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TOM REED GOLD MINES COMPANY

APRIL 1939

Recommended Future Mine Development:

Benjamin Harrison:

(1) Drive the Ben Harrison 800 level west to the winze, to the 1400 level.

(2) Reopening the 1400 winze to the 1400 level and driving west on the 1000 and 1400 levels sufficient to prove the west end of the Tom Reed, as with reasonable assumed extension of the Tom Reed ore body it is possible to develop considerable commercial ore at the present price of gold, also in driving east on the 1000 and 1400 it is possible that another ore shoot may be found under 700 to 900 feet west of Ben Harrison shaft.

(3) In driving west from the 1000 and 1400 winze levels it seems advisable to prove the United Eastern Mine under the mined out area, as with reasonable assumed extension of the United Eastern ore body, it is possible to develop a large tonnage of commercial ore at the present price of gold.

The cost of proving the Tom Reed and United Eastern would be small in comparison with the amount usually required for prospecting on ore body in depth, due to being able to work through the present winze to 1400 level, which should be in good shape as it was sunk in the foot wall.

Grey Eagle - Aztec - Bald Eagle:

(1) Driving east from the 200 level Grey Eagle to the east end of the 3245 stope. There should be a net profit of \$15,000 to \$20,000 in a comparatively small tonnage in the back of the 3420 and 3245 stopes, with an additional \$3500.00 of possible ore.

(2) Developing the east end of the 3245 stope from the 400 level Aztec by raises. With reasonable assumed extension to the east of the 3245 ore shoot it is possible to develop 2000 tons of commercial ore. The east end of the 3245 stope samples average \$12.75, width 4 feet.

Recommended Future Mine Development:

(3) In stoping on the above mentioned block at 80 feet above the 400 Aztec a hanging wall cross-cut should be driven into the hanging wall vein. This will be over the top of the 3295 stope, and in which it is possible to develop 500 tons of commercial ore.

(4) To continue mining 2750 stope above the 2805 stope - 500 tons possible ore.

(5) Aztec 400 level west of the 4000 block above and below the 400 Aztec. Drive a hanging wall drift west on the streak within which the high grade ore in the 4000 block occurred.

(6) Grey Eagle - Bald Eagle on Mallery Fault. Continue stoping on the 3480 stope on east side of 3480 raise.

(7) Drive raise from top of 3480 raise, 400 Aztec, upward to prove the area between the 3480 stope and the Frayne stope on the 200 Bald Eagle.

East Aztec on Telluride Vein:

(8) Drive west on the 700 Aztec on the Telluride vein - with a chance of finding another ore shoot below the Ingram Lease.

West Aztec:

(9) Driving a number of diamond drill holes southwest from the 600 Big Jim near the intermediate vein, to intersect the faulted west extension of the Aztec ore body. It is possible that 5,000 to 10,000 tons of ore could be in this faulted section.

Relative order of importance of the above recommended development:

Benjamin Harrison	1-2)	
Grey Eagle, Aztec, Bald Eagle	1-2-3)	1st.
West Aztec	9	
	4-5-6-7)	2nd.

Respectfully submitted,

RMG:F

/s/ R. M. Gammell
/t/ R.M. GAMMELL

POSSIBLE ORE IN FURTHER DEVELOPMENT

TOM REED GOLD MINES COMPANY

APRIL 1939

BENJAMIN HARRISON

<u>Location</u>		<u>Tons Possible Ore</u>
T.R. - 700 - 1000 Level	1-A	14,000.00
" 1000 - 1100 "	1-A-1	3,000.00
" 700	1-A-E	---

GREY EAGLE - AZTEC - BALD EAGLE

Top		
3245 Stope	1-A-1-A-1	3,500.00
East End		
3245 Stope	No. 1-B	2,000.00
Top		
3295	No. 1-D	500.00
East Bald		
Eagle Shaft	No. 1-E	
Top 2805		
Stope	No. 1-D	500.00

400 LEVEL AZTEC MAIN VEIN 4000 BLOCK

Above and Below	
400 Aztec	No. 1-B

GREY EAGLE, BALD EAGLE, ON MALLERY FAULT

Between 400 Aztec and	
200 Bald Eagle	No. 1-C

EAST AZTEC ON TELLURIDE VEIN

No. 1-E

WEST AZTEC

No. 1-A	10,000.00
Total	<u>35,500.00</u>

Oatman, Arizona
May 27, 1939

Mr. Jack Zwinge, Supt.
Tom Reed Gold Mines Co.
Oatman, Arizona

Dear Sir:

Possible ore in further developments.
Supplementary to report of April 1939.

As an immediate source of ore, I recommend the following:

- (1) Lay track on the 700 Aztec to the old 4140 lease transfer chute, Telluride vein.
- (2) Transfer the stope fill above the 550 intermediate level under Ingram lease to 700 Aztec, using old transfer chute. Grab samples of the gob indicate that by excluding the coarse waste, this old fill should be \$8.00 to \$12.00 ore. By mucking on the fill every other day, a control on the value can be kept. If ore happened to be too low grade some days it can be trammed to the old open stope between 700 and 1100.
- (3) There is considerable waste in the drift west of the 4140 manway, 700 level, and on the days you were not working on fill this waste could be trammed to the old stope between 700 and 1100.
- (4) I recommend driving the west drift, 650 level Telluride, at least 100 feet west, also some cross cutting. I believe this work to be fully justified considering structural conditions. Also you may get sufficient ore from the 550 intermediate level fill to pretty well pay for the level development.
- (5) I recommend cutting out for a double chute and manway on the Bobby Vein on 500 Aztec near vein junction. I believe it possible to carry up a 25 or 30 foot section, at mill grade, up to the 400 Aztec. Sampling during cutting out should indicate if it is possible to mine this section.
- (6) In driving the proposed crosscut on 400 Aztec, into old stope opposite 3195 chute, the foot wall next to old stope can be slabbed off, making a space where the ore falling from 3195 chute would be caught, and making a convenient place to muck it as it accumulates.

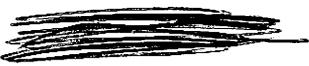
Respectfully submitted,

/s/ R. M. Gammell
/t/ R. M. GAMMELL

Mineral Hill, Duval Corp.
Cerbats
operated as underground
in old days

Early 1950
Kennebecott / Bear Creek
drilled and turned it down

Duval later came in
and found substantial
ore body



Tom Reed Prop. - ~~18~~ million
United Eastern - 11 "

Aug¹⁷, 1969

Oct. 9, 1971

Victor light

250,000 tons of $\$$ 23⁰⁰

"Call 273-1455

HELMICK MACHINERY RENTALS

— for your construction & mining equipment needs "

4550 E. Washington St. — Phoenix, Arizona

Rentals — Leases

Darwin Mine, Lead & Silver
in Calif.

• thought to be mined out
and in late 1940's

Anacosta drilled some 10-15'
from old workings and
hit 75-85% Lead Ore Body

Several of Millions Produced

Old Dick Mine in Bogda

mined of and on until late 50's.

Hollinder & K^o Farland together
with S. Owens deepened the
shaft and excited hitting

new ore body in eskalon

was then sold to Cyprus
and is still being operated

Everything In Material Handling

Tom Reed Mill Data - 1934-36 - U.S. Bureau of Mines -
Paris Brough

plus 200,000 tons averaging \$12.00 Heads
 (0.68) Tails

<u>Reagent Consumption:</u>	<u>Cost</u>	<u>Est. Today's Cost</u>
3.5 # balls -	0.09	0.05 ✓
1.75 # CaCN -	0.16	0.28 ✓
Liners -	0.07	0.05 ✓
4.07 Lime	0.03	0.04 ✓
0.46 Zinc	<u>0.05</u>	<u>0.07</u> ✓
	0.40	0.49

Summary Total Costs: 1935

Labor (incl. Super.)	\$ 0.37	-	0.50
Power	-	0.53	0.40
Reagents + Supplies	-	0.55	0.70
Equip. + Repair	-	<u>0.23</u>	<u>0.30</u>
		\$ 1.68	\$ 1.90

Plus cost of removing low grade tails

Denver Equip. Co. (Hood 0.04 Au 0.16 Ag)
 recovered in 24 hr cyanide Test
 37.6 % Au + 62.4 % Ag
 35% of Au. Water Soluble

Metals Engineering
 (57.2% Au Recov.)

DETAIL OF CUSTOM MILLING PROFITS FOR MONTH OF AUGUST, 1934.

Average recovery for period 95.48%.

SHIPPER	Lot No.	Dry tons.	Total Value.	Extraction paid.	Extraction profit.	Milling charges.	Total mill revenue.	Total milling cost @ \$1.54	Net mill profit.	Add royalties on lease ore.	Total net profit on lease and custom ore.
<u>Outside Custom Ores.</u>											
Baldwin & Bayliff	1	9.83	\$258.03	92%	\$11.66	\$54.23	\$65.89	\$15.14	\$50.75		\$50.75
Consolidated Gold	7	40.99	545.17	95	2.62	147.56	150.18	63.12	87.06		87.06
" "	8	55.28	531.79	95	2.56	199.01	201.57	85.13	116.44		116.44
" "	9	235.38	2306.72	95	11.08	847.39	858.47	362.48	495.99		495.99
" "	10	121.82	1097.60	95	5.27	438.55	443.82	187.60	256.22		256.22
" "	11	181.04	1584.10	95	7.60	651.74	659.34	278.80	380.54		380.54
Fred LeBeau	1	18.97	272.22	92	9.48	85.36	94.84	29.21	65.63		65.63
A. D. Morton	1	18.33	168.45	92	5.87	82.48	88.35	28.23	60.12		60.12
J. D. Parsons	1	45.48	501.19	95	2.41	181.92	184.33	70.04	114.30		114.30
" " "	2	26.27	312.61	95	1.50	105.08	106.58	40.45	66.13		66.13
W. K. Ridenour	24	27.27	496.31	95	2.38	109.08	111.46	41.99	69.47		69.47
" "	25	28.90	310.10	95	1.49	86.70	88.19	44.51	43.68		43.68
Courtney Contract	10	118.42	1222.68	95	5.87	426.31	432.18	182.37	249.81		249.81
John Warden	1	25.02	179.52	95	0.87	100.08	100.95	38.53	62.42		62.42
Sweetland & Willoughby	1	56.31	640.53	95	3.08	225.24	228.32	86.71	141.61		141.61
Ferra & Brewer	1	32.60	385.00	95	1.85	130.40	132.25	50.20	82.05		82.05
Davis & Conley	1	15.61	404.30	92	14.07	70.25	84.32	24.04	60.28		60.28
J.T. Welch	1	5.02	53.16	92	1.85	32.59	34.44	7.73	26.71		26.71
Gardner & Gustafson	3	28.24	405.24	95	1.94	112.96	114.90	43.49	71.41		71.41
Totals		1090.78	11674.72		\$93.45	\$4086.93	\$4180.38	\$1679.77	\$2500.62		\$2500.62
<u>Tom Reed Lease Ores.</u>											
McCulloch & McCulloch	11	119.12	\$2376.44	95	\$11.41	\$428.83	\$440.24	\$183.44	\$256.80	\$338.64	\$595.44
Eyster & James	5	72.00	1713.60	95	8.23	259.20	267.43	110.88	156.55	325.58	482.13
" "	6	70.50	1899.97	95	9.12	282.00	291.12	108.57	182.55	451.24	633.79
Fuller & Curry	4	27.18	275.88	95	1.32	108.72	110.04	41.86	68.18	15.73	83.91
Dan Sullivan	4	39.96	853.14	95	4.10	159.84	163.94	61.54	102.40	162.10	264.50
Stoney & Crane	1	17.30	246.70	92	8.59	77.85	86.44	26.64	59.80	20.42	80.22
J. G. Castleberry	1	16.21	70.84	92	2.47	24.31	26.78	24.96	1.82	3.26	5.08
L. M. Tobin	10	21.81	148.85	92	5.18	98.14	103.32	33.59	69.73	6.85	76.58
" " "	11	31.17	365.31	95	1.76	124.68	126.44	48.00	78.44	20.82	99.26
" " "	12	24.61	282.03	95	9.82	73.83	83.65	37.90	45.75	15.57	61.32
" " "	13	25.48	260.91	95	1.26	76.44	77.70	39.24	38.46	14.87	53.33
" " "	14	26.11	411.23	95	1.97	78.33	80.30	40.21	40.09	58.60	98.69
Reid & Carrara	6	72.20	1244.73	95	5.98	274.36	280.34	111.19	169.15	177.37	346.52
Putnam & Tenney	8	107.39	939.66	95	4.51	386.60	391.11	165.38	225.73	44.63	270.36
A. Consentini	6	41.09	86.29	95	---	86.29	86.29	63.28	23.01	---	23.01
Chas. E. Golding	4	85.63	599.41	95	2.88	325.39	328.27	131.87	196.40	28.47	224.87
Totals		797.76	\$11774.99		\$78.60	\$2864.81	\$2943.41	\$1228.55	\$1714.86	\$1684.15	\$3399.01
United American Lease.	68 to 77	1374.60	\$13703.20	96	Loss	\$71.27	\$3092.84	\$3021.57	\$2116.88	\$904.69	\$904.69
Totals		3263.14	37152.91		100.78	\$10044.58	\$10145.36	\$5025.20	\$5120.17	\$1684.15	\$6804.32

Circle 6

I. C. 6975
November 1937

INFORMATION CIRCULAR

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

MILLING METHODS AND COSTS AT THE MILL OF THE
TOM REED GOLD MINES CO., OATMAN, ARIZ.^{1/}

By Paris V. Brough^{2/}

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^{1/} The Bureau of Mines will welcome reprinting of this paper provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 6975."

^{2/} One of the consulting engineers, Bureau of Mines, and former superintendent of Tom Reed mill.

INTRODUCTION

This paper, which describes the practice of milling custom ore, in addition to that produced under company and lease operations in the Tom Reed mines, is one of a series being prepared by the Bureau of Mines.

ACKNOWLEDGMENT

Acknowledgment is made to W. B. Phelps, managing director, and Jack Zwinge, superintendent, for permission to publish, and to G. E. Jarpe, the present mill superintendent, for his assistance in preparing the paper.

LOCATION

The mill is in Oatman, adjacent to the Benjamin Harrison shaft of the Tom Reed Gold Mines Co., in the foothills on the western slope of the Black Mountains, western Mohave County. The railroad shipping point is Kingman, Ariz., 25 miles northeast of Oatman. Paved highway U. S. 66 passes by the mill. The altitude is approximately 2,700 feet.

GENERAL

Sources of Ore

The mill treats ore mined on company account, that produced by lessees on company property, and custom lots from outside sources. The lease ore is treated on a custom basis.

Ore produced on company account is hoisted through the Benjamin Harrison and Black Eagle shafts; the latter shaft is approximately 1 mile to the southeast and connected to the mill by an aerial tramway. Most of the company lease ore is hoisted through shafts that are not being worked by the company and is trucked to the crushing-plant bins. An occasional lot of lease ore, however, is hoisted at the Black Eagle shaft and shipped via the aerial tramway. Most of the outside custom ore comes from the Oatman district within a radius of 10 miles and includes company lease production from the Gold Road Mine of the United States Smelting and Refining Co. (1936), and ore from the Ruth and Rattan claims of the Oatman Eastern Gold Mines Co. in the Silver Creek section, the Pioneer group 4 miles west of Oatman, and smaller quantities from many properties in the district. Ore also comes from various other sections within a radius of 100 miles, some coming from California and southern Nevada. All outside ore is trucked to the bins of the crushing plant.

Tom Reed ore is mined from shrinkage and cut-and-fill stopes; the method is governed by ore widths and wall-rock conditions rather than by metallurgical requirements. To date (April 1937), most of the mining since starting in 1934 has been done around the fringes of old stopes. Unwatering, cleaning out, and retimbering of both the Benjamin Harrison and Black Eagle mines has been proceeding since February 1934 for the purpose of developing the vein system below the old mined areas.

Tom Reed lease ore is mined under the supervision of a lease foreman, whose duty it is to enforce reasonably safe mining operations. Outside custom ore is mined by both open-cut and underground methods; many of the smaller leases are partnerships.

Character of Ore Treated

With the exception of occasional odd lots from distant districts and the Oatman Eastern production, the ore milled is characteristic of the Oatman District. The chief gangue minerals consist of quartz, calcite, silicified andesite from stringer lodes, quartz monzonite, and varying amounts of fluorspar, adularia, and oxides of iron.

The stringer lodes of the Black Eagle and Gold Road mines produce some very hard and tough ore, while the quartz calcite ore bodies of the district are of average hardness. Most of the ore produced by the Tom Reed, United Eastern, and Gold Road vein systems requires grinding to 85 percent or more through 200 mesh for a satisfactory recovery, as the gold occurs as very fine particles disseminated in the gangue. The ores originating elsewhere in the district are more free milling; the metallic particles are larger and occur chiefly in the parting planes. A satisfactory yield is obtained by grinding to 60 to 70 percent minus 200 mesh, providing the contact period in cyanide solution is 72 hours or more.

Oatman Eastern ore carries finely disseminated sulphides, reputedly arsenopyrite, with from 2 to 6 ounces of silver per ton in addition to gold. This ore requires small additions of lead acetate to the agitators as an aid to silver recovery and the prevention of matte formation in the melting of bullion. Occasional lots of silver-bearing ore from outside the district are milled, but with these exceptions mill feed carries gold and silver at a ratio of approximately one to one by weight.

Microscopic Examination

When characteristic Tom Reed, Gold Road, and Pioneer ores are milled alone, 95 percent or more of the gold and only about 50 percent of the silver is recovered. These recoveries indicate that all the silver was not alloyed with the gold and the probable presence of minute quantities of some silver mineral. Microscopic examinations have borne out this conclusion; both electrum, containing all of the gold and part of the silver, and native silver have been identified.

The following quotations are from reports of microscopic investigations of the Tom Reed tailings made by the American Cyanamid Co.^{3/} The earlier investigation was on tailing after about 60 hours agitation, and the latter one on tailings after 72 hours agitation on somewhat coarser ground ore. The May 12, 1936, report states:

^{3/} Microscopical Examination of a Tailing Sample Submitted by Tom Reed Gold Mines Co.; Technical Investigation 58, Experiment 947, May 12, 1936, and Experiment 1097, January 13, 1937.

Present Operations: The sample submitted was a washed tailing that had been composited from daily samples on the basis of tonnage treated during the month of February 1936. The sample was said to represent the tailing from 7,201 tons of ore, of which 3,600 tons were custom ores received from other mines in the district.

Purpose of Investigation: The purpose of this investigation was to determine the mode of occurrence of the gold and silver present in the tailing.

Preliminary Test Work. Preparation of Samples for Microscopical Investigation: The entire amount of material received was mixed thoroughly by rolling on a cloth; it was subsequently sampled by quartering.

Because of the small size of the sample, it was not possible to use any of the material for assay purposes.

A representative portion of the tailing weighing 600 grams was screen-sized. The plus 200-mesh screen products were reserved for microscopical examination. The minus 200-mesh material was concentrated on a vanning plaque and the concentrate was dried.

A second representative portion of the tailing as received was carefully concentrated on a vanning plaque and the concentrate was dried for subsequent examination.

The samples used for the microscopical examination were numbered as follows:

- No. 1 Pan concentrate of tailing.
- No. 2 Plus 100 mesh tailing.
- No. 3 Plus 150 mesh tailing.
- No. 4 Plus 200 mesh tailing.
- No. 5 Pan concentrate of minus 200 mesh tailing.

Microscopical Examination: The microscopical examination of the samples was conducted by our Dr. P. L. Merritt.

A portion of each of the prepared samples was first molded into a briquette of bakelite by means of a heated, hydraulic press. The briquettes were then polished to a plane surface on a Graton-Vanderwilt automatic polishing machine.

As a result, the individual grains of tailing material were presented in cross section and it was possible to examine them with reflected light. The relationship between the metallic minerals and the gangue minerals was readily observable.

Similar portions of each prepared sample were reserved for examination of the unmounted grains by means of transmitted light.

The investigation showed that pyrite was the principal sulphide mineral and that some chalcopyrite also was present. Hematite was the most abundant metallic oxide mineral. The gangue minerals were largely quartz and chert, but carbonates also were present.

The gold present in the tailing was found to occur only as the natural gold-silver alloy, electrum. Silver, however, was also found to occur in the metallic state.

Dr. Merritt's observations of the various samples, together with suitable photomicrographs, follow.

Sample 1. - Panned Concentrate of the Tailing: Pyrite and a small amount of chalcopyrite were found in this sample. Electrum and native silver were observed. Most of the electrum was free; the particle size of the electrum was from 12 x 34 microns to 25 x 50 microns. However, one particle of electrum, 30 x 30 microns in size, was observed, which was attached to pyrite. Another particle was noted which was surrounded by hematite.

