



CONTACT INFORMATION

Mining Records Curator
Arizona Geological Survey
1520 West Adams St.
Phoenix, AZ 85007
602-771-1601
<http://www.azgs.az.gov>
inquiries@azgs.az.gov

The following file is part of the

Arizona Department of Mines and Mineral Resources Mining Collection

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES FILE DATA

PRIMARY NAME: EL ORO

ALTERNATE NAMES:

COPPER AGE
BLOSSOM
GRAND BOY
GENERAL METALS

MOHAVE COUNTY MILS NUMBER: 122C

LOCATION: TOWNSHIP 23 N RANGE 18 W SECTION 11 QTR. NW
LATITUDE: N 35DEG 23MIN 40SEC LONGITUDE: W 114DEG 10MIN 39SEC
TOPO MAP NAME: CHLORIDE - 7.5 MIN

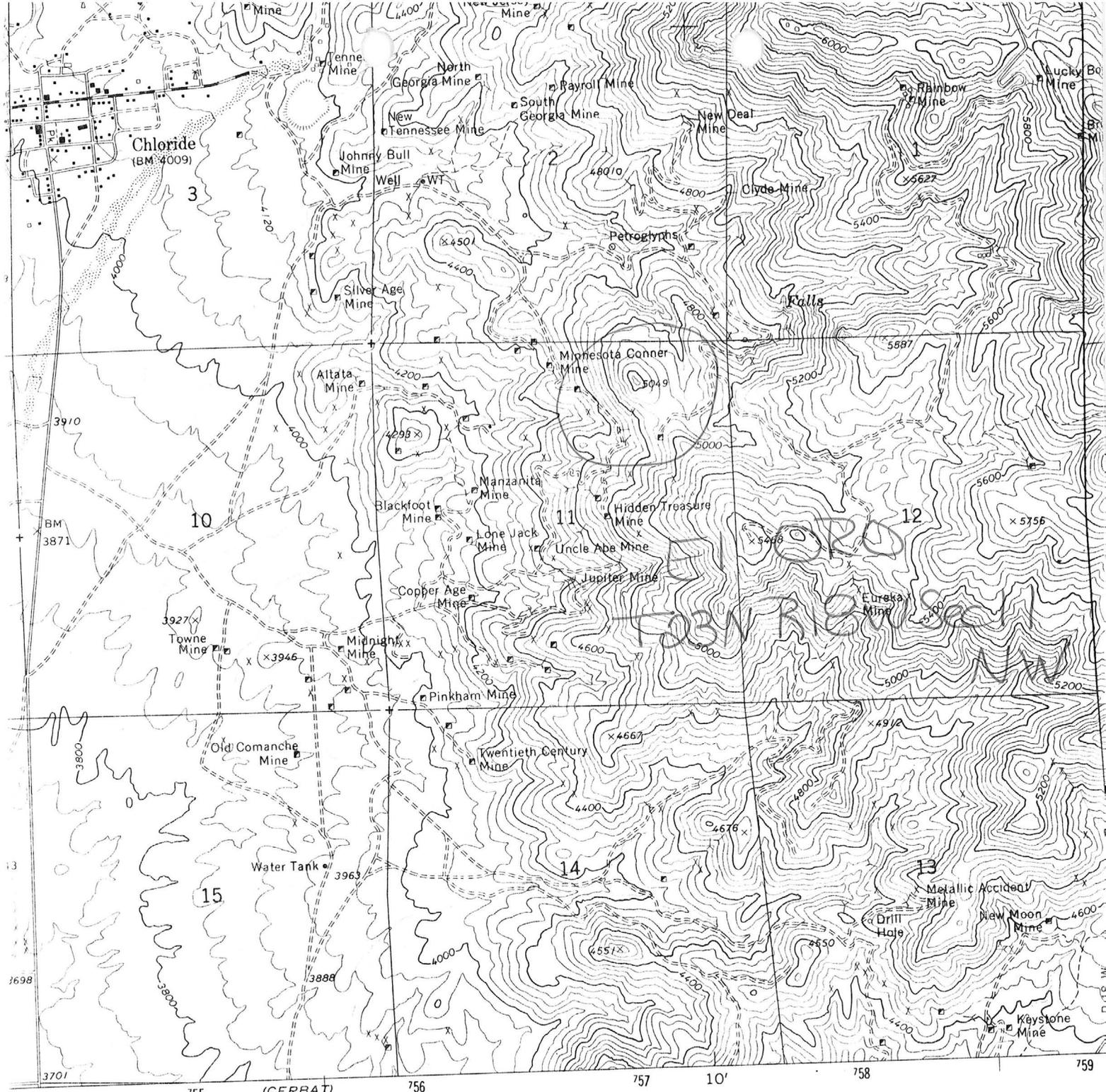
CURRENT STATUS: PAST PRODUCER

COMMODITY:

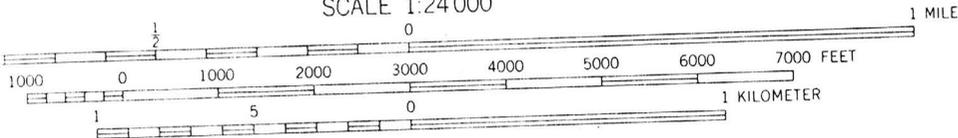
LEAD-PRIMARY
ZINC-PRIMARY
SILVER-COPRODUCT
GOLD-BYPRODUCT
ANTIMONY-BYPRODUCT
COPPER-BYPRODUCT

BIBLIOGRAPHY:

