	500	N	N	200	10	1500	2	L	L	10	1000	N	2.	.15	.4	.7	L
091[illegible]	Soil 2E+900N	N	N	60	40	N	L	4.	N	30	20	200	N	N	N	500	100	N	N	300	30	1500	3	20	L	20	700	30	1.5	1.	.7	1.	3.
091[illegible]	Soil 4E-900N	N	N	60	[illegible]	N	L	4.	N	30	20	200	N	L	N	700	150	N	N	300	30	1500	3	50	L	20	700	50	3.	1.5	.7	1.5	3.
091[illegible]	Rock 2E+0	N	.5	150	20	N	10	2.	N	20	N	300	N	3000	200	70	500	N	N	200	10	1000	2	N	L	N	700	30	1.	.1	.2	L	N
091[illegible]	Rock 4E+0	N	.5	300	20	N	60	2.	L	10	N	300	N	300	L	70	700	N	N	200	10	1000	2	N	L	N	700	20	.7	.1	.3	.5	N
091[illegible]	Soil 2W+0	N	L	500	30	200	L	3.	N	30	10	150	N	1000	500	200	700	N	N	200	30	3000	2	N	L	5	1000	20	10.	.7	.2	.5	L
091[illegible]	Rock 4W+0	N	.5	300	20	300	10	15.	700	20	N	200	N	1500	1000	200	200	N	N	100	30	1000	3	N	L	5	1500	N	.3	.05	.1	L	N
091[illegible]	Rock 6W+0	N	N	10	[illegible]	N	N	.3	N	5	N	N	N	N	N	300	100	N	N	50	10	300	N	N	N	N	1000	N	G 20.	3.	.1	N	N
091[illegible]	Soil 2W+300N	N	N	100	20	200	5	5.	N	30	20	150	N	700	200	500	100	N	N	70	50	1500	2	N	L	10	700	10	1.5	1.5	.3	1.	3.
0916[illegible]	Rock 4W+300N	N	L	60	20	N	L	3.	N	30	N	200	N	300	100	100	1000	N	N	50	10	1500	2	N	L	N	300	20	2.	.3	.2	N	.5
0916[illegible]	Rock 6W+300N	N	L	50	20	200	N	.7	N	30	N	200	N	N	500	70	50	N	N	50	10	1500	2	N	L	N	200	N	.2	.1	.2	N	N
091[illegible]	Soil 2W+600N	N	N	50	20	N	L	1.5	N	30	10	200	N	500	100	300	100	N	N	70	30	2000	2	L	L	5	1000	10	1.5	.5	.3	.5	.7
091[illegible]	Soil 4W+600N	N	N	70	[illegible]	L	L	2.	N	30	20	100	N	200	N	500	70	N	N	100	30	1500	3	20	L	10	700	20	1.5	.7	.3	1.	3.
Lower Detection Limit →		10	0.5	5	10	200	5	0.05%	50	5	5	5	20	200	100	10	10	10	10	10	10	10	2	20	10	5	100	10	0.05%	0.02%	0.001%	.2%	.5%

N = Not detected. L = Detected, but below limit of determination. G = Greater than value shown.

REMARKS: Job #31, Namel C20 - Snow Point Project (Reno, Nev.)
IRON POINT

CODED BY

ANALYST [illegible signature]

spectrograph analysis. A property map is being researched and will be forwarded when completed. No additional work is outlined for this area until the geochemical results are returned and studied.

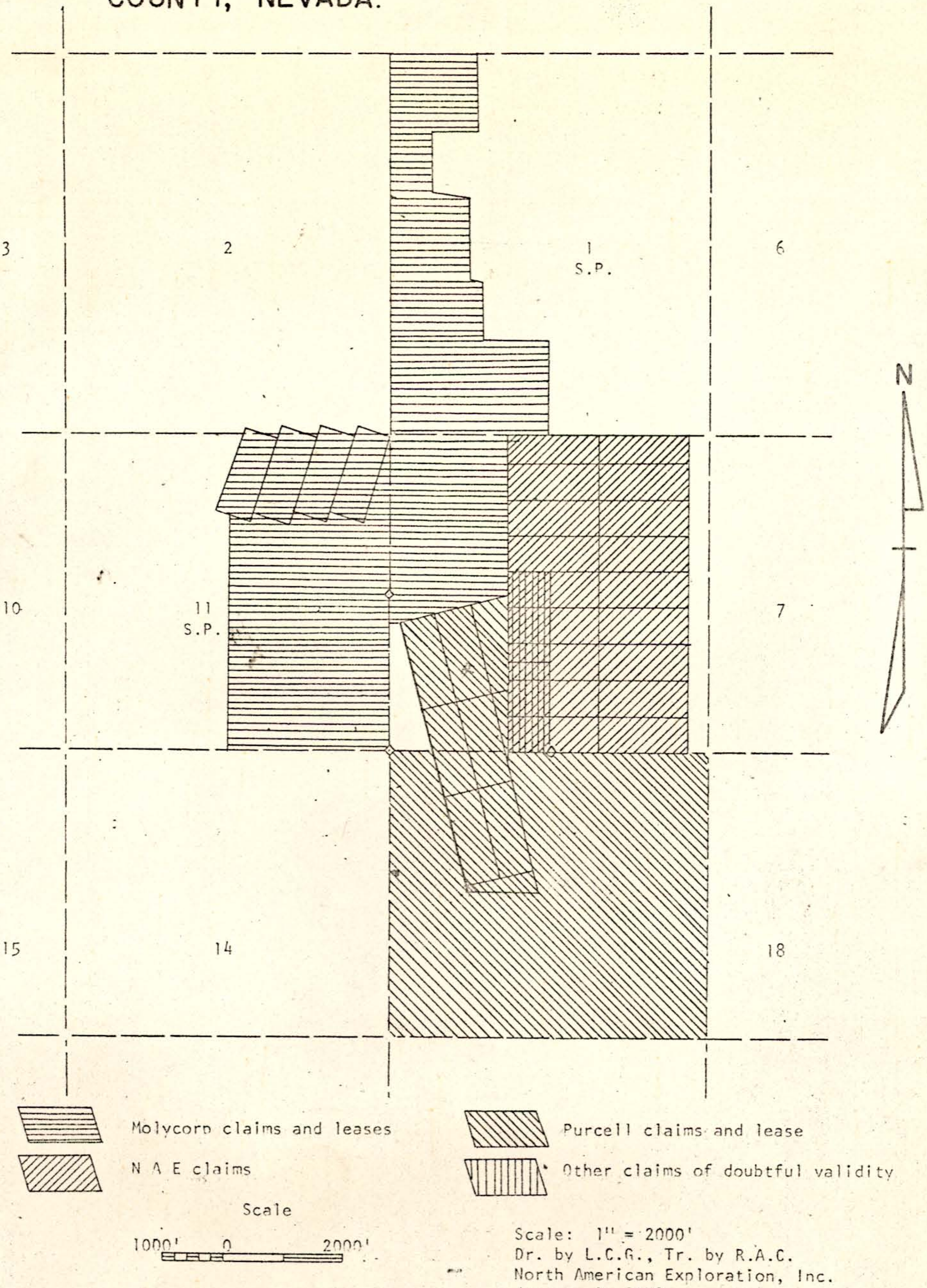
basis of results from geochemical sampling. It is recommended that the open portion of Section 12 and the east 1/2 of Section 14 be claimed at once.

Results of 42 samples taken from a grid centered about the present mine in the north-central claim of the Purcell group have been plotted for vanadium, mercury, copper, and molybdenum. Copper values show a maximum of 700 ppm at the mine site; contours of anomalous values are open to the east. Contours of vanadium values also show a pattern open to the east and south with maximum values of 2000 ppm vanadium occurring on the borders of the sample area. Mercury values form a pattern open to the east and have a maximum of 60 ppm in the southwest quadrant of the sample area. Molybdenum values from 10 to 70 ppm occur on the eastern edge of the sample area.

Iron Point (044): A series of forty-two rock and soil samples have been taken on the existing grid over the Iron Point Prospect. Samples were taken at 200-foot intervals along east-west lines, with a spacing between lines of 300 feet. These samples have been sent to W. A. Bowes for emission

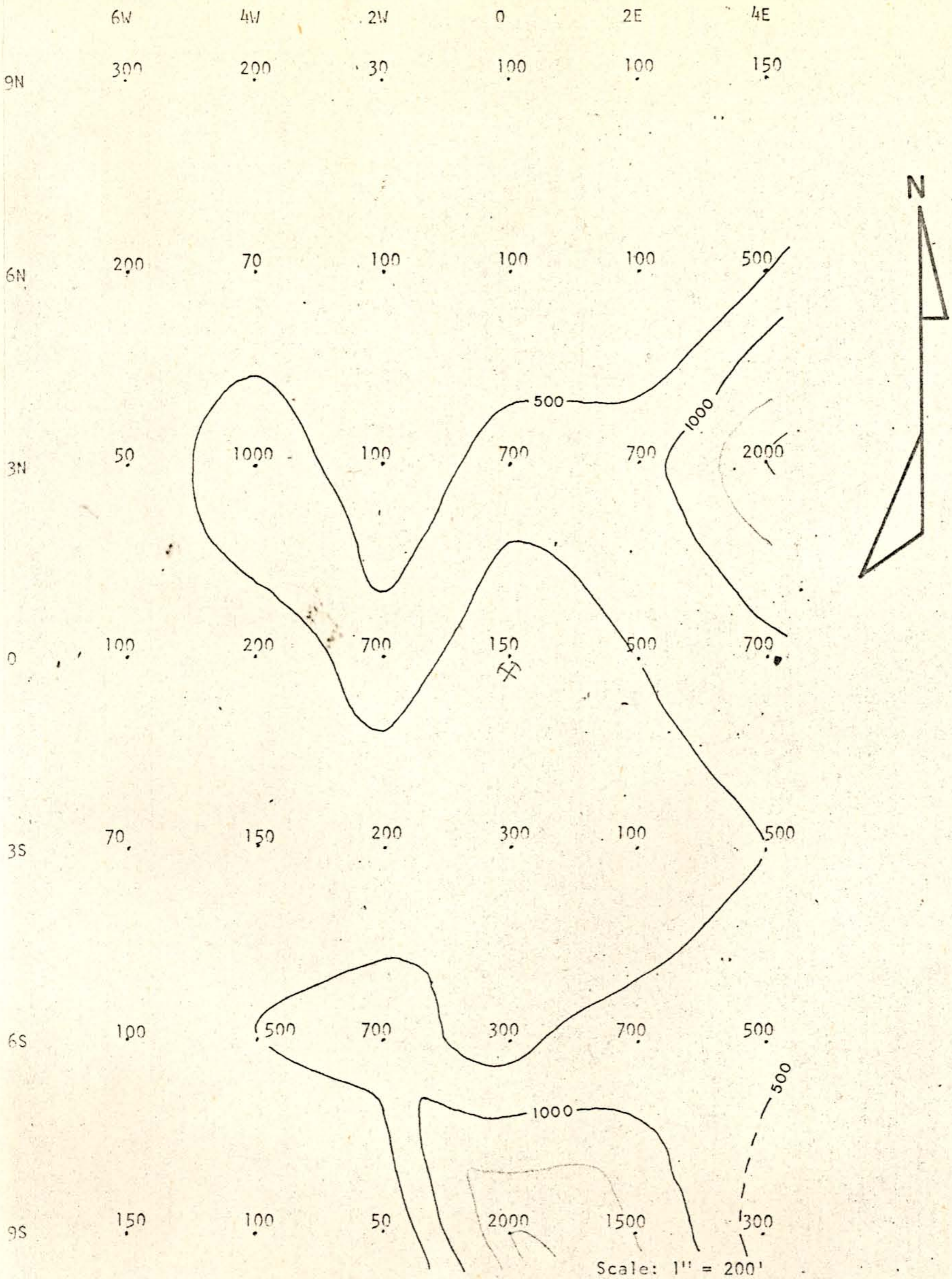
Iron Point (044): A property map has been constructed showing various land holders in the area of the Iron Point prospect. Eighteen claims were staked, by location monuments only, to the east of the Purcell group on the

PERTY LOCATION MAP, IRON POINT PROSPECT, HUMBOLDT COUNTY, NEVADA.



Scale: 1" = 2000'
Dr. by L.C.G., Tr. by R.A.C.
North American Exploration, Inc.
January 1, 1971

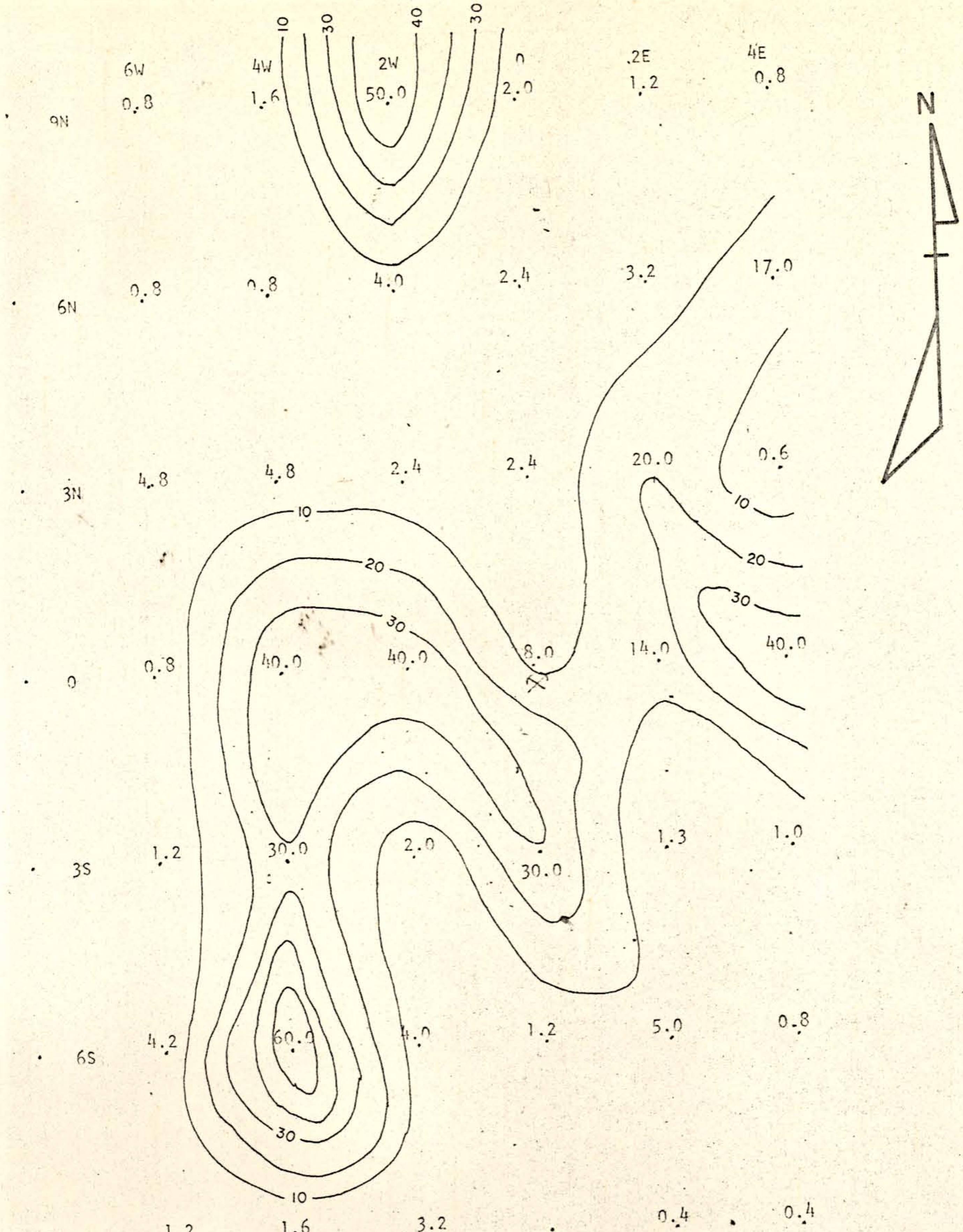
DISTRIBUTION OF VANADIUM VALUES, IRON POINT PROSPECT, HUMBOLDT COUNTY, NEVADA.



Scale: 1" = 200'
Contour Interval = 500 PPM
Dr. by L.C.G.; Tr. by R.A.C.
North American Exploration, Inc.
January 1, 1971

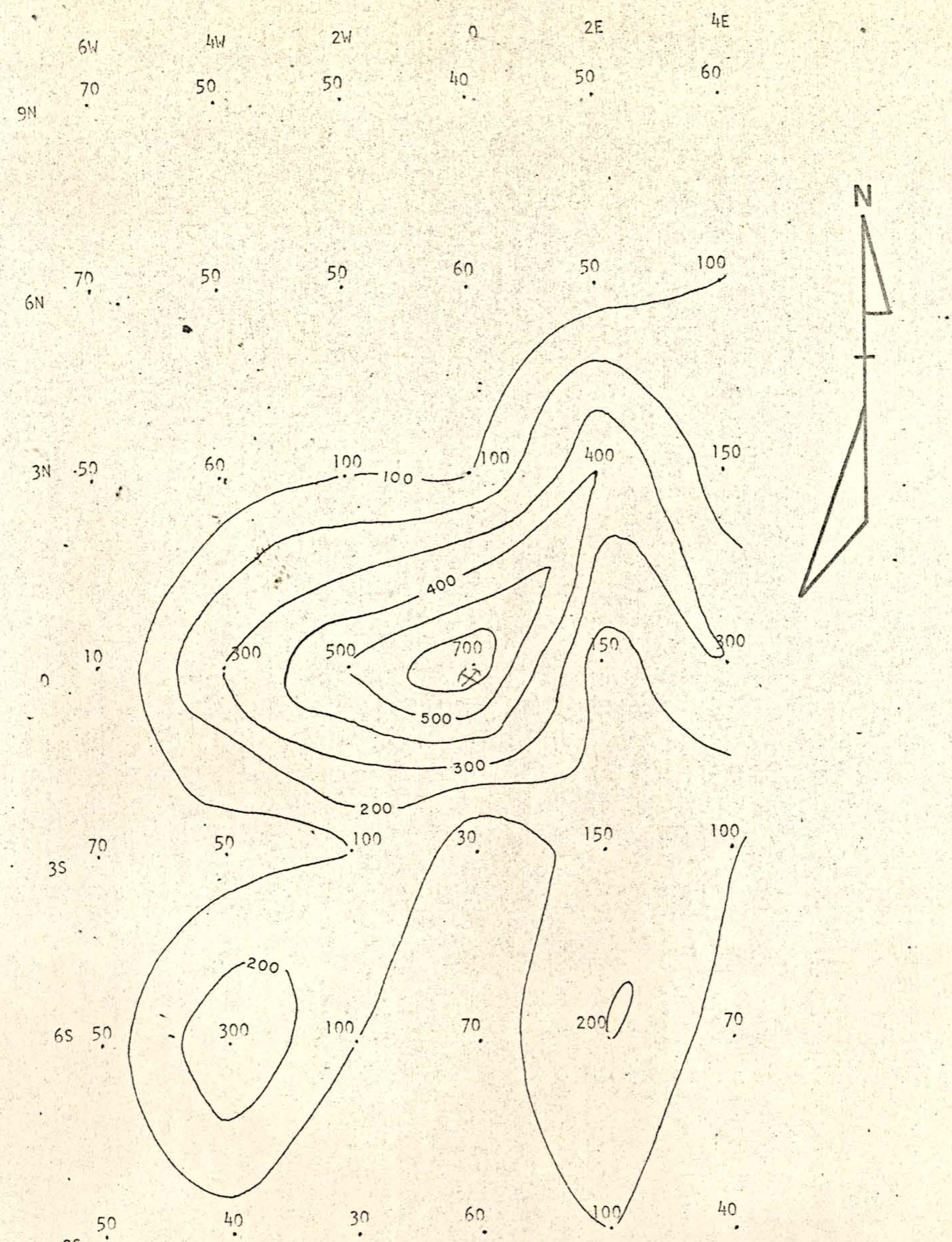
BUTION OF MERCURY VALUES, IRON POINT PROSPECT, HUMBOLDT

TY, NEVADA.



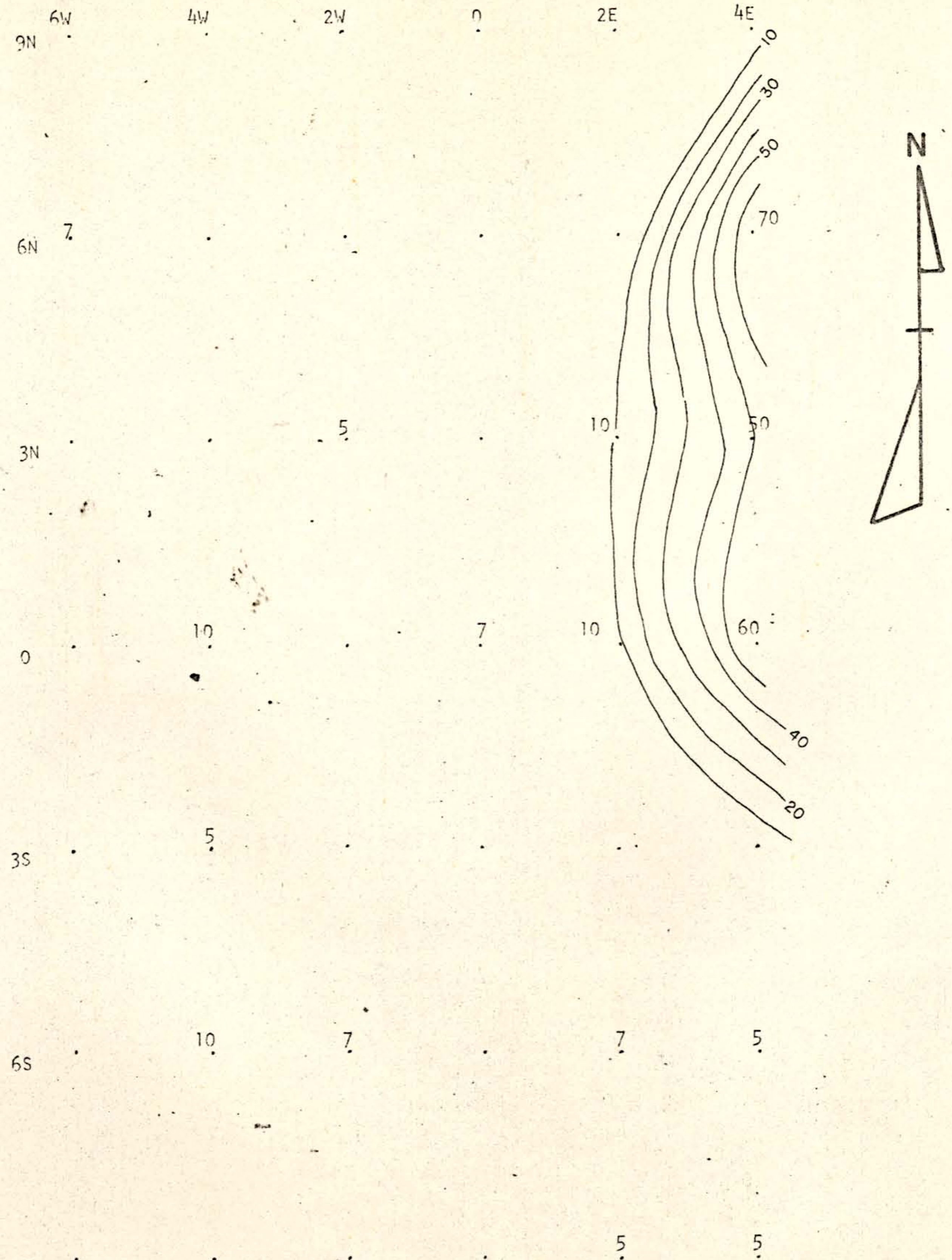
Scale: 1" = 200'
Contour Interval = 10 PPM
Dr. by L.C.G., Tr. by R.A.C.
North American Exploration, Inc.
January 1, 1971

DISTRIBUTION OF COPPER VALUES, IRON POINT PROSPECT, HUMBOLDT COUNTY, NEVADA.