Sample 2. - Plus 100 mesh Screen Product: The examination of this product showed that free silver and electrum, as well as locked particles of these, were present. One particle of electrum, 15 x 15 microns in size, was found attached to a particle of gangue mineral.

Sample 3. - Plus 150 mesh Screen Product: This sample was essentially like the plus 100 mesh sample. A particle of free electrum was noted that measured approximately 40 x 50 microns.

Sample 4. - Plus 200 mesh Screen Product: This sample did not differ greatly from the previous screen products. It did contain a little more chalcopyrite. The occurrence of native silver and electrum also was observed. This sample contained a free particle of electrum that measured 10 x 35 microns in size.

Sample 5. - Pan Concentrate of minus 200 mesh Screen Product: Since this was a concentrated sample, the briquetted portion showed a greater number of metallic minerals than the other samples.

Pyrite and chalcopyrite were present together with native silver and electrum.

The native silver was free for the most part. A few particles were observed attached to gangue.

The electrum particles were largely free from all attachment. The particles were from about 5×10 to 20×110 microns in size.

Summary and Conclusions: A sample of cyanide tailing containing 0.021 ounce per ton gold was investigated for the Tom Reed Gold Mines Co. The results of this investigation may be summarized as follows:

1. Screen-sized portions of the tailing as well as a pan concentrate of the total tailing and a pan concentrate of the minus 200 mesh tailing were examined.
2. The gold was found to occur in all samples as the natural gold-silver alloy, electrum.
3. Silver was found to be present in the native state as well as in the alloy.
4. The electrum and native silver were largely free from mineral attachment. Occasional particles of electrum were found attached to hematite, pyrite, or gangue.
5. The greater number of electrum particles noted were less than 325-mesh sizes; a few particles observed were +150 mesh size. It has been shown that the particle size range of electrum and silver was from 5 to 110 microns. (Five microns is equivalent to a theoretical screen opening of about 2,000 mesh, and 110 microns is approximately equivalent to 150 mesh).

The fact that a majority of the gold-bearing electrum particles are free or substantially free from mineral attachment makes it appear that finer grinding alone will not result in better extraction of the values. Since the gold occurs only in association with silver, it would appear that an effort should be made to determine the effect of time of contact, alkalinity, and cyanide strength on the recovery of additional values from this tailing.

The tests shown in the January 13, 1937, report were made after another large agitator and new thickener had been added to the mill. The samples consisted of the composite mill tailing, a panned concentrate of the composite mill tailings, and a panned concentrate of minus 200 mesh composite tailing. A separate portion of the tailing, as received, was examined under the petrographic microscope for the purpose of identifying the transparent mineral constituents.

Microscopical Examination:A. Composite Mill Tailing

The following metallic constituents were identified:

Hematite
 Pyrite
 Sphalerite
 Chalcopyrite
Electrum
Native silver

The transparent minerals identified were as follows:

Quartz
 Chert
 Carbonate

Although most of the metallic constituents apparently were free from the transparent constituents, some were still locked.

The gold values occurred in the form of the gold-silver alloy electrum. Silver values were present both as electrum and as native silver.

Electrum occurred both as apparently free grains and as particles of micron size, which were locked with the transparent gangue minerals.

The free metallic constituents were panned out of a portion of the original composite tailing. The resulting clean sand tailing was then reground so as to pass through a 325-mesh screen. The reground product was then panned on the Haultain mechanical panner and the metallic concentrate was examined microscopically. Grains of metallic constituents, including electrum, were observed in the panned concentrate; evidently they had been freed during the extra grinding operation.

B. Panned Concentrate of Composite Mill Tailing

The following metallic constituents were observed:

Hematite
 Pyrite
 Sphalerite
 Chalcopyrite
Electrum
Native silver

The only gold values observed were in the form of apparently free grains of electrum. No electrum was observed to be locked with the metallic constituents.

The size of the free grains of electrum ranged from 4 x 15 microns (approximately 3,700 mesh) to 30 x 60 microns (approximately 500 mesh).

C. Panned Concentrate of Minus 200-Mesh Composite Tailing

The following metallic constituents were identified:

Hematite
Pyrite
Sphalerite
Chalcopyrite
Electrum
Native silver

The electrum, which was observed, occurred as apparently free grains, which were within the same size range as those present in the panned concentrate of the composite mill tailing.

Conclusions:

1. Hematite, pyrite, sphalerite, chalcopyrite, electrum, and native silver were the metallic constituents identified in the tailing. The chief transparent gangue minerals were quartz, chert, and carbonate.
2. The gold values were in the form of gold-silver alloy electrum, some of which was free.
3. The silver values were present both as native silver and as the gold-silver alloy electrum.
4. Apparently free grains of electrum, ranging in size from approximately 3,700 mesh to approximately 500 mesh, were observed.
5. According to the assays furnished by the subject company, the composite mill tailing assayed 0.0183 ounce, or \$0.64 per ton in gold. Both the minus 200 mesh sand and slime assayed 0.01 ounce, or \$0.35 per ton in gold.

In view of the fact that the minus 200 mesh material assayed \$0.35 per ton in contrast to an assay of \$0.64 in gold in the composite tailing, it would appear that finer grinding should reduce materially the gold content of the final tailing.

That finer grinding should improve the recovery of gold is substantiated by the fact that electrum was panned out of the reground clean sand. Moreover, particles of electrum of micron size were observed as inclusions in the transparent gangue minerals.

CUSTOM-MILL SCHEDULES

The following, quoted from posted notices, are the schedules of milling rates and basis of settlement under which custom ore is received at the mill of the Tom Reed Gold Mines Co.

Settlements on all custom and lease ores will be made tri-monthly on all completed assays on the 5th, 15th, and 25th of each month. Checks should reach Oatman on or about the 8th, 18th, and 28th of each month.

Settlements on gold at \$35 per ounce.

Settlements on silver at domestic price.

The following schedule regarding custom ore rates became effective February 15, 1934:

For 35 tons daily lot shipments or more. Regular daily shipment schedule.

Milling rate \$3.60 per ton will pay 95 percent of the gold content.

- - - - -
For 25 ton daily lot shipments to 35 tons.
Regular daily shipment schedule.

Milling rate \$3.80 per ton will pay for 95 percent of the gold content.

- - - - -
For 25 ton or more individual lot shipments.
Irregular shipment schedule.

Milling rate \$4 per ton will pay for 95 percent of the gold content.

- - - - -
For less than 25 ton individual lot shipment.
Irregular shipment schedule.

Milling rate \$4.50 per ton will pay for 92 percent of the gold content.

- - - - -
For lots less than ten tons a flat extra charge of \$10 will be added for sampling and assaying.

The above schedule is subject to revision on 20 days' notice. A shipper will be considered in the daily lot shipment class when he ships at least three or more consecutive shipments. Lessee royalties will remain the same, but the above schedule applies to lessees' ores.

TOM REED GOLD MINES CO.

Oatman, Ariz., March 12, 1935.

ORE SCHEDULE RATE

The following reductions over the old, or base rate of \$3.60 per ton, is herewith submitted:

For a daily average tonnage covering a period of one month:

Plus 30 tons to 50 tons per day.....	\$3.50	per ton
Plus 50 tons to 70 tons per day.....	3.45	per ton
Plus 70 tons per day.....	3.40	per ton

We will pay 95 percent of the gold content, provided our plant, as normally operated, can make this recovery.

These rates are based on present commodity, labor, and power prices. Thirty days' notice will be given by the Tom Reed Gold Mines Co. in case of an advance in the cost of these items and a change of milling rates.

Our rate changes will be calculated solely upon the advance of labor, supplies, or power.

If for any reason, such as failure of equipment or repairs to same, we are unable to receive ore from a shipper in this class, the shipper will not be penalized for a shortage of tonnage at the end of the settlement period.

TOM REED GOLD MINES CO.

November 9th, 1935

Milling rates and conditions pertaining to the custom milling of ore concentrates and high grade ores suitable for our mill

Concentrates and ores will be classified as high grade when the assay value is greater than four ounces of gold per ton, and ten ounces is the maximum we will receive.

Individual shipments of such products will be limited to a maximum of 15 tons and the moisture content must not exceed 4 percent.

Milling rate \$4.50 per ton.

Payment will be made on 92 percent of the gold content.

Silver content will be disregarded on irregular shipments.

Due to the extra hazard of salting, in running such material through the bins and sampling mill, an extra charge of \$10.00 per lot will be made, to cover the expense of extraordinary cleaning up of equipment.

TOM REED GOLD MINES CO.

LOW-GRADE ORE SETTLEMENT SCHEDULE

Commencing April 1, 1936, the extraction deductions on free milling ores, regardless of tonnage, will be made as follows:

<u>Grade of ore</u>	<u>Extraction deduction</u>
0.23 oz. au. (\$8.05) or more.....	5 percent
0.17 oz. au. (\$5.95) to 0.23 oz.....	8 percent
Under 0.17 oz. au.....	10 percent

Tailing requiring regrinding and refractory ores will be subject to separate consideration.

Settlements for silver content will be subject to separate consideration as to grade, tonnage, and the results of small-scale test work.

SAMPLING AND ASSAYING OF LESSEES AND OUTSIDE CUSTOM ORES

Control sample

Original and duplicate control sample to both buyer and seller in sealed envelopes.

For the purpose of checking, both buyer and seller will run control sample designated as "original". If difference between these results does not exceed 0.02 ounce per ton, settlement will be made on split.

Umpire

If the difference between results of buyers' and sellers' assays is such that either buyer or seller may object to settlement thereon, the sample for umpire (which has been placed in sealed envelope in Tom Reed vault) shall be sent to some reputable and recognized umpire assayer mutually agreed upon by buyer and seller.

- - - - -

Settlement basis

Settlement basis shall be on either buyer's or seller's assay showing returns closest to the umpire's results.

HISTORY

Operations on the Tom Reed vein began in 1904. About 1906 a 10-stamp mill was built. Recovery was made by inside and apron-plate amalgamation followed by sand leaching in vats, the slime being impounded without treatment. In 1908 a new 20-stamp mill with a capacity of about 125 tons daily was built; the process adopted was all-slime batch treatment followed by Butters-type filtration and washing. Flint pebble mills were used for secondary grinding, as the first mill had demonstrated that finer grinding was necessary. Cones were used for classification. Thickening also was accomplished with cones of larger diameter, which discharged to Pachuca-type agitators. Precipitation was by zinc shavings. Plates were installed in this new mill but amalgamation was soon discarded, as amalgamation recovery was reported to have been only 50 to 60 percent.

About 1912 a Dorr primary thickener was installed, and in 1913 or 1914 the first Dorr counter-current decantation plant was added, and the Pachuca agitators were put in series. This latter practice was not satisfactory, for colloidal accumulations formed, which seriously reduced the active area. After these changes, the Butters filter was used only for clarification of solution. About 1915 one Merrill zinc-dust precipitation press was installed in parallel with the zinc boxes.

In 1917, after the discovery of the Aztec ore body, Allis-Chalmers ball mills of about 200 tons daily capacity were installed for primary and secondary grinding. Stamp milling was discarded, except in emergencies. At this time additions to the treatment plant were made by installing one 40- by 12-foot primary thickener, four 40- by 12-foot agitators, and five 28- by 12-foot decantation thickeners in parallel with the early installation. This was all Dorr equipment. Zinc-shaving precipitation was discontinued and a second press was added.

Company operation of the mine and mill ceased in 1924, at which time leasers took over both with the intention of mining pillars and arches left in the mine. During the leasing period the mill was operated on reduced tonnage and some of the decantation plant was dismantled, and the fourth agitator was converted into a tailing thickener. Lease operation was intermittent until January 1930.

Reduced tonnage company operations were resumed about January 1, 1930, as development work had opened up the Black Eagle ore body. This operation continued until February 1932, at which time the mill was shut down.

The \$35 an ounce price of gold aroused new interest in the district, and the Tom Reed Gold Mines Co. decided to start the mill on a custom basis in addition to milling their own product. The company mines were in such condition that little production could be expected from them for some time. In order to encourage the custom ore business, an attractive schedule of milling rates and bases of settlement was posted, which, with but few modifications, is still in effect.

The mill was started in February 1934 on a one-shift grinding basis. The custom business grew fast, and by June of that year it became necessary to replace some abandoned thickeners. Facilities for receiving custom ore were very poor, so three hopper-bottomed steel bins, with accessory equipment, and a Merrick weightometer were installed. The latter eliminated the necessity of estimating Black Eagle and Ben Harrison tonnages and weighing ore hauled by truck on platform scales. Several improvements were made in the sampling mill also.

Early in 1936 a new ball-mill unit went into service and was followed by further additions and alterations to the treatment plant, which now (April 1937) usually operates up to the settling capacity of the thickeners. The additions and alterations have been justified by satisfactory reduction in costs as well as a material increase in tonnage with but little sacrifice in recovery.

MILLING

The mill (1937) is an all-slime cyanide plant embodying single-stage crushing, ball-mill grinding, agitation, and counter-current decantation. A daily capacity of 290 tons is obtained under current grinding practice.

Water for milling purposes is pumped from the mines, there having been an excess up to the present time.

Crushing

Ore from the Benjamin Harrison Mine and lease ore is crushed at the main crushing plant adjoining the mill. A crushing plant at the Black Eagle shaft handles ore from that mine. Run of mine ore up to 10 and 12 inch is received at both crushing plants.

The mill crushing plant was built in 1908 and had an initial capacity of 125 tons; since that time several changes have been made. The crushing-plant site is poorly adapted for modernizing the plant with screens or grizzlies. There is a fair location, however, for a secondary crushing unit, with accessories, between the present crushing plant and the sampling mill, if future developments justify the expenditure.

The Black Eagle plant was built in 1929, but no provision was made for grizzlies, screens, or sorting. Plans are now being considered for installing a grizzly and sorting belt ahead of this crusher.

The Black Eagle tramway loading terminal is approximately 5,000 feet from and 257 feet higher than the discharge terminal at the Benjamin Harrison crushing plant. Bucket speed is governed by a 30-horsepower alternating current motor through belts.

Tom Reed company production from the Benjamin Harrison and Black Eagle shafts is weighed and sampled separately, as carefully as is all custom and company lease ore. Black Eagle crushing plant costs are recorded, the plant being so far from the mill, but these charges are included in the total milling costs. Benjamin Harrison crushing costs are not available, as crushing and milling are carried on as a single operation.

The capacity of the Ben Harrison crushing plant is sufficient to crush the ore for a days' run of the treatment plant on one shift. It is operated, however, two shifts daily, day and afternoon, as (1) custom ore, being hauled in trucks, is frequently delivered over an 8-hour period and bins must be emptied for another shipper on the following morning; (2) the mill bins do not have sufficient live storage satisfactorily to supply the treatment plant for 16 hours without shoveling.

Crushing on one shift would require constant operation during the period, while the two-shift scheme permits time for proper cleaning up between runs, lubrication, and minor repairs to equipment; these duties are performed by the operating crew. The custom business necessitates the employment of a larger crushing-plant crew than would be required in the milling of company ore only. In order to avoid confusion in running and sampling the separate ores, a foreman is employed on each shift and receives his instructions direct from the mill superintendent.

The milling characteristics of ores, even from the Tom Reed and Gold Road vein systems, vary considerably. In order to work to the best advantage, ores of similar nature are crushed consecutively as far as possible and are delivered to bins feeding to both primary grinding units. When a change of ore reaches the mill bins, the crushing-plant foreman informs the ball-mill operator, who makes the necessary adjustments relative to classifier solids to be carried until the next change of ore. Crushing plant flowsheet is shown in figure 1. The crushing rate of the Benjamin Harrison plant is 40 to 45 tons per hour, which is the normal capacity of the conveyor belts and the weightometer. It is equipped with a 12-inch Traylor type R crusher.

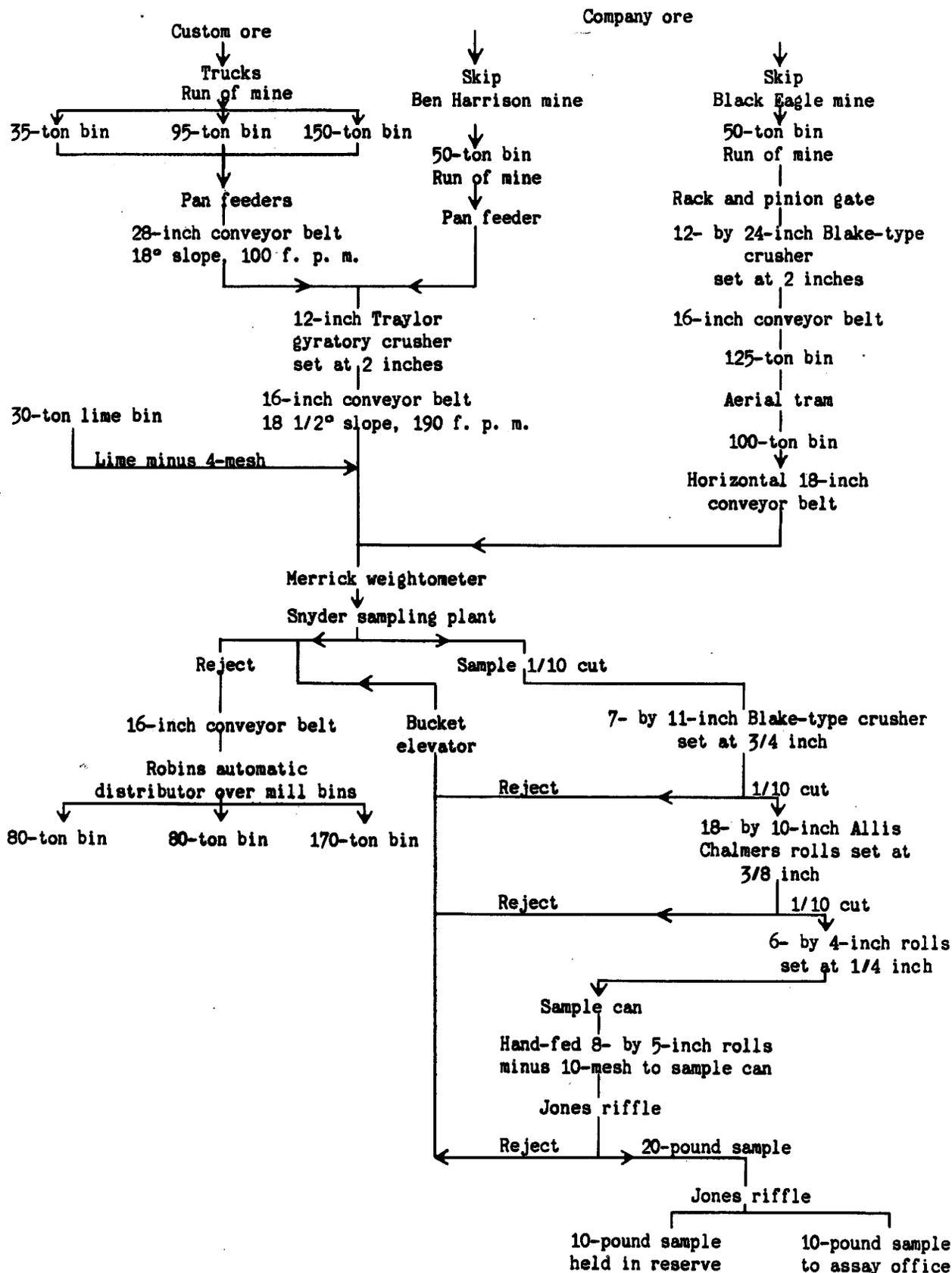


Figure 1.- Flow sheet, crushing plants, Tom Reed Gold Mines Co.