Scale: 1" = 200'
Contour Interval = 100 PPM
Dr. by L.C.G., Tr. by R.A.C.
North American Exploration, Inc.
January 1, 1971

DISTRIBUTION OF MOLYBDENUM VALUES, IRON POINT PROSPECT, HUMBOLDT COUNTY, NEVADA.



Scale: 1" = 200'
Contour Interval = 10 PPM
Dr. by L.C.G., Tr. by R.A.C.
North American Exploration, Inc.
January 1, 1971

Hg Values

Names Job # 31 SENT 12/15/7[illegible]

	Film # 7-7 Sample #	PPM		Film # 8-7 Sample #	PPM		Film # Sample #	PPM
00	1 09144	2.0	1	6W 6N 09167	.8	1		
2E+3S	2 09145	1.3	2	2W 9N 09168	50.0	2		
4E-3S	3 09146	1.0	3	4W 9N 09169	1.6	3		
2E-6S	4 09147	5.0	4	6W 9N 09170	.8	4		
4E-6S	5 09148	.2	5	2W-3S 09171	2.0	5		
2E-9S	6 09149	.4	6	4W-3S 09172	30.0	6		
4E-9S	7 09150	.4	7	6W 3S 09173	1.2	7		
2E 3N	8 09151	20.0	8	2W 6S 09174	4.0	8		
4E 3N	9 09152	.6	9	4W 6S 09175	60.0	9		
2E 6N	10 09153	3.2	10	6W 6S 09176	4.0	10		
4E 6N	11 09154	17.0	11	2W 9S 09177	3.2	11		
2E 9N	12 09155	1.2	12	4W 9S 09178	1.6	12		
4E 9N	13 09156	.2	13	6W 9S 09179	1.2	13		
2E-0	14 09157	[illegible]	14	3W 0W 09180	2.4	14		
4E-0	15 09158	<2.0 (?)	15	6N 09181	2.4	15		
2W-0	16 09159	<2.0 (?)	16	9N 09182	2.0	16		
4W-0	17 09160	[illegible]	17	3S 09183	30.0	17		
6W-0	18 09161	[illegible]	18	6S 09184	1.2	18		
2W-3N	19 09162	[illegible]	19	9S 09185	Missing	19		
4W-3N	20 09163	[illegible]	20			20		
6W-3N	21 09164	[illegible]	21			21		
2W-6N	22 09165	[illegible]	22			22		
4W-6N	23 09166	[illegible]	23			23		

IRON POINT

Presented at Royal Society London symposium on "Volcanism and the Structure of the Earth," Nov. 12-13, 1970. To be published in the Transactions of the Royal Society.

CENOZOIC VOLCANISM AND PLATE-TECTONIC EVOLUTION OF THE WESTERN UNITED STATES. PART 1: EARLY AND MIDDLE CENOZOIC[1]

by

Peter W. Lipman, Harold J. Prostka, and Robert L. Christiansen

U.S. Geological Survey, Denver, Colorado, U.S.A.

[1] Publication authorized by the Director, U.S. Geological Survey.

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[Abstract] Variations in Cenozoic volcanism in the Western United States correlate rather closely with changes in tectonic setting: intermediate-composition rocks and their associated differentiates were erupted through orogenic or fairly stable crust, whereas basaltic or bimodal basalt-rhyolite suites were erupted later--concurrently with crustal extension and normal faulting.

Lower and middle Cenozoic continental lavas, erupted onto post-orogenic terranes, are predominantly intermediate types (andesite to rhyodacite), commonly with closely associated more silicic ash-flow sheets. Compositional zonations in individual ash-flow sheets, from rhyolite upward into quartz latite, record magmatic differentiation in underlying batholithic source chambers. The intermediate lavas probably represent the greater part of these batholiths and the ash-flow tuffs their differentiated tops. Continental volcanic activity of this type was most voluminous in the northwestern United States in Eocene time, but shifted southward in the Oligocene; contemporaneous sea-floor basalts occur in the Oregon-Washington Coast Ranges.

Largely intermediate-composition calc-alkalic igneous suites that become more alkalic toward the continental interior are characteristic of most of the North and South American cordilleran belt. Similar volcanic associations are forming now around most of the Pacific margin where continental plates override oceanic crust along active subduction systems, marked by Benioff seismic zones and oceanic trenches. A

similar subduction mechanism probably operated in the Western United States until late Cenozoic time. Analogy with chemical variations across active island arcs suggest that early and middle Cenozoic subduction occurred along two subparallel imbricate zones that dipped about 20° eastward. The western zone emerged at the continental margin, but the eastern zone was entirely beneath the continental plate, partly coupled to the western zone below the low-velocity layer.

Predominantly intermediate-composition volcanism persisted throughout the Western United States until the initial intersection of North America with the East Pacific Rise started the progressive destruction of the subduction system.

Introduction

The Pacific margins of North and South America are marked by a belt of Mesozoic and Cenozoic volcanism, plutonism, and tectonism about 500 km wide that grades eastward into terranes of gentle structure and minor igneous activity. In middle North America, however, the belt bulges eastward to form a zone as wide as 1500 km (figure 1)

Figure 1.--NEAR HERE.

---

that is characterized by complexly overlapping structures and igneous activity. Within this anomalously wide area, we believe that variations in Cenozic volcanism can be correlated rather closely with tectonic setting. In this and the second part of this paper (Christiansen & Lipman, this volume) we summarize the characteristics of Cenozoic

REPORT ON EXAMINATION

IRON POINT MERCURY PROPERTY

(40° 55' N -- 117° 18' W)

HUMBOLDT COUNTY

NEVADA, U. S. A.

Prepared For

Purcell Development Co. Ltd.

Prepared By

Angus G. MacKenzie Mining Consultants Ltd.

Calgary, Alberta

February, 1971

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A. G. MacKENZIE

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PROFESSIONAL ENGINEER ALBERTA
A. G. MacKENZIE

AUTHORITY

This study of the Iron Point Mercury Property in Humboldt County, Northern Nevada, U. S. A. was authorized by Mr. L. Wilder of Purcell Development Co. Ltd.

We understand that this report may be used as part of a submission to a Securities Commission by Purcell Development Co. Ltd.

This report is the result of a property examination by Angus G. MacKenzie, P. Eng. in February, 1971 and the compilation and reinterpretation of pertinent data from Government reports and Company reports supplied by Purcell Development Co. Ltd.

PROPERTY

The property consists of six full-sized and three fractional, unpatented claims which are contiguous and cover an area of approximately 150 acres. The mineral claims are as follows:

Full Size:

Iron Point No. 1

Iron Point No. 3

Nightmare

Nightmare Annex

Annex No. 1

Annex No. 2

PROFESSIONAL ENGINEER A. G. MacKENZIE ALBERTA

Fractional:

Sweet Dreams

Sweet Dreams Fraction

Annex Fraction

Purcell Development Co. Ltd. took over an option on the Nightmare and Nightmare Annex claims from Mr. C. A. Beagle of Sacramento, California. The company subsequently staked the rest of the above claims.

While we did not check on the standing of the claims ourselves, J. M. Dawson, P. Eng. (B. C.) reported that the claims were correctly staked and assessment work has been filed for the year 1970.

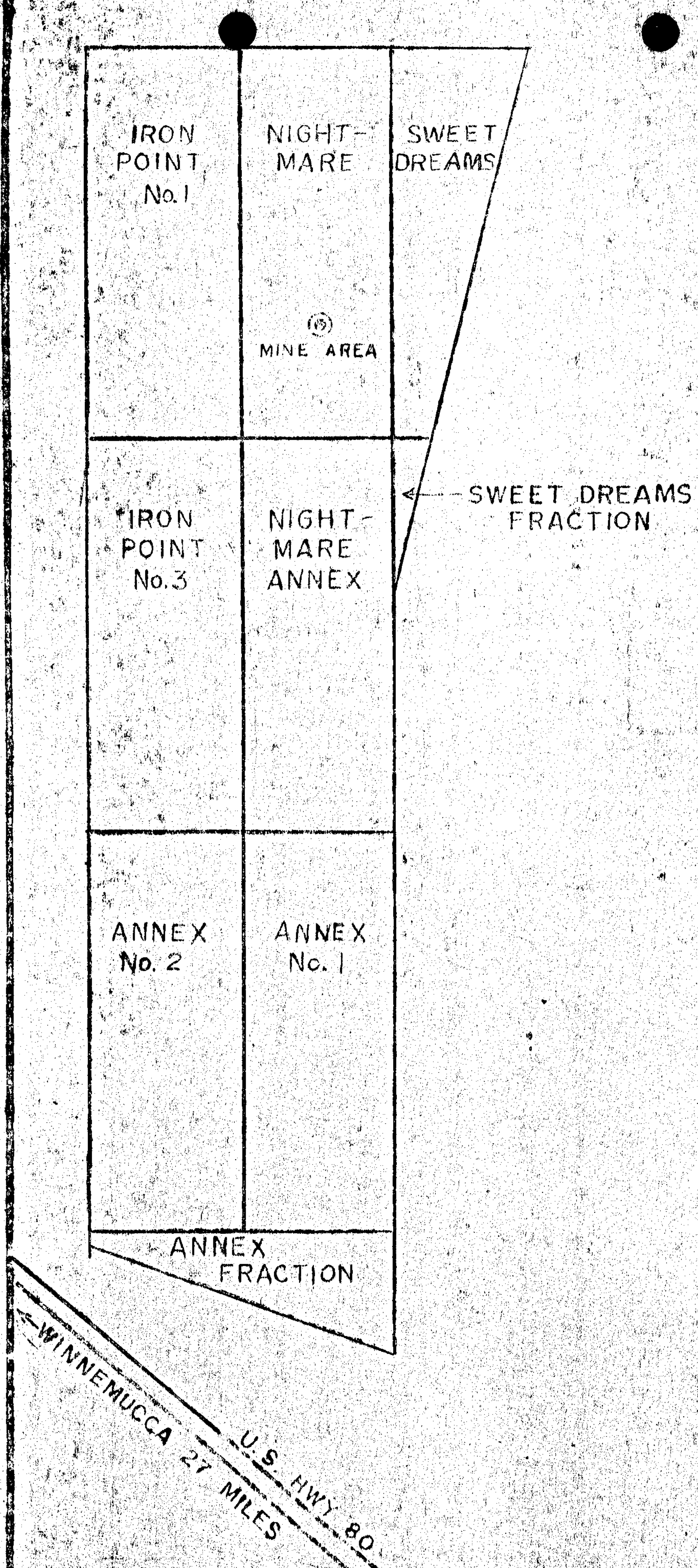
In addition to the above claims, Purcell Development Co. Ltd. has obtained a mineral lease from the railroad company (which owned the land south of the group of claims) for an area of one square mile immediately south of the claims. This area has not yet been surveyed nor picketed on the ground.

Figure 1 is a mineral claim map showing the claims.

LOCATION AND ACCESSIBILITY

At present only the location of the group of mineral claims is described but it should be kept in mind that the area of one square mile to the south is also leased by Purcell Development Co. Ltd. and is considered part of the property, inasmuch as potential extension of the deposit southward and an exploration program are concerned.

PROFESSIONAL ENGINEER ALBERTA
A. G. MacKENZIE



NOTE: PREPARED FROM DATA SUPPLIED BY PURCELL DEVELOPMENT CO. LTD

FIG. 1

ANGUS G MACKENZIE
MINING CONSULTANTS LIMITED
703 5th St, CALGARY, ALBERTA

FOR
Purcell Development Co. Ltd.

MINERAL CLAIMS MAP
IRON POINT MERCURY PROPERTY
HUMBOLDT COUNTY, NEVADA, USA

Date: Feb/71 Appd:
Dwg No: Scale:

To accompany report by A G Mackenzie Mining Consultants Ltd.

The group of claims is located in the Gold Run (Iron Point) Mining District, Southeastern Humboldt County, Nevada. The claims occupy portions of Sections 12 and 13, Township 35 North, Range 4 East, and lie just north of U. S. Highway #80. The approximate geographic centre of the group is 40° 55' North Latitude and 117° 18' West Longitude. The village of Golconda is located about 10 miles to the west-northwest (See Figure 2).

The property can be reached by driving east for 27 miles along U. S. Highway #80 from Winnemucca, Nevada and thence north over an unimproved gravel road for three-quarters of a mile to the property. All parts of the property can easily be traversed on foot.

The town of Winnemucca is not serviced by commercial airlines but a good, paved, landing strip suitable for light aircraft is available about five miles south of the town. Reno, 165 miles south and Elko, 126 miles east, are cities serviced by commercial airlines.

PHYSIOGRAPHY, CLIMATE, VEGETATION

The property is located near the northeast edge of the Edna Mountains, a range of low hills about 15 miles long and from 1 to 6 miles wide. The Edna Mountains are separated from the Osgood Mountains to the north by a narrow valley traversed by the Humboldt River. To the south the Edna Mountains are separated from the Sonoma Mountains by a narrow pass.

The claims cover portions of the east slope of a north trending ridge. There are two east-west gullies across the ridge. Outcrops are relatively scarce but in most places only a thin (one to two feet thick) overburden is present.

PROFESSIONAL ENGINEER A. G. MacKENZIE ALBERTA

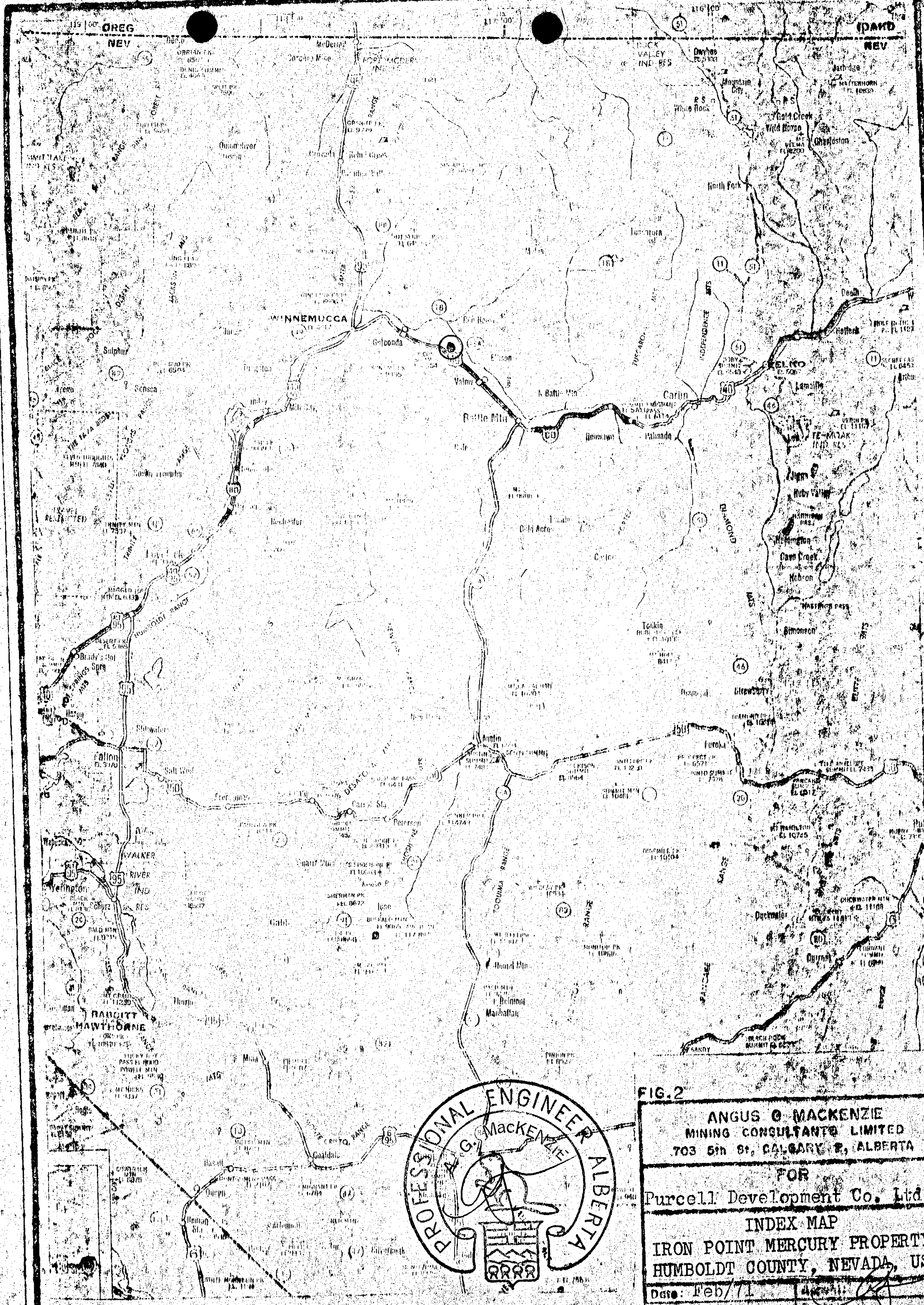


FIG. 2

ANGUS G. MACKENZIE
MINING CONSULTANTS LIMITED
703 5th St. CALGARY 2, ALBERTA

FOR

Purcell Development Co. Ltd.

INDEX MAP
IRON POINT MERCURY PROPERTY
HUMBOLDT COUNTY, NEVADA, USA

Date: Feb/71
Dwg No:

To accompany report by A G Mackenzie Mining Consultants Ltd.

Elevations on the property vary from 4,400 to 4,700 feet above sea level. The ground is gently rolling with a maximum relief of about 300 feet.

The climate can be classified as arid. The normal precipitation in Humboldt County varies between 5 and 10 inches. About half of this falls in the winter months and only about one inch in the summer. The general area is characterized by hot summers and cold winters. Summer temperatures can go as high as 100 degrees but the low 90's are more common. The normal daily temperature in the middle of winter is about 15 degrees but temperatures as low as -20 degrees have been recorded.

Vegetation is relatively non-existent, there being only scattered sagebrush and bunch grass on the property.

WATER AND POWER SUPPLIES

There are no creeks on the property nor in the general vicinity. Shallow, high-yield water wells have been drilled in the general area, however. Water for drilling would have to be trucked to the property. For production a well would have to be drilled.

Power lines pass along Highway #80 at the south end of the property.

HISTORY

Mercury mineralization was first discovered on the property in the late 1930's by Mr. Victor Thornton of Reno, Nevada. Thornton dug a shaft at the discovery site and later sank an incline to a depth of 50 feet immediately south of the shaft. At the end of the incline he drove a cross-cut to the

PROFESSIONAL ENGINEER A. G. MacKENZIE ALBERTA

west for a short distance then sunk a winze to a depth of 18 feet. From this he obtained high grade "ore" which he shipped to a local smelter.

Thornton optioned the property to a Mr. Gould of California during World War II, who did little with it. It lay idle until 1968 when C. A. Beagle of Sacramento, California optioned the property from Victor Thornton, Jr., son of the original staker. Beagle extended the underground workings to the west and north and mined out the present stope.

Mr. W. C. Jones of Purcell Development Co. Ltd. visited the property in November, 1969 and in the spring of 1970 an agreement was entered between Mr. Beagle and Purcell Development, whereby the latter took over the option of the property.

In April, 1970 Purcell Development commenced underground and surface geological mapping, detailed underground sampling and also did a geochemical survey over the Sweet Dreams section, most of the Nightmare claim and parts of Iron Point #1, Iron Point #3, Nightmare Annex and Sweet Dreams claims (See Figure 3).

At this time about 1,200 tons of badly diluted "ore" mined by Beagle were shipped to a local smelter. Returns yielded about 2 pounds of mercury per ton. It had been estimated that the "ore" stockpile would run between 4 and 6 pounds of mercury per ton.

In October, 1970 Stampede International Resources Ltd. of Calgary became interested in the property and sent J. M. Dawson of Versatile Mining Services to examine the property. Nothing has been done by way of agreement

PROFESSIONAL ENGINEER
A. G. MacKENZIE
ALBERTA

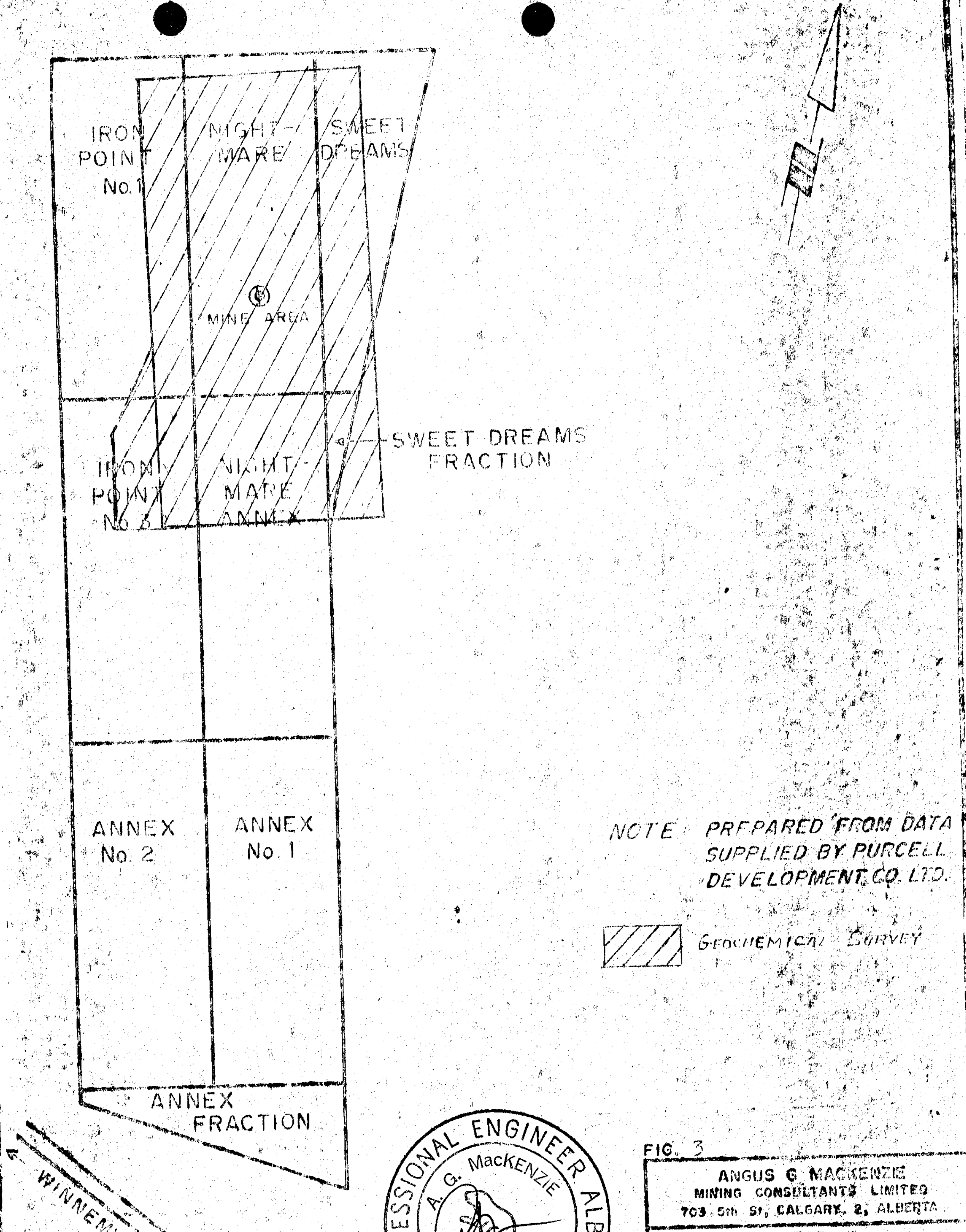


FIG. 3

ANGUS G. MACKENZIE
MINING CONSULTANTS LIMITED
703 5th St, CALGARY, 2, ALBERTA

FOR
Purcell Development Co. Ltd.

GEOCHEM SURV LOCATION MAP
IRON POINT MERCURY PROPERTY
HUMBOLDT COUNTY, NEVADA, USA

Date: Feb/71	Appv'd:
Dwg No:	Scale:

To accompany report by A. G. Mackenzie Mining Consultants Ltd.

or participation by Stampede International and Purcell Development continues to be the operators of the property.

Angus G. MacKenzie Mining Consultants Ltd. was requested by Purcell Development to look at the property in February, 1971. This report is the result of that site visit and the interpretation of data gathered by Purcell Development in their 1970 field work.

PROFESSIONAL ENGINEER ALBERTA
A. G. MacKENZIE

GEOLOGY

Lithologic Units

The only available geological map covering the area was prepared by R. Willden at a scale of 1:250,000 in 1963 ("Geology and Mineral Deposits of Humboldt County, Nevada", Nevada Bureau of Mines Bulletin 59). Five units are shown on the geological map (Figure 4) excluding Quaternary alluvium and glacial cover.

TABLE OF FORMATIONS

Pleistocene - Recent	
Alluvian-Glacial Deposits	Sand and Gravel
Unconformity	
Pennsylvanian	
Antler Limestone	Limestone, Shale
Pumpernickel Formation	Greenstone, Limestone, Chert, Argillite
Unconformity	
Ordovician	
Valmy (Comus) Formation	Chert, Limestone, Volcanics, Shale
Fault Contact	
Cambrian	
Preble Formation	Limestone, Shale

Of these five units only the Valmy Formation is of interest and is the only unit discussed in detail below.

Valmy Formation

On the geological map prepared by R. Willden the general area of the Iron Point property has been mapped as Comos Formation. However, the description of the formation at the type locality north of the mine area does not mention any occurrence of volcanic rocks in the formation. To the south Willden mapped some outcrops of Valmy Formation, which is of the same age as the Comos but contains altered volcanics (greenstone) within the formation. The lithology of the Valmy is essentially similar to the Comos Formation.

Because of the predomincance of volcanic rocks in the mine area we are inclined to believe that the rocks here belong to the Valmy Formation. There is a strong possibility that these rocks are a transitional facies of the Comos and Valmy Formations. This we believe to be the case, since there is more limestone, dolomite, and volcanics present than is apparently characteristic of either.

The Valmy Formation is characterized in the basal portion by a generally light-coloured quartzite, dark chert, siliceous shale, a significant amount of altered volcanic rocks, and an upper portion of principally dark, thinly-bedded chert interbedded by dark shale and little greenstone.

The chert is green and light grey to black and thinly-bedded to massive. Cherts often contain light green, siliceous shale partings occurring as beds up to two feet thick interbedded with limestone and altered volcanics.

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The greenstone is altered andesitic lavas and altered pyroclastic materials. Some of the pyroclastic materials have a calcareous matrix.

As mentioned before, the rocks in the mine area fit the description of the Valmy Formation except that there is considerably more limestone to the west of the mine area.

Trachyte(?) porphyry intrusives cut through the Valmy Formation in the area. These occur as narrow dykes following fractures in the formation. No dating has been done on the intrusives but since they cut the Valmy they are definitely post-Ordovician. We believe they are Tertiary intrusives and probably precede the period of mercury mineralization.

STRUCTURE

The main structure in the area is a high-angle, reverse fault which brought the Cambrian Preble Formation in contact with the Ordovician Valmy Formation. This fault can be traced in the area for several miles, trending north to northwest. It has been displaced in several locations by east-west faults.

This major fault is probably the oldest and caused the zone of weakness on the east block of the fault where later movements occurred. A smaller and younger fault parallels the major fault about 1,000 to 1,200 feet to the east. It is this smaller fault that appears to have controlled the mineralization. The fault plane of this smaller fault has been strongly mineralized and altered and has acted as an impervious barrier to the mercury-bearing mineralizing solution.

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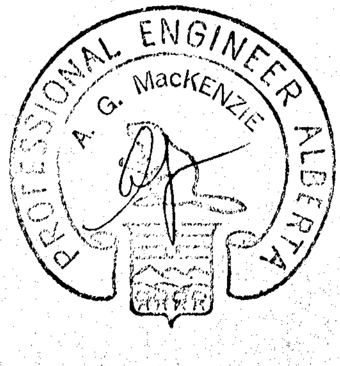
The east-west cross-faults displaced this fault.

Folds

Some tight folding and drag folding have been noted in the underground workings and from outcrops. An interpretive, structural, cross-section is shown in Figure 4. The section cuts the old workings in an east-west direction. These folds are probably much tighter and are broken by many more tension fractures than are shown in the diagrammatic section.

Here we should point out that the trend of the geochemical anomalies follows the trend of the folds. The occurrence of these anomalies (that are presently interpreted as mineral concentrations) over the folds may not be directly associated with the folds but rather with the fractures brought about by the tight folding.



UNDERGROUND MAPPING AND SAMPLING

The present underground workings are accessible. W. C. Jones, P. Eng. who mapped the workings described the underground geology as follows: QUOTE: "Cinnabar and metacinnabar coat fracture surfaces in the siliceous rock. They vary from a fine, paint-like coating to clusters of small crystals. Locally the mercury sulphides are intimately admixed with clay minerals to yield a pinkish clay. Considerable limonite and hematite are present locally, the former appearing to change in colour on being exposed to sunlight suggesting the presence of calomel (HgCl). Mercury values vary considerably across the ore body exposed underground, relatively small, pipe-like, intensely fractured bodies of very high grade material alternating with areas less brecciated containing much less mercury sulphide. Gypsum occurs locally underground as small anhedral crystals and some copper carbonate staining was observed along the back of the incline. No primary sulphides other than those of mercury were detected." END OF QUOTE

The geology of the underground workings is shown in Figure 5. Based on assay results of sampling done underground, both in the rock samples from the working face and sludge samples taken from eight-foot, jackleg holes, it is indicated that the best mineralization occurs on the western side of the workings and around a trachyte(?) porphyry intrusive. The western side of the workings is more highly fractured than the east side, thus the increase in sulphide content.

Mineralization extends eastward from the intrusive trachyte up to 20 feet. To the west it extends another 20 feet until it butts on barren, un-

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fractured, argillaceous beds which apparently acted as a local barrier or dam to the mineralizing solution. The trend of mineralization appears to parallel the strike of the argillaceous barrier and tends to decrease in value northward where the intrusive also pinches out. To the south where the extent of the intrusive is not yet known the values appear to be increasing.

METALLOGENESIS AND STRUCTURAL ORE CONTROLS

As in almost all other mercury deposits the emplacement of mercury sulphide is about the last of the geological events to transpire. A rough metallogenesis and structural controls bringing about the present deposit is outlined below. Generalization is used because of the limited data available. Such generalization is based on a study by C. N. Schuette of almost all mercury deposits in the United States. It was found that although local differences do occur generalities and similarities are common. Such similarities are:

1. Source of the ore is a deep-seated igneous rock magma.
2. The "ore" minerals are carried to the point of deposition by hot alkaline solutions ascending through fissures in the rock.
3. The ascending mineral-bearing solutions are directed and limited or even dammed at some point in their upward course by relatively impervious rocks.
4. Precipitation of the ore minerals is caused by the cooling and dilution of the mineral-bearing solution by loss of pressure or by precipitating agents such as organic matter or ~~gaseous~~ reagents.

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5. The ore body forms in any pervious rock or in the interstitial spaces of any broken rock mass or in other voids underlying the relatively impervious cap rock.
6. The formation of an orebody is caused by the concentration of the ore mineral in a trap formed by the relatively impervious rock. This trap has directed and limited the upward flow of the mineralizing solutions to the porous rock mass below.
7. The ore minerals are predominantly primary minerals, secondary minerals being rare and of little importance as ore.

With the above general controls in mind an attempt to interpret the metallogenesis of the Iron Point Mercury deposit is made.

The present highly altered zone was obviously a zone of weakness in the area. Along this zone, movement of rock units has taken place one after the other to relieve whatever stress or strain had been imposed on it. This resulted in the shearing and brecciation of rocks along the zone. In between movements, hydrothermal solutions seeping through fissures along the zone silicified brecciated fragments only to be broken up by the succeeding movements.

Varying degrees of silicification and varying competence of the original rock unit resulted in varying degrees of both brecciation and apparent porosity. Also, the fault planes would not be straight so that certain portions of the bounding rocks would receive more stress and break more readily than other parts. The position of the zone of greatest fracturing could be

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prognosticated if enough physical data were collected. Here mineralization will most likely take place. A good example of this is the present underground workings, which are located in the convex side where the west fault plane swings to the left. This variation in apparent porosity provided the element for deposition mentioned in Control No. 5 above.

Certain portions in the fault zone have been highly silicified and become impervious, providing suitable cap rock. The west side (hanging wall) fault face appeared to be such and provided the element of deposition mentioned in Controls 3 and 6 above. The anomalous zone along the west margin of the geochemical survey appears to be located in an area favourable to deposition of sulphides. Other lenticular units in the fault zone itself have taken in strains without fracturing and have also provided adequate damming effect on the rising mineralizing solution. The barren argillaceous beds to the west of the old working on which the mineralized body butts is probably one of those local barriers.

The trachyte porphyry intrusive probably followed fissures along the shear zone. Its presence indicates that an igneous rock magma was present underneath the area at one time (See Figure 4). Control No. 1 is present therefore.

The mineral-bearing solutions probably followed the same course as the dyke either at that time or later or followed other fissures without the intrusives. While this provides No. 2 in the generalized control of mercury deposition, it also explains why concentration of mercury sulphides is near the intrusive body as noted in the underground workings.

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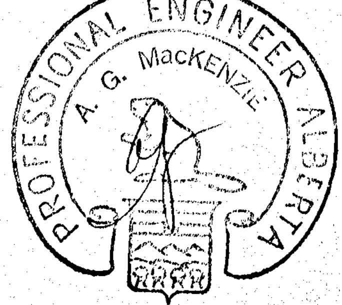
Precipitation of ore-bearing solutions is believed to be mainly the loss of pressure through interaction of ground waters seeping downward from the surface which may have also had some effect.

The mercury sulphides noted in the area are mainly "Cinnabar" which is a primary mineral. Cinnabarite only occurs as a coating which may have been brought about by oxidation of the original mercury. The amount of cinnabarite present is apparently only nominal.

It would appear from the discussion above that all elements required for the deposition of commercial quantities of mercury are present in this area.



GEOCHEMICAL SURVEY

The Geochemical survey conducted in 1970 by Purcell Development Co. Ltd. under the supervision of W. C. Jones was done on a 100' x 100' grid. Soil samples were taken at a depth of about 8 inches with sampling equipment, which was cleaned between each hole to avoid contamination. The samples were air dried, sieved and analyzed for mercury content in the Cordero Mining Co. laboratory in Winnemucca using a high sensitivity, atomic absorption unit. The U. S. Bureau of Mines assured us that geochemical analyses made by the Cordero Mining Co. laboratory are reliable.

Results of the survey are shown in Figure 6. The mercury contents are given as parts per billion because mercury content in rocks is very low, averaging only about 80 p.p.b. for ordinary acidic rocks. In this area, which has produced considerable mercury over a period of time, the average background value is about 250 p.p.b. The values of Figure 6 are contoured at 1,000 p.p.b. intervals and are shown in Figure 7.

The present "mine" area does not coincide on the highest points of the anomaly noted over the old workings. This may indicate that stronger mineralization is still unworked. However, in this particular area, the ground has been moved around during the operation of the mine, so that the resulting anomalies could be caused by displaced muck from the mine itself.

Another anomaly which is open on the southeast end was detected northeast of the mine workings. The anomaly is about 300 feet long and varies in width from 100 to 200 feet. It has a peak value of 8,400 p.p.b. on the northwest knob and 6,800 p.p.b. on the southeast knob. The ground ~~in~~ this area

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has not been prospected or trenched. Displacement will be small because in this area very little ground water is available to move the mercury from its original position in bedrock. It should be mentioned that mercury, being quite heavy, will be displaced by its own weight alone. Most of the anomalies therefore will be displaced to some degree down slope from their original positions by either water movement or gravity.

The most consistent and the strongest anomaly mapped in the survey is along the western margin of the area. This western margin coincides with the hanging wall of the highly sheared and altered rock. To the west is the highly silicified limestone breccia and unaltered limestone.

The anomalous trend is 1,500 feet long and varies in width from 200 to 500 feet. It consists of 5 peaks interconnected by the 2,000 p.p.b. contour. The peak values from north to south are 22,000, 7,400, 15,480, 5,700 and 64,300 p.p.b. To the east of the southern and highest peak is another seemingly isolated anomaly which may be an off-shoot along some fracture from the major anomaly.

South of this anomaly is another anomaly with a peak value of 12,110 p.p.b. separated from the above by a fault(?) gully. It is along the same trend as the large anomaly and is open to the south.

Assays of bedrock along old trenches which coincide with anomalous knobs substantiated the existence of the anomaly. For example, there is a trench cut 50 feet south of the highest peak of the anomaly. Samples from this trench assayed .8 pounds per ton and 1.3 pounds per ton. Other trenches along the trend also contain values of mercury although lower. These values may seem

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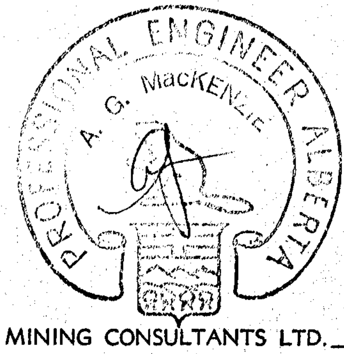
low but it should be remembered that mercury deposits are notoriously very erratic, changing from low grade to high grade in a few feet. The fact that this big anomaly occurs and is substantiated by actual surface values is a very strong indication that a continuous zone of mineralization is present.

It is the purpose of recommended work later in this report to probe this deposit and decide on the economics. Certainly this deposit has all the earmarks of a large scale, low grade mining operation.



MINING ECONOMICS AND PROFITABILITY MARGIN

Two factors have developed in the last five years or so which are pertinent to the potential productivity of this mercury deposit: first, the development of the Electrolytic Oxidation process of recovering mercury and secondly, the spiralling of Vanadium prices.

The electrolytic oxidation process (See Appendix V), which is a new method, does not produce mercury vapours. The overall milling cost is lowered and with lower cost, lower grade ore can be mined economically. The U. S. Bureau of Mines has tested samples from this ore and found that the ore is amenable to this process (See Appendix VI).

The market price for Vanadium Pentoxide has spiraled in the last five years as shown in Figure 8. The sharp increase in price clearly indicates that the demand has increased rapidly. Vanadium occurs in quantities between .08% and .25% as indicated by the assay results taken by J. W. Dawson (See Appendix II). The vanadium may be recovered by adding more extraction cells after the recovery of mercury. At present prices it can be seen that vanadium could be a profitable by-product, increasing the potential profitability. We do not believe the additional metallurgy would be involved or expensive.

The following factors also tend to minimize mining costs:

1. The nature and size of the mercury deposit on the Iron Point property is such that it could be mined by a simple open-pit method. A D-9 bulldozer with a ripper could readily break the rock. A rubber-tired, front-end loader could load and haul the material to the mill. These operations are relatively inexpensive.

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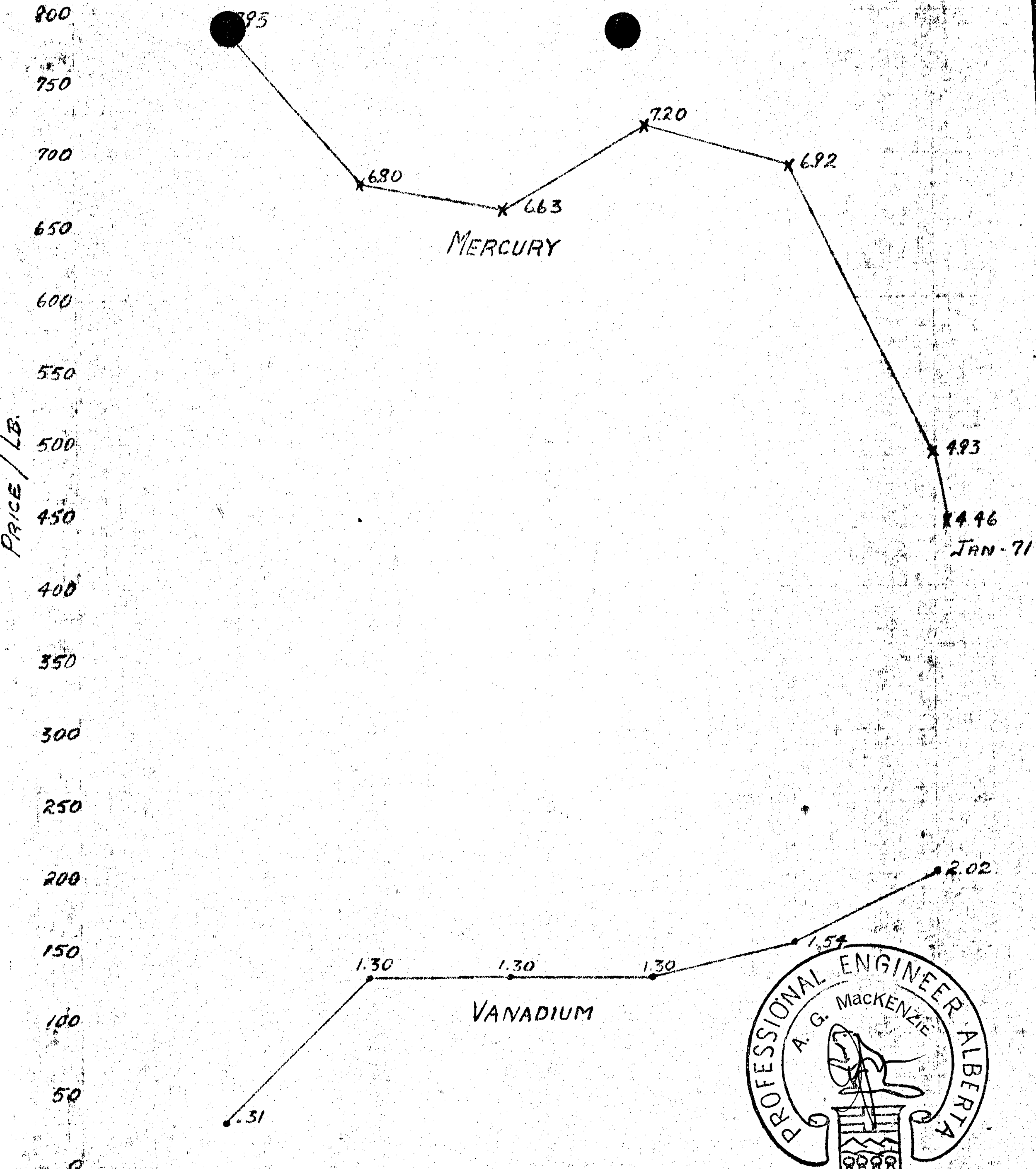

× Mercury price December yearly

• Vanadium price December yearly

Values taken from the "Engineering and Mining Journal"

FIG. 8

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FOR
Purcell Development Co. Ltd.

GRAPH OF Hg and V_2O_5
PRICES 1965 - 1970

Date: Feb/71	Appv'd:
Dwg No:	Scale:

To accompany report by A G Mackenzie Mining Consultants Ltd.

2. The electrolytic oxidation requires considerable quantities of salt. We understand that an abundant and cheap salt supply is available in the area.

3. Power is available locally.

4. The property is easily accessible and railroad transportation is available only a short distance away.

The following calculations will give an idea of possible mining costs for a 1,000 ton per day operation. Please note that these figures are illustrative only and local costs of material and wages would have to be carefully checked.

BREAKING AND HAULING COSTS

BREAKING COST

Capital:

Caterpillar D-9 Bulldozer with Ripper $125,000.00		
Depreciates in 12,800 hours (8 years)		
Depreciation cost per hour	$ 9.77	
Interest, taxes, insurance @ $.03 per $1,000.00	3.75	
TOTAL OWNING COST (FIXED) PER HOUR	13.52	$13.52

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Operating:

Fuel - 18 gal./hour @ $.18/gal.	$ 3.24	
Gasoline for starting	.01	
Lubricating oils	.21	
Fillers	.06	
Repairs (100% of depreciation cost)	9.77	
Tip cost	1.40	
Operator (wages, insurance, benefits)	4.25	
TOTAL OPERATING COST PER HOUR	18.94	$18.94

TOTAL OWNING AND OPERATING COST PER HOUR	$32.46
BREAKING COST PER TON (Assume total efficiency of 200 tons per hour)	$.16/ton

NOTE: The bulldozer-ripper would produce about 1,600 tons (1,400 cu. yd.) in $5\frac{1}{2}$ hours. During the balance of the time the Cat would muck broken rock and improve roads and the pit area. This cost has been thrown in to the breaking cost.