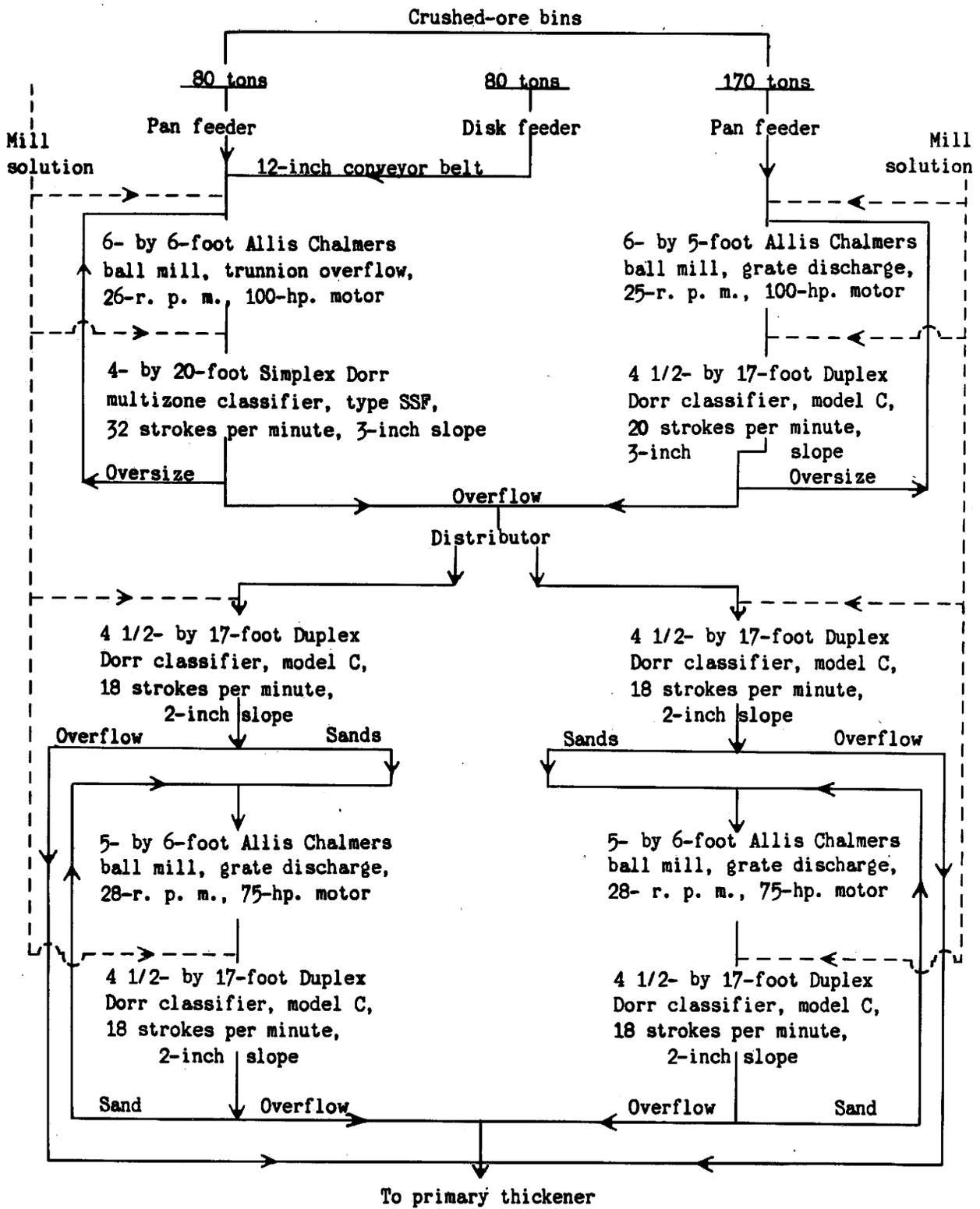


Figure 2.- Grinding circuit, Tom Reed mill.

In order to maintain a fairly uniform feed size to the ball mills, with one stage crushing, two crusher shafts and three mantles are used; they are changed frequently. The mantles have different diameters and each one is built up to its respective dimension with hard surfacing, in the shop, after removal from the crusher. With this system, lower concaves are worn to holes with only one resetting. Shaft and mantle changes are made in a short time, while concave resetting requires a serious loss of crusher time.

One-stage crushing is practiced at the Black Eagle plant also. An Allis-Chalmers, 12- by 24-inch, Blake-type crusher is used. It is equipped with nonchoking type swing jaw plates in order to minimize the amount of oversize and extend the life of jaw plates. These plates are also built up with hard surfacing when worn. The crushing rate is about 20 tons per hour.

A flat belt drive, slack enough to throw if tramp steel gets into the crusher, is used at the Benjamin Harrison plant. The Black Eagle crusher is driven through texrope belts, the toggles of the crusher being the safety factor for tramp iron.

Grinding

Two-stage grinding is practiced. The primary grinding unit consists of two ball mills; the first is a 6- by 6-foot trunnion overflow mill equipped with a heavy manganese-steel slotted grid cast integral with the discharge-end throat liners and shiplap-type shell liners. Manganese-steel liners are used throughout. This ball mill, installed in 1936, is direct-driven through a Weust gear and pinion with offset apex feature for reduction of vibration. The second is a 6- by 5-foot grate-discharge ball mill with shiplap-type shell liners and tool-steel bar-grate sections; the liners are manganese steel. It was installed in 1917 and is driven through a Weust gear and pinion with center apex.

The secondary grinding stage consists of two 5- by 6-foot grate-discharge mills of like design. They are equipped with manganese-steel, wave-type shell liners and cast tool-steel grate sections, and are direct driven through Weust gear and pinion with center apex. They were installed in 1917.

The flow sheet of the grinding circuit is shown in figure 2. All grinding is done in cyanide solution; the solids in the primary mills are maintained at approximately 72 percent and in the secondary mills at about 63 percent. The primary mills are operated in parallel most of the time, the only exceptions being when there is a shortage of ore or when milling an ore that requires exceptionally fine grinding. More efficient grinding is obtained when all four mills are operated, for at such times higher circulating loads can be carried. When only one primary mill is operating, it is usually operated in open circuit, at higher than average solids, as a guard against severe pounding of the liners. This practice results in a coarser feed to the secondary mills but keeps them well loaded.

Solids in the primary classifiers are subject to wide variations as ore changes occur. Solids in the intermediate classifiers are adjusted to correspond to the closed-circuit secondary machines. Frequent solid changes are made at these points as fine or coarse grinding is desired. Fine or coarse grinding practice at this mill is only comparative, as the average grind is nearly all through 100 mesh.

There is no standard practice concerning circulating loads in the primary circuits, as ore changes occur frequently. Full rakes are always carried on the secondary classifiers, this load being approximately 2-1/2 to 1, which is the limit for these machines at current speed. Intermediate and secondary classifier solids vary from 7-1/2 to 13 percent, this flow being the primary thickener feed.

Settling area in the primary thickener at 290 tons a day is 4.33 square feet per ton. Average specific gravity of mill feed is 2.7.

Typical screen sizings of the grinding circuit feed and products are illustrated in table 1.

TABLE 1. -- Screen sizes, grinding circuit products, October 1936

Screen	Grinding		Primary classifier				Intermediate classifiers		Secondary classifiers		
	Feed, primary ^{1/} Nos. 1 and 2	Feed, secondary ^{1/} Nos. 3 and 4	No. 1 unit		No. 2 unit		Feed,	Overflow,	Feed,	Overflow,	
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	
+3-inch ring	0										
-3 do.											
+2 do.	2.50										
-2 do.											
+1 do.	21.64										
-1 do.											
+1/2 do.	23.62										
-1/2 do.											
+3 mesh	18.34										
-3 do.											
+4 do.	4.07										
-4 do.											
+6 do.	5.06		1.96		3.13						
-6 do.											
+10 do.	6.36		2.85	3.86	6.21	2.21	3.03				
-10 do.											
+14 do.	3.99	0.84	5.15		10.94						

^{1/} Screen sizes, as shown on primary and secondary mill feed, is initial feed only and does not include classifier sand returns

I. C. 6975

TABLE 1. - Screen sizes, grinding circuit products, October 1936 (Cont'd.)

Screen	Grinding		Primary classifier				Intermediate classifiers		Secondary classifiers		
	Feed, primary ¹ / Nos. 1 and 2	Feed, secondary ¹ / Nos. 3 and 4	No. 1 unit		No. 2 unit		Feed,	Overflow,	Feed,	Overflow,	
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	
-14 +20	do. do.	2.54	3.52	7.79	6.00	14.19	5.67	5.84			
-20 +28	do. do.	2.19	9.71	11.18		13.22					
-28 +35	do. do.	1.89	15.10	11.72		10.71				3.00	
-35 +48	do. do.	1.63	19.09	10.98	15.05	8.15	16.44	15.75		9.43	
-48 +65	do. do.	1.14	19.09	7.99	19.14	7.18	22.18	20.66		20.66	
-65 +100	do. do.	1.11	13.79	9.28	7.78	5.93	5.27	6.52	5.67	26.46	5.67
-100 +150	do. do.	.77	8.30	6.50	7.68	3.36	7.37	7.53	10.48	14.29	10.48
-150 +200	do. do.	1.04	6.57	7.05	7.68	5.01	7.98	7.83	16.59	11.24	16.59
-200	do.	2.19	3.99	17.55	32.76	11.97	32.88	32.84	67.26	14.92	67.26

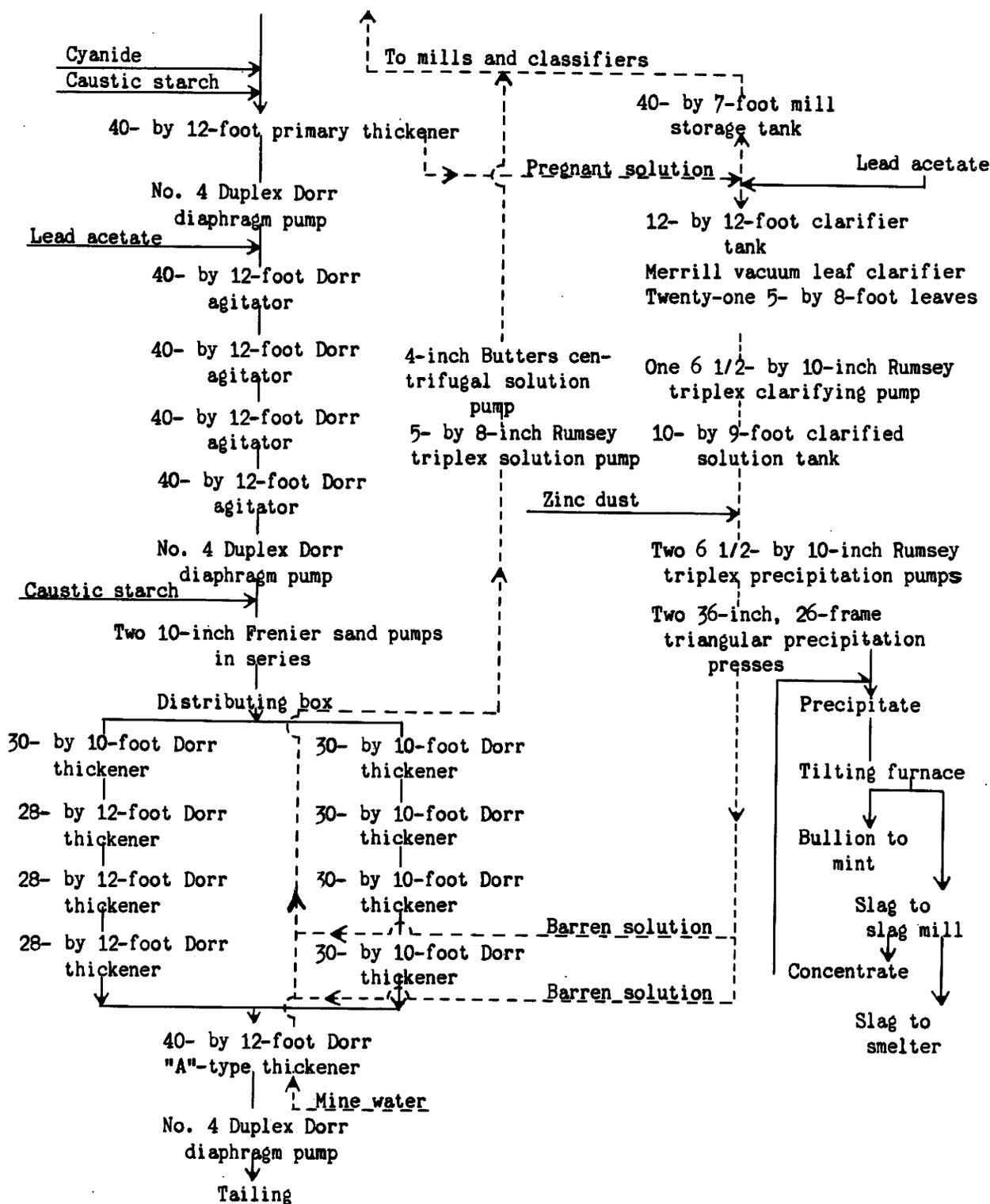


Figure 3.- Flow sheet of treatment plant, 1936, Tom Reed mill. Capacity, 290 tons.

Cyanidation

The flow sheet of the treatment plant is shown in figure 3. The underflow from the primary thickener is maintained at approximately 40 percent solids, except when a poor settling feed is on. This thickener will not function satisfactorily for any length of time with a higher percentage of solids, as island trouble develops or the slime line rises to the surface. Lime is added to the mill bins at a rate that maintains an alkalinity of about 1 pound of CaO per ton of solution in the primary thickener. This strength drops to 0.4 pound in the tailing thickener, but is sufficient to promote settling at that point. Caustic starch solution prepared at the mill is added to the primary thickener feed and at the head of the decantation plant when needed, these two points being most subject to muddy overflows.

No. 4 simplex Dorr diaphragm pumps serve the eight small thickeners and duplex pumps serve at other points. Solids in the decantation plant are carried at 45 to 50 percent, except the tailing, which is carried at about 54 percent in summer and 52 percent in winter.

Cyanide strength has been varied from 1.5 pounds to 2.5 pounds per ton of solution in the primary agitator, without any noticeable effect on gold recovery. The lower strengths of cyanide are not conducive to barren precipitation tail solutions, particularly in cold weather. Current practice calls for all additions of cyanide to be made to the primary thickener and maintaining the grinding and precipitation circuits at 2.2 pounds per ton. Lack of de-aeration equipment is probably responsible for the need for such strong solutions.

The grinding circuit and primary thickener account for a recovery of 65 to 70 percent of the gold. Assays for silver are made only on the monthly tail composite and bullion.

Clarification and Precipitation

Pregnant solution flows by gravity to the clarifier tank, in which twenty-one 5- by 8-foot Butters-type leaves, furnished by the Merrill Co., are suspended. This equipment was installed in 1935 to take the place of an old Merrill plate and frame sluicing clarifier of insufficient capacity. The leaf header is connected to the suction of an 8- by 10-inch Rumsey triplex pump, which discharges to the clarified gold tank. In spite of slime-flocculating reagents, the leaves soon collect a hard cake about 1/4-inch thick and it is necessary to clean and replace three or four leaves daily. The filter cake assays up to \$9 per ton and is dumped into the primary agitator, it having been demonstrated in the laboratory that the pieces disintegrate and release the values after agitation.

The leaves are scrubbed with weak acid after being cleaned and are submerged immediately in a precoating tank, which is kept full of clarified solution. The alkaline solution neutralizes any residual acid. Three pounds of Hy-flo Supercell, a Johns-Manville product, are emulsified in water and dumped in the tank with each two leaves. Air jets below the leaves keep the Supercell in suspension while it coats the leaves.

The leaves are connected to the suction header and the vacuum is applied, while the tank is kept full with a stream of solution. The coated leaves are then returned to the clarifier tank. One No. 10 double-filled canvas filter bag is used on each leaf. Several modifications were made in the leaf construction after comparatively short service. The life of the bags is about 3 months.

There being no de-aerating equipment, pregnant solution flows by gravity to the precipitation pump. Zinc dust is added to the pump suction. The mixture is pumped about 200 feet to the precipitate presses. A drip of lead acetate solution is added to the clarifier tank. Except for occasional short periods, press tails are generally practically barren. This latter condition is essential, due to the fact that the barren solution is returned to the circuit as wash solution in the two thickeners preceding the one that discharges tailing. When there is doubt about press tail values, and until assays are obtained on press tail grab samples after cutting in a clean press, the press tail solution is diverted to the third pair of decantation tanks as a guard against enriching the mill tailing solution.

Filter media in the precipitate presses consists of one thickness of no. 10 double-filled canvas covered with one thickness of no. 230 Reeve-Angel filter paper. Canvases are acid-treated each month and have a life of 3 months. The paper is precoated with Hy-flo Supercell, added to the pump suction, and the press is cut in. This is repeated at times when the precipitate cake is sloughed. The Super-cell is figured as silicious flux in the melting process.

Barren solution is metered with a no. 5 Latham solution meter. Precipitation heads and tails are drip-sampled, and a meter reading is taken for each shift at the time samples are collected. The head solution is assayed daily for silver and gold. The silver content varies considerably from time to time, so the silver assay is used as a guide of the rate for feeding for zinc dust. Precipitation tonnage rate is varied from day to day, in an effort to maintain fairly uniform solution values throughout the plant, particularly in gold. Due to custom milling, there is no control over mill heads and a uniform precipitation tonnage rate cannot be set. The average rate is under 3 tons of solution for each ton of ore milled.

Clean-up procedure is as follows: The press to be cleaned is cut out and blown with compressed air to about 50 percent moisture, while a normal precipitation rate continues with the other press. Upon opening the press, most of the precipitate can be scraped from the frames or shaken off the

filter paper. The papers are rolled up and then sprinkled with oil, without being dried, and ignited. The residual ash is added to the moist precipitate; the mixture is fluxed and charged to the melting furnace. The furnace is oil fired and takes a no. 150 graphite crucible. Crucible life is approximately 40 firing hours.

The flux is varied slightly, from time to time, but is approximately as follows:

	<u>Percent</u>
Borax glass.....	43
Sodium carbonate.....	32
Silica.....	20
Manganese dioxide.....	6.5
KNO ₃	Some occasionally
Previous slag shell.....	Variable
Thirty-three pounds of flux is used for 100 pounds of precipitate.	

If sulphur fumes are present in the furnace gas, a wrought iron pipe is inserted in the melt after the charge is fused. Bullion bars will average about 875 in fineness with a single melt. Each bar is drilled from top to bottom, the drillings being assayed, after which the bar is shipped to the mint. The gold-silver ratio of bars varies over a wide range.

Tailings Disposal

The prevailing climate being arid, advantage is taken of the high evaporation rate, and tailing is impounded with a minimum of trestle and launder construction. Fresh water is added to the tailing to carry it out over the surfaces of the ponds. Light spiral pipe carries the tailing to the edge of but well above the top of the pond in service. The stream is deflected consecutively to one side or the other or to the center of the pond, as conditions justify. A fresh curb is hoed up around the edge of a pond as the tailing compacts; the ditch left by hoeing then serves as a launder when the stream is turned in.

Insets are made at 2-foot vertical intervals, the resulting shelf being used as a walkway until the next inset is made. The average slope of the banks is about 45°. A pipe is stuck through the curb on the low side of the pond as a means of removing the clear solution that accumulates. This solution carries low values, and an artificial dam is now being built with tailing, behind which this run-off will later be impounded, concentrated by evaporation, and then returned to the mill.

From one to three ponds usually are being carried up, at least two being kept in workable condition as a reserve during wet or freezing weather. Experience is an important factor in this system of impounding; if the

pond is too large cracks will develop, followed by fast cutting washouts, or if the pond is too small or is carried up too fast, slips will occur in the banks. Many areas of the tailing pile are now 60 feet in depth. The elevation of the new tailing thickener will permit gravity storage of an additional 35 feet over all early tailing. One man, with some occasional help, takes care of the tailing disposal.

A crust, which is the product of evaporation and capillary attraction, forms on the surface of the tailing piles from time to time. The amount of gold in the solution tailing has been reduced considerably in recent years, so that this crust is not enriched nearly as much as in former years. It averages about \$10 per ton, so is occasionally scraped, on a lease basis, and returned to the mill as custom ore. As the product requires no grinding, and as its valuable content is water soluble, it takes a low treatment rate.

SAMPLING

Treatment Plant

Routine samples of pulp are taken by hand at hourly intervals of no. 1 agitator feed, no. 4 agitator discharge, and the tailing stream. Due to the fineness of grinding and the high solids content at these points, there is no segregation of sizes and launder drops for sampling are not provided. A few c.c. of permanganate of potash solution is put in the sample bucket to prevent any dissolving action after the sample is cut. These samples are washed thoroughly in a pressure filter at end of 24-hour periods, dried, and sent to the assay office.

Solution samples are taken as follows: Drip samples of precipitation heads and tails are taken up at 8-hour intervals. Hand-cut samples are taken at the overflows of the two thickeners at the head of the decantation plant and of the tailing thickener; they are taken up at 24-hour intervals. The decantation-plant samples serve as checks on the wash balance of the parallel decanters as well as indicate the trend of solution values to precipitation; the last is the value of solution being discharged to the tailing pile.

It has been determined that the difference, if any, between solution values in the tailing-thickener overflow and underflow cannot be determined by assay. The overflow assay, therefore, is used in calculating the daily solution value in mill tailing. Specific-gravity determinations of ball-mill discharges, classifier overflows, and of all thickener underflows are made and recorded at regular intervals. The liquid-to-solid ratio of daily mill tailing is determined by averaging the specific gravities; the daily tailing loss is the sum of the separate tonnages multiplied by the respective assay values. A daily 24-hour sample of the primary thickener underflow is also taken for screen test. The sum of the gold in the tailing and the net value of the bullion retained in presses is considered the mill head for the daily mill record. A portion of the daily washed tailing sample is retained without being pulverized; it is composited daily on the basis of tonnage milled. The solution tailing is composited in like manner. These are rather

large samples by the end of each month; they are assayed very carefully for gold and silver by several fusions and cupellations of each. A careful screen analysis, with assay of sizes, is also made on the pulp sample.

Tailing composite assays and mint returns are the bases of monthly reports. These do not account for slag or other absorption, such as cutting in additional tankage, with its accompanying tie-up of values. It is intended in the future to clean up all scoop boxes and classifier sand beds, in addition to marketing slag, for a metallurgical check against the sampling mill before the end of each fiscal year. Indications are that there is a tie-up of approximately 1 percent in the scoop boxes and sand beds.

Handling of Control Samples

Samples containing excess moisture are riffled for a moisture sample and then dried as a guard against pancaking when being put through the hand-fed rolls. Two 10-pound samples from each lot of ore are riffled by hand on a Jones divider; one sample is sacked and held at the mill as a reserve and the other is sent to the assay office for moisture determination and further preparation. Samples riffled at night are placed in a pan, the latter then being returned to the can containing its original moist reject. This, in turn, is covered, as a guard against moisture loss, until morning.

In cases of small odd lots, the entire lot is either run through the sampling mill or the third cutter is stopped, in which case only two automatic cuts are made, and the final sample is ample for further working. Size of shipment governs choice of these two alternatives.

Assay office procedure is as follows: The sample is dried thoroughly and the moisture recorded; it is then pulverized in a Braun pulverizer and further ground in a porcelain mortar to pass through a 100-mesh sieve. It is then rolled for 30 minutes. In the case of calcitic ores, which tend to agglomerate in the rolling process, the sample, after 15 minutes rolling, is put through a 30-mesh sieve in order to break up the agglomerations, and then rolling is continued. The rolled sample is spread out in a thin layer over a 30-inch circle. Small dips are then taken with a 5-inch spatula over the entire surface at about 1-inch intervals for one control. Successive controls are the product of staggering dips between the previous ones.

Six controls are prepared for each lot of ore, one for the shipper, one for the buyer, and a third for a possible umpire. The remaining controls are held for a possible dispute. Umpires are sent to several reputable western firms, the shipper having his choice.

Settlement is made on the basis of dry tonnage, silver at domestic price and gold at \$35 per ounce. Control assays for silver are made only on known silver-bearing ores carrying 2 ounces or more. Milling rates and settlement schedules are given under "Custom-Mill Schedules."

During the 20 months a weightometer has been in operation, an exact record has been kept of ore settlements, based upon weightometer and sampling-mill records, as compared with the record of bullion plus tails. Over that period, the assay value of ores by the sampler was \$1,855,907.11 in gold; the value by bullion plus the gold in the tails was \$1,835,116.51 in gold. This value (of bullion plus tails) is 98.88 percent of the assay value by the sampling mill.

Considering that since the weightometer was installed there has been an estimated \$2,500 additional tie-up of values in the new agitator, it will be seen that the addition of this value to bullion plus tails would raise the total to 99.01 percent of the sampling mill value. The difference of 0.99 percent can probably be accounted for by natural absorption throughout the entire plant, exclusive of the classifier and scoop box beds, which are cleaned at the end of each fiscal year and do not enter into the absorption figures.

ORE-TESTING LABORATORY

Although most of the custom ore received at the mill originates in the Oatman District, certain of these ores will yield a satisfactory tailing with a coarser grind than will others. Other ores, including concentrates from concentration mills, are offered, some being accepted. Settlements are made on silver, also, provided the content is 2 ounces or more. In order to check the amenability of the outside ores to treatment under the customary milling conditions, as well as to determine the grinding requirements of all ores, the mill was equipped with laboratory testing apparatus early in 1934. This apparatus consists of a Braun-Welch batch-grinding mill and rolls for turning several 5-pound reagent bottles, in which usual agitation tests are made, and a high-speed spindle-type agitator for cyanide testing. There is also the usual accessory equipment, including a 500-gram Denver Equipment Co. flotation test machine. This equipment has been the source of much interesting information and is a safeguard against the receipt of refractory ores. A representative sample is requested before any strange ore is accepted. The posted milling rates and settlement schedules apply to the free milling ores of the local district and to others that are amenable to treatment at the plant.

POWER

Power is furnished by the Citizen's Utility Co. of Kingman. The current requirements of the Tom Reed place the company on a 1-3/4 cents per kw. hr. rating. Power consumption per ton of ore milled during 1934-36 was 32.68, 30.10, and 28.31 kw. hrs., respectively.

METALLURGICAL DATA

The following tabulation gives the tonnage treated and other metallurgical data for the fiscal years 1934-36:

Fiscal year	Tons milled	Mill heads		Mill tails		Extraction, percent	
		Gold ^{1/}	Silver ^{2/}	Gold ^{1/}	Silver ^{2/}	Gold	Silver
1934	58,791.47	\$11.408		\$0.549		95.19	
3/1935	68,610.96	12.605	\$0.588	0.675	\$0.232	94.65	60.55
1936	91,310.65	12.370	0.460	0.780	0.155	93.69	66.30

1/ Gold at \$35.

2/ Silver at 77.57 cents.

3/ Strike conditions caused 56-day shutdown.

Consumption of major supplies, October 1936, 9,053.22 tons milled

<u>Item</u>	<u>Pounds per ton of ore milled</u>
Grinding balls, 5-inch.....	1.66
Grinding balls, 2-1/2 inch.....	1.85
Aerobrand cyanide, 25 to 27 percent cyanogen.....	1.75
Lime.....	4.07
Zinc dust (Merrillite).....	0.46

COSTS

The following tabulation gives the milling costs for the period 1934-36:

Year	Superintendence	Labor	Power	Misc. supplies and expense ^{1/}	Equipment repair	Total
1934	\$0.049	\$0.310	\$0.572	\$0.611	\$0.166	\$1.718
1935	.056	.328	.527	.551	.232	1.694
1936	.052	.361	.495	.544	.137	1.589

1/ Includes industrial insurance.

The cost of major supplies per ton was

Balls.....	\$0.099
Cyanide.....	.157
Liners.....	.069 (at \$0.09 per pound)
Lime.....	.025
Zinc.....	.052

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DEPARTMENT OF THE INTERIOR
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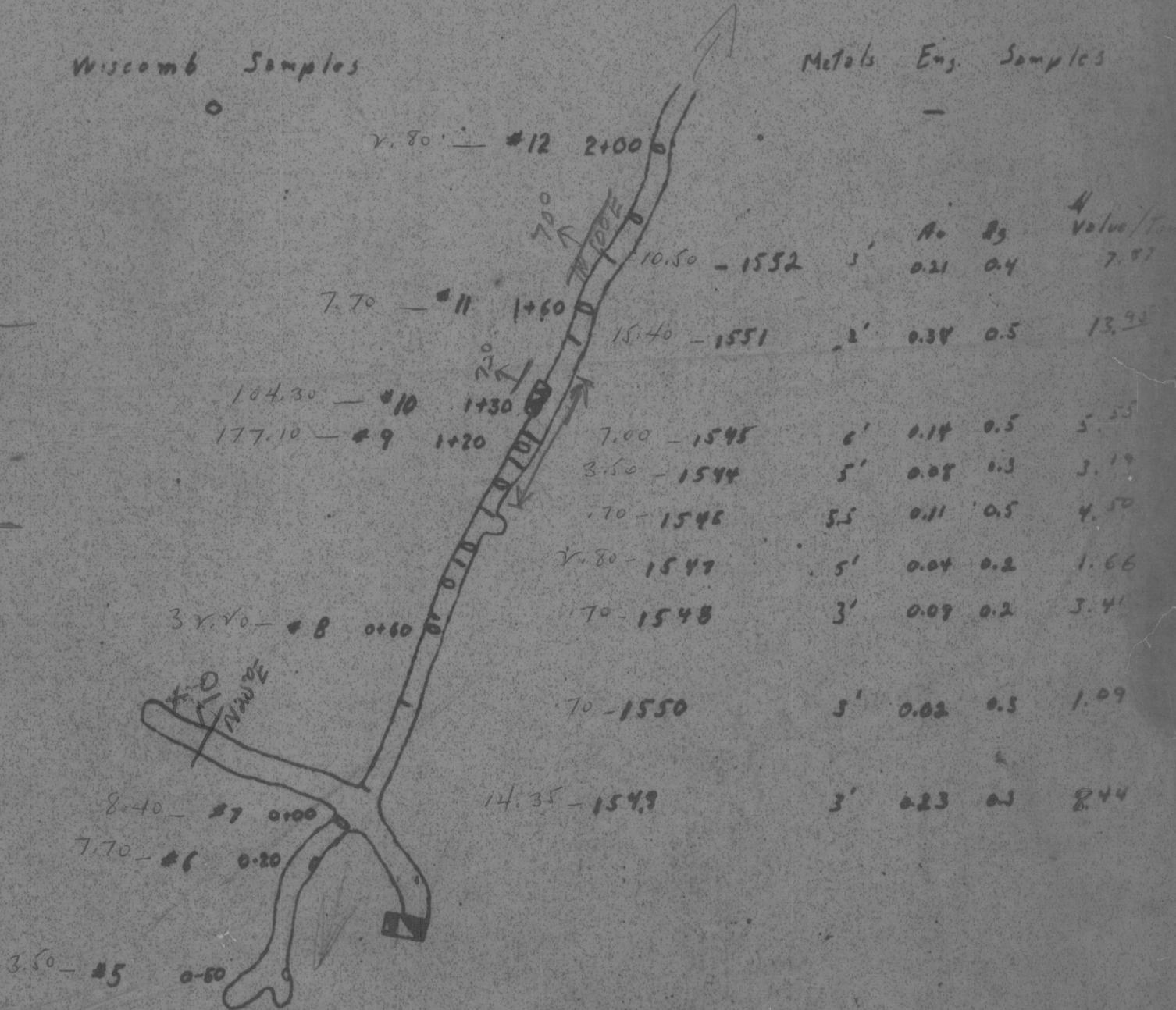
MEMORANDUM

TO
FROM
SUBJECT

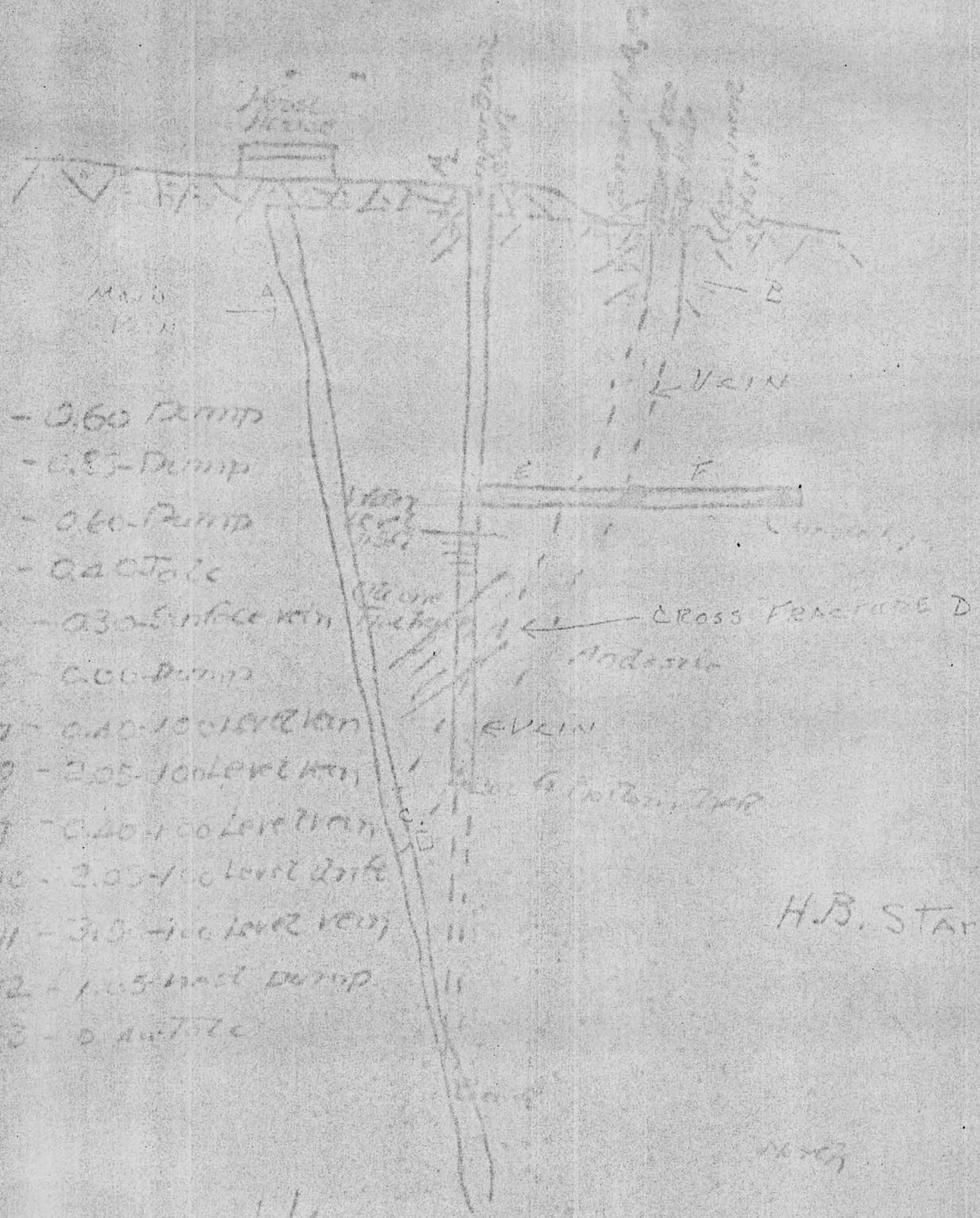
DATE

Wiscomb Samples

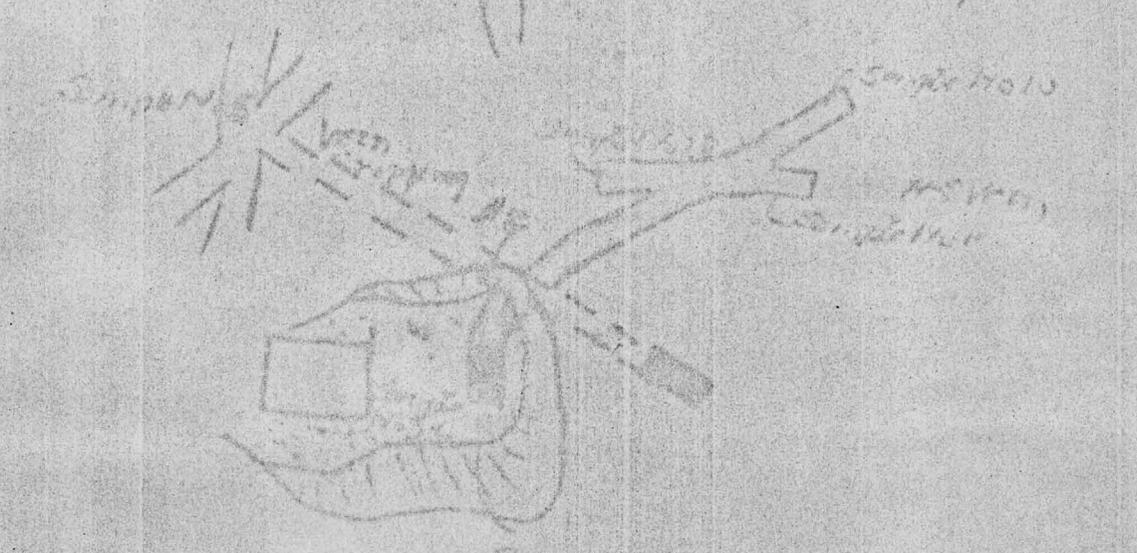
Metals Eng. Samples



- 1 - 0.60 Dump
- 2 - 0.85 Dump
- 3 - 0.60 Dump
- 4 - 0.20 Talc
- 5 - 0.30 Surface vein
- 6 - 0.00 Dump
- 7 - 0.40-100 level vein
- 8 - 2.05-100 level vein
- 9 - 0.40-100 level vein
- 10 - 2.05-100 level vein
- 11 - 3.10-100 level vein
- 12 - 1.05 level dump
- 13 - 0.20 Talc



H.B. Starbird



Went Copy

LEASE OF WATER-RIGHTS.

THIS INDENTURE, made and entered into in duplicate on this the 18th day of December, 1915,

BY AND BETWEEN

CROWN CITY GOLD MINES COMPANY, a corporation organized and existing under the laws of the State of California, party of the first part, hereinafter designated as the lessor; and

TOM REED GOLD MINES COMPANY, a corporation organized and existing under the laws of the Territory of Arizona, party of the second part, hereinafter designated as the lessee;

WITNESSETH:-

THAT WHEREAS, the lessor is the owner of certain water-rights appurtenant to, and a part of, a certain water and mill-site claim situate in Cottonwood Canyon, in the San Francisco Mining District, County of Mohave, State of Arizona, known as the Independence Mill-site, from which water is now flowing by gravity through pipes, from a spring situate on said water-claim or mill-site.

NOW THEREFORE, in consideration of the covenants and agreements of the lessee hereinafter contained, said lessor does hereby and by these presents, lease, demise and let to the lessee, the said water-claim and mill-site, and the right to use and appropriate to its own use, all the water now flowing from the spring situate thereon, and all water which may hereafter be developed therein, or caused to flow therefrom, for the period or term of one year, commencing with the 19th day of December 1915, to and including the 18th day of December, 1916.

For and in consideration of the leasing and demising aforesaid, the lessee does hereby covenant and agree to pay to the lessor, for rental of said water and said water-claim and mill-site, the rental or sum of Two hundred and eight and 34/100 Dollars (\$208.34) per month, commencing with the 18th day of January, 1916, and thereafter on the 18th day of each month ensuing, to and including the 18th day of December, 1916.

The lessor does hereby covenant and agree with the lessee, that the said lessor shall maintain and keep in good condition and repair, the pipe-line now running from the said water-claim or mill-site to the mining property now owned by the said lessor, in said San Francisco mining district, and will keep the said spring situate upon said water-claim or mill-site, well and thoroughly cleaned out, and free from debris and sediment, and said lessor shall place a screen around the point of egress of said water, so as to filter the water flowing from said spring before the same shall pass through said pipe-line, and shall keep the said pipe-line free and clear and prevent the same from becoming stopped up. The said lessor shall further protect its said pipe-line from freezing, by opening the gates or unions therein at such times as may be necessary, in order to prevent the freezing of said pipe-line, and in the event that said lessor shall find it necessary or essential to open such gates or unions for such purpose, said lessor shall notify the lessee of its intention so to do, in order that the said lessee may secure such supply of water, prior to the opening of such unions, as will meet its necessary needs until such gates or unions shall again be closed.

The said lessee is hereby granted the option to withdraw the water developed at said spring or upon the said

water-claim or mill-site, either at said water-claim or mill-site, or at the end of the existing pipe-line terminating on the mining property now owned by the lessor, in said San Francisco mining district.

It is understood and agreed by and between the lessor and lessee that if at any time the flow of water from the said water-claim or mill-site shall fall below the quantity of ten thousand gallons per day, then and in that event, a corresponding reduction shall be made in the rental to be paid by the lessee to the lessor, in the same proportion as to price as the proportion of water furnished is less than ten thousand gallons per day. And provided further, that if for any reason, the quantity of water flowing from said water-claim or mill-site shall so decrease that it shall be of no practical use to the lessee, then and in that event, the lessee shall be released from any and all obligation to pay to the lessor any rental for such water or water-rights or mill-site for and during such period of time as the quantity of water flowing from such water-claim shall be of no practical use to the lessee.

In the event that the existing pipe-line now running from said water-claim or mill-site to the mining property now owned by the lessor and situate in said San Francisco mining district, shall be damaged or destroyed by the elements, the lessor shall immediately and with the exercise of proper care and diligence, repair or replace the damaged portions of such pipe-line with all possible speed. In the event that the water to be used by the lessee is cut off, and the flow thereof stopped by reason of such damage or destruction of the said pipe-line, then and in that event, the lessee shall be relieved of all obligation to pay the rental herein reserved, during such time as the said pipe-

line shall remain in such condition that water will not flow through said pipe-line.

It is understood and agreed that the lessor shall not be held liable for damages for any reasonable delay in the repair of such pipe-line, in the event that the same is destroyed or damaged.