HAULING COST

Capital:

Rubber-tired, front-end loader with 15 cu. yd. bucket $85,000.00

Depreciates in 12,800 hours (8 years)

Depreciation cost per hour	$6.64	
Interest, taxes, insurance @ $.03 per $1,000.00	2.55	
TOTAL OWNING COST PER HOUR	9.19	$9.19

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Operating:

Fuel - 10 gal./hour @ $.18/gal.	$ 1.80	
Engine and lubricating oil	.13	
Filters	.13	
Tire cost	2.00	
Bucket cost	2.00	
Repairs (100% of depreciation cost)	6.64	
Operator (wages, insurance, benefits)	4.25	
TOTAL OPERATING COST PER HOUR	16.95	$16.95

TOTAL OWNING AND OPERATING COST PER HOUR	$26.14
HAULING COST PER TON (Assume total efficiency of 200 tons per hour)	$.13/ton

TOTAL ESTIMATED COST OF BREAKING AND HAULING TO ORE BIN OR STOCKPILE = $.29/ton.

The U. S. Bureau of Mines at Reno, Nevada, who is operating a pilot plant for the electrolytic oxidation process for the recovery of mercury, says that the capital cost of such a plant for a 1,000 TPD mill would be about $600 or $800 per ton or around $800,000.00 for a 1,000 TPD mill. We will use the "rule of thumb" estimate of $1,000.00 per ton or $1,000,000.00 capital cost for the mill.

Total Capital Cost for basic mining and milling equipment would then be in the order of $1,500,000.00 ($1\frac{1}{2}$ million dollars).

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MILLING COSTS

Capital:

Mill Value $1,000,000.00	
Depreciates in 1,500 days (5 years)	
Depreciation cost per day	$666.66
Taxes, interest, insurance @ $.24 per $1,000.00	240.00
ESTIMATED OWNING COST PER DAY	$906.66

COST PER TON AT 1,000 TPD CAPACITY = $.91

Operating:

Based on rated 1,000 TPD Mill = $1.50

ESTIMATED TOTAL MILLING COST PER TON = $2.41

MINING AND MILLING COSTS

Total estimated milling cost per ton	$2.41	
Total mining cost per ton	.29	
TOTAL ESTIMATED MINING AND MILLING COST	2.70	$2.70
ADD: Other Allowances		
25% for exploration & engineering costs		.68
10% for mill losses		.27
25% for profitability margin		.68
MINIMUM VALUE OF MINEABLE ORE		$4.33

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Cut-Off Grades

Minimum per cent of Mercury per ton in "ore"	.054%
Minimum pounds of Mercury per ton in "ore"	1.08 lbs.

We would suggest that the above "horseback" estimate may be considerably lower than the actual cost as the exact costs of the electrolytic method are not yet definitely known (although the U.S. Bureau of Mines has verbally given us some of the "horseback" figures we have used in these estimates).

The price of mercury since 1965 has been erratic as shown in Figure 8. It has never been below $4.00 per pound, so for our calculations we will use this lower price. A cut-off grade of .075% mercury will be a reasonable value to use in delineating mineable ore grade.

As indicated in all assay results (See Figures 5 and 6 and Appendix III) this cut-off grade is available. However, because of the apparent erratic distribution of values it may be necessary to mix high-grade and low-grade ore to maintain a .075% mercury mill head.

Any Vanadium content will greatly increase the potential profitability at .075% mercury mill head or the mercury mill head could be lowered and still maintain a 25% possible profitability margin.

Ore Reserves

There is not sufficient factual data to calculate a definitive ore reserve. Within the economic limits that we have tentatively assigned (cut-off grades) there is a potential reserve in the block covered by the surface geochemical survey, underground work and surface trenching. We would estimate sufficient to support a 1,000 TPD operation for about 5 years. Certainty of this volume and grade can only be attained by completion of the exploration program we have outlined. Extension of known ore along strike is completely dependent on more surface work and drilling as recommended.

AERIAL PHOTOGRAPHY

After the field examination in February, 1971, Angus G. MacKenzie verbally recommended to Purcell Development Co. Ltd. that certain aerial photography be flown. It was felt that a colour and false infra-red photography combination would be a useful tool toward structural and lithologic interpretation. Two flight elevations were decided on: one at a high level of 10,600 feet A.S.L. (equivalent to a scale of 1"=1,000') and the other at a low elevation of 7,700 feet A.S.L. (equivalent to a scale of 1"=500'). Aerial photography was flown by Machair Surveys Ltd. of Calgary on February 13 and 14, 1971. Photographs were made available to Angus G. MacKenzie Mining Consultants Ltd. on February 17th. Flight lines are shown on Figure 9. Both types of photography turned out to be excellent in scale, clarity and coverage.

Colour Photography

Positive prints were made of the colour photography on both of the abovementioned scales.

The high level photography was used for regional interpretation and the low level photography for local and detailed interpretation. Both scales were found useful.

From the 1"=1,000' scale the Valmy Formation is readily delineated trending almost north-south, bounded by a major fault on the west, and covered by glacial till and alluvium to the east. On the east boundary a strong gossan marks the contact.

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Scale 1:24000

• Colour Air Photo No

× False Infrared Photo No

Fig 9

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703 5th St, CALGARY 2, ALBERTA

FOR
Purcell Development Co. Ltd.

FLIGHT LINE INDEX MAP
IRON POINT MERCURY PROPERTY
HUMBOLDT COUNTY, NEVADA, USA

Date: Feb/71	Appv'd:
Dwg No:	Scale:

To accompany report by A G Mackenzie Mining Consultants Ltd.

Major cross-faults are also very evident in the smaller scale photographs but most of the smaller cross-faults had to be examined more closely in the larger scale to pick up smaller bedding displacements and strike variations. The structural elements shown on the geological map (See Figure 4) are based mainly on air-photo interpretation.

False Colour Infra-Red Photographs

Positive transparencies were the end product of the air photography for false infra-red. No prints were made because of the nature of the film used.

The false colour infra-red photographs were used to follow the continuity and extensions of the mineralized zone. While all the major faults noted in the colour photography can also be picked up on infra-red, this photographic technique also shows some colour differentiation between the mineralized zone and the barren zone.

The mineralized zone shows a weak, bluish tint as compared to the purely greenish background of barren rocks. The zone can be traced northward until the large cross-fault separating the Moly Corp Vanadium-Copper prospect from the Iron Point Mercury-Vanadium prospect is reached. To the south it carries about 1,600 feet from the old workings to another cross-fault. The block to the south of the fault does not show this bluish tint. It appears again on the south side of the next cross-fault where it is apparently stronger. From here it carries southward across the highway and swings south-southwestward under Quarternary-Tertiary basalt cover. It is pertinent to mention here that mercury showings have been noted in the road-cut along the old highway. No

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showings have been noted on the block where the bluish tint is absent. In fact, there is only one small test-pit in the whole barren(?) block.

Another area north of the highway (See Figure 4) with the bluish tint has been noted to the west and partly outside the property of Purcell Development Co. Ltd. The area is mostly under cover but four trenches have been cut across a trend which means there must have been something in this area that someone was trying to follow.

The anomalous (mineralized?) zone on the main prospect is along the east portion of the Valmy Formation and is at a relatively lower elevation than the west which is massive and barren. The west boundary of the zone is along a strike fault that has been highly silicified and marks the change of elevation between the east and west portions of the Valmy Formation. This strike fault is only weakly indicated in the photographs but has been detected on the surface. It coincides with the west edge of the bluish tinted area in the false infra-red photograph.

Note that the bluish tint in the false infra-red may <u>not</u> be directly related to sulphide mineralization. The bluish tint could be caused by the difference of water content between the fractured rocks containing minerals and the unbroken nature of the barren rock. This probably explains why the bluish tint is weaker over the known mineralized area than the continuation near the highway. Our reasoning is that the ground around the main showing has been considerably disturbed and consequently the natural water table has been affected.

Regardless of its cause, the bluish tint has been found here to be useful in delineating the mineralized zone. It has been used to extend the mineralized and/or altered zone from known areas of mineralization in the main showing southward across the highway as shown in Figure 4.

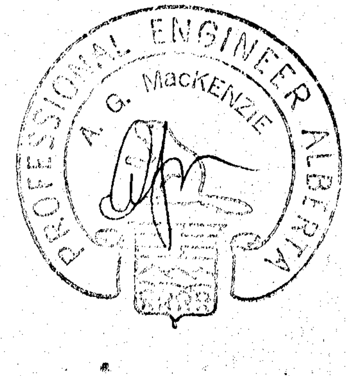
RECOMMENDATIONS

Drill the anomalous zones presently delineated by the geochemical survey to test the extension sub-surface. Figure 7 shows the proposed drill hole layout. The holes are presently planned for total depths of 250 feet at -45 degree angles to the east. The reason for this is to get both horizontal and vertical ideas of the extent of mineralization and to gather structural information, especially of the hanging wall contact. This data could be used to pick other areas of possible mineralization.

A total of 30 holes are laid out which, when completed, should give all the information required to plot the form and size of the deposit. Other holes required for planning an open-pit would be filled in between the present hole lay-out. A reserve estimate would then be computed from results of these 30 holes.

The 30 hole layout has been split into two sections. The first priority ones are marked red and the second marked green. In the drilling program the reds should be drilled out first and the results evaluated as drilling progresses.

Based on these results the greens could be drilled as planned or their locations and angles changed to give maximum information. For this reason it is imperative that a supervising professional geologist be on the property during any drilling program.



Additional exploratory drilling will probably be necessary to outline the possible extension of the mineralization to the south. A drilling program for this phase would be laid out on completion of the initial drilling. We believe that the size of the program would be about the same as the one above and the estimates for this could be used for the additional program.

Since the host rocks in the area are shattered a special core barrel would have to be used. The special barrel we refer to is a three-barrel core recovery unit which Longyear has developed to core especially badly broken rocks and unconsolidated sediments. Longyear guarantees satisfactory recovery with this core barrel.

It is also feasible to use the Becker Drill if precautions are taken to cut the dust emission down at the cyclone. Otherwise a considerable amount of mercury sulphide could be lost.

Stripping of the overburden and shallow trenching with a bulldozer should be done so that a systematic surface sampling can be done. Assays of the surface sampling will be used in the computation of "ore" reserves and the designing of an open-pit, in conjunction with the diamond or other type drilling results.

Depending on the economics it might be more advantageous to drill a water well early in the drilling program rather than ferry water into the property. Information on the surrounding water wells would have to be studied to spot the best location for a water well on the property. It is believed that water can be obtained at a reasonable cost from wells in the general area.

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Based on presently available geological information the mineralized zone appears to swing westward to the south. The grounds south of the highway are secured by the square mile lease from the railroad company, but ground west of Iron Point #3 and Annex #2 should be acquired if possible.

A cost estimate of a recommended, minimum, initial diamond drilling program and two estimates for a more extensive program follow.

ANGUS G. MACKENZIE MINING CONSULTANTS LTD.

PROFESSIONAL ENGINEER
A. G. MacKENZIE
ALBERTA

Angus G. MacKenzie, P. Eng., MCIM,
Consulting Mining Engineer - Mining Geologist

Calgary, Alberta.
February 25, 1971.

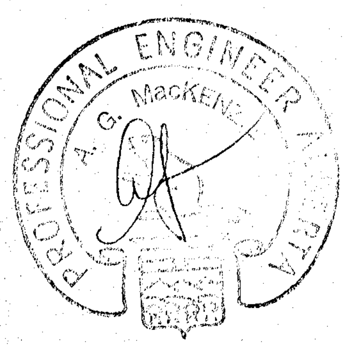
RECOMMENDED MINIMUM INITIAL

DIAMOND DRILLING PROGRAM

A minimum program of diamond drilling may be initiated right away. For this program the total depth of each drill hole may be cut to 200 feet and the spacings between the holes could be larger. The purpose of this initial program will be mainly to test the anomalies to get a rough idea of the size of the deposit. For this program the holes to be drilled will be the primary holes 1, 2, 4, 5, 6, 7, 8, 10 and 12 as shown in Figure 7. The total footage will be about 1,800 feet.

Cost Estimate

Diamond Drilling - 1,800 feet @ $7.00 per foot	$12,600.00	
Assays at 5-foot intervals - 20 samples per hole @ $5.00 each	900.00	
Geological Supervision for 1 month @ $150.00 per day	4,500.00	
Room and Board for 1 month @ $20.00/day	600.00	
Transportation for 1 month	500.00	
Total	19,100.00	
Add: Contingencies	2,865.00	
Total	21,965.00	$21,965.00
Report Compilation and Reproduction		2,000.00
Consulting Fee and Supervision		1,000.00
TOTAL ESTIMATED COST		$24,965.00



COST ESTIMATE (BECKER)

DRILLING

Primary Holes:

3,750 feet @ \$5.00/foot	\$18,750.00	
Assays at 5-foot intervals 750 samples @ \$17.00 each	12,750.00	
Geological Supervision $1\frac{1}{2}$ months @ \$150.00/day	6,750.00	
Room and Board for $1\frac{1}{2}$ months @ \$20.00/day	900.00	
Transportation ($1\frac{1}{2}$ months)	750.00	
Total	39,900.00	
Add: Contingencies	6,000.00	
TOTAL DRILLING COSTS FOR PRIMARY HOLES	45,900.00	\$ 45,900.00

Secondary Holes:

3,750 feet @ \$5.00/foot	18,750.00	
Assays at 5-foot intervals 750 samples @ \$17.00 each	12,750.00	
Geological Supervision $1\frac{1}{2}$ months @ \$150.00/day	6,750.00	
Room and Board for $1\frac{1}{2}$ months @ \$20.00/day	900.00	
Transportation ($1\frac{1}{2}$ months)	750.00	
Total	39,900.00	
Add: Contingencies	6,000.00	
TOTAL DRILLING COSTS FOR SECONDARY HOLES	45,900.00	45,900.00
REPORT COSTS (compilation, reproduction, drafting, etc.)		5,000.00
CONSULTING FEE AND SUPERVISION		5,000.00
TOTAL COST OF DRILLING PROGRAM		\$101,800.00

PROFESSIONAL ENGINEER ALBERTA A. G. MacKENZIE

STRIPPING AND SAMPLING

D-8 Cat for 200 hours @ $32.00/hour	$ 6,400.00	
1 Sampler @ $600.00/month	600.00	
Geological Supervision (covered by cost of geologist supervising diamond drilling if done simultaneously)		
Assays - 500 @ $17.00 each	8,500.00	
Total	15,500.00	
Add: Contingencies	2,325.00	
TOTAL COST OF STRIPPING AND SAMPLING	17,825.00	$17,825.00

SUMMARY OF COSTS

Drilling Program	$101,800.00
Stripping and Sampling	17,825.00
TOTAL	$119,625.00

PROFESSIONAL ENGINEER A. G. MacKENZIE ALBERTA

COST ESTIMATE (LONGYEAR)

DRILLING

Primary Holes:

3,750 feet @ $8.00/foot	$30,000.00	
Assays at 5-foot intervals 750 samples @ $17.00 each	12,750.00	
Geological Supervision $1\frac{1}{2}$ months @ $150.00/day	6,750.00	
Room and Board for $1\frac{1}{2}$ months @ $20.00/day	900.00	
Transportation ($1\frac{1}{2}$ months)	750.00	
Total	51,150.00	
Add: Contingencies	7,600.00	
TOTAL DRILLING COSTS FOR PRIMARY HOLES	58,750.00	$ 58,750.00

Secondary Holes:

3,750 feet @ $8.00/foot	30,000.00	
Assays at 5-foot intervals 750 samples @ $17.00 each	12,750.00	
Geological Supervision $1\frac{1}{2}$ months @ $150.00/day	6,750.00	
Room and Board for $1\frac{1}{2}$ months @ $20.00/day	900.00	
Transportation ($1\frac{1}{2}$ months)	750.00	
Total	51,150.00	
Add: Contingencies	7,600.00	
TOTAL DRILLING COSTS FOR SECONDARY HOLES	58,750.00	58,750.00
REPORT COSTS (compilation, reproduction, drafting, etc.)		5,000.00
CONSULTING FEE AND SUPERVISION		5,000.00
TOTAL COST OF DRILLING PROGRAM		$127,500.00

PROFESSIONAL ENGINEER A. G. MacKENZIE ALBERTA

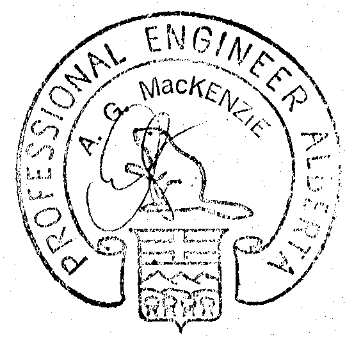
ANGUS G. MacKENZIE MINING CONSULTANTS LTD.

STRIPPING AND SAMPLING

D-8 Cat for 200 hours @ $32.00/hour	$ 6,400.00	
1 Sampler @ $600.00/month	600.00	
Geological Supervision (covered by cost of geologist supervising diamond drilling if done simultaneously)		
Assays - 500 @ $17.00 each	8,500.00	
Total	15,500.00	
Add: Contingencies	2,325.00	
TOTAL COST OF STRIPPING AND SAMPLING	17,825.00	$17,825.00

SUMMARY OF COSTS

Drilling Program	$127,500.00
Stripping and Sampling	17,825.00
TOTAL	$145,325.00



Telephone 363-3302

Hand Sample Serial 38?01-38713

ASSAY REPORT
UNION ASSAY OFFICE, Inc.
W. C. WANLASS, President
L. G. HALL, Vice President
G. P. WILLIAMS, Treasurer
GERALDINE A. WANLASS, Secretary
P. O. Box 1528
Salt Lake City, Utah 84110

Mine: Versatile Mining Services Ltd.
Box 609
Kamloops, BC, Canada

RESULTS PER TON OF 2000 POUNDS — Nov. 6, 1970

NUMBER	GOLD Ozs. per Ton	SILVER Ozs. per Ton	LEAD Wet on Ore	COPPER Per Cent	INSOL. Per Cent	ZINC Per Cent	SULPHUR Per Cent	IRON Per Cent	LIME Per Cent	Per Cent Hg-%	Hg-lbs per ton
34738 Grab 25? N E of Post [illegible]										0.025	0.50
34739 S-9 Grab Sample [illegible]										0.025	0.50
34740 S-7 [illegible]										0.035	0.70
34741 S-11 [illegible]										0.110	2.20
34742 S-12 [illegible]										0.140	2.80
34743 S-2 Grab Sample [illegible]										0.020	0.40
34744 S-8 Grab Sample [illegible]										0.030	0.60
34745 S-6 [illegible]										0.040	0.80
34746 S-3 Grab Sample [illegible]										0.040	0.80
34747 S-4 Grab Sample [illegible]										0.020	0.40
34748 S-5 Grab Sample [illegible]										0.065	1.30
34749 S-13 Grab Sample [illegible]										0.020	0.40
34750 S-10 Grab Sample [illegible]										0.035	0.70

Remarks

Charges $ 78.00

[signature]

Telephone 363-3302

Hand Sample Serial 41089-41101

ASSAY REPORT

UNION ASSAY OFFICE, In[c.]

W. C. WANLASS, President
L. G. HALL, Vice President
G. P. WILLIAMS, Treasurer
GERALDINE A. WANLASS, Secretary

P. O. Box 1528
Salt Lake City, Utah 84110

Mine Versatile Mining Services Ltd.
Box [illegible]
Kamloops, BC, Canada

RESULTS PER TON OF 2000 POUNDS Nov. 25, 1970

NUMBER	GOLD Ozs. per Ton	SILVER Ozs. per Ton	LEAD Wet on Ore	COPPER Per Cent	INSOL. Per Cent	ZINC Per Cent	SULPHUR Per Cent	IRON Per Cent	LIME Per Cent	Per Ce[nt] V_2O_5
34738 Grab 25° [illegible] of Port[illegible]										0.20
34739 S-9										0.17
34740 S-7										0.20
34741 S-11										0.22
34742 S-12										0.20
34743 S-2										0.25
34744 S-8										0.14
34745 S-6										0.14
34746 S-3										0.08
34747 S-4										0.14
34748 ?										0.14
34749 S-13										0.22
34750 S-10										0.17

Remarks

Charges $ 91.00

Glen P. Williams

Purcell Mining Company Inc.
Samples by W. C. Jones

Underground Drillings	# I	.... 0.20
	# 2	.... 0.10
	# 3	.... 0.10
	# 4	.... 1.70
	# 5	.... 1.70
	# 6	.... 0.30
	# 7	.... 0.30
	# 8	.... 0.10
	# 9	.... 0.20
	#10	.... 0.20
	#11	.... 0.10
	#12	.... 0.10
	#13	.... 13.80
	#14	.... 0.30
	#15	.... 0.90
	#16	.... 5.70
	#17	.... 0.80
	#18	.... 0.80
	#19	.... 0.30
	#20	.... 0.40
	#21	.... 0.10
	#22	.... 0.30
	Av	1.296

Lyle Bradley
Lyle Bradley
April 24, 1970

To: Purcell Development Limited
Brisco, B. C.
Mr. W. G. Jones

File No. 2411
Date November 14, 1969
Samples Grab

Certificate of ASSAY
LORING LABORATORIES LTD.

629 BEAVERDAM RD., N.E., CALGARY 67
PHONE 277-6797

SAMPLE No.	#'s Hg / ton	Hg @ $6.20/# Gross Value	Hg %	
21276	187.0	# 1159.40	9.35	Picked high grade sample
21277	27.6	# 171.12	1.38	Narrow " " vein (underground.)
21278	65.0	# 403.00	3.25	Across E wall of W drift (20')
21279	1.8	# 11.16	.09	Across W wall in stope. (6')
21280	2.0	# 12.40	.10	Across S wall in stope (7')
21281	6.0	# 37.20	.30	Across E wall in stope (6')
21282	0.4	# 2.48	.02	Most southerly cut (20')
21283	0.04	# 0.25	.002	" northerly cut (near glory hole) (15')
21284	1.4	# 8.88	.07	Across trench about 300' S of incline (15')
21285	5.0	# 31.00	.25	Random dump sample

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.
Pulps Retained one month unless specific arrangements made in advance.

[signature]
Provincial Assayer of British Columbia

Iron Mt. Mercury.

Random Dump Sample

CAN TEST LTD.

1650 PANDORA STREET, VANCOUVER 8, B.C. • TELEPHONE 254-7278

Report On Spectrographic Analysis **File No.** 48762-A

Report No.