It is also understood and agreed by and between the parties hereto, that the leasing of the water and water-rights herein described, by the lessor to the lessee, shall under no condition or circumstances be construed or interpreted as to give to the lessee any vested right to use said water for any greater period than the period herein reserved, or during such extension of this lease as may hereafter be entered into, and all the right of the lessee in or to the use of said water shall terminate at the end of the period herein reserved, or any extensions thereof, and the said lessee does hereby recognize the absolute ownership of such water and water-rights by the said lessor.

In the event that the lessee shall be unable for any period to operate its mills, mines or property, for which the use of said water is designated, by reason of labor strikes, storms, fires, or acts of providence occurring to said mills, mines or property, and beyond the control of the lessee, or in the event that the lessee is restrained or enjoined by the order of any court from operating its said mills, mines or machinery, or in the event that the ore in the mines of the lessee shall become of so low a grade as would not justify the running or operation of said mines or machinery, then and in either of said events, the lessee shall not be obliged to use or pay for the water or water-rights hereby demised or the rental hereinbefore pro-

vided, during the said time in which the said lessee is unable to operate the said mills, mines or property by reason of the above mentioned causes. But the said lessee shall use due diligence and the best endeavor to resume as soon as possible the operation of its mines, mills or property, and the use of the water and water-rights as herein provided.

For and in consideration of the covenants of the lessee herein contained, the lessor does hereby grant to the said lessee, the right to demand and receive an extension of this lease for the further period of one year from and after the 18th day of December, 1916, and the right to the use of the water and water-rights hereby demised during all of the said period upon the same terms and conditions as those hereinbefore contained, and for the same rental.

The lessor does hereby reserve from the foregoing lease, for its own use, a sufficient portion of the water developed upon the water-claim and mill-site aforesaid, to supply its employees which may be employed by it, upon the mining claims owned by the lessor in the said Mohave County, for domestic purposes, and a sufficient amount of said water for the conduct of any mining or milling operations which may be carried on by the lessor upon its aforesaid mining claims. And it is understood and agreed that the lessor shall, at all times, be entitled to a sufficient flow of said water for the purposes aforesaid.

IN WITNESS WHEREOF, the said corporations parties hereto have hereunto caused their respective corporate names and seals to be affixed by their respective officers there-

unto duly authorized, on the day and year hereinabove first written.

CROWN CITY GOLD MINES COMPANY.

By _____
Its President.

And _____
Its Secretary.

TOM REED GOLD MINES COMPANY.

By _____
Its President.

And _____
Its Secretary.

The S. F. Wood, Pasadena

Dear Mr Wood

I enclose you herewith
a copy of the report I have made to
Judge Lindley. Trusting that this will
serve your purpose I am

Yours sincerely
Andrew C. Cannon

UNIVERSITY OF CALIFORNIA
BERKELEY

Aug 28 '18

Berkeley, California, August 23, 1918.

C. H. Lindley, Esq.,
Mills Building,
San Francisco, California.

My dear Judge Lindley:

Agreeably to your request I have made a preliminary examination of the Tom Reed Vein at Oatman, Arizona, particularly with reference to the geological facts which determine the position of the apex of the vein, and beg to advise you as follows:

The Vein. The Tom Reed Vein is a large fissure vein the walls of which have been mineralized for some distance from the main deposit within the fissure. Within the fissure walls the vein is composed chiefly of calcite and quartz, having a width very commonly of from 10 to 30 feet or more. In places the calcite has been replaced by silica and the silicifying process has also affected the walls for a moderate distance from the fissure. The wall rocks in the vicinity of the fissure are also very commonly traversed by stringers of calcite and quartz; and within the fissure there are numerous masses of country rock more or less silicified. Owing to the silicification and mineralization of the walls the precise boundaries of the vein are not always discernible. The minable ore consists of vein rock containing over \$6.00 per ton of gold. This ore occurs in shoots of irregular form and distribution in the vein, and to these of course the stoping is confined.

There has been much development work done in the vein, however, in the search for profitable shoots. There are two kinds of volcanic rock traversed by the vein fissure. One of these has been called an andesite and the other a latite. The latite is superimposed upon the andesite. The displacement of the contact of andesite and latite affords a proof of the faulting which has affected the vein.

Grey Eagle Claim. The apex of the Tom Reed Vein extends thru the Grey Eagle Claim roughly parallel to its side lines and intersects both end lines. It nowhere intersects the side lines. Its general course is about N 35°W and the dip of the vein is from 70° to 75° to the N.E.

Beneath the surface of the Grey Eagle Claim the Tom Reed Vein is cut by a fault, known as the Mallery fault, the strike of which is nearly parallel to that of the vein, varying from N 30° to 35°W, but the dip of which is in the opposite direction, or S.W. at an angle of about 55°. The Mallery fault is a normal fault and its outcrop is in the Big Jim Claim on a course nearly parallel to the common side line of the Big Jim and Grey Eagle, and distant from that line about 70 to 90 feet.

The effect of the fault is to dislocate the vein into two segments of which the one on the southwest or upper side of the fault is down thrown relatively to the

segment on the northeast or lower side of the fault. The vertical displacement in the section thru the 2820 stope of the Grey Eagle is about 215 feet, and the amount of the dip slip is 260 feet; but the throw may be somewhat greater than this in other sections.

There can be no question of the ownership of the vein from its apex down to its abutment upon the fault. The upthrown portion of the vein below the fault terminates upward against the fault in the vicinity of the common side line of the Grey Eagle and Big Jim claims, so that its terminal edge is partly in one claim and partly in the other. Assuming the correctness of the position of this side line in relation to the mine workings it is evident from an inspection of these workings that:

1. At the extreme southeast end of the 200 level, at the N.E. corner of the Grey Eagle Claim, about 4 feet of the vein is on the Grey Eagle side of the line. This condition extends beyond the present face of the drift probably 40 feet, but what this distance actually is can only be determined by extending the drift. At the common end line of the Aztec and Big Jim, however, the upper edge of the vein below the fault is well within the Big Jim Claim.

Northwest-ward from the N.E. corner of the Grey Eagle a portion of the vein about 4 feet in width is on the Grey Eagle side of the line for an observable distance of 35 feet.

2. For the next 155 feet northwest-ward it is probable that a portion of the vein is on the Grey Eagle side of the line, but the ground is not opened up sufficiently to reveal this as a matter of observation.

To do this raises should be put up on the Mallery fault from the 200 feet intermediate level until they encounter the foot wall of the vein, and from these points the line of abutment of the foot wall upon the fault should be opened up, care being taken to remove as little of the vein as possible in the operation.

3. For the next 30 feet northwest-ward the vein is exposed on the Grey Eagle side of the line in the 200 intermediate level to the bottom of the winze which connects this level with the 200 crosscut from the Grey Eagle shaft.

4. To the northwest-ward of the 200 crosscut from the shaft the vein is well exposed in the 300 and 325 levels and there is no doubt of the fact that the terminal edge of the vein as it abuts upon the fault is wholly or in part within the Grey Eagle claim for a distance of more than 250 feet, to the face of the 325 drift.

This condition probably continues for several hundred feet farther, but openings have not yet been made to prove the fact.

5. The exposures in the vein in the 200, 200 intermediate, 300 and 325 levels show that the abutment of the vein upon the fault rakes down to the N.W.

6. Below the Mallery fault within the Big Jim Claim, the vein is probably broken by other minor faults which will be found perhaps to interrupt its continuity, but which will not in my opinion seriously obscure its identity with the vein opened up on the Big Jim 400 level.

Bald Eagle Claim. On the Bald Eagle Claim the apex of the Tom Reed vein continues thru from the Grey Eagle Claim beyond the prolongation of the common end line of the Aztec and Big Jim. The vein is best exposed underground in the 500 foot level. The intersection of the vein on its downward course with the Mallery fault has not yet been reached by the mine workings. The upper edge of the upthrown segment of the vein where it abuts upon the fault between the east end line of the Grey Eagle and the east end line of the Big Jim is wholly in the Big Jim Claim for the greater part of its course, as may be inferred from the relations exposed in the 200 crosscut from the Bald Eagle shaft.

Identity of the two segments of the vein. In my opinion no serious question can be raised as to the identity of the vein on the two sides of the Mallery fault. The fact of faulting and the approximate extent of the throw on the fault may be proved by the displacement apparent in the rocks entirely independently of the vein. The character of the vein is the same on both sides of the fault; and altho the ore shoots have not yet been matched on the two sides, I think it possible that this defect in the demonstration may be remedied by further development.

Conclusion. There is no doubt in my mind but that the vein which has been opened up in the Big Jim Claim on the 400 level is the same identical vein as that which has its apex in the Grey Eagle and Bald Eagle claims as a terminal edge due to erosion. The dislocation of this vein by the Mallery fault can be proved to the satisfaction of any court. This proof carries with it the identity of the faulted segments as parts of one and the same vein. But even if the apex thus established should, for any reason that I am unacquainted with, fail to give the Tom Reed Company the right to mine the vein on its downward course in the Big Jim Claim, then it will be impossible to escape the conclusion that the upward termination of the upthrown segment of the vein against the Mallery fault is the apex. To whatever extent,

therefore, this apex lies wholly or in part within the Senior Grey Eagle Claim, the latter owns the vein on its dip beneath the surface of the Big Jim. I have shown, assuming the correctness of the surveys, that, excepting 155 feet where the ground is not sufficiently opened up to reveal the facts, this apex actually does lie wholly or partly within the Grey Eagle from the east end line of the claim northwest-ward for over 500 feet.

Yours truly,

Andrew Lawson

Report of Fred J. Soper

to

John Hays Hammond

on

Tom Reed Gold Mines

1909

REPORT
On the Mining Property
of the
TOM REED GOLD MINES CO.
Mohave County,
Arizona.

... R E P O R T ...

on the mining property of the
TOM REED GOLD MINES COMPANY
Mohave County, -----Arizona

T O

Mr. John Hays Hammond,
71 Broadway,
New York City.

Dear Sir:-

In accordance with your instructions, I have made an examination of the mining property of the TOM REED GOLD MINES COMPANY, and herein submit my report:

L O C A T I O N

The property is located in the San Francisco Mining District, Mohave County, Arizona. The mine is situated on the south-west slope of the Blue Ridge Mountains and overlooks the Colorado river, above Needles, California.

The mine is equally accessible by wagon road from Needles or Kingman. From Kingman to the mine the distance is about 28 miles - from Needles about 20 miles. From Needles the road is all up-grade and ferrying across the Colorado river involves considerable expense and delays. At present supplies are brought in from Kingman.

P R O P E R T Y

The property consists of eleven claims located

along the croppings of the vein, viz:

PASADENA
FRENCH AMERICAN
NANCY HANKS
BESSELL
OLLA OATMAN
TOM REED
BEN HARRISON
RISING STAR
BLACK EAGLE
BALD EAGLE
GREY EAGLE

Five of these claims viz, Bessell, Olla Oatman, Tom Reed, Ben Harrison and Rising Star are patented.

In addition to the above claims which cover the mine per se there are several other claims as north of the Ben Harrison and Tom Reed upon which the houses of the town are built and a mill-site claim south of the Ben Harrison.

T I T L E

Not investigated.

GENERAL CONDITIONS

1. POWER

When I began my examination (Oct. 21, 1909) the entire plant was operated by steam, with oil for fuel at \$4.70 per barrel delivered at the mine (i.e. about \$16.00 to \$17.00 per H.P. month). During the period of my examination a change from steam to electric power was made in the (old)

ten-stamp mill. The new mill will be operated by electric power and I understand that in the near future changes will be made so that the entire plant will be operated by electric power,- the present steam plant being maintained for emergencies.

At Kingman a Company has installed a steam power plant for generating electricity and this Company delivers electric power at the mine for \$15.00 per H.P. month.

2. TIMBER

There is no timber in the district. Timber and lumber are obtained from outside sources at from \$30.00 to \$35.00 per H. F.O.B. Mine.

The walls of the mine stand well and no timbering is required within the stopes. The backs of the levels under the stopes have to be well timbered but after the stopes have been drawn a large proportion of the material can be re-used. The shaft is well-timbered.

Total timbering charges per ton of ore mined aggregate about .40 ¢.

3. WATER

Down to the lowest level (350) feet) the workings are dry. Sinking (shaft and winze) below this level is encountering considerable water which to some extent retards development. It is believed however, that this water is only residual within the interstices of the vein and contiguous shattered rock and that once the water is lowered it will give no further serious trouble. On the whole such water as has been developed in the mine is a welcome condition as it can be well utilized in milling operations.

While the mine supplies a small portion of the water requisite for milling purposes yet the greater quantity is brought by a pipe line from a distance of several miles. It is believed that this supply is adequate for any probable requirements.

GENERAL GEOLOGY

The country rock of the mine is a chloritic andesite. Overlaying this is a series of undifferentiated flows of andesites, trachytes, rhyolites and latites. Underneath the chloritic andesite, exposed to the west, is an older andesite several hundred feet thick which has not been proven to contain economic ores.

The chloritic andesite has a total estimated thickness of about 800 feet.

Within the vicinity of the Tom Reed vein erosion has removed about 100 feet, leaving about 350 feet of favorable formation beneath the present (350 feet) lowest level and about 275 feet below the lowest estimated ore.

The Chloritic andesite in which the Tom Reed mine occurs is not a homogeneous rock. There are local variations due to magmatic differentiation during cooling- similar to those attending the solidifying of matte or slag. For the most part the andesite is composed of a fine-grained, greenish-grey, ground-mass in which chlorite is prominent as an alteration product.

This phase of the rock is decidedly porphyritic (feldspar phenocrysts), breaks with a rough surface, is the predominant type and will be referred to as the normal andesite.

Within the normal phase there are, here and there, basic variations. These variations in the extreme cases have a dark reddish-brown to a dark greenish color- break with a semi-conchoidal fracture and are very tough. Between the normal andesite and the extreme basic type there are all gradations. In most instances between the two types there is no pronounced dividing line- the one imperceptibly graduating into the other.

A band of this basic phase (locally termed dike) striking N.E. and S.W. crosses the Tom Reed vein at the operating shaft and it is within this basic phase (where the vein cuts it) that the developed ore-body is found and it is my opinion that such new ore-bodies as may be developed will be found to be closely associated with a basic phase of the andesite.

The formation of the ore within the Tom Reed mine is the result of a series of geological events which may be roughly outlined as follows:

1. The major fissuring or faulting which opened up the vein. When this fissuring took place brecciation and crushing within the break was not uniform throughout its entire length, but varied, depending upon the kind of andesite through which the fissuring passed.

Within the normal andesite the tendency was for the displacement to be more or less restricted to a gauge or narrow fracture, whereas within the basic phase the crush was distributive and a considerable width was brecciated.

2. Subsequent to the primary fracturing mineralizing solutions introduced and deposited calcite. This calcite made vein matter in two ways:-

- (a) by replacement (metasomatic) of the andesite.
- (b) by deposition.

3. A second displacement along the vein. This second displacement, similar to the primary, within the normal andesite was more or less restricted to a gouge or narrow fracture whereas within the basic phase the already formed calcite was well fractured and opened up.

4. This secondary fracturing was followed by the introduction of silicious solutions which carried little if any economic values. The silica largely replaced the calcite and some of the andesite so that the result was an intermixed vein material of calcite and quartz.

5. A third disturbance or fracturing. Similarly to the preceding fracturing within the normal andesite the movement was not distributive, but was more or less restricted to a gouge or narrow fracture not sufficient to afford a free passage for the introduction and deposition of mineralizing solutions. Within the calcite-quartz portion of the vein however (i.e. within the basic andesite) the movement was more or less distributive. Here the vein material was opened up affording easy passage for the introduction and deposition of mineralizing solutions.

6. This third period of fracturing was followed by the introduction of silicious solutions which brought

in the gold values. These silicious solutions in part replaced the calcite and in part was deposited per se.

Thus the introduction and deposition of economic values was dependent upon the conditions of fracturing and the conditions of fracturing were dependent upon the character of the andesite through which the vein passed- it being demonstrated by present developments that the basic phase of the andesite afforded conditions of fracturing favorable for the deposition of economic values and that the normal type did not.

ORE RESERVES

On the map submitted in connection with this report there is given:

- location of samples taken.
- widths sampled.
- values obtained.
- tonnages.
- gross values.
- averages for levels.
- estimate of gross and net values.

The actual results of my sampling give 15,909 tons, with an average gross value of \$ 57.46 per ton, i.e. a total gross value of \$ 914,179.49. In places the walls are broken and loose. The ore is mined with machines and of necessity considerable of the rock from the walls goes into the actual ore. After close observation and a series of

measurements I have estimated that on an average approximately one foot of waste wall rock goes into the ore. Equating this incorporated rock with the values actually obtained we have,

Total tons-----	18,510
Average value per ton (gross)	\$49.38
Total gross value	\$914,179.49

On map I have made an estimate of costs and net values.

PROSPECTIVE POSSIBILITIES

Under the caption "General Geology" it has been intimated that economic ore is closely associated with the basic phase of the andesite.

Within the mine at the east periphery of the ore-body the transition from the basic andesite to the normal occurs within a few feet and economic values cease abruptly. The drifts to the East beyond the ore-body are in normal andesite, and there are no indications of ore in this part of the workings. On the surface going East from the band of basic andesite (within which the ore occurs) the country is for the most part covered with wash. The few rock crop-pings which are exposed are all of the normal type of andesite and nothing was observed which would indicate the probability of economic ore being found east of the present ore-body. Going west from the developed ore-body for some 450 feet the country rock is a mixture of normal andesite and semi-basic, the two phases graduating into each other. Near the old shaft, some ore has been stoped.

Below these old workings and over a distance of 100 feet my sampling gave an average value of approximately \$10.40 per ton.

N.B. After deducting from this average value costs of \$8.15 per ton and a treatment loss of \$1.00 would leave only \$1.25 per ton profit. Hence tonnage in this part of the mine has not been included in my estimate of ore Reserves.

In the above mentioned portion of the mine the general indications are that with depth the basic andesite is getting more and more pronounced and it is highly probable that the 350 foot level when driven west so as to be under this part of the vein will encounter higher values than those found on the 250 foot level, i.e. that the 350 foot level west under this portion of the vein will develop ore of a sufficient grade to leave a comfortable margin of profit. I believe that this portion of the vein especially with depth has good prospective possibilities. This mixture of the two phases of the andesite, which with depth presents possibilities for ore, maintains for about 150 feet west of the old shaft. From this point for a considerable distance west the rock is essentially of the normal type, and the surface indications are not attractive. At a point about 150 feet East from the new shaft (being sunk opposite the bunk house), there is a small occurrence of the basic phase of the andesite

and from this point for a distance of about 150 feet east, the surface would indicate the possibility of finding profitable ore with depth. I understand that it is contemplated to run along the vein at a depth of about 350 feet a drift which will connect the new shaft with the present workings. This I consider most judicious exploration, and it should determine pro or con the possibilities I have mentioned.

As shown on map the ore-Reserves estimated include ore to a depth of 70 feet below the lowest level, or 50 feet below the lowest workings, (i.e. bottom of winze in floor of 350 foot level).

At a depth of approximately 300 feet below the lowest estimated ore the vein it is believed will pass through the chloritic andesite into the underlying older andesite and since nowhere in the district has economic ore been demonstrated to occur in this older andesite it is extremely doubtful if economic values will be found to maintain below the contact of the two andesites. As to whether the present ore-body will maintain with its present average values and tonnage all the way to the contact is in my opinion somewhat doubtful. Results of sampling on the various levels gave average gross values per ton as follows:

150 foot level-----	\$50.21
250 foot level-----	55.12
350 foot level-----	35.60

Thus it is patent that there is a very marked falling off of grade on the lowest level. This may

may be only a local depletion of values, or it may be the beginning of a lessening of values, which will be more and more accentuated with depth. In this connection it is to be noted that a magmatic variation such as the basic phase of the andesite can with depth graduate into the normal type just the same as it can laterally and it is possible that with depth the band of the basic phase of the andesite within which the developed ore-body occurs is graduating into the normal type. In the lower workings the rock is so altered that I was unable to definitely ascertain whether the basic phase is or is not changing into the normal. The character of the vein however, in the lower part of the winze most closely resembles the vein where it passes through a mixture of semi-basic andesite and normal andesite then it does ^x the vein within the principal ore-body where the higher average values are found. Thus in my opinion it is not absolutely assured that the average values found within the present development of the developed ore-body will maintain to the contact.

M I L L

The present (old) mill is equipped with ten-stamps and all necessary accessories. In addition there is a more or less incomplete cyanide plant to handle the tailings from the stamps. Capacity about 600 tons per month. A new and thoroughly up-to-date mill and cyanide plant is under construction and will be ready for operation early in the new year. Primarily the new plant will have ten-stamps, - later, the ten-stamps in the present mill will be installed.

From the stamps the ore will pass over amalgamation plates and thence to a tube-mill for fine grinding. The cyanide plant includes Pachuca tanks and a Butters filter. When completed the new mill will have a capacity of about 2000 tons per month.

As a whole, the plant is being arranged for economic treatment, and it is probable that my estimated milling and cyaniding costs will be somewhat reduced.

Present practice in the old mill does not include fine grinding. The tailings average about \$9.50 per ton, and the slimes \$16.00 per ton, i.e., the total present saving is about 76% or losses 24%. With fine grinding in the new mill it is estimated that on average ore there will be a saving of 93%.

N.B. The accumulated sand and slime dump from the present mill will be re-treated in the new mill. For gross and net values of same see Map.

M A N A G E M E N T

At any mining operation it is comparatively easy for an outsider to criticise. At the Tom Reed Mine, I think these criticisms would at the most be trivial. Taken as a whole, I regard the management as excellent. In the mine all work is done well and economically. All contemplated exploration work is fully justified, and is based on good reasons. The new mill and cyanide plant is being arranged for economic work and will, I am sure, give excellent results.

Respectfully,

Los Angeles, California
November 21st, -- 1909.



Tom Shaw, III

Does he rely on Ramsome Report
Crested
Lewis

Roy Blodgett

U 2
Stevens
Grade
Command
Dr. Blumett

Memo Journal
1921 - 1940
Miss G. G. Sewing
137, 145 (1937)
134
late 1930s
U.S.G.S
Ramsome

Maxim Pope (in)

Steven Navin

Drama ^{Comp} 57-58

Shaw Baturo

Canada
Central Amer. 1962-64
Solitas 3 compact
8x15

M. H. Gt. Kirk 102,350
Grants 64,638⁰⁰

135⁰⁰ Foot
in Road 470' - 8,000
surface work
Double Den - 12,500

125 HP 48" Dia
Mark. Center
Salt Lake
in Denver
Head, 50
Bin 10x10x5
100 ton
Piping
11,000
5,000
7,500
3,000.00
1350.00
Each
-2041.00

Blk Bldg.
Butter Bldg.
all Bldgs. 22,300
Ship's Case - ?
Electrical
(Chaw Lane)

Raul Hunkl.

Does show rely on Ransome Report???

Seam striking no good in A0

1932 ~ 37 peak out

Ground Report 1937
3000' drifting

Cut & Fill 35⁰⁰/yr breakwater

TOM REED GOLD MINES COMPANY

APRIL 1939

Recommended Future Mine Development:

Benjamin Harrison:

(1) Drive the Ben Harrison 800 level west to the winze, to the 1400 level.

(2) Reopening the 1400 winze to the 1400 level and driving west on the 1000 and 1400 levels sufficient to prove the west end of the Tom Reed, as with reasonable assumed extension of the Tom Reed ore body it is possible to develop considerable commercial ore at the present price of gold, also in driving east on the 1000 and 1400 it is possible that another ore shoot may be found under 700 to 900 feet west of Ben Harrison shaft.

(3) In driving west from the 1000 and 1400 winze levels it seems advisable to prove the United Eastern Mine under the mined out area, as with reasonable assumed extension of the United Eastern ore body, it is possible to develop a large tonnage of commercial ore at the present price of gold.

The cost of proving the Tom Reed and United Eastern would be small in comparison with the amount usually required for prospecting on ore body in depth, due to being able to work through the present winze to 1400 level, which should be in good shape as it was sunk in the foot wall.

Grey Eagle - Aztec - Bald Eagle:

(1) Driving east from the 200 level Grey Eagle to the east end of the 3245 stope. There should be a net profit of \$15,000 to \$20,000 in a comparatively small tonnage in the back of the 3420 and 3245 stopes, with an additional \$3500.00 of possible ore.

(2) Developing the east end of the 3245 stope from the 400 level Aztec by raises. With reasonable assumed extension to the east of the 3245 ore shoot it is possible to develop 2000 tons of commercial ore. The east end of the 3245 stope samples average \$12.75, width 4 feet.

Recommended Future Mine Development:

(3) In stoping on the above mentioned block at 80 feet above the 400 Aztec a hanging wall cross-cut should be driven into the hanging wall vein. This will be over the top of the 3295 stope, and in which it is possible to develop 500 tons of commercial ore.

(4) To continue mining 2750 stope above the 2805 stope - 500 tons possible ore.

(5) Aztec 400 level west of the 4000 block above and below the 400 Aztec. Drive a hanging wall drift west on the streak within which the high grade ore in the 4000 block occurred.

(6) Grey Eagle - Bald Eagle on Mallery Fault. Continue stoping on the 3480 stope on east side of 3480 raise.

(7) Drive raise from top of 3480 raise, 400 Aztec, upward to prove the area between the 3480 stope and the Frayne stope on the 200 Bald Eagle.

East Aztec on Telluride Vein:

(8) Drive west on the 700 Aztec on the Telluride vein - with a chance of finding another ore shoot below the Ingram Lease.

West Aztec:

(9) Driving a number of diamond drill holes southwest from the 600 Big Jim near the intermediate vein, to intersect the faulted west extension of the Aztec ore body. It is possible that 5,000 to 10,000 tons of ore could be in this faulted section.

Relative order of importance of the above recommended development:

Benjamin Harrison	1-2	}	1st.
Grey Eagle, Aztec, Bald Eagle	1-2-3		
West Aztec	9		

4-5-6-7) 2nd.

Respectfully submitted,

RMG:F

/s/ R. M. Gammell
/t/ R.M. GAMMELL

POSSIBLE ORE IN FURTHER DEVELOPMENT

TOM REED GOLD MINES COMPANY

APRIL 1939

BENJAMIN HARRISON

<u>Location</u>		<u>Tons Possible Ore</u>
T.R. - 700 - 1000 Level	1-A	14,000.00
" 1000 - 1100 "	1-A-1	3,000.00
" 700	1-A-E	---

GREY EAGLE - AZTEC - BALD EAGLE

Top 3245 Stope	1-A-1-A-1	3,500.00
East End 3245 Stope	No. 1-B	2,000.00
Top 3295	No. 1-D	500.00
East Bald Eagle Shaft	No. 1-E	
Top 2805 Stope	No. 1-D	500.00

400 LEVEL AZTEC MAIN VEIN 4000 BLOCK

Above and Below 400 Aztec	No. 1-B	
------------------------------	---------	--

GREY EAGLE, BALD EAGLE, ON MALLERY FAULT

Between 400 Aztec and 200 Bald Eagle	No. 1-C	
---	---------	--

EAST AZTEC ON TELLURIDE VEIN

No. 1-E

WEST AZTEC

No. 1-A 10,000.00

Total 35,500.00

Oatman, Arizona
May 27, 1939

Mr. Jack Zwinge, Supt.
Tom Reed Gold Mines Co.
Oatman, Arizona

Dear Sir:

Possible ore in further developments.
Supplementary to report of April 1939.

As an immediate source of ore, I recommend the following:

- (1) Lay track on the 700 Aztec to the old 4140 lease transfer chute, Telluride vein.
- (2) Transfer the stope fill above the 550 intermediate level under Ingram lease to 700 Aztec, using old transfer chute. Grab samples of the gob indicate that by excluding the coarse waste, this old fill should be \$8.00 to \$12.00 ore. By mucking on the fill every other day, a control on the value can be kept. If ore happened to be too low grade some days it can be trammed to the old open stope between 700 and 1100.
- (3) There is considerable waste in the drift west of the 4140 manway, 700 level, and on the days you were not working on fill this waste could be trammed to the old stope between 700 and 1100.
- (4) I recommend driving the west drift, 650 level Telluride, at least 100 feet west, also some cross cutting. I believe this work to be fully justified considering structural conditions. Also you may get sufficient ore from the 550 intermediate level fill to pretty well pay for the level development.
- (5) I recommend cutting out for a double chute and manway on the Bobby Vein on 500 Aztec near vein junction. I believe it possible to carry up a 25 or 30 foot section, at mill grade, up to the 400 Aztec. Sampling during cutting out should indicate if it is possible to mine this section.
- (6) In driving the proposed crosscut on 400 Aztec, into old stope opposite 3195 chute, the foot wall next to old stope can be slabbed off, making a space where the ore falling from 3195 chute would be caught, and making a convenient place to muck it as it accumulates.

Respectfully submitted,

/s/ R. M. Gammell
/t/ R. M. GAMMELL

Oatman, Arizona,
July 12, 1935.

Mr. Jack Zwinge,
Supt. Tom Reed Gold Mines Co.,
Oatman, Arizona.

Dear Sir:

Relative to the work being carried on by the present leasers on the 160-foot level of the Mexican shaft, I beg to submit the following report:

A drift was driven on the main ledge of the Tom Reed vein in a southeasterly direction. Values were low, and the vein was intersected in places by minor faults, which had a common strike eastward.

About seventy-five feet east of the shaft a cross-cut was driven into the hanging wall and a wide parallel vein was discovered which showed low values. After twenty-five feet of cross-cutting a fault was encountered, consisting of blue mud, and work in that direction was stopped.

Drifting was resumed toward the possible junction on the new parallel vein, and the original drift vein. About thirty feet east of the cross-cut, another vein was encountered having a strike, south--ten degrees--east, and carrying high gold values. It has not as yet been determined as to what part of orebody the new vein represents, or what connection it has with the two previously discovered veins; although it appears to be a converging of two nearly parallel veins.

At that point a cross-cut was driven into the footwall a distance of about ten feet, which probably is the true footwall structure. Easterly projection of the footwall would probably encounter the rich vein at a drifting distance of about ten or fifteen feet, and may influence the vein to turn and run parallel with the original footwall. Or, if the footwall proves to be of fault nature, it may cut the rich vein off or displace it.

The new vein averages about five and one-half feet wide, *ave.* assay values being \$46.73 per ton at the *new* price. The better values are lying in the hanging-wall portion of the vein.

Respectfully yours,

Ed. Matsen

Ed Matsen---Engineer

SUMMARY
U.S.G.S. Report - Geology of Oatman Gold District
F. L. Ransome, 1923

Work done Dec. 1920 - April, 1921 by Ransome

pg 4
Although the Tom Reed vein was exposed on surface (Most of the productive veins were not such as United Eastern) values of interest was not discovered until 1901 when the Bon Harrison was sunk to 100' where values increased.

pg 6
At the United Eastern no distinct vein was exposed at surface but J.L. Melver in 1913 suspected a fissure due to an exposed rock contact. In 1914 he sunk a shaft 40' and was out of funds. He interested Seeley Mudd & Phil Wiseman in 1915, they optioned the property for \$50,000⁰⁰ (part in stock). They deepened the shaft and at 465 feet ran a crosscut and hit 25' of vein assaying \$22⁹³, old price gold. 11 million dollars finally realized.

1
pg The Big Jim vein, southeast of Ben Harrison shaft, had no conspicuous outcrop but was discovered by a crosscut run from the 400 level hit the ore body. United Eastern purchased the Big Jim, or that is the faulted segment from the Tom Reed vein. This resulted in an Apex lawsuit.

Quote Ransome - Pg 32

"As a rule the large ore bodies of the district have been mined from veins or parts of veins that are not prominent at the surface"

Quote Ransome - Pg 44

"The NE branch of the Tom Reed vein, or the United Eastern vein, in contrast with the other branch, is marked by no outcrop of vein material and probably would not have been recognized as a vein had it not been discovered by mining operations"

Mineral Hill, Duval Corp. - Cerbat Mts.
(Open Pit) (15 mi. West Kingman)

This area ~~was drilled~~ in the early 1950's by Kennecott Copper (Bear Creek Explor.) and was turned down due to insufficient tonnage & grade.

Duval Corp. (Pennzoil) started drilling program in the early '60's and found a substantial ore body very near to Kennecott's drilling and of good grade. Has been a very successful operation.

(3)

pg 44 Tom Reed Co. drifted from the Ben Harrison shaft to the NW. to where the veins separate. They drifted ~~on~~ what is now known as the United Eastern segment for about 100 feet beyond Tom Reed property but found nothing of interest. Had they drifted a few feet further they would have discovered the rich United Eastern ore body

pg 50 Reed "Practical Conclusions" pg 50

pg 52 Possible depth of 3,400'

pg 54 United Eastern ore body extended from 270' below surface to a depth of 1,070 feet.

The ore bodies worked from Ben Harrison shaft (Tom Reed) extended from 0' below surface to a depth of a little more than 1300 feet

Derwin Mine - Lead + Silver, Darwin, Calif.
(Underground) (Near Lone Pine, Calif.)

Operated in early 1900's - Then in late 1940's Anaconda extended some old workings 10-15 feet and hit an extremely high grade ore body of 75-85% Lead - ? Silver. Was a very high profit operation

=====
=====
Old Dick Mine - Lead, Zinc + Copper, Bagdad, Ariz.
(Underground)

Mined off and on until late 1950's

Optioned by Cyprus Mines and their drilling unsuccessful

Then Hollinder + M^o Forland and S. Owens deepened the shaft and crosscutted which hit new off-set ore body. (Cyprus drilling only missed this 20 feet)

It was then sold to Cyprus Mines (1 million plus) and are still operating.

pg 56 Quote Ransome

"That additional orebodies remain to be discovered in the Oatman district at moderate depths is probable. The district, as has been shown, presents some rather unusual difficulties to prospecting of the ordinary kind, as some of the largest ore bodies thus far discovered gave little or no indication of their presence at or near the surface."

Sections & Plans page 40

BREAKDOWN TIMBER REQUIREMENTS - OATMAN SHAFT
 (470' Deep) water table

Timber Per Set

Board Feet

2-16' - 10x10 - 32' - 10x10 = $\frac{3200}{12} = 267$

3-16' - 8x10

1-12' - 8x10

1-8' - 8x10

- 68' - 8x10 = $\frac{5440}{12} = 437$

704 x 80 = 56,320

Ladder way

4x4 stringers - 960 x $\frac{16}{12}$ = 1280

2x4 Rungs - 664 x $\frac{8}{12}$ = 443

Railings (2x4) - 960 x $\frac{8}{12}$ = 640

Logging

28 - (2x12) - 480 = 2 x 28 x 480 = 26,880

Blocking

16 - 1' - 2x12/set x 80 = 32 x 80 = 2560

Wedges

600

Stringers for Rails

480 x 4 x 8x8 = 1920 x $\frac{64}{12}$ = 10,240

Rail Ties

42" long x 480 x 4x6 = $\frac{24}{12}$ x 3.5 x 480 = 3,360

Total Board Ft = 102,123

17360
 2500
 8680
 34720
 4340

102,123 x 170[¢] (incl. Framing) = \$ 17,360.00

PLUS: 1920 - Rail - 30[¢] (10[¢]/ft.) @ 200[¢]/ton = 2000.00

1920 - Sp. Kcs + Fish Plates = 500.00

3350' - $\frac{3}{4}$ " Rod for Hangers + Pins @ 17[¢] = 570.00

Total Estimated Cost = \$ 20,430.00



INTERMOUNTAIN CONSTRUCTION LTD.

1255 WELCH STREET - NORTH VANCOUVER, B.C. - TELEPHONE 985-5331

11617 N. Sundown Drive,
Scottsdale, Arizona 85254.

May 17th, 1971.

Mr. George A. Freeman,
4328 N. 56th St.,
PHOENIX, Arizona 85018

Dear George:

As per your request, we are pleased to quote on the following Shaft Rehabilitation:

Clean up Shaft Head and Shaft in preparation
for timbering \$ 22,500.00
Re-timbering 3-compartment 470' Incline
17' x 7', including all timber & hardware
..... @ 290.00 ft. 136,300.00

The following Hoisting Equipment would be required for
an eventual depth of 900' to 1200':

1 only MINE SHAFT HOIST - Vulcan Iron Works, Single Drum,
S/N 1155, Drum 96" dia., Face 90", Grooved Depth of
Flange 6", Rope Capacity 3600' in 2½ laps, Rope dia.
1½", Rope Speed 1000 fpm, Rope Pull 24000 lbs.:
Flexible Coupling to G.E. 400 hp motor, 60-cycle,
2300 volt, 105 amps, 504 rpm, Secondary Volts 740,
Secondary amps 245, S/N 694266 45,000.00
Dismantling & transportation of Hoist 8,000.00
Installation of Hoist 15,000.00
1 only HEAD FRAME, All steel portable construction,
72' high, equipped with 1 only 96" Solid Cast
Sheave for 1½" Rope 4,500.00
Dismantling & transportation of Head Frame 3,000.00
Re-erection of Headframe at Site 5,000.00
1 only MINE SHAFT SERVICE CAGE 3,500.00
1 only MINE SHAFT MUCK SKIP 1,500.00
1 only MINE SHAFT MAN CAGE 2,400.00
Wire Rope & Fittings 2,500.00
\$ 249,200.00

Trusting the above meets with your approval, we remain,

Yours very truly,

[Signature]
INTERMOUNTAIN CONSTRUCTION LTD., *[Signature]*

HOME-STAKE PRODUCTION COMPANY

P. O. BOX 7277
 INDIAN SCHOOL STATION
 PHOENIX, ARIZONA 85011

Main Office:

PHILTOWER BUILDING
 TULSA, OKLAHOMA 74103

Phoenix Office:

3443 N. CENTRAL AVENUE
 PHOENIX, ARIZONA 85012
 TELEPHONE: 802-274-8049

November 3, 1969

Mr. Wilbert G. Anderson, Attorney
 Suite 1800
 First Federal Savings Building
 3003 North Central Avenue
 Phoenix, Arizona

Re: Fire Loss at Oatman, Arizona
American Investment Company

Dear Mr. Anderson:

Attached is a copy of the quotation from Intermountain Construction, Ltd. covering rehabilitation at the burned out shaft and replacement of the equipment that was destroyed. The equipment covered in this quote is used machinery but we feel will do the same job as the previous equipment that was installed for operation.

Intermountain Construction Ltd. is a subsidiary of Nelson Machinery Company which is an old reliable used machinery company and is one of the larger ones.

In addition to the above equipment and shaft repair, I would estimate the cost of equipment, construction and repairs to be as follows:

4	3 Timber Ore Bins - approx. 10' x 12' x 15' deep	7,000	(\$5,000 each)	\$15,000.00
1	" Waste Bin	"	"	5,000.00
1	Tramline house and guides			6,000.00
1	40' x 60' (approx.) Engine House @ \$2.00	300		4,800.00
1	60' x 100' (") Compressor House @ \$2.00	7,200		12,000.00
1	10' x 18' (") Foreman's office	2,000		1,000.00
3	50 KVA Transformers 12,000/440 volt			1,800.00
	1000' - 4" pipe (installed) (used)			4,500.00
	1000" - 2" " " " "			2,000.00
	2 - 40 H.P. Centrifugal Pumps - 3 stage			2,500.00
	Electric Control Panel in Compressor House			3,000.00
	Electrical Wiring			2,000.00
				<hr/>
				\$59,600.00
	Plus shaft repairs			94,000.00
	" hoist, motor, skips, headframe, etc.			70,400.00
	(as per Intermountain Const. quote)			
				<hr/>
				TOTAL \$224,000.00

RECEIVED

NOV 13 1969

PHOENIX OFFICE

Ex. 2
 Dep. of Bro. Freeman

Mr. Wilbert G. Anderson

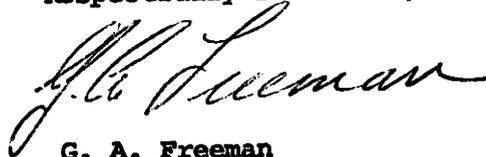
-2-

November 3, 1969

The above does not include any of the miscellaneous supplies and equipment that was in buildings, but you can probably obtain a realistic list of this from the watchman that is employed at the mine.

Also there will be an additional cost when the shaft timbering is completed to tie-in and timber from the shaft to the various mine levels. It would be almost impossible to make a realistic estimate on this without being able to examine the damage at each level.

Respectfully submitted,



G. A. Freeman
Mining Engineer

GAF:hj

RECEIVED

NOV 13 1969

PHOENIX OFFICE

Copy



INTERMOUNTAIN CONSTRUCTION LTD.

1255 WELCH STREET - NORTH VANCOUVER, B.C. - TELEPHONE 985-5331

1900 United Bank Bldg.,
3550 N. Central Ave.,
Phoenix, Arizona, 85012

July 11th, 1959.