Reported to Loring Laboratories Ltd. **Date** Nov. 26, 1969

629 Beaverdam Road N.E. P.O. #385

Calgary 67, Alberta

We certify we have tested the sample of ore pulp submitted by you on November 24, 1969, and report as hereunder.

Sample Identification

The sample was labelled "File 2411, #21285".

Spectrographic Analysis

	File 2411 #21285	P.P.M		File 2411 #21285	P.P.M
Al	6.0		Pb	0.004	40
Sb	0.02	200	Mg	0.3	
As	ND		Mn	0.005	
Ba	0.3	Barite (?)	Mo	0.002	20
Be	ND		Nb	ND	
Bi	ND		Ni	0.003	30
B	0.002		Si	Matrix	
Cd	ND		Ag	0.0001	1
Ca	0.5		Sr	0.4	strontianite (?)
Cr	0.003	30	Ta	ND	
Co	ND		Sn	0.002	20
* Cu	0.03	300	Ti	0.1	
Ga	0.002	20	W	ND	
Au	Trace		* V	0.03	300
Fe	5.0		Zn	ND	
			U	ND	
			Th	ND	

.6 #'s/ton *

CAN TEST LTD.

D. Timuss

Provincial Assayer

Form No. 7

TESTING LABORATORIES

ABBOT A. HANKS

ESTABLISHED 1866

P. O. BOX 77265 • SAN FRANCISCO, CALIFORNIA 94107

TELEPHONE (415) 282-8600

STANDARD OIL COMPANY OF CALIFORNIA
Minerals Staff
225 Bush Street
San Francisco, California

ATTENTION: MR. B. GREIDER

Re: [illegible]

LABORATORY REPORT

No. 7101

Date October 27, 1970

File No.

Lab No.	Mark	Results: MERCURY
26238-1	G-1	0.02%
-2	G-2	0.05%
-3	G-3	less than 0.01%
-4	G-4	less than 0.01%
-5	G-5	less than 0.01%
-6	G-6	less than 0.01%
-7	G-7	0.04%
-8	G-8	1.25%
-9	G-9	less than 0.01%
-10	G-10	less than 0.01%
-11	G-11	0.12%
-12	G-12	less than 0.01%
-13	G-13	less than 0.01%
-14	G-14	0.06%
-15	G-15	0.46%

ABBOT A. HANKS

BY [signature]

CHARLES J. TAYLOR

sl

TESTING LABORATORIES

ABBOT A. HANKS

ESTABLISHED 1866

P. O. BOX 77265 • SAN FRANCISCO, CALIFORNIA 94107

TELEPHONE (415) 282-8600

STANDARD OIL COMPANY OF CALIFORNIA
Minerals Staff
San Francisco, California

ATTENTION: MR. B. GREIDER

LABORATORY REPORT

No. 7101

Date October 27, 1970

File No.

Lab No.	Mark	Results		
26238-16	COMPOSITE 1-15	GOLD	Less than 0.005	oz/ton
		TUNGSTIC OXIDE	Less than 0.01%	
		ANTIMONY	0.01%	100 PPM
		ARSENIC	0.02%	200 PPM

ABBOT A. HANKS

BY Charles J Taylor

CHARLES J. TAYLOR

al

ABBOT A. HANKS
ESTABLISHED 1866
P. O. BOX 77265 • SAN FRANCISCO, CALIFORNIA 94107
TELEPHONE (415) 282-6600

LABORATORY REPORT

No. 7101

Date October 27, 1970

File No.

STANDARD OIL COMPANY OF CALIFORNIA
Minerals Staff
225 Bush Street
San Francisco, California

ATTENTION: MR. B. GREIDER

QUALITATIVE SPECTROGRAPHIC ANALYSIS
Metals Found and Estimated Percentage Range

300 to 3000 ppm

Less than .03%	.03% to .30%	.30% to 3%	3% to 30%	30% to 100%
Con Test 2H	Con Test 2H			
Antimony .02	Magnesium .3	Iron 5.0 ?		Silicon
Boron .002	Vanadium .03 (?)	Aluminum 6.0 ?		
Lead .004	Titanium .1	Strontium .4		
Manganese .005	Calcium .5	Barium .3		
Gallium .002				
Zirconium –				
Sodium (?) –				
Chromium .003				
Copper .03(?)				
Silver .0001				
Nickel .003				

Lab No. 26238-16

Page 3 of 3

Sample Mark: Composite 1-15

sl

ABBOT A. HANKS

By Charles J. Taylor
CHARLES J. TAYLOR

Iron Point, Grab Samples
Ore Dump Samples, etc

PURCELL MINING COMPANY INC.
c/o W. C. Jones
Beagle Property
Pounds Hg./Ton

# I	.... 4.50
# 2	.... 0.70
# 3	.... 4.I0 ✓
# 4	.... 4.80 ✓
# 5	.... I.20
# 6	.... 0.80
# 7	.... I.90
# 8	.... 2.60
# 9	.... 0.50
# I0	.... 5.20
Av =	2.630

Lyle Bradley

Lyle Bradley
April I0, 1970

Grab samples, ore dump

[illegible]
Box 1008
Winnemucca, Nevada.
ASSAY REPORT
Pounds Hg./Ton

Crushed Ore Purcell by Jones 4/21/70	....	4.20
Uncrushed Ore Purcell by Jones "	....	9.10

Lyle Bradley
Lyle Bradley
April 21, 1970

STAR CITY MINES LIMITED
Box 1008
Winnemucca, Nevada.
ASSAY REPORT
Pounds Hg./Ton

Calcine	Day	Purcell Mining Company Inc.	4/27/70	..	Nil
Calcine	Swing	"	"	..	Nil
Calcine	G-Y	"	"	..	Nil

Lyle Bradley
Lyle Bradley
April 28, 1970

Jones

STAR CITY MINES LIMITED
Box 1008
Winnemucca, Nevada.
ASSAY REPORT
Pounds Hg./Ton

Heads	Purcell Mining Company Inc.		4/24/70	... 3.10
Heads	"		4/25/70	... 2.00
Heads	"		4/26/70	... 2.00
Heads	"		4/27/70	... 3.80
Calcine	Day	"	4/24/70	... 0.01
"	Swing	"	"	... 0.01
"	G-Y	"	"	... Nil
Calcine	Day	"	4/25/70	... Nil
"	Swing	"	"	... 0.01
"	G-Y	"	"	... 0.02
Calcine	Day	"	4/26/70	... 0.02
"	Swing	"	"	... 0.01
"	G-Y	"	"	... 0.02

Lyle Bradley
Lyle Bradley
April 27, 1970

Jones

B. S.

[illegible] CITY MINES LIMITED
Box 1008
Winnemucca, Nevada.
ASSAY REPORT
Pounds Hg./Ton

Heads	Purcell Mining Company Inc.	4/23/70	... 2.20
Calcine Day	"	"	... 0.02
Calcine Swing	"	"	... 0.02
Calcine G-Y	"	"	... 0.02

Lyle Bradley

Lyle Bradley
April 24. 1970

Jones

Very conservative sample

O.K.

Mill Heads

Star City Mines,
Winnemucca, Nev.

STAR CITY MINES LIMITED
Box 1008
Winnemucca, Nevada.
ASSAY REPORT
Pounds Hg./Ton

Grab Sample Crushed Ore "Purcell" 4/22/70 ... 3.10

Lyle Bradley
Lyle Bradley
April 22, 1970

Jones

Very conservative sample

O.K.

Mill Heads
Star City Mines,
Winnemucca, Nev.

STAR CITY MINES LIMITED
Box 1008
Winnemucca, Nevada.
ASSAY REPORT
Pounds Hg./Ton

Grab Sample Crushed Ore "Purcell" 4/22/70 ... 3.10

Lyle Bradley
Lyle Bradley
April 22, 1970

Jones

B.S.

STAR CITY MINES LIMITED
Box 1008
Winnemucca, Nevada.
ASSAY REPORT
Pounds Hg./Ton

Mill Heads

Heads	Purcell Mining Company Inc.	4/22/70	.. 1.40
Calcine Day	"	"	.. 0.02
Calcine Swing	"	"	.. 0.02
Calcine G-Y	"	"	.. 0.02

Lyle Bradley
Lyle Bradley
April 23, 1970

Jones

Mill Heads

STAR CITY MINES.

STAR CITY MINES LIMITED
Box 1008
Winnemucca, Nevada.
ASSAY REPORT
Pounds Hg./Ton

Heads	Purcell Mining Co. Inc.		4/20/70	.... 0.90
Calcine	"	Swing	"	.... 0.05
Calcine	"	J-Y	"	.... 0.05

Lyle Bradley

Lyle Bradley
April 21, 1970

Lage

Av heads = 1.90 #s/Ton

Low Grade: Mostly east workings

Purcell Mining Company Inc.
By W. C. Jones
ASSAY REPORT
Pounds Hg./Ton

# I1	4/20/70	.... 0.10
# I2	"	.... 0.05
# I3	"	.... 0.30
# I4	"	.... 0.10
# I5	"	.... 3.10
# I6	"	.... 1.10
# I7	"	.... 0.90
# I8	"	.... 0.30
# I9	"	.... 0.30
# 20	"	.... 0.40

Av = 0.665

Lyle Bradley

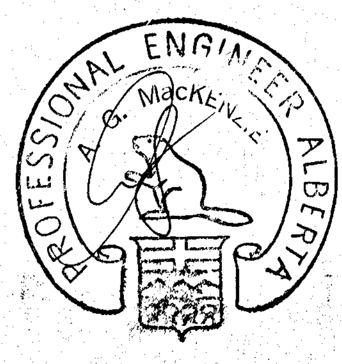
Lyle Bradley
April 2[illegible], 1970

ANGUS G MACKENZIE MINING CONSULTANTS LTD

SAMPLE RECORD

HOLE NO ____________ LOCATION IRON POINT MERCURY PROPERTY CODE NO ____________

SAMPLE NO	DEPTH	LENGTH	ASSAY RESULTS %Hg		lb./ton				DESCRIPTION AND REMARKS
26238-1			.02		.4				Samples taken by Standard
26238-2			.05		1.0				Oil Co. of California.
26238-3			.01		.2				No sample locations are
26238-4			.01		.2				available.
26238-5			.01		.2				
26238-6			.01		.2				
26238-7			.04		.8				
26238-8			1.25		25.0				
26238-9			.01		.2				
26238-10			.01		.2				
26238-11			.12		2.4				
26238-12			.01		.2				
26238-13			.01		.2				
26238-14			.06		1.2				
26238-15			.46		9.2				
	ARITHMETIC	AVERAGE	.14		2.6				Value of Hg at $4.00/ton = $10.

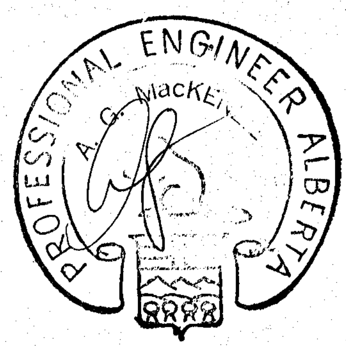


ANGUS G MACKENZIE MINING CONSULTANTS LTD

SAMPLE RECORD

HOLE NO ______ LOCATION IRON POINT MERCURY PROPERTY CODE NO ______

SAMPLE NO	PRICE ~~DEPTH~~ MERCURY	LENGTH	ASSAY RESULTS %Hg		lb. Hg/ton			DESCRIPTION AND REMARKS
1	$4.00/lb.		.01		0.2			Jack leg drill holes -
2			.005		0.1			8 feet deep
3			.005		0.1			
4			.085		1.7			Assay results taken from
5			.085		1.7			Plan of Underground Workings
6			.015		0.3			by: W.C. Jones (May, 1970)
7			.015		0.3			
8			.005		0.1			
9			.01		0.2			
10			.01		0.2			
11			.005		0.1			
12			.005		0.1			
13			.69		13.8			
14			.015		0.3			
15			.045		0.9			
16			.285		5.7			
17			.04		0.8			
18			.04		0.8			
19			.015		0.3			
20			.02		0.4			
21			.005		0.1			
22			.015		0.3			
	ARITHMETIC	AVERAGE	.065		1.3			Value of Hg at $4.00/ton = $5.2



ANGUS G. MACKENZIE MINING CONSULTANTS LTD

WEIGHTED AVERAGE SAMPLE RECORD

HOLE NO ____________ LOCATION ________________________________ CODE NO ____________

SAMPLE NO	XXXXX	(L) LENGTH	ASSAY RESULTS lb. Hg	lb. x (L) Hg	lb. V_2O_5	lb.x (L) V_2O_5	DESCRIPTION AND REMARKS
34738		1'	.50	.50	4.0	4.0	Grab 250' NE of Post at corners of Iron Point #3
34739	S-9	50'	.50	25.0	3.40	170.0	Grab sample over 50' in cat trench
34740	S-7	6'	.70	4.2	4.0	24.0	Grab sample over 6' in trench above tunnel
34741	S-11	1'	2.20	2.20	4.4	4.4	Chip sample along wall in old workings
34742	S-12	1'	2.80	2.80	4.0	4.0	Chip sample along wall in old workings
34743	S-2	25'	.40	10.0	5.0	125.0	Grab sample over 25' in cat trench
34744	S-8	60'	.60	36.0	2.8	168.0	Grab sample over 60' in cat trench
34745	S-6	20'	.80	16.0	2.80	56.0	Grab sample over 20' in cat trench
34746	S-3	20'	.80	16.0	1.60	32.0	Grab sample over 20' in cat trench
34747	S-4	45'	.40	18.0	2.80	126.0	Grab sample over 45' in cat trench
34748	S-5	40'	1.30	52.0	2.80	112.0	Grab sample over 40' in cat trench
34749	S-13	34'	.40	13.6	4.40	149.6	Chip sample over 34' in wall of decline
34750	S-10	45'	.70	31.5	3.40	153.0	Grab sample over 45' in wall of stope
		348'		227.8 / 348		1128.0 / 348	
				.66		3.24	WEIGHTED AVERAGE - lb./ton
							Value of Hg at $4.00/ton = $2.64
							Value of V_2O_5 at $2.00/ton = $6.48

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SAMPLE RECORD

HOLE NO ____________ LOCATION IRON POINT MERCURY PROPERTY CODE NO ____________

SAMPLE NO	DEPTH	LENGTH	ASSAY RESULTS % Hg	lb. Hg		% V_2O_5	lb. V_2O_5		DESCRIPTION AND REMARKS
34738			.025	.50		0.20	4.0		Grab 250'NE of Post at corners of Iron Point #3
34739	S-9		.025	.50		0.17	3.40		Grab sample over 50' in cat trench
34740	S-7		.035	.70		0.20	4.0		Grab sample over 6' in trench above tunnel
34741	S-11		.110	2.20		0.22	4.40		Chip sample along wall in old workings
34742	S-12		.140	2.80		0.20	4.0		Chip sample along wall in old workings
34743	S-2		.020	0.40		0.25	5.0		Grab sample over 25' in cat trench
34744	S-8		.030	0.60		0.14	2.8		Grab sample over 60' in cat trench
34745	S-6		0.040	0.80		0.14	2.80		Grab sample over 20' in cat trench
34746	S-3		.040	0.80		0.08	1.60		Grab sample over 20' in cat trench
34747	S-4		.020	0.40		0.14	2.80		Grab sample over 45' in cat trench
34748	S-5		.065	1.30		0.14	2.80		Grab sample over 40' in cat trench
34749	S-13		.020	0.40		0.22	4.40		Chip sample over 34' in wall of decline
34750	S-10		.035	0.70		0.17	3.40		Grab sample over 45' in wall of stope
									SAMPLES TAKEN BY J.M. DAWSON
	ARITHMETIC AVERAGE		.047	.93			3.5		

Value of Hg at $4.00/ton = $3.7

Value of V_2O_5 at $2.00/ton = $7.0

ANGUS G. MACKENZIE MINING CONSULTANTS LTD

SAMPLE RECORD

HOLE NO ____________ LOCATION IRON POINT MERCURY PROPERTY CODE NO ____________

SAMPLE NO	DEPTH	LENGTH	ASSAY RESULTS % Hg		lb./ton Hg			
1			.01		0.2			
2			.005		0.1			
3			.005		0.1			
4			.085		1.7			
5			.085		1.7			
6			.015		0.3			
7			.015		0.3			
13			.69		13.8			
14			.015		0.3			
15			.045		0.9			
16			.285		5.7			
17			.04		0.8			
18			.04		0.8			
19			.015		0.3			
20			.02		0.4			
21			.005		0.1			
	ARITHMETIC	AVERAGE	.086		1.72			

DESCRIPTION AND REMARKS

MERCURY ASSAYS WEST OF EDGE OF "ORE BODY"

Jack leg drill holes

Assay results taken from "Plan of Underground Workings" by: W.C. Jones (May, 1970)

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SAMPLE RECORD

HOLE NO ____________ LOCATION IRON POINT MERCURY PROPERTY CODE NO ____________

SAMPLE NO	DEPTH	(L) LENGTH	ASSAY RESULTS % Hg	% x (L)		lb./ton	lb./ton x (L)		DESCRIPTION AND REMARKS
									FACE SAMPLES
1		20'	0.2	4.0		4.1	82.0		Assay results taken from
2		34'	0.15	5.1		3.1	105 4		"Plan of Underground Workings"
3		24'	.055	1.32		1.1	26.4		by: W. C. Jones (May, 1970)
4		23'	.09	2.07		1.8	4.14		
5		38'	.24	9.12		4.8	1824		
6		17'	.045	.765		0.9	15.3		
7		17'	.06	.102		1.2	20.4		
8		23'	.025	.575		0.5	11.5		
9		17'	.005	.085		0.1	1.7		
10		29'	.015	.435		0.3	8.7		
11		24'	.0025	.06		0.05	1.2		
12		44'	.005	.22		0.1	4.4		
13		50'	.02	1.0		0.4	20.0		
	ARITHMETIC	AVERAGE	.071			1.42			
	WEIGHTED	AVERAGE (lb./ton)		.069			1.34		Value of Hg at $4.00/ton = $5.36

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SAMPLE RECORD

HOLE NO ________ LOCATION IRON POINT MERCURY PROPERTY CODE NO ________

SAMPLE NO	DEPTH	(L) LENGTH	ASSAY RESULTS % Hg	% x (L)		lb./ton	lb./ton x (L)		DESCRIPTION AND REMARKS
1		20'	0.2	4.0		4.1	82.0		MERCURY ASSAYS WEST OF EDGE OF "ORE BODY"
2		34'	0.15	5.1		3.1	1054		
3		24'	.055	1.32		1.1	26.4		FACE SAMPLES
4		23'	.09	2.07		1.8	4.14		Assay results taken from "Plan of Underground Workings"
5		30'	.24	7.2		4.8	144.0		by: W. C. Jones (May, 1970)
6		17'	.045	.765		0.9	15.3		(Samples from face on west
7		17'	.06	.102		1.2	20.4		side of old workings)
8		14'	.025	.350		0.5	7.0		
9		5'	.005	.025		0.1	.5		
13		22'	.02	.44		0.4	8.8		
	ARITHMETIC	AVERAGE	.089			1.80			
	WEIGHTED	AVERAGE (lb./ton)		.10			2.00		

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CORDERO MINING COMPANY
POST OFFICE BOX 506
WINNEMUCCA, NEVADA 89445

May 5, 1970

Bill Jones
F.R. Hoar
Beagle Organization
2617 K St., Suite 1
Sacramento, California

Sample No.	Mercury(ppb)	Sample No.	Mercury(ppb)
6N-5E	510	1N-5E	4010
9N-1W	250	1N-1E	1850
3S-5W	280	1S-2E	2250
1S-3W	3170	1N-2E	4450
0N-2E	5250	1S-2W	5700
1N-1W	1080	0N-1E	2090
4N-1W	628	2S-4W	3580
0N-1W	1920	1N-4E	785
0N-3W	2970	1S-1E	820
8N-4E	154	200S	1350
0N-4E	790	3S-1W	2000
0N-5E	209	0N-4W	4130
1N-4W	1310	1S-1W	930
8N-1W	5550	100S	4320
0N-2W	2610	00+00	2970
1S-3E	1515	1N-3W	15160
0N-3E	725	1N-2W	4740
1N-3E	900	100N	2530
1S-5E	203	1S-4E	1515
1S-4W	420	6N-4W	321

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…RTA

Sample No.	Mercury (ppb)
6N-4E	460
6N-1E	700
6N-3W	139
6N-3E	1730
6N-2E	223
6N-2W	1610
6N-1W	4340
600N	560
5N-4W	526
5N-3W	6360
5N-2W	7400
5N-1W	4230
5N-1E	1305
5N-2E	238
5N-3E	4820
5N-4E	4010
5N-5E	480
500N	990
4N-4W	4450
4N-3W	4950
4N-2W	5100
4N-1E	270
4N-2E	2000
4N-3E	4010
4N-4E	8400
4N-5E	1480
400N	230
3S-5E	1240
3S-4E	990
3S-3E	750
3S-2E	4570
3S-1E	935
300S	900
3S-2W	2090
3S-3W	63400
3S-4W	21600
2S-5E	920
2S-4E	595
2S-3E	4950
2S-2E	4570
2S-1E	7540
2S-1W	560
2S-2W	1920
2S-3W	3270
3N-5E	700
3N-4E	4950
3N-3E	1690
3N-2E	2000
3N-1E	280
300N	1410
3N-1W	750
3N-2W	3170
3N-3W	13920
3N-4W	12280

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Sample No.	Mercury (ppb)
7N-5E	540
7N-4E	450
7N-3E	460
7N-2E	725
7N-1E	295
700N	3070
7N-1W	2520
7N-2W	7000
7N-3W	262
7N-4W	56
8N-5E	390
8N-3E	121
8N-2E	530
8N-1E	5250
800N	4230
8N-2W	22200
8N-3W	930
9N-5E	1020
9N-4E	665
9N-3E	340
9N-2E	900
9N-1E	595
900N	4130
9N-2W	5520
9N-3W	1515

Sample No.	Mercury (ppb)
10N-5E	129
10N-4E	490
10N-3E	3690
10N-2E	2970
10N-1E	1770
1000N	648
10N-1W	1805
10N-2W	450
10N-3W	785
2N-5E	6800
2N-4E	121
2N-3E	1410
2N-2E	860
2N-1E	223
200N	4700
2N-1W	246
2N-2W	400
2N-3W	15480
2N-4W	630
4S-5E	127
4S-4E	665
4S-3E	560
4S-2E	360
4S-1E	820
400S	8640

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Sample No.	Mercury (ppb)
4S-1W	8100
4S-2W	2780
4S-3W	8400
4S-4W	29600
4S-5W	500
5S-5E	2440
5S-4E	430
5S-3E	990
5S-2E	700
5S-1E	1380
500S	1920
5S-1W	900
5S-2W	1350
5S-3W	4950
5S-4W	3600
5S-5W	7200
5S-6W	72
6S-5E	1210
6S-4E	238
6S-3E	530
6S-2E	1020
6S-1E	1180
600S	490
6S-1W	510
6S-2W	3170
6S-3W	990

Sample No.	Mercury (ppb)
6S-4W	4950
6S-5W Slough from open cut	31000
6S-6W	1805
7S-5E	173
7S-4E	210
7S-3E	220
7S-2E	1030
7S-1E	700
700S	785
7S-1W	430
7S-2W	1850
7S-3W	1440
7S-4W	3070
7S-5W	380
7S-6W	81
7S-7W	97
8S-5E	195
8S-4E	79
8S-3E	150
8S-2E	135
8S-1E	930
800S	595
8S-1W	630
8S-2W	262
8S-3W	27[illegible]
8S-4W	180

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Sample No.	Mercury (ppb)
8S-5W	672
8S-6W	7400
8S-7W	1080
9S-5E	210
9S-4E	180
9S-3E	240
9S-2E	280
9S-1E	468
900S	173
9S-1W	280
9S-2W	48
9S-3W	300
9S-4W	118
9S-5W	12120
9S-6W	2700
9S-7W	510
10S-5E	118
10S-4E	386
10S-3E	140
10S-2E	595
10S-1E	120
1000S	135
10S-1W	340
10S-2W	142

Sample No.	Mercury (ppb)
10S-3W	665
10S-4W	209
10S-5W	1080
10S-6W	4700
10S-7W	7870

Bkgr generally [illegible] 50±

[illegible]

PROFESSIONAL ENGINEER ALBERTA
A. G. MacKENZIE

ELECTROLYTIC OXIDATION OF CINNABAR ORES FOR MERCURY RECOVERY

by

B. J. Scheiner,[1] R. E. Lindstrom,[2] D. E. Shanks,[3]
and T. A. Henrie[4]

ABSTRACT

Electrooxidation of cinnabar mercury ores (HgS) was investigated as a means of providing an effective and economical hydrometallurgical technique for extraction of mercury from its ores, particularly those too low in grade to allow economical metal recovery by retorting or furnacing techniques. Oxidation was accomplished by electrolysis of ore slurried with brine. Cinnabar was dissolved by oxidation of the insoluble sulfide to soluble mercuric salts. The mercury ion in a brine solution forms a stable tetrachloro complex. Typical laboratory experiments required 1 to 7 hours of electrolysis at 35-percent pulp density in a brine solution that contained 4 to 20 weight-percent sodium chloride (NaCl). Power consumption ranged from 10 to 50 kwhr/ton of dry ore. Mercury extraction values between 90 and 99 percent were obtained with all of the ores investigated. Subsequent mercury recovery from leach solutions was readily accomplished by precipitation on zinc.