Mr. George Freeman,
P.O. Box 7277,
3443 North Central Ave.,
Phoenix, Arizona 85012

Dear George:

As per your request, we are pleased to quote on the following Shaft Excavation:

470 ft. 3-Compartment Incline Shaft, 17' x 7'	@ 1650.00 ft.	\$ 77,550.00
Timbering - if required, 470'	@ 350.00 ft.	<u>16,450.00</u>
		<u>\$ 94,000.00</u>

The following Hoisting Equipment would be required for an eventual depth of 900' to 1200':

1 only Mine Shaft Hoist - Ottumwa Iron Works, Double Drum, Drum 78" dia., Face of Drum each side of divisions 33-5/8", depth of drum flange 6", Maximum Rope Pull 15,600#, Balanced Load Capacity 9600#, Rope Speed 600 FPM, Drums grooved for 1" rope, Herringbone Gears, Face of Gears 12", S/N 4167, Flexible Coupling, GE Motor, 200 hp, Slip-Ring, Type MT, 3-phase, 60-cycle, 2200 volt, 435 RPM, Lilly Control Model "D", approx. weight 75,000#, c/w 1 only Steel Head Frame 54' height, equipped with 2 - 54" Bicycle Sheaves for 1" rope.	"AS IS-WHERE IS" - Arizona	\$ 35,000.00
1 only Mine Shaft Service Cage		3,500.00
1 only Mine Shaft Muck Skip		1,500.00
1 only Mine Shaft Man Cage		2,400.00
Wire Rope and Fittings		2,500.00
Dismantling & Truck Freight to Site		7,500.00
Installation and Preparation at Site, including Erection of Head Frame		<u>18,000.00</u>
		<u>\$ 70,400.00</u>

Trusting the above meets with your approval, we remain,

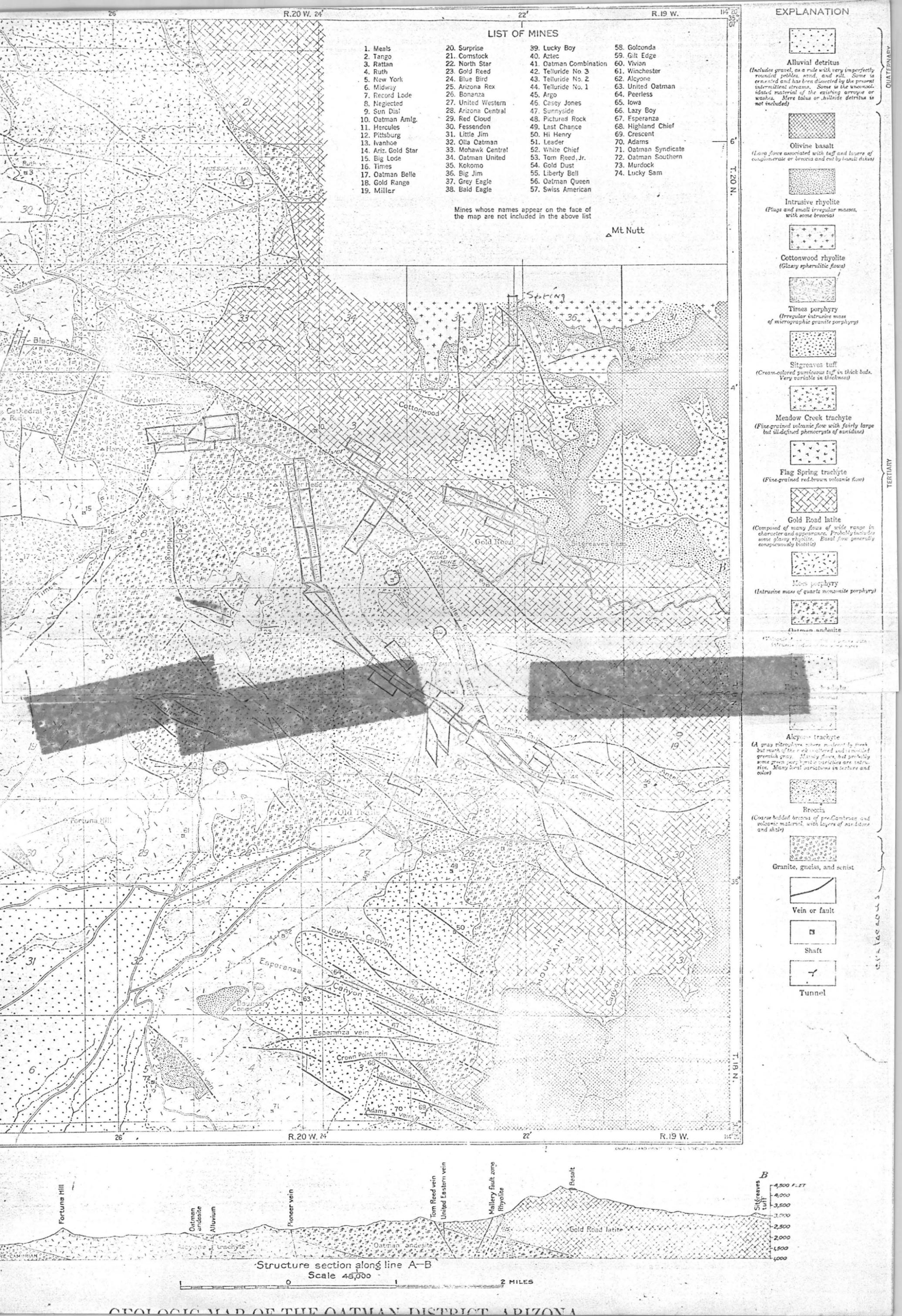
Yours very truly,

INTERMOUNTAIN CONSTRUCTION LTD.,

JHMG:eg

PLANT AND EQUIPMENT SUPPLIED ON CONTRACT AND RENTAL BASIS President.

EX 4
Dep of
Freeman



LIST OF MINES

- | | | | |
|---------------------|---------------------|------------------------|----------------------|
| 1. Meats | 20. Surprise | 39. Lucky Boy | 58. Golconda |
| 2. Tango | 21. Comstock | 40. Aztec | 59. Gilt Edge |
| 3. Rattan | 22. North Star | 41. Oatman Combination | 60. Vivian |
| 4. Ruth | 23. Gold Reed | 42. Telluride No. 3 | 61. Winchester |
| 5. New York | 24. Blue Bird | 43. Telluride No. 2 | 62. Alcayone |
| 6. Midway | 25. Arizona Rex | 44. Telluride No. 1 | 63. United Oatman |
| 7. Record Lode | 26. Bonanza | 45. Argo | 64. Peerless |
| 8. Neglected | 27. United Western | 46. Casey Jones | 65. Iowa |
| 9. Sun Dial | 28. Arizona Central | 47. Sunnyside | 66. Lazy Boy |
| 10. Oatman Amlg. | 29. Red Cloud | 48. Pictured Rock | 67. Esperanza |
| 11. Hercules | 30. Fessenden | 49. Last Chance | 68. Highland Chief |
| 12. Pittsburg | 31. Little Jim | 50. Hi Henry | 69. Crescent |
| 13. Ivanhoe | 32. Olla Oatman | 51. Leader | 70. Adams |
| 14. Ariz. Gold Star | 33. Mohawk Central | 52. White Chief | 71. Oatman Syndicate |
| 15. Big Lode | 34. Oatman United | 53. Tom Reed, Jr. | 72. Oatman Southern |
| 16. Times | 35. Kokomo | 54. Gold Dust | 73. Murdock |
| 17. Oatman Belle | 36. Big Jim | 55. Liberty Bell | 74. Lucky Sam |
| 18. Gold Range | 37. Grey Eagle | 56. Oatman Queen | |
| 19. Miller | 38. Bald Eagle | 57. Swiss American | |

Mines whose names appear on the face of the map are not included in the above list

EXPLANATION

- Alluvial detritus
(Includes gravel, as a rule with very imperfectly rounded pebbles, sand, and silt. Some is cemented and has been dissected by the present intermittent streams. Some is the unconsolidated material of the existing terraces or scabbs. Mine talus or hillside detritus is not included)
- Olivine basalt
(Lava flows associated with tuff and layers of conglomerate or breccia and cut by small dikes)
- Intrusive rhyolite
(Plugs and small irregular masses, with some breccia)
- Cottonwood rhyolite
(Glassy spherulitic flows)
- Times porphyry
(Irregular intrusive mass of micrographic granite porphyry)
- Sitgreaves tuff
(Cream-colored pumiceous tuff in thick beds. Very variable in thickness)
- Meadow Creek trachyte
(Fine-grained volcanic flow with fairly large but ill-defined phenocrysts of sanidine)
- Flag Spring trachyte
(Fine-grained red-brown volcanic flow)
- Gold Road latite
(Composed of many flows of wide range in character and appearance. Probably includes some glassy rhyolite. Basal flow generally conspicuously botitic)
- Mees porphyry
(Intrusive mass of quartz monzonite porphyry)
- Oatman andesite
(Intrusive mass of quartz monzonite porphyry)
- Alcayone trachyte
(A gray vitrophyre, where present in thick but much of the rock is weathered and is mottled greenish gray. Many flows but probably some green porphyry. Characteristics are indicative. Many local variations in texture and color)
- Breccia
(Coarse bedded breccia of pre-Cambrian and volcanic material, with layers of sandstone and shale)
- Granite, gneiss, and schist
- Vein or fault
- Shaft
- Tunnel

Structure section along line A-B
Scale 45,000

0 1 2 MILES

A PROPOSAL
FOR THE PURCHASE AND OPERATION OF
THE SAWYER PETROLEUM COMPANY GOLD
MINING PROPERTIES, OATMAN, ARIZONA

Americana Investments

SUITE 7-3015 EAST THOMAS ROAD
PHOENIX 16, ARIZONA
PHONE 266-3031

August 17, 1962

To: The Board of Directors
From: The President

Gentlemen:

I wish to submit for your consideration a proposal to enter into negotiations to purchase and operate the entire properties held by Sawyer Petroleum Company at Oatman, Arizona.

The properties consist of 27 patented mining claims, the power distribution system, the water system, several buildings, the Tom Reed Mine and the Tom Reed tailing dump. The tailing dump contains approximately 1,300,000 tons of tailings which samplings indicate contain an average of \$2.68 worth of gold and silver per ton. This average value was determined from 200 samples recently taken by others. We will of course spot-sample to verify these values.

According to a preliminary survey made by the Infilco Corporation and Techmanix Corporation in 1960, the accompanying schedule of mill costs and processing economics (tailings) would be applicable. I have modified their figures upward to our probable conditions and possible increased costs, raising the per ton cost of processing from the 62¢ they quoted, to an estimated 83¢.

May I direct your attention to the following points:

(1) The properties have previously been offered for \$400,000 cash or \$500,000 on an extended contract. The tailings dump alone has been offered for 10 percent of the mint returns received. We intend to negotiate both ways or a combination of lease on the tailings with extended option to buy the whole properties, subject to additional facts which we will obtain. In any event our offer, if the Board approves, will be on an option basis.

(2) Our preliminary figures are based on a purchase price of \$400,000. We probably could negotiate better interest rates on the whole package, including the mill costs, than we could by erecting the mill on mortgaged property.

(3) The erection of a 500-ton-per-day cyanide mill at an estimated cost of \$250,000, plus a property cost of \$400,000, equals an estimated proposed investment of \$650,000.

(4) I am proposing that we furnish \$90,000 and borrow the balance. This would require a loan of \$560,000 which we could amortize over a five-year period.

(5) The profitability of the mill could be greatly enhanced by pre-planning and incorporating a crushing and grinding (milling) unit for the purpose of processing ore from the various mines in the district. It is almost certain that the re-appearance of milling facilities in the historic Oatman region would revive mines such as the Oatman Queen, the Leland, the King Midas and the Triumph. These and possibly others would become customers for our mill as soon as they began operating.

(6) A 125-ton-per-day crushing and milling unit could be operated in conjunction with the 500-ton cyanide plant with the addition of only three men working one shift per day. A custom milling charge of \$4.00 per ton could easily be obtained for custom milling. This would bring in additional revenue of \$500 per day in addition to absorbing the major cost of maintaining the assayer and his office. Custom milling would extend the life of the present visible amount in the tailing dump. This addition could be constructed at a later date, after operating costs of the cyanide mill were accurately determined. It is estimated that such an addition would cost approximately \$50,000.

Several factors make this a very attractive business venture at the present time. The price of silver -- which on November 28, 1961, was 91 $\frac{1}{2}$ ¢ per ounce -- is now \$1.10 per ounce, and the price is expected to rise further. At the same time, the greatest upward pressure that we have seen in almost three decades is being exerted upon the price of gold. A rise in the price of gold could make the present Tom Reed Mine again a profitable mining operation. The Tom Reed produced \$20,000,000 in gold and silver before it was closed down by President Roosevelt's closing order at the beginning of World War II which put the American gold mining industry in moth balls. Thousands of tons of ore reputedly averaging \$22 per ton at the present price are blocked out on five levels of the mine. All levels are presently under water. Tom Reed could be an excellent producing mine if the price of gold rises even a few dollars per ounce, or if the pressure on the government to subsidize the American gold mining industry should be successful.

Gold mining is an excellent recession industry because the present price of gold, which was fixed at the 1935 level, will not go down. To the contrary, it probably will go up. In addition, there is a 15 percent depletion allowance for mines which, with the mill depreciation, makes it possible to recoup our entire investment plus \$117,000 of tax-free income.

It is the opinion of your president that these probabilities and peculiar circumstances affecting gold today, as well as the soundness of the Sawyer properties, would make this venture an extremely profitable one.

Note that provision is made for salaries for all officers of Americana Investments.

If we proceed with the project, it is imperative that the accompanying information be treated as **STRICTLY CONFIDENTIAL** throughout the negotiating period and until an actual agreement is consummated.

Respectfully submitted,


Leland M. Wiscombe
President

LME/jj

TOM REED MINE

Gold Tailings Recovery Project

(Preliminary Figures)

Location: Tom Reed Mine, Oatman, Arizona

OWNERSHIP: Sawyer Petroleum Company (100%)

Material to Be Worked: 1,300,000 tons of tailings located on Company's patented claims. Tailings are stacked 20 feet to 60 feet high.

VALUES: 200 samples average \$2.68 per ton in gold and silver.

Required for Treatment: Water -- Company owned (existent)
Electricity -- Company distributed (existent)
Process Plant -- Build and Equip
Labor -- Company employed

Process Plant: Simultaneous counter current cyanide leach ion exchange plant. Infilco basic design modified by Techmanix. Capacity, 500 tons per day. The 1,300,000 tons of tailings would supply a 6½-year operation.

Technical supervision on installation: Techmanix Corporation
or Infilco Corporation

TOTAL INSTALLED FACILITY COSTS:

Pre-plant investigation	\$ 5,000
Basic plant costs	175,000
Auxiliaries (cyclones (pumps (screens, etc.	20,000
Material handling equipment	25,000
Installation and start-up costs including technical supervision	20,000
20-ton pilot plant	4,000
	<hr/>
TOTAL COST ESTIMATE	\$ 249,000

ESTIMATED OPERATING COSTS

(500 tons per day basis)

Costs per ton of material treated:

Labor	\$.31
Handling equipment	.04
Electricity	.05
Water (pumping)	
Collector resin	.10
Chemicals	
(cyanide	
(soda ash	.25
Reduction to bullion	
from resin and	
shipping costs	.05
Assay control	.05
	<hr/>
TOTAL COST PER TON	\$.85

Recovery Factor: 99% of contained gold and silver

Royalty: 2% mint returns to Infilco-Techmanix for
process design

Total tons to process: 1,300,000 (200,000 per year
for 6½ years)

NOTE: The United Eastern tailings dump containing an estimated
750,000 tons is in the area and might be obtained for
processing.

PROJECTED PROFIT AND LOSS STATEMENT (Est.)

	<u>200,000 Tons (Per Year)</u>		<u>1,300,000 Tons (6$\frac{1}{2}$ Years)</u>	
Gross receipts based on \$2.68 per ton with 99% recovery		\$ 530,064		\$ 3,444,916
Operating Costs	166,000		1,079,000	
2% Royalty	10,601		68,898	
Property Taxes	6,071		42,500	
Interest Expense	12,803		89,620	
Overhead Expense 10%	53,006	<u>248,481</u>	<u>344,492</u>	<u>1,624,510</u>
Net before Depreciation & Depletion		\$ 281,583		\$ 1,820,406
Depreciation 90% -- 7 Years	32,014		224,100	
Depletion 15%	79,510	<u>111,524</u>	<u>516,737</u>	<u>740,837</u>
Net before Income Taxes		\$ 170,059		\$ 1,079,569
Federal Income Taxes	82,930	<u>82,930</u>	<u>513,231</u>	<u>512,231</u>
NET PROFIT		\$ 87,129		\$ 566,338

OPERATING RETURN: 16.44%

RETURN ON \$100,000 INVESTMENT PER YEAR: 87.13%

ANNUAL CASH FLOW FIRST FIVE YEARS:	Net profit after taxes	\$ 87,129
	Add back depletion allowance and depreciation	<u>111,524</u>
	TOTAL	\$ 198,653
	Less principal payments 5-year loan @ 6%	<u>129,924</u>
		\$ 68,729
ANNUAL CASH FLOW AFTER LOAN RETIREMENT:		\$ 198,653

March 20, 1939

Mr. Jarpe

Board of Directors,
Tom Reed Gold Mines Co.,
512 Security Building,
Pasadena, California.

Gentlemen:

Re: Treatment of Ben Harrison Tailings.

We are enclosing Mr. Jarpe's data pertaining to the treatment of Ben Harrison Tailings with two proposals for your advice and instruction.

First, may I state that Mr. Jarpe went to Cananea, and the writer paid a visit to Yellow Aster operations; here they are handling 600 and 1000 tons per day, respectively, of tailings from ponds similar to our situation or set-up.

Costs and estimations have been prepared from actual quotations, and figures have been derived from years of operations at the plant in treating ores and from the actual treatment of more than 1000 tons of these tailings in our mill. They are, we believe, carefully computed, are direct costs only and are conservative. You will note details from Mr. Jarpe's letter; I will try to confine myself more to generalities.

During the past few weeks I have made a number of separated statements regarding these tailings. These statements were much in the way of advance information, arrived at without detailed information, but for all practical purposes and for rough calculations were nevertheless fairly accurate. To get this all before you at one time, we ask that you bear with a repetition of these statements.

(a) There are approximately 250,000 to 300,000 tons of valuable tailings. These valuable tailings, unfortunately, are covered by worthless tails to the extent of 2 to 1. That is, two tons of worthless to one ton of valuable material.

(b) From all calculations, but without actually drilling the ponds, they will assay \$2.45 to \$2.50 per ton.

(c) Bullion recovery from small scale tests and from actual treatment of 1000 tons returned \$2.00 per ton.

(d) There should be very nearly, a few cents more or a few cents less, \$1.00 per ton profit in this material if handled with a fair degree of efficiency.

(e) Our mill, with small additional equipment, when handling tailings alone, will treat 250 to 300 tons per day, 7500 to 9000 tons per month or 90,000 to 100,000 tons per year.

(f) Profits then should accrue at the rate of \$250.00 to \$300.00 per day, \$7500.00 to \$9000.00 per month or \$90,000.00 to \$100,000.00 per year if the plant is run to full capacity on tailings alone.

(g) To increase the tonnage to the point where profits would come in faster or in larger amounts per time period would necessitate a large capital outlay and would not in our opinion be warranted.

(h) There are other tailings besides our own in the district that indicate some possibilities of profits. One is the United Eastern pond with some 750,000 tons having a value of \$1.50 per ton. We believe that with experience gained from treating our own material it may not be beyond the realm of possibilities to work out something in the way of profits on such other materials.

(i) The quantity of tailings possible to treat per period of time is flexible; we can treat all tailings, or continue taking custom ore, our own ores filling in with tailings to make a full mill load.

(j) If the mill is closed for a considerable period our old equipment will deteriorate quickly. Hardly ten cents on the dollar could be realized. The mill is situated handily not only for treating our own but other tailings.

RESUME OF MR. JARPE'S COSTS

(Please note his letter on this subject)

At arriving at the ratio of stripping to valuable tails an actual and accurate survey was made of the ponds by our engineer and careful calculations of worthless tails to valuable tails gave a ratio of 2 to 1. Fortunately, at the lower end of the pond 50,000 tons of valuable tails are covered at the ratio of only 1 to 1. This 50,000 tons would be treated first and it is upon this ratio of 1 to 1 that the following calculations are based. As we would work to the north on the ponds the ratio of stripping increases, in some places being as high as 3 to 1, but with an average of 2 to 1 for the whole.

COST OF TREATMENT - Ratio 1 to 1:

Stripping of Overburden	\$.10
Slushing valuable tailings to pump		.06
Trucking to Mill		.10
		<hr/>
Total Cost of getting tails to mill	\$.26
Milling at rate of 300 tons per day		.80
		<hr/>
Total Cost	\$	1.06
Total profit per ton on \$2.00 bullion recovery	\$.94

Or, speaking in generalities, \$1.00 per ton.

Mr. Jarpe's estimate of the capital necessary to equip to handle tailings at the rate of 300 tons per day, is as follows:

MILL EQUIPMENT:

12' Bowl Classifier	\$2700.00
3" Wilfley Pump - without motor (have motor here)	350.00
Installation	250.00
	<hr/>
Total	\$3300.00

TAILING HANDLING EQUIPMENT:

Cananea Slide (See photos)	\$ 600.00
Sullivan 3 drum slusher hoist - 50 HP	2600.00
Installation	300.00
	<hr/>
Total	\$3500.00

TAILING PUMPING PLANT:

3" Wilfley pump (have motor here)	\$ 350.00
3" Double pipe line and Small Trommel	1850.00
Installation	300.00
	<hr/>
Total	\$2500.00

RECAPITULATION:

Classifier or milling equipment	\$3300.00
Slusher Hoist equipment-material handling	3500.00
Pumping Plant for pumping tails from ponds to mill	2500.00
	<hr/>
Total	\$9300.00

PROPOSALS OR PLANS:

(1) Calling for investment of \$9300.00

This would allow for slushing tails to pumping plant, erection of classifier in mill, a small scrubber or trommel, laying of double 3" pipe lines from pumping plant to mill, etc.

This is the kind of equipment used by the Anaconda Copper Corp., at their Cananea Unit, only that they use trucks instead of pumping. At Yellow Aster they use a pumping unit instead of trucks. Operating costs are a little in favor of pumping.

Cost per ton of getting material to mill by use of this type of equipment - per ton \$.26
- - - - -

(2) Calling for investment of \$4300.00

Classifier Installation	\$3300.00
Feeder, Scrubber and Small bin	1000.00
	<u>\$4300.00</u>

Mr. Roy Dunton has submitted the following based on handling approximately 200 tons per day. The Company directing and having the privilege of stopping the contract at any time.

Stripping	\$.07 $\frac{1}{2}$	per ton
Shoveling and Trucking valuable tails to mill		.22 $\frac{1}{2}$	" "
		<hr/>	
Total	\$.30	" "

This compared with our estimate based on Anaconda and Yellow Aster data, i.e., \$.30 (Dunton's) less \$.26 (Anaconda's) or four cents higher. If calculations are correct Dunton would be making a four cent profit and we would save a capital investment of some \$5000.00
- - - - -

My reaction, particularly now that we are rather short on cash due to having to tie up \$45,000.00 in bonds for the Brady Appeal, is to accept No.2 proposal or plan. On such a plan we would be called to invest at the most \$4300.00. We have estimated \$1000.00 for feeder, scrubber, bin and short pipe line to classifier for this set-up. This is new equipment and a high figure. By purchasing a second hand feeder and building the scrubber we believe this item would be reduced to less than \$500.00 All this could later be used

on the Cananea Slide. Installation of the classifier would be quickly accomplished and we would be only a short time in getting started on the treatment of this kind of material. After treating say 25,000 or 30,000 tons our experience would be better and we would know a great deal more about the whole affair. Later we could handle the material ourselves after realization of some profits and better experience or continue along as we were with contracting. (I might add here that Anaconda is handling their own material and Yellow Aster is contracting.

It is my suggestion that Mr. Howard be personally contacted as to his reactions regarding this matter and we be instructed out here just how the Board takes to this whole matter of tailing treatment.

We feel that our estimates of both costs of operations and cost of equipment are conservative and that actual operations will prove that \$1.00 per ton in profits will be realized.

Any suggestions or criticisms on the part of the Board will be appreciated.

Very truly yours,


W. B. Phelps

WBP:F

March 20, 1939

Mr. W. B. Phelps,
Consulting Engineer,
Tom Reed Gold Mines Co.,
512 Security Building,
Pasadena, California.

Dear Sir:

Practically all of the information has been compiled in regard to installations contemplated for the recovery of the old Ben Harrison tailings. Some of it is guess-work but on the whole may be accepted as quite accurate.

The first subject to consider is a 12' Bowl Classifier. As you know, in handling these tailings the product that is fine enough in them will not be ground but will be removed and sent directly to the treatment plant. Our present classifiers are not adequate to do this although they are satisfactory for handling ore where the physical state of the material is different. Of course, they are large enough to handle lesser quantities but in that case there would not be enough sand returned to run a ball mill.

Various sources have quoted on this classifier. The choice has worked itself down to getting one from the Western Machinery Co., of Sacramento or from the Binco Corp., of Salt Lake City. Both machines will be satisfactory but that from the Western Machinery Co., is a much sturdier machine although it will cost about \$200.00 more than that from the Binco Corp. Basing on the quotation from the Western Machinery Co., the classifier installation will cost \$3300.00 to put it in complete. This includes a Wilfley pump @ \$350.00 and the necessary accessories.

With this classifier we could make the fine separation that is needed to effect a good recovery on these tailings. It could be used alone when milling tailings and while milling ore it could be used in conjunction with our present secondary classifiers if it does not prove itself adequate to rake the sand load. The present intermediate classifiers would be removed for the Bowl Classifier to replace them.

The foregoing takes care of the necessary requirements for the mill.

For the actual handling of the tailings several alternatives have been considered. The most promising, if it is to be an operation that is to be run on company account, is to use a Power Drag Scraper. Photographs are enclosed depicting how this is done at Cananea, Sonora, Mexico. It would be entirely applicable to our project. A rough sketch is also enclosed showing how this would be managed.

It would be well at this point to consider briefly what it is intended to accomplish and the physical obstacles in our path. As almost everybody connected with the Tom Reed Gold Mines Co., knows, the tailings being considered were placed in their present location during the years 1910-1915 inclusive. It is estimated from our own surveys and corroborated by the annual reports for the aforementioned years that there are approximately 250,000 tons of these tailings. The reports for those years does not say what the value per ton of these tailings was. The reports merely stated what the recoveries were. The recoveries were not so bad when it is considered that the type of equipment they worked with was not very good in the light of present day knowledge. However, with the technical improvements in milling machinery since those days and with a price of gold 60% higher than at that time these tailings can now be handled at a good profit. Preliminary information, though it may be considered not altogether complete, is convincing enough to instill a firm belief that the value of these tailings is not less than \$2.45 per ton, or 0.07 oz. of gold per ton. On the original ore, which contained about 1.00 oz. of gold per ton, this would represent a recovery of 93.00%. This recovery is, indeed, not bad considering what they had to work with. However, the writer believes that \$2.00 of this \$2.45 can be extracted in the form of bullion. His belief is substantiated by the fact that over 1000 tons of these tailings have all ready been treated with a recovery of about 80% of their values.

Unfortunately for a very convenient situation, these tailings are overlain with an accumulation of later day tailings in the ratio of approximately 2 tons of overlying tailings (too low in value to treat) to 1 ton of the valuable tailings. The overlying tailings contain about 60% per ton in gold. Of the entire amount of 250,000 tons of commercially valuable tailings there are about 50,000 tons covered over with worthless tailings where the ratio of 1:1. That is, there are only 50,000 tons to remove to expose 50,000 tons of valuable tails.

To treat those 50,000 tons the direct cost would be as follows:

Stripping of overburden	\$.10 per ton
Slushing of valuable tailings to a site from which they could be hauled to the mill	.06 " "
Trucking (with our own truck)	.10 " "
Milling (@ rate of 300 tons per day)	.80 " "
Total Cost (@ rate of 300 tons per day)	\$ 1.06 " "
Total Profit from the \$2.00 recovered in bullion	\$.94 " "

Since the writer is not familiar with anything but the direct costs he is considering that only. He realizes that other costs must be added. However, the profit is still a substantial one after taking everything into account.

Trucking is mentioned mainly because the photographs of the Cananea operation show their job being done in that manner. But it is not, by any means, the cheapest means of handling them after the scraper has discharged them. Probably the cheapest method is to pump them.

Pumping is attractive mainly from the angle of its low cost. But it is admitted that it has drawbacks which need not be mentioned here. Suffice to say that it entails the installation of a somewhat large plant on the tailings dump which might be unwieldy to move about as it would have to be moved with a Power Drag Scraper installation. The cost of such a plant would be about \$2500.00 and the direct cost of pumping would be \$.05 per ton as against a very low figure of \$.10 per ton for trucking. The writer is not entirely conversant with trucking costs but for the distance we consider and the condition of the terrain he believes that \$.10 is very close. This is based on owning our own truck as no contractor would tackle it at that figure on our small tonnage.

Mr. N. N. Dunton has bid for the job and quotes a price of \$.10 per yard (about \$.07½ per ton) for removing overburden plus a price of \$.22½ for hauling to the mill. He requires a minimum delivery of 200 tons per day. Rather than put out a large sum of money on putting in our own equipment it is the writer's belief that this is the best means to employ for the first 50,000 tons at least. He would use a Diesel tractor equipped with a bull-dozer for stripping and would use a small shovel and trucks to get them to the mill. The equipment for handling them after they got to the mill would cost, installed, about \$1000.00. It consists of small bin, scrubber, trommel and a pipe line to the storage tank.

As to the cost of a Power Drag Scraper, we have a quotation from the Sullivan Machinery Co., who have long specialized in this type of material handling equipment for both surface and underground work. Their price is \$2600.00 F.O.B. Kingman for a hoist, sheaves, 50 HP motor and the starting equipment. No cable is mentioned but we have plenty of that around here that is good enough for slushing. The hoist is a 3 drum machine of great flexibility. It would strip overburden and reclaim valuable tailings without changing the set-up. The scraper that goes with it is made by the Alloy Steel and Metals Co. It has a capacity of 36 cu.ft. The price is about \$250.00.

The cost of making such a slide as shown in the picture would be about \$600.00. If a pumping plant were placed on it the cost would be a little higher.

To summarize:

Item 1.

Classifier Installation	\$ 3300.00
Hoist, scraper and slide	6500.00
Pumping plant	2500.00
Total	<u>\$ 9300.00</u>

Item 11. Contracting Stripping & Hauling
Classifier installation
scrubber, trommell, etc., at mill
Total

\$ 3300.00
1000.00
\$ 4300.00

The foregoing seems to cover everything of importance. No personal recommendations are mentioned as being especially favorable or otherwise to the writer. He is mainly interested in arriving at the most efficient method and the one that will most quickly produce results. Contracting a large part of the job will relieve the company of a large part of the responsibility and will be entirely satisfactory if the company is permitted a complete supervision of the most important details.

On the other hand an operation completely on company account would be equally satisfactory, although the initial expenditure would be about twice as high. However, the salvage value of the equipment would be of considerable value.

Thanking you very much for your kind attention and with the most sincere of personal regards, I am,

Very truly yours,

G. E. Jarpe

G. E. Jarpe, Mill Supt.

March 7, 1938

Board of Directors,
Ton Reed Gold Mines Co.,
512 Security Building,
Pasadena, California.

Gentlemen:

There is very little of importance in regard to the mine to report.

The principal piece of development work being carried on at this writing is in the Big Jim. This consists in getting under the so called Shaft Ore Body with our 1100 foot level. Between the East Ore Body and the Shaft Ore Body there exists a barren space of unknown length. It is on this barren material we have been driving the 1100 for the past weeks. It is just a job that has to be done to develop the second, or Shaft Ore Body. So nothing of very much interest has come to hand in the last two or three weeks. Yesterday the face of the 1100 assayed \$3.50 which may indicate we are nearing the ore chute. We are possibly some 20 or 30 feet from a point plotted downward from the 600 level where we should expect the ore chute to appear on the 1100.

I sent Mr. Jarpe, our Mill Superintendent, to Cananea to watch for a day or two the operation of handling, sampling and milling some 600 tons per day of mill tailings by the Anaconda Copper Co. We have been attracted by reports of the low cost obtained at this property by use of a three drum slusher hoist in handling old tailings. Also, their method of moving the material through the mill bins. You will recall that one of the first obstacles we ran into in handling our material was that it has an earthy dampness so that it will pack in bins and no feeder we know of will move it without a lot of poking by an attendant.

Also, another obstacle encountered was that as most of these tailings have been previously ground to some 50 to 60 percent minus 200 mesh our old classifiers (purchased about 1910 to 1915) do not have sufficient settling capacity. We have been corresponding with a number of second hand or rebuilt machinery houses regarding a bowl classifier. Replies have been coming in and when collected we will make you a schedule showing estimated costs of installation, cost of operations and profits to be expected.

Board of Directors -

At the present writing rough estimates show that there are some 250,000 to 300,000 tons that should yield about \$1.00 per ton in profits. That our capacity to treat this material will be about 90,000 tons per year when treating nothing but tailings. In other words, \$90,000 per year should be the yearly payoff if what we have estimated above is correct. We do not intend to treat only tailings, but plan to treat as much mine ore as possible and fill in with tailings to make up a full mill load. That is how we see the setup at present and as mentioned a number of times previously will make up later a schedule of the best estimates we can possibly arrive at. We want to go slow on this and get definite figures as the profits are small and a small mistake could be disastrous to the scheme.

We would appreciate any comments. If the profits per year are not large enough to be of interest, it would take quite large outlays of capital to increase the tonnage or do the job in a shorter time. While we have not spent much money on this scheme so far, we are devoting considerable time and effort to it. Therefore, comments by the Board would be appreciated. In other words, if you do not think the efforts are worth the profits possible, a word from you would set us aright and possibly save time and a little money.

As you possibly know, Mr. Gus George had two strokes of paralysis all within a duration of some ten days or two weeks. Mr. Swinge corresponded with the Pasadena office, so feel that you must know the full details.

Very truly yours,

TOM HINNED GOLD MINES CO.,


W. B. Phelps

WBP:R

TOM REED GOLD MINES COMPANY

MINE OFFICE
OATMAN, ARIZONA

April 20, 1936.

METALLURGICAL REPORT FOR FISCAL YEAR ENDING MARCH 31, 1936.

Mr. Jack Zwinge, Supt.
Tom Reed Gold Mines Co.
Oatman, Ariz.

Sir;

During the past year the mill was operated a total of 309 days. The following is a summary of accomplishments in the milling department, in addition to routine operation and repairs.

April 21st. Completed structural and mechanical repairs on the inclined mill conveyor belt.

May 17th. Merrick weightometer placed in commission, enabling us to weigh all ore entering the mill.

June 9th. Started dismantling the stamps in preparation for installation of a new ball mill and classifier unit.

July 1st. Ceased grinding and started mill clean-up, due to strike conditions.

July 15th. Completed mill clean-up and prepared mill for an indefinite shut-down.

Aug. 9th. The strike being called off, general repairs, in and about the mill were started.

Aug. 26th. Resumed milling operations after a 56 day shut-down.

Sept. 22nd. Completed facilities for more adequate tailing disposal.

Oct. 6th. Conditional settlements on silver were agreed on, subject to tonnage, grade, and results of small scale test work.

Oct. 13th. Completed pouring of foundations and floors for the new mill unit.

Dec. 15th. Installed spare shaft in Traylor crusher. This spare item of equipment insures better control of the crusher product.

Dec. 29th. Completed installation of new launders and pulp distributing system between the primary and secondary grinding circuits. #1 mill bin was also prepared for ore storage over the new or #1 ball mill.

Feb. 13th. Tuned up the new mill unit and stepped tonnage rate up to 250 tons daily.

Feb. 23rd. Tonnage rate stepped up to 270 tons.

Mar. 8th. Tonnage rate stepped up to 290 tons, which appeared to be about the settling capacity of the primary thickener. The recovery of precious metals will be somewhat lowered at this rate, due to short time contact. We have about 48 hours agitation at 300 ton rate.

Mar. 20th. #2 mill bin feeder rebuilt for purpose of feeding to #1 mill. This gives us approximately equal storage over each primary mill.

Mar. 21st. Laboratory experiments resulted in adoption of an especially prepared solution of caustic starch, for the purpose of better flocculating slime in the thickeners.

Respectfully submitted,

Paris V. Brough

Mill Supt.

**SUMMARY OF ORES MILLED DURING THE FISCAL YEAR OF
1935. TONNAGES ONLY.**

	Ben Harrison.	Black Eagle.	United American Lease.	Tom Reed Lease.	Outside Custom.	Pasadena Dump.
April	393.40	1006.41	748.71	886.98	3168.92	
May	789.02	1574.85	858.75	863.50	2372.07	
June	771.55	2156.78		1061.46	1862.55	
July		Mill closed down.				
August	297.78			302.24	606.87	
September	713.44	225.47	699.14	2079.20	2434.49	32.55
October	555.78	404.95	607.09	769.54	4747.06	
November	783.85	537.77	679.18	1399.45	3033.88	
December	473.91	342.18	492.09	818.91	4135.07	
January	444.83	762.79	364.77	1025.48	4234.01	
February	767.02	1621.84	98.00	1087.93	3627.78	
March	1151.49	2436.54	205.48	896.59	4292.46	
Totals	7142.07	11069.58	4753.21	11191.28	34515.16	32.55

GROSS VALUE OF ORES BY MONTHS.*

	Ben Harrison.	Black Eagle.	United American Lease.	Tom Reed Lease.	Outside Custom.	Pasadena Dump.
April	\$5266.90	\$13009.72	\$5857.86	\$18196.93	\$41219.99	
May	3878.30	10266.51	8429.61	19081.59	31751.94	
June	6710.05	18565.46		15301.90	33562.45	
July		Mill closed down.				
August	3909.73			7413.33	10209.19	
September	6681.03**	2311.34**	4821.33	34722.43	34426.46	\$150.23
October	5426.18	3218.97	5521.83	12172.91	56117.19	
November	8920.68	5385.23	6387.12	21242.03	37441.39	
December	4204.56	3708.49	4125.35	16340.12	57420.70	
January	5307.41	7761.91	2811.85	15183.87	59665.75	
February	2795.38	4520.42	599.76	15984.18	61553.13	
March	17825.59***	25220.99***	1625.93	11754.51	60884.33	
Totals	\$70925.81	\$93968.84	\$40180.64	\$187393.80	\$484252.52	\$150.23
Averages	\$9.93	\$8.48	\$8.45	\$16.74	\$14.03	\$4.61

* Values include silver on Ben Harrison and Black Eagle ores, at ratio of 1 oz Ag. to 1 oz Au.

** Adjusted to smelter returns on slag lot #13 and sand lot #14.

*** Adjusted to smelter returns on slag lots #15 and #16.

Excess silver recovered and credited to
Miscellaneous milling income. \$16165.56

MILL PRODUCTION REPORT FOR FISCAL YEAR OF 1935.

Total dry tons received and crushed. 68610.96
 Total dry tons milled. 68610.96

	Milled.	Gross Value.		Tailing Value.*		Tons Solution	Bullion Marketed.	
	Tons.	Au.	Ag.	Au.	Ag.	Precipitated.	Au.	Ag.
April	6204.42	\$83332.84	\$4039.45	\$3972.30	\$1503.64	21361	\$79360.54	\$2535.81
May	6458.19	73207.08	4081.17	4254.74	1738.05	22167	68952.34	2343.12
June	5852.34	73776.89	3602.96	4096.37	1338.80	20825	69580.52	2264.16
July		Mill Closed Down.						
August	1115.00	19891.60	**	**	**	**	**	**
September	6184.29	86974.39	2079.17	4439.15	847.99	19542	82535.24	1231.18
October	7084.42	79408.25	4172.41	4462.89	2036.92	20965	74945.36	2135.49
November	6434.13	79066.27	3223.05	4538.46	1128.89	21367	74527.81	2094.16
December	6262.16	83305.76	4456.52	4329.84	1474.38	21005	78975.92	2982.14
January	6831.88	88882.08	3931.14	4588.18	1257.96	21977	84293.90	2673.18
February	7201.57	82541.91	5748.80	5746.38	2937.56	21078	76795.53	2811.24
March	8982.56	114463.36	5009.80	5900.15	1715.76	22967	101176.70	2989.12
Totals	68610.96	\$864850.43	\$40344.47	\$46328.46	\$15979.95	213254	\$791243.86	\$24059.60
Slag Lot #13			Period.	Feb. 1/35 to July 15/35.			1771.97	61.77
Slag " #14			"	Feb. 13/34 to July 30/35.			4688.76	72.44
Slag " #15			"	Sept. 1/35 to Feb. 1/36.			1480.17	66.54
Slag " #16			"	Feb. 1/36 to Mar. 1/36.			5906.34	238.38
Totals							\$805091.10	\$24498.73

Average mill heads. Au. \$12.605 Ag. \$0.588 Total \$13.193
 Average mill tailing. " 0.675 " 0.232 " 0.907
 Average recovery. " 94.65% " 60.55% " 93.13%
 Milled tonnage per operating day. 222.04 Per operating hour. 9.25
 Average milling cost per ton. Direct \$1.704 Indirect Total

* Started compositing slime and solution tailing Jan. 1/35 for more accurate information based upon bullion plus tails.

** No record, as no tailing was discharged and no solution precipitated until Sept. 1/35. Indicated tied-up value. \$13430.87 in gold.

Respectfully submitted,

Paris V. Brough

Mill Supt.