Pilot mill experiments in a 100- to 200-lb/hr extraction plant are in progress to quantify power and reagent requirements, and extraction and recovery data obtained to date closely parallel those obtained in the laboratory.

INTRODUCTION

An aqueous oxidation treatment process developed by the Bureau of Mines has been shown to be effective for treating carbonaceous gold ores to improve gold recovery. Ozone, chlorine, sodium hypochlorite (NaOCl), and calcium hypochlorite [$Ca(OCl)_2$] were all shown to be effective reagents for oxidizing the carbonaceous material in the ore. However, generation of oxidizing conditions in the ore pulp by electrolysis of brine was the most efficient and offered the lowest operating cost. During the course of development of the oxidation sequence for carbonaceous gold ores, it was observed that most of

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[2]Supervisory chemical research engineer.
[3]Chemist.
[4]Research director.
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the mercury present in the carbonaceous ore was dissolved. Investigation of this phenomenon showed that the very small amount of HgS mineral present in the ore was oxidized to a soluble salt during electrolysis. The effectiveness of electrooxidation in extracting the mercury in the parts-per-million range from carbonaceous gold ores indicated that a sequence based on electrolysis of cinnabar ore, slurried with brine, would be effective in extraction of mercury from low-grade sources.

Many geologists and mill operators think that extensive deposits of low-grade mercury (1 to 2 lb/ton) exist in Nevada. This thought is confirmed by a University of Nevada study.[5] Mercury recovery from these materials by retorting and furnacing techniques has generally been considered questionable from the economic standpoint, because of either untenable operating costs or excessive mercury losses in off gases.

Hydrometallurgical processes for treating mercury ores are not new. The use of aqueous chlorine solutions for leaching mercury was reported by Glaeser[6] in a patent as early as 1927; however, no commercial use of the process was ever made. In the most recent patent, which appeared in 1969, by Parks and Baker,[7] a hypochlorite system was used to leach mercury from the ore, and the dissolved mercury was recovered from solution by activated carbon. Although much of the chemistry involved is similar, electrolytic oxidation differs from hypochlorite addition in the following ways: (1) The chloride concentration is substantially higher, which facilitates formation of the stable and highly soluble $HgCl_4^{-2}$ species, and (2) comparable data show that electrooxidation is more efficient than the addition of an equivalent amount of hypochlorite for dissolving mercury, which indicates that considerable oxidation of the mineral occurs in the proximity of the anode.

RESULTS AND DISCUSSION

Preliminary electrooxidation experiments were conducted on a variety of ores from the Clear Lake Region in California and the Tonopah district, the Midas region, and the Winnemucca and Reno areas of Nevada to evaluate the oxidation system. This investigation represented a wide range of host rock, varying from clay to hard opalite. The grade of the ore ranged from 0.6 to 20 lb mercury/ton. Extractions of 90 to 99 percent were obtained on all of these ores with 10 to 50 kwhr/ton.

Important parameters in the electrooxidation process include temperature, salt concentration, current density, type of electrodes, electrode spacing, treatment rate (amp/ton of ore), and particle size of ore. Ore from the Goldbanks district, Nevada, was selected as a standard, and optimum operating conditions were studied for this ore. The ore occurs in volcanic rock and is opalitic in nature. The cinnabar is disseminated through the opalite rock and

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[5] Bailey, Edgar H., and David A. Phoenix. Quicksilver Deposits in Nevada. Nevada State BuMines, v. 38, No. 5, December 1944, p. 27.

[6] Glaeser, W. Method of Producing Mercury. U.S. Pat. 1,637,481, Aug. 2, 1927.

[7] Parks, G. A., and R. E. Baker. Mercury Recovery. U.S. Pat. 3,476,552, Nov. 4, 1969.

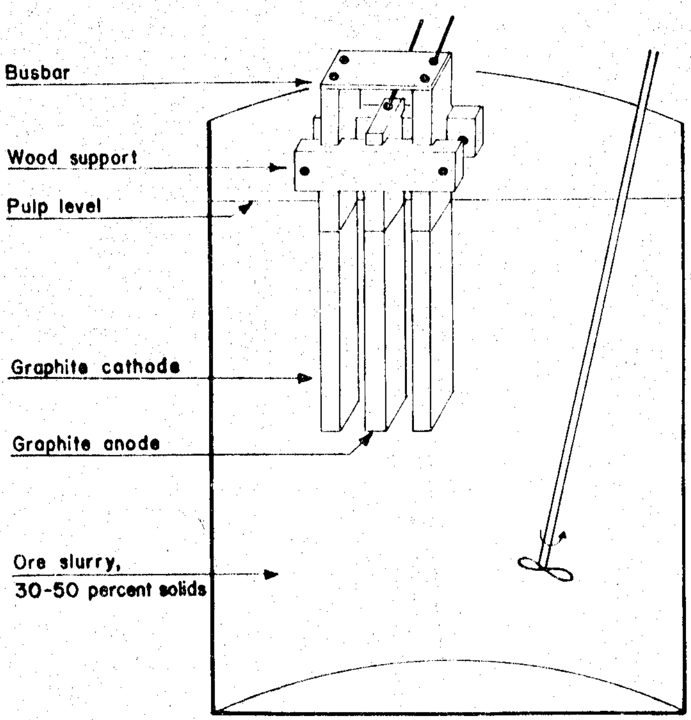


FIGURE 1. - Laboratory Scale Electrooxidation Cell and Agitation Vessel.

coats fragments and line fractions in the brecciated chalcedonic rock. The ore sample treated contained 2.5 lb mercury/ton.

Laboratory experiments were conducted in the following manner: (1) 1,350 grams (~3 pounds) of ore, 300 grams of NaCl, and 2,500 ml of water were slurried together in a 4-liter beaker; (2) the temperature was held constant; (3) the electrodes were immersed in the ore slurry; and (4) the direct current was adjusted to the desired amperage. Figure 1 shows the reaction system. (The electrolytic cell dimensions are out of proportion so that the anode-cathode relationship can be shown.) The following conditions were chosen for initial runs, based on preliminary experiments and experience gained from development of the carbonaceous gold process: Ore size, 100 percent minus 35 mesh; treatment rate, 5 amperes; current density, 0.3 amp/in^2; pulp density, ~35 percent; salt concentration, 10 percent; reaction temperature, 30° C; and graphite-graphite electrodes. The possible cell reactions and overall oxidation and solution reactions are presented below. The hypochlorite ion is produced in the proximity of the anode, with equivalent production of hydroxyl ions and hydrogen gas at the cathode. The hypochlorite or oxidizing species then decomposes with the following oxidizing reactions:

$$OCl^- \rightarrow O + Cl^-, \tag{1}$$

$$HgS + 4O \rightarrow HgSO_4, \tag{2}$$

and

$$3HgSO_4 + 2H_2O \rightarrow HgSO_4 \cdot 2HgO + 2H_2SO_4. \tag{3}$$

These two products have limited solubility in relatively neutral aqueous solutions. However, the tetrachloro mercury complex is very soluble in brine solutions. Therefore, the following reaction is proposed:

$$HgSO_4 + 4NaCl \rightarrow Na_2HgCl_4 + Na_2SO_4 \tag{4}$$

or

$$HgSO_4 \cdot 2HgO + 12NaCl + 2H_2O \rightarrow 3Na_2HgCl_4 + Na_2SO_4 + 4NaOH. \tag{5}$$

If some direct oxidation of cinnabar takes place at the anode, it could be represented by the following equation:

$$HgS + 4O^{=} - 8e \rightarrow HgSO_4 . \quad (6)$$

Reactions 3 and 5 are included because the basic mercuric sulfate is known to exist in the oxidation sequence of cinnabar.

The effect of salt concentration on the power consumption required to attain 90- to 95-percent mercury extraction was the first parameter investigated (fig. 2). Salt concentrations of 5, 10, 16, and 20 percent were studied. Figure 2 shows a sharp decrease in required power for 90- to 95-percent extraction if the salt concentration is increased from 5 to 10 percent. The curve levels off between 10 and 20 percent salt. The data indicate that 10 percent salt is an adequate concentration to obtain high conductivity with the graphite-graphite electrode system. Because salt consumption is an important economic factor, selection of the salt concentration to be used in a commercial operation depends on several factors, such as the price of salt versus the cost of power at the millsite, the amenability of the particular ore to low-cost liquid-solid separation and washing schemes, and the attendant salt loss in the tails. For example, if operations were being conducted on an ore that filtered poorly and was located in close proximity to low-cost salt, a countercurrent decantation washing circuit would be favored. Conversely, if the filtering and washing characteristics of the ore were good, comparatively high prices could be paid for both power and salt because high salt concentrations

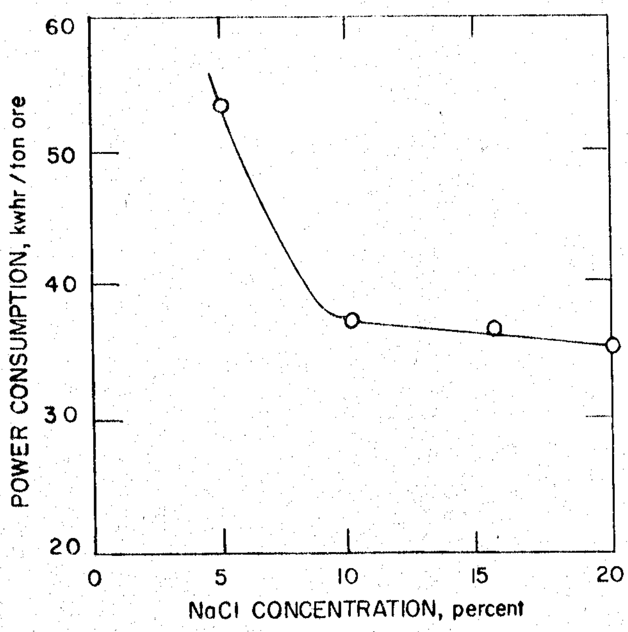


FIGURE 2. - Effect of NaCl Concentration on Power Consumption Required to Attain 90- to 95-Percent Mercury Extraction.

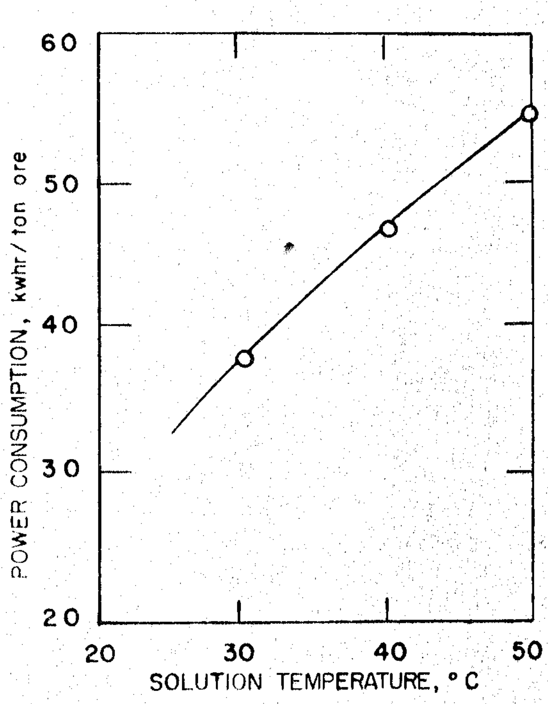


FIGURE 3. - Effect of Temperature on Power Consumption Required to Attain 90- to 95-Percent Mercury Extraction.

could be used to reduce power consumption and the salt could easily be recovered for recycle.

Experiments are presently being conducted with a different electrolysis cell which incorporates a lead dioxide (PbO_2) anode-iron cathode electrode system. Data obtained with this cell indicate that effective oxidation is generated with half the salt concentration required for graphite-graphite electrodes. Successful development of this system will add considerable flexibility to the process in that salt and power costs will contribute much less to overall operating costs.

The effect of temperature on mercury extraction was determined at 30°, 40°, and 50° C. Figure 3 shows a sharp increase in power consumption as the temperature increases. The optimum temperature appears to be 30° C; moreover, a temperature of 30° C can be sustained in the system under the power conditions without external temperature control. Operation at temperatures much lower than 30° C would be impractical, because the heat generated during electrolysis would require cooling of the pulp. As temperature is a function of the conductivity of the electrolyte and the power required to accomplish the oxidation, both the electrode spacing and salt concentration are critical in maintaining desired temperature. Generally speaking, electrode spacing should be as close as is consistent with good pulp flow between the electrodes. The effect of increasing electrode spacing on voltage-amperage relationships is shown in figure 4. Spacings of 3/8, 5/8, and 1-1/8 inches, a pulp density of 40 percent, and a salt concentration of 10 percent were used for the experiments. As expected, the resistance drop across the electrodes increased directly with an increase in electrode spacing. Generally, the use of lower pulp density enables the use of closer electrode spacing, which in turn allows the use of lower salt concentrations. However, exploitation of these favorable effects is limited by lower concentrations of the oxidation agent and consequent slowing of reaction rates, difficulty in suspending solid particles in the agitation system, and increased complexity in solid-liquid separation.

The effect of treatment rate (amperes) on the mercury extraction, obtained at a total treatment of 17.5 amp hr, was determined in a series of experiments in which the ore was treated with current loads of 2.5, 5, and 10 amperes (fig. 5). The treatment rate of this particular ore appears to be a 5-ampere load, which corresponds to 3.5 hours of treatment time. If the treatment time is doubled to 7 hours (2.5 amperes), no change in the power consumption per ton is observed; but if the treatment time is halved (10 amperes), the power required for 90- to 95-percent extraction is increased nearly 20 percent. Because the treatment rate affects the sizing and capital cost of almost all the plant equipment, the increased cost of rectification and operation for higher treatment rates should be carefully balanced against the cost of smaller agitators and supplemental equipment.

Current density is a critical operating parameter in that excessive current densities tend to increase the temperature and decrease the efficiency of the desired chemical reactions at the electrode-electrolyte interface. Figure 6 shows the effect of increasing the current density from 0.15 to 1.0 amp/in^2 on the power required to give 90- to 95-percent mercury extraction at

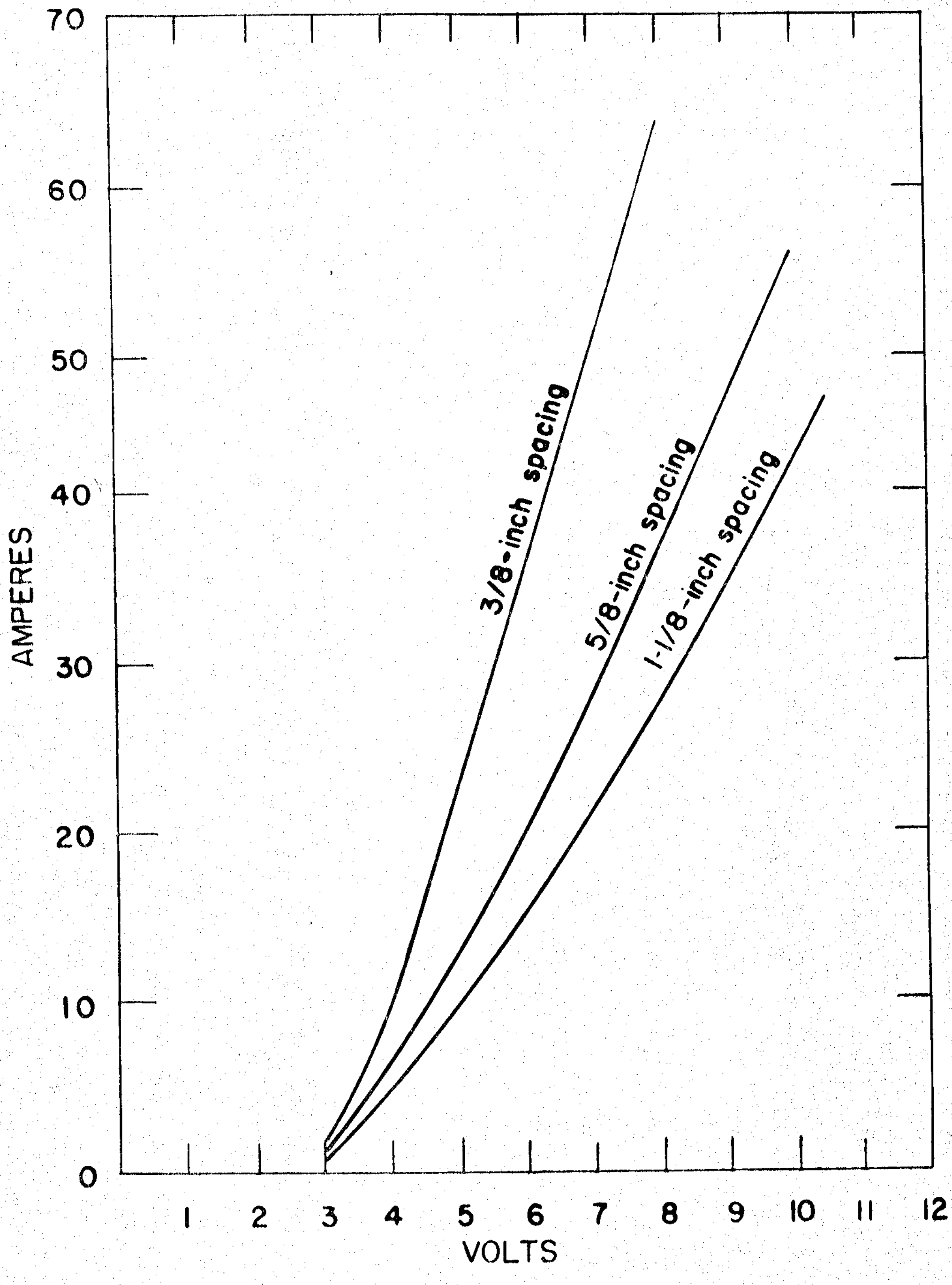


FIGURE 4. - Voltage-Amperage Relationship of Graphite-Graphite Electrode System at Various Electrode Spacings in 40-Percent Pulp Density Slurry.

a constant temperature of 30° C. The data show that current densities of <0.40 amp/in^2 should be used for maximum efficiency; however, the tonnage of a mill and the agitator size required are important considerations in projecting the practical number of cells that can be employed.

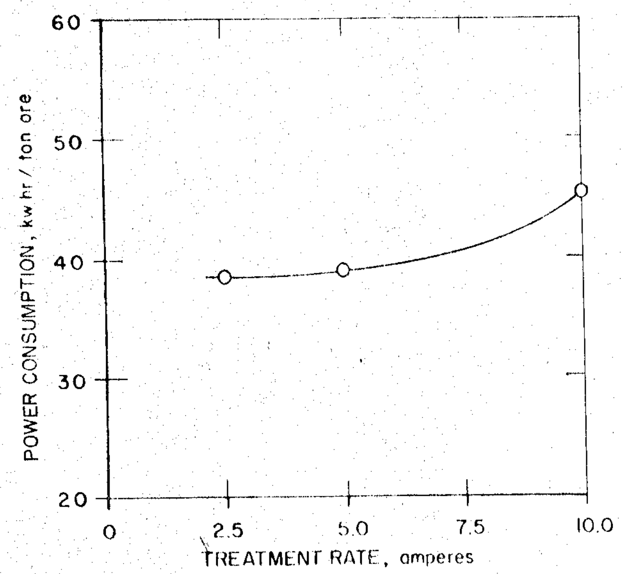


FIGURE 5. - Effect of Treatment Rate on Power Consumption Required to Attain 90- to 95-Percent Mercury Extraction.

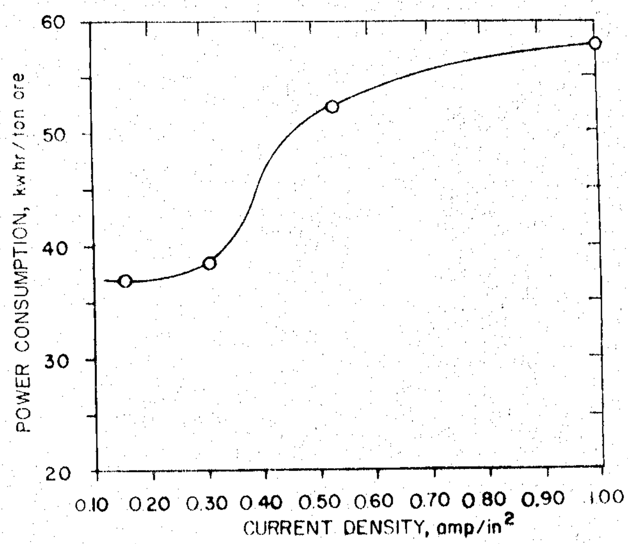


FIGURE 6. - Effect of Current Density on Power Consumption Required to Attain 90- to 95-Percent Mercury Extraction.

Grinding is an important part of any hydrometallurgical process because it is necessary to release the mineral from the host rock so that it can come in contact with the reactants. The effect of particle size on mercury extraction was investigated using several ores with different host rocks. A coarse grind of 100 percent minus 35 mesh was shown to be sufficient for all ores tested. However, excessive grinding resulted in an 80 percent minus 200-mesh pulp and caused a decrease in mercury extraction. The decline in mercury extraction with fine grinding was attributed to a loss in oxidizing efficiency caused by consumption of oxidant by other minerals in the gangue material. A grind of 100 percent minus 35 mesh should not be construed as a standard grind required for the process, because each ore would have to be tested individually to determine the optimum particle size for reaction.

Precipitation of the mercury from leach solutions was investigated in the laboratory, with active metals such as zinc, iron, and aluminum. Zinc was the most effective for precipitation, followed by iron and finally aluminum which gave poor results under all conditions investigated. A pH of 2 to 3 gave the best results in the precipitation step. Because the ore buffered the recycle barren solutions, only a small amount of brine was required to maintain an electrolysis pH of 7 to 8. Iron does not amalgamate with mercury; consequently, experiments with iron as the precipitant resulted in recovery of part of the mercury as finite droplets and the remainder as a black iron-mercury sludge containing 30 to 50 weight-percent mercury. The only problem encountered with iron was that it became passive with time and a zinc scavenging step was required to obtain barrens in the 1- to 10-ppm range. The effect of pH and the amount of zinc in contact with solutions on mercury recovery is shown in table 1.

TABLE 1. - Effect of pH on mercury precipitation with zinc dust

Run	pH[1]	Zinc dust in contact with Hg, lb Zn/lb Hg	Barrens, ppm Hg	Precipitation, percent
1.........	5.0	1.30	530	3.7
2.........	4.0	1.30	260	52.8
3.........	3.0	1.30	5	99.1
4.........	2.5	1.30	21	96.2
5.........	3.0	1.06	78	98.6
6.........	3.0	.80	31	94.4

[1] pH adjusted with H_2SO_4.

The data indicate that near optimum pH for precipitation appears to be close to 3.0 with a ratio of 1.3 lb zinc/lb mercury in contact with the pregnant solution. Mercury recovery was 99.1 percent under these conditions, and zinc consumption per pound of mercury recovered was 0.5 pound. Since amalgamation with zinc starts immediately on contact with the pregnant solution, vigorous stirring is important.

A process flow diagram, based on laboratory data, is shown in figure 7. The conceptual plant would consist of a crusher; a ball mill; four agitation tanks for electrolytic oxidation; a digestion tank; provision for solid-liquid separation such as a filter, centrifuge, or thickeners; a clarifier; and a mercury precipitator. This general flow scheme was utilized for additional experiments conducted in the 100- to 200-lb/hr pilot mill shown in figure 8. Mercury ore from a hot-spring deposit containing 1.4 lb mercury/ton was used

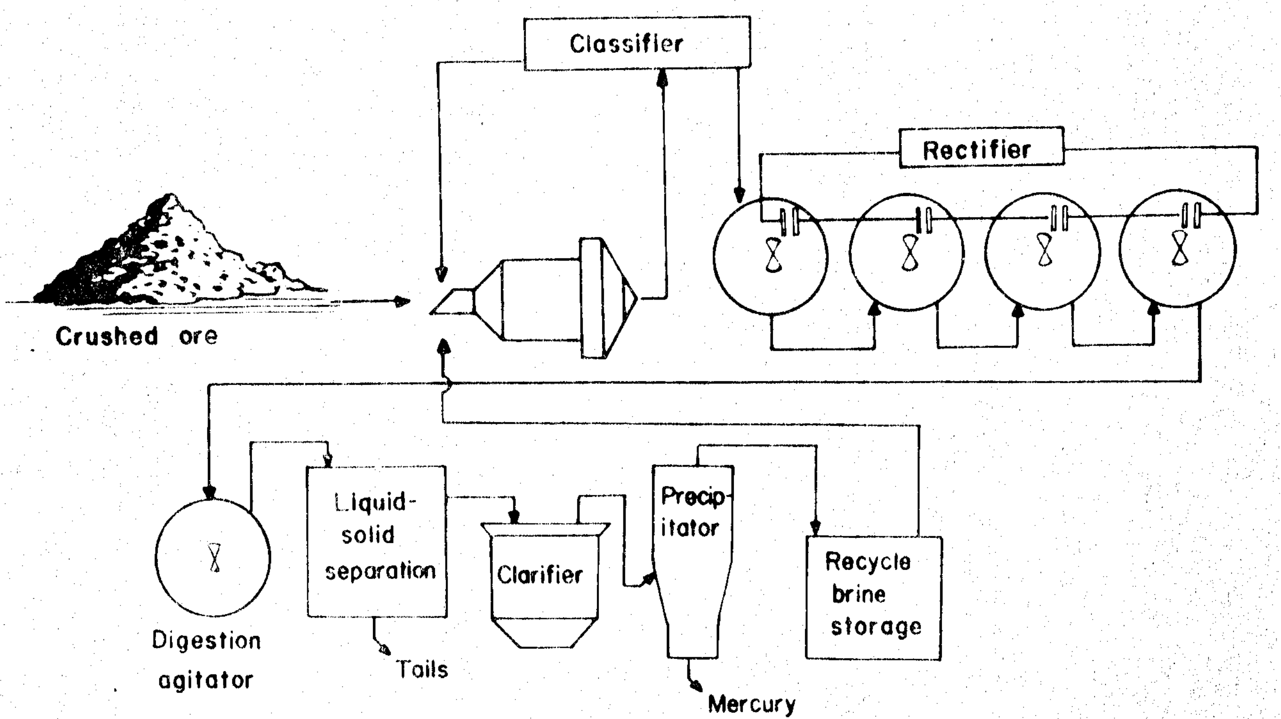


FIGURE 7. - Conceptual Plant Layout and Flow Diagram Based on Laboratory Data.

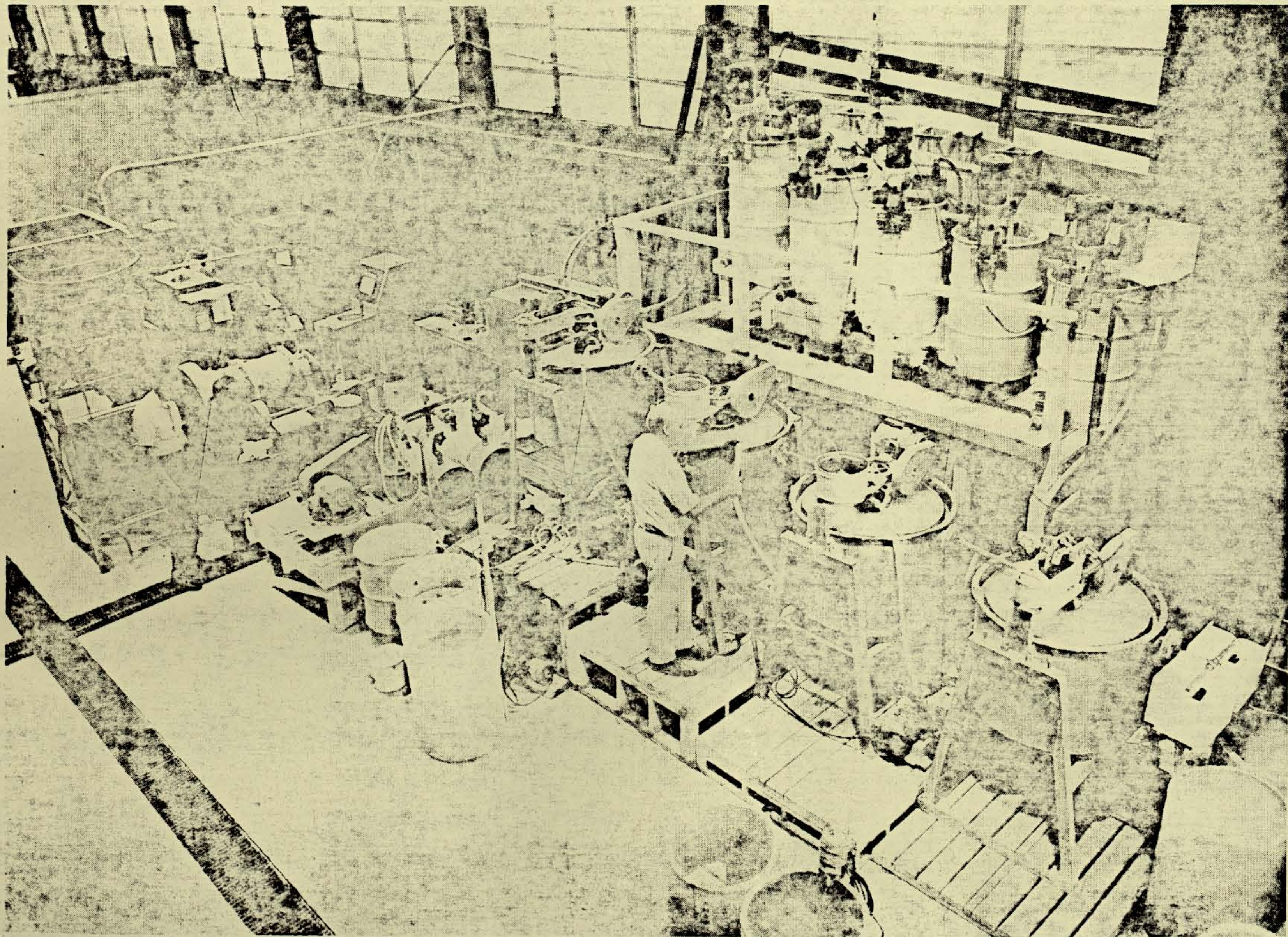


FIGURE 8. - Pilot Mercury Extraction Mill at Reno Metallurgy Research Center.

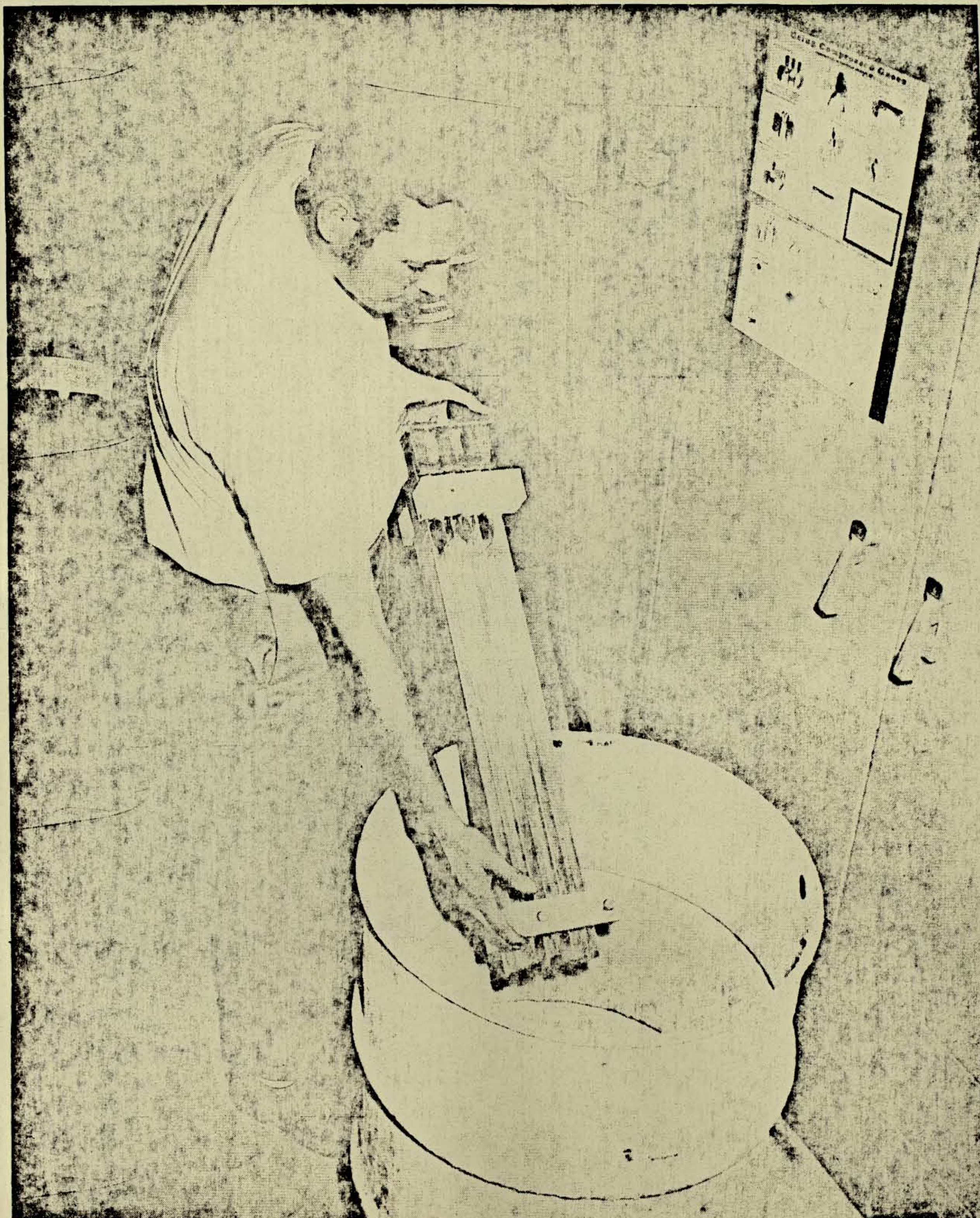


FIGURE 9. - Pilot Plant Oxidation Tank and PbO_2-Iron Electrolytic Cell.

for initial pilot mill experiments. The ore was ground to 100 percent minus 20 mesh and oxidized with a power consumption of 12 kwhr/ton of ore. Figure 9 is a closeup view of an oxidation tank, showing the PbO_2 anode-iron cathode electrolytic cell utilized for the experiments. Total mercury recovery was 96 percent. The ore was filtered, and the filter cake was washed with a displacement wash. Total salt loss in the filter cake was 26 lb/ton of ore. The pregnant solution was acidified with H_2SO_4 to a pH of 2.3 to 2.5 and recovered from leach solutions by two methods, including precipitation on detinned cans, followed by a scavenging precipitation on zinc shavings and precipitation with zinc dust. Barren electrolyte solutions were recycled to the ball mill. Precipitation on detinned cans closely paralleled laboratory experiments in which the iron was coated with mercury and became passive with time, thus requiring a zinc scavenging step to obtain low barrens. The use of a 30 percent excess of zinc dust for precipitation resulted in >99 percent (1 to 4 ppm barrens) mercury recovery as zinc amalgam. Distillation of the mercury for the zinc at 550° C resulted in complete recovery as metal. The precipitation procedure is being optimized at present.

CONCLUSIONS

The Bureau of Mines Reno Metallurgy Research Center has developed a hydrometallurgical process for low-grade mercury ores. Mercury recovery of 90 to 99 percent was obtained in the laboratory by electrooxidation of mercury ore pulps at 30° C with a 10-percent salt solution as the electrolyte. Power consumption ranged from 10 to 50 kwhr/ton ore. Operation of the process in a 100- to 200-lb/hr pilot mill substantiated laboratory data in demonstrating the feasibility of the process. Precipitation of mercury from solution in a sequential iron-zinc treatment was shown to be feasible; however, zinc was more effective as a precipitant in achieving low barren solutions. Pilot mill experiments are continuing with emphasis on evaluating a variety of different ores and optimizing the precipitation step. The use of PbO_2 anode-iron cathode electrode systems that show promise for effectively oxidizing the cinnabar minerals at salt concentrations in the 4- to 5-percent range is also presently under investigation.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

1605 EVANS AVENUE
RENO, NEVADA 89505

July 23, 1970

Mr. W. C. Jones
Purcell Development Co., Ltd.
Brisco, B. C.
Canada

Dear Mr. Jones:

We have completed laboratory scale study on the amenability of the ore sample you submitted from your Iron Point Mine property.

Analysis of the sample showed your ore to contain 16.3 pounds mercury per ton of ore. Treatment of the ore by electrooxidation at 3.2 volts and 5 amperes for 6 hours resulted in 96 percent extraction of the mercury contained in the sample. Sodium chloride concentration in the electrolyte solution was 200 pounds per ton solution. Pilot scale practice has shown that recovery of dissolved mercury from electrolysis solutions is readily accomplished by precipitation on zinc.

The test on the sample submitted indicates that the ore is amenable to mercury recovery by this technique.

Sincerely yours,

R. E. Lindstrom
Supv. Chemical Research Engineer

cc:
Mr. Lloyd M. Wilder, Purcell Mining Company, P. O. Box 579, Invermere, B.C., Canada

LIST OF REFERENCES

Dawson, J. M.: Report on the Iron Point Mercury Property, Gold Run District, Humboldt County, Nevada, U.S.A. for Stampede International Resources Ltd., 1970

Jones, W. C.: Iron Point Mercury Property, 1970

Lovering, T. S.: Physical Factors in the Localization of Ore; Ore Deposits as Related to Structural Features; edited by W. H. Newhouse, pp. 5 to 9

Newhouse, W. H.: Structural Features Associated with Ore Deposits Described in this Volume; Ore Deposits as Related to Structural Features; edited by W. H. Newhouse, pp. 9 to 53

Schuette, C. N.: Occurrence of Quicksilver Orebodies; Transaction of the A.I.M.M.E., 1931, pp. 403 to 488

Willden, Ronald: Geology and Mineral Deposits of Humboldt County, Nevada; Nevada Bureau of Mines, Bulletin 59, 1964

PROFESSIONAL ENGINEER ALBERTA
A. G. MacKENZIE

DECLARATION OF QUALIFICATIONS

OF

ANGUS G. MACKENZIE, P. ENG., MCIM

1. I, Angus G. MacKenzie, hereby certify that I am a Consulting Mining Engineer - Mining Geologist. I am a graduate (B. E.) in Mining and Metallurgy of Nova Scotia Technical College, Halifax, N. S. and I have taken post-graduate economic geology at Dalhousie University.

2. I have spent the past thirty years in the Mineral Industries as a Mining Engineer and/or Mining Geologist and have maintained responsible positions in these fields at mining properties in Newfoundland, Nova Scotia, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, the Yukon and Northwest Territories. I have also had considerable experience in the U. S. A. and Mexico.

3. I am a Registered Professional Engineer in the Provinces of Alberta and Manitoba and the Yukon Territory and am licensed to practise in Saskatchewan and British Columbia. I have been registered in Nova Scotia, Quebec and in the State of Colorado, U. S. A.

4. I have no personal interest directly or indirectly in the property herein reported on, nor in the securities of Purcell Development Co. Ltd. or any of its associated companies, nor do I expect to receive any such interest.

PROFESSIONAL ENGINEER ALBERTA
A. G. MacKENZIE

5. This report is the direct result of a property examination by myself and a review of all pertinent literature for the area, in addition to photo-geologic interpretation from colour and infra-red photography.

6. I have made this report at the request of Mr. L. Wilder of Purcell Development Co. Ltd.

Angus G. MacKenzie, P. Eng., MCIM,
Consulting Mining Engineer - Mining Geologist

Calgary, Alberta.
February 25, 1971.

September 18, 1970

Mr. Patrick Darcy
Parnasse Delaware Co. Inc.
Lenart Building, Suite 209
7000 East Camelback Road
Scottsdale, Arizona 85215

Dear Patrick:

Re: Iron Point Hg Deposit, Winnemucca, Nevada

Conversations with the owners indicate that the property noted above may be of real interest to Penarroya. (Location map attached.)

The property is now held by a Canadian company under their American subsidiary, Purcell Mining. Contact with Mr. L. M. Wilder, the president, was made through the French Consulate who is a friend of Jean Merlo. The Canadian parent company, Purcell Developments, also holds three properties in Canada. It is a private company with three principals- Mr. L. M. Wilder of Invermere, B.C., W. Wolfenden, and W. C. Jones. The latter two reside at Brisco, B.C.

W. C. Jones, their geologist, says that the ore is in fractured and silicified limestone with cinnabar occurring mainly along fractures. It is not the "opalite" type of cinnabar ore. They believe an open pit mining operation is possible. The grades reported are incredibly high and if we could see a few million tons open pit reserve it could be quite profitable. Testing by rotary or percussion drilling is proposed.

Jones also mentioned that a new mercury concentrating process appears to be practical for their deposit. This was discovered by the U.S.G.S. Bureau of Mines while working on the Cortez gold ores and a report on the process can be obtained from the Bureau of Mines. The author and discoverer is Dr. T. A. Henry.

Mr. Wilder will be going to the United States next week and there will be an opportunity to see the property at that time. If you wish to contact him, his home phone number is 604-342-9544 at Invermere, B.C.

There is a possibility of a joint venture association with Purcell Development in B.C., however on present evidence their most attractive property is in your area of jurisdiction.

I do not have any reports or further information on this property but Jones will have these available during his visit to the property. There may be a record of the old Iron Point Mines available in Nevada.

Best regards.

Yours truly,

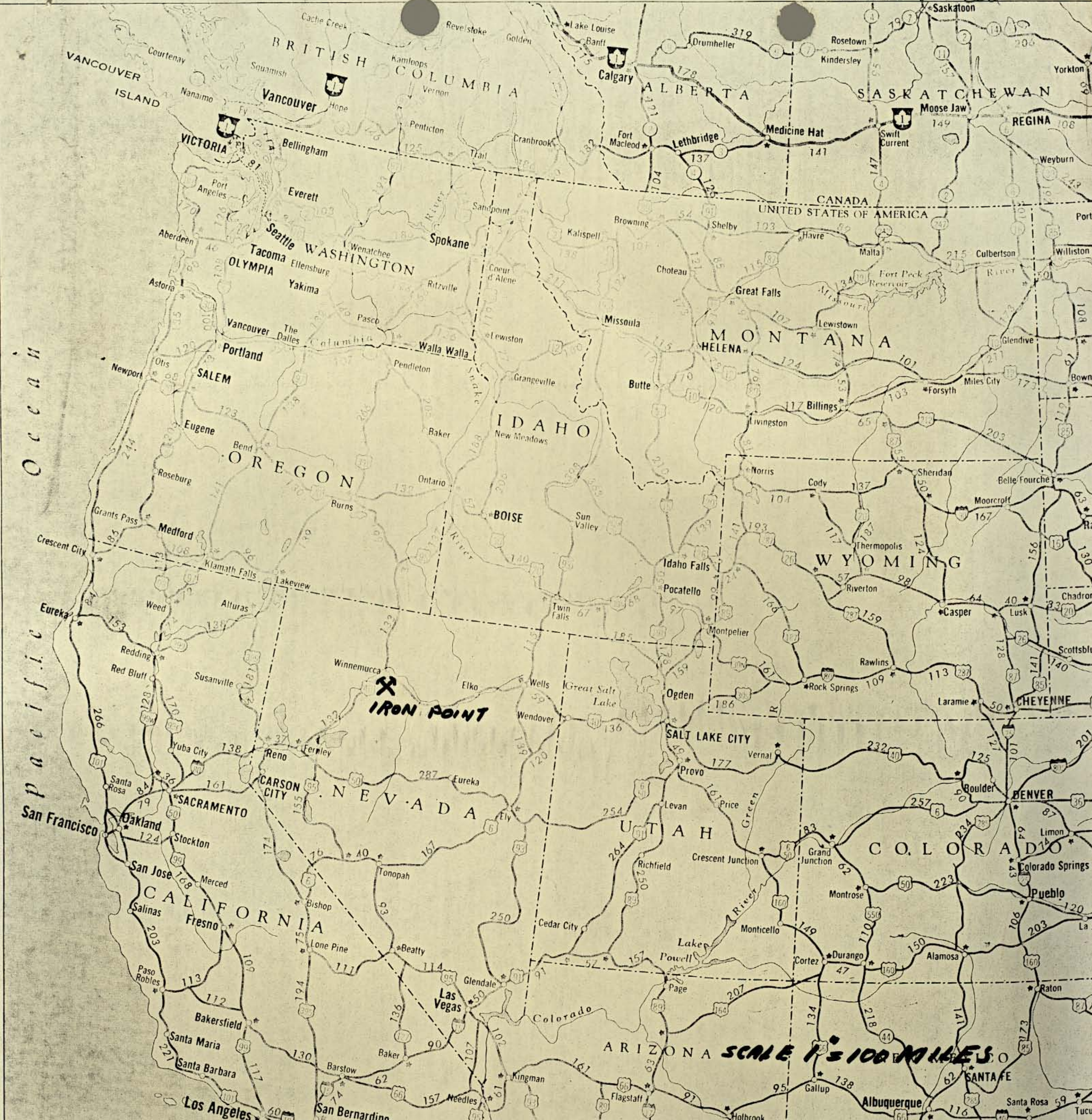
P.T.B

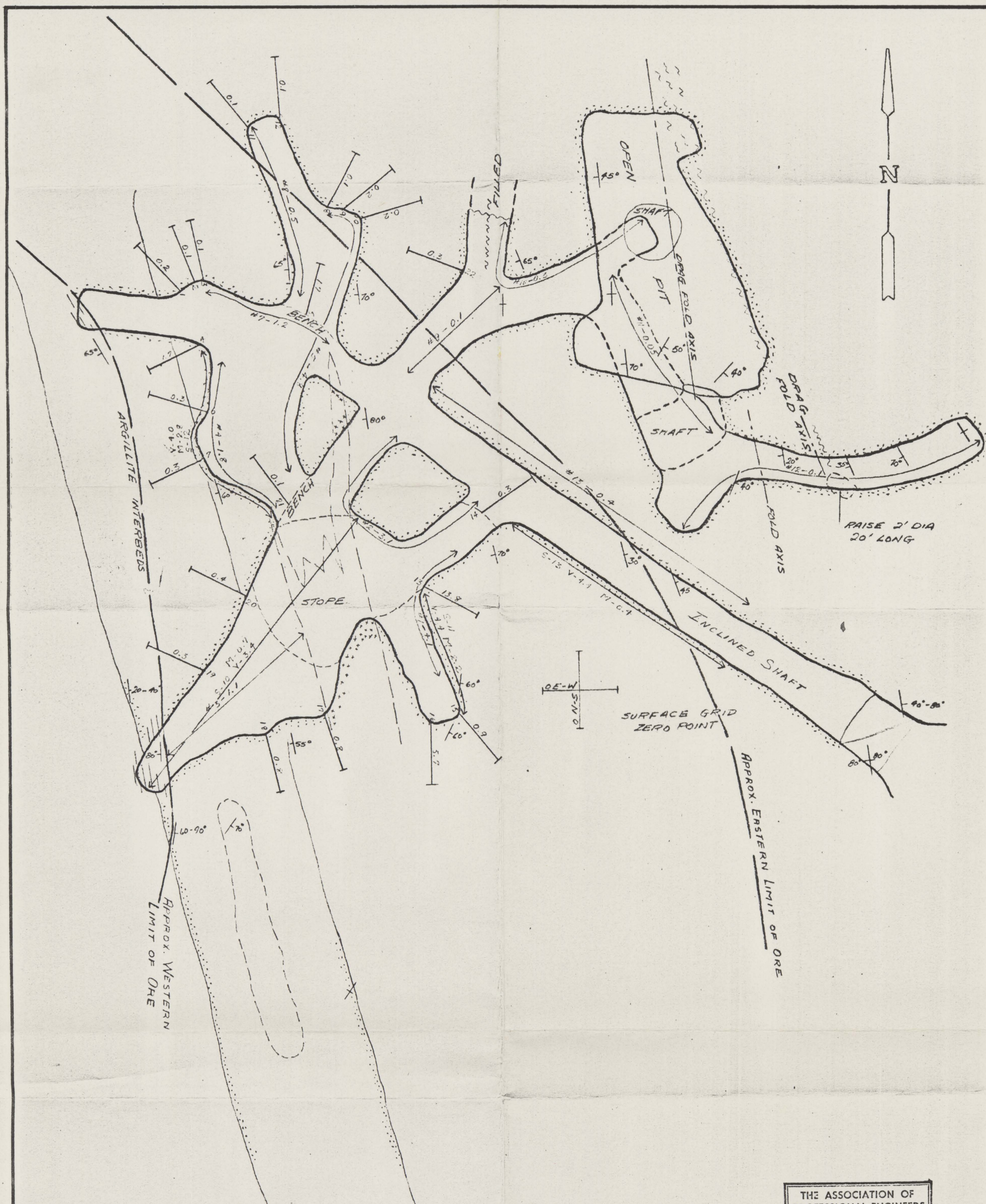
Philip T. Black
Chief Geologist

PB/ia
encl.
cc. P. de Bretizel

BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
CANADA
UNITED STATES OF AMERICA
WASHINGTON
OREGON
IDAHO
MONTANA
WYOMING
NEVADA
UTAH
COLORADO
CALIFORNIA
ARIZONA
Pacific Ocean
VANCOUVER ISLAND
VICTORIA
Vancouver
Calgary
Lethbridge
Medicine Hat
Moose Jaw
REGINA
Saskatoon
Seattle
Tacoma
OLYMPIA
Spokane
Portland
SALEM
Eugene
Medford
BOISE
Missoula
HELENA
Butte
Billings
Great Falls
Idaho Falls
Pocatello
Ogden
SALT LAKE CITY
Provo
Reno
CARSON CITY
SACRAMENTO
San Francisco
Oakland
Stockton
San Jose
Fresno
Bakersfield
Santa Barbara
Los Angeles
San Bernardino
Las Vegas
Kingman
Flagstaff
Albuquerque
SANTA FE
DENVER
Colorado Springs
Pueblo
CHEYENNE
Casper
Rock Springs
Winnemucca
Elko
Wells
Wendover
Tonopah
Ely
Eureka
IRON POINT
SCALE 1" = 100 MILES

Nevada - Purcell





LEGEND

- S-11 — Samples taken by J. M. Dawson Oct. 1970
- #4-1.8 — Face samples with assay results in lbs Hg/ton
- 3 — 0.1 — Jackley drill holes with assay results in lbs Hg/ton
- silicified limestone & possibly chert
- Argillite
- Intrusive sills - Porphyritic trachite.
- 55 — Bedding attitude.
- – – – Geological Contact.
- ~ ~ ~ fault.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF ALBERTA
PERMIT NUMBER
P502
ANGUS G. MacKENZIE MINING CONSULTANTS LTD.

PROFESSIONAL ENGINEER A. G. MacKENZIE ALBERTA

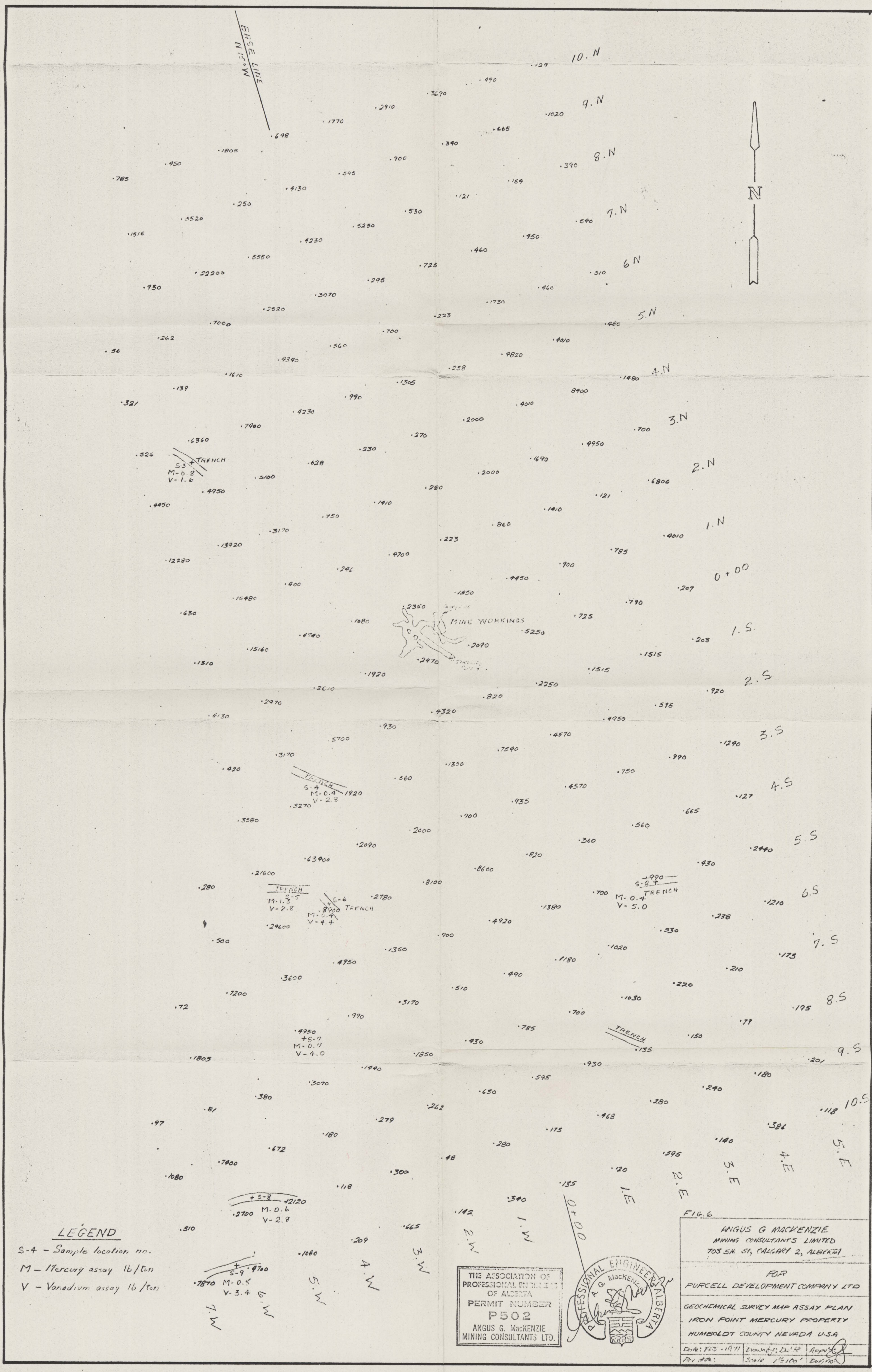
FIG. 5

ANGUS G MACKENZIE
MINING CONSULTANTS LIMITED
703 5th St, CALGARY 2, ALBERTA

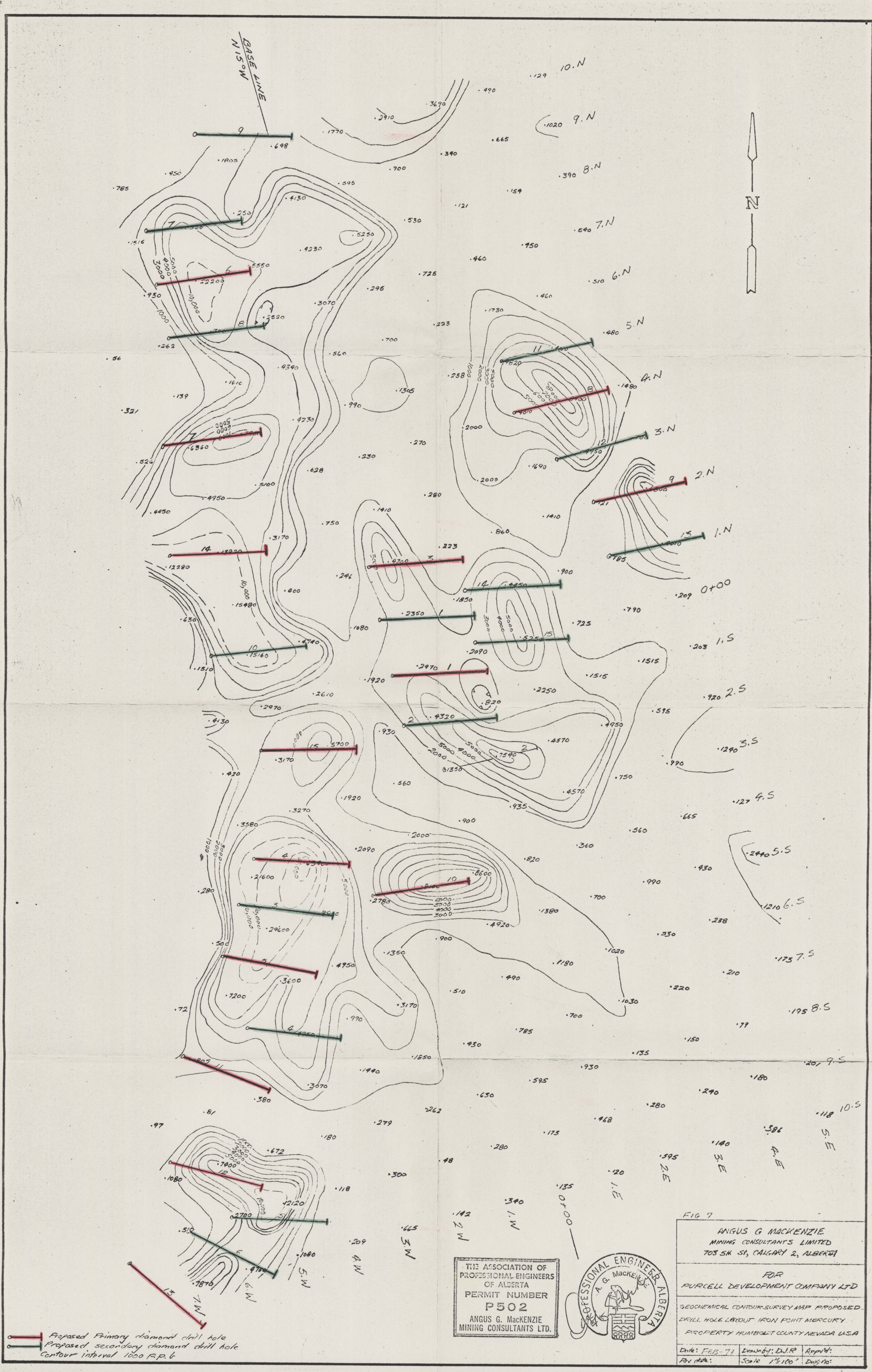
FOR
PURCELL DEVELOPMENT COMPANY LTD.

UNDERGROUND GEOLOGICAL MAP AND ASSAY PLAN IRON POINT MERCURY PROPERTY HUMBOLDT COUNTY NEVADA USA

Date: FEB.-71	Drawn by: ELK	Appv'd:
Rev date:	Scale: 1" = 10'	Dwg no.


BASE LINE N 15° W
N
10.N
9.N
8.N
7.N
6N
5.N
4.N
3.N
2.N
1.N
0+00
1.S
2.S
3.S
4.S
5.S
6.S
7.S
8.S
9.S
10.S
1.E
2.E
3.E
4.E
5.E
1.W
2.W
3.W
4.W
5.W
6.W
7.W
MINE WORKINGS
TRENCH
S-3
M-0.8
V-1.6
S-4
M-0.4
V-2.8
S-5
M-1.3
V-2.8
S-6
M-0.4
V-4.4
S-7
M-0.7
V-4.0
S-8
M-0.6
V-2.8
S-9
M-0.5
V-3.4
M-0.4
V-5.0
LEGEND
S-4 - Sample location no.
M - Mercury assay lb/ton
V - Vanadium assay lb/ton
THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF ALBERTA
PERMIT NUMBER
P502
ANGUS G. MacKENZIE MINING CONSULTANTS LTD.
PROFESSIONAL ENGINEERS ALBERTA
A. G. MacKENZIE
FIG. 6
ANGUS G MACKENZIE
MINING CONSULTANTS LIMITED
703 5th St, CALGARY 2, ALBERTA
FOR
PURCELL DEVELOPMENT COMPANY LTD
GEOCHEMICAL SURVEY MAP ASSAY PLAN
IRON POINT MERCURY PROPERTY
HUMBOLDT COUNTY NEVADA U.S.A
Date: Feb. 1971
Scale 1"=100'

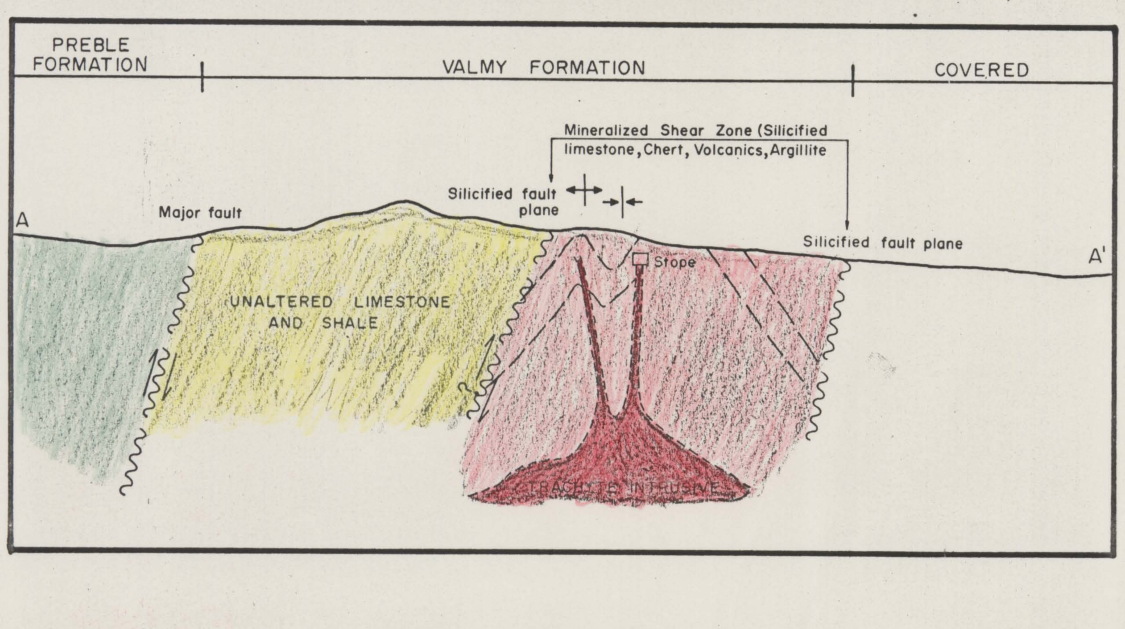
2460 0038



BASE LINE N15°W
N
10.N
9.N
8.N
7.N
6.N
5.N
4.N
3.N
2.N
1.N
0+00
1.S
2.S
3.S
4.S
5.S
6.S
7.S
8.S
9.S
10.S
1.E
2.E
3.E
4.E
5.E
0+00
1.W
2.W
3.W
4.W
5.W
6.W
7.W
Proposed Primary diamond drill hole
Proposed secondary diamond drill hole
Contour interval 1000 P.P.b
THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF ALBERTA
PERMIT NUMBER
P502
ANGUS G. MacKENZIE MINING CONSULTANTS LTD.
PROFESSIONAL ENGINEER ALBERTA
A. G. MacKENZIE
FIG 7
ANGUS G MACKENZIE
MINING CONSULTANTS LIMITED
703 5th St, CALGARY 2, ALBERTA
FOR
PURCELL DEVELOPMENT COMPANY LTD
GEOCHEMICAL CONTOUR SURVEY MAP PROPOSED
DRILL HOLE LAYOUT IRON POINT MERCURY
PROPERTY HUMBOLDT COUNTY NEVADA U.S.A
Date: FEB-71
Drawn by: D.J.R
Appv'd:
Rev date:
Scale 1"=100'
Dwg no:

2460 0038

INTERPRETIVE GEOLOGICAL CROSS—SECTION ALONG A—A'



LEGEND

- Major fault.
- Fault.
- Thrust fault.
- Geological contact.
- Anticline.
- Syncline.
- Form lines.
- Visicular basalt — Quarternary tertiary. — QTV
- Highway limestone. — PPU } Pennsylvainian formation.
- Pumpernickel formation. — PP } Pennsylvainian formation.
- Valmy formation — Ordovician. — OV (Barren / Mineralization)
- Preble formation — Cambrian. — ЄP
- Stream or creek (Dry).
- Gravel road.
- Mine access road.
- Mining propect.
- Bench mark. — + B.M 4723
- Triangulation station. — △ FORTY 4909

Note. Base map taken from aerial photo by Mach Air Ltd, Feb 1971.

Location of mineral claims approximate.

To accompany report by A G Mackenzie Mining Consultants Ltd

THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF ALBERTA
PERMIT NUMBER
P502
ANGUS G. MacKENZIE MINING CONSULTANTS LTD.

PROFESSIONAL ENGINEER A. G. MacKENZIE ALBERTA

FIG. 4

ANGUS G MACKENZIE
MINING CONSULTANTS LIMITED
703 5th St, CALGARY 2, ALBERTA

FOR
PURCELL DEVELOPMENT COMPANY LTD

GEOLOGICAL MAP
IRON POINT MERCURY PROPERTY
HUMBOLDT COUNTY NEVADA U.S.A

Date: FEB, 1971	Drawn by: D.J.R	Appv'd:
Rev date:	Scale: 1"= 500'	Dwg no:

2460 0038