USGS CHLORIDE QUAD
ADMR MOHAVE CARD FILE
HAURY, P.S., USBM RI 4101, P. 43
ADMR MOHAVE CUSTOM MILL PROJ. CARD FILE
DINGS, M., USGS 978-E, P. 147
WEED, W., MINES HANDBOOK, VOL. XIV, P. 247
ADMR EL ORO MINE FILE
WEED, W., MINES HANDBOOK, VOL. XIII, P. 367-
368
MALACH, R., MOHAVE COUNTY MINES, 1977, P. 20
THOMAS, B.E., GEOL. OF THE CHLORIDE QUAD,
P. 406, ADMR GEOLOGY FILE
RABB, DAVID "RECOVERY OF METAL VALUES PRIOR TO RECLAMATION OF MINED
AREAS OF THE SOUTHWEST" (ADMMR GEOLOGY FILE)



(CERBAT)
3154 I SW
SCALE 1:24 000



CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL



QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D. C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

COPPER AGE

MOHAVE

I spent the morning with C.G. (Pat) Patterson at his home in Chloride, discussing mines and mine and mill dumps in the Cerbat Mt. Range. Pat owns the Copper Age mine (7 lode claims) located about $\frac{1}{2}$ mile northwest of the Pinkham mine. VBD WR 6/20/76

Fass, Doss and I drove to the Copper Age Mine. The dump there is a large one but contains very little mineralization. VBD WR 7/22/76

We drove to the Copper Age mine where we cut a sample from about 30 tons of ore mined about 1950. VBD WR 8/24/76

Rick Doss and I went underground at the Copper Age mine. The lower level is in good condition and can be sampled without unusual difficulty. VBD WR 9/21/76

George Fass, Mike Price and I started sampling the Copper Age mine between the Emerald Isle Mine and Chloride. VBD WR 10/20/76

We cut samples at the Copper Age mine. VBD WR 10/21/76

We continued sampling the Copper Age mine. VBD WR 10/22/76

Mike Price, George Fass and I continued cutting underground samples at the Copper Age Mine. VBD WR 10/25,26/76

We completed the sampling of the Copper Age Mine. VBD WR 10/27/76

KAP WR 2/13/81: Eldon Lee and Bill Bafflew of Archaean Mining, P.O. Box 104, Berthoud, Colorado 80513, reported that they are in the initial phase of starting up the Copper Age Mine, Mineral Park District, Mohave County. They plan start up of a mine/mill complex in the First Quarter of 1982, with a capital investment in the neighborhood of 4.2 Million Dollars. Plans include a selective flotation mill to handle 200-250 TPD. They have indicated 1.2 - 1.3 million tons of lead-silver-zinc ore. Typical assays are reported to be 17% lead, $6\frac{1}{2}$ tr.oz/ton silver, and 3-4% zinc. They plan to operate a small portable pilot mill until the mine/mill is completed. They are continuing to drill out and delineate the deposit. There is a possibility they might consider custom milling in the future. A visit should be made to the property.

RH

From "The Wallapai Project" by Mountain States Resource Development, Inc.
 Complete report in Tennessee-Schuylkill file.

Ore minerals are principally cerargyrite (silver), native gold, galena (lead) sphalerite (zinc), and chalcopyrite (copper). Some arsenopyrite occurs along with cerrusite and oxidized base metal minerals. One can consider this to be a typical "Rocky Mountain Lead, Zinc, Copper Ore."

In March 1977 Messers Dale and Rudy reported on their efforts to justify a custom mill for the small miners of Mohave County. They were funded by a government grant and did their work in conjunction with a number of governmental agencies. In the northern part of the district they report 256,700 tons of dump and tailing ore grading .018 to .103 oz/T gold, .66 to 6.63 oz/t silver, .03 to .16% copper, .13 to 1.79% lead and .50 to 3.56% zinc. They considered this to be proven ore.

It is interesting to note that this is only the northern part of the district and only includes materials that were easily accessible. Items like the buried table and jig tails at the Tennessee were not included.

H. Mason Coggin, a well known and respected mining engineer, evaluated the Copper Age group of claims in April, 1980. He measured many ore occurrences and interpreted a number of undeveloped one in the Copper Age group has a potential of 4.730 million tons averaging \$200/ton.

In the Hidden Treasure section of the property Mr. Coggin estimates .5 million tons of ore grading \$200/ton or better.

The Arizona Bureau of Mines lists the following known reserves in the Wallapai Mining District:

<u>Mine</u>	<u>Tons</u>	<u>% Cu</u>	<u>% Pb</u>	<u>% Zn</u>	<u>oz/T Au</u>	<u>oz/T Ag</u>
Banner	3841	.5	22.6	11.9	.21	7.4
	5000	.5	22.6	11.9	.21	7.4
Summit	25,000	.58	4.3	6.3	.066	4.5
	25,000	.58	4.3	6.3	.066	4.5
Golconda	40,000	.5	.5	14.0	.20	4.0
	40,000	.5	.5	14.0	.20	4.0
Fountain Head	1,250	.61	.65	16.4	.2	3.5
	3,750	.61	.65	16.4	.2	3.5
Detroit	1600	2.31	1.0	5.5	.01	7.2
	1600	2.31	1.0	5.5	.01	7.2
Wrigley	56,000	.1	9.0	.1	.1	.2
Tennessee	29,503	.1	4.1	8.2	.01	.2
	50,000	.1	4.1	8.2	.01	.2

Tennessee	100,000	.1	4.1	8.2	.01	.2
New Moon	11,000	.1	5.0	8.0	.05	7.5
	9,900	.1	5.0	8.0	.05	7.5
	10,000	.1	5.0	8.0	.05	7.5
Minnesota	900	.6	5.0	4.0	.01	.2
Lone Jack	2000	.19	5.51	4.66	.035	3.47
Copper Age	7,000	.1	3.6	7.3	.06	2.0
	7,000	.1	3.6	7.3	.06	2.0
Champion	570	.1	8.0	15.6	.26	10.0
	6,000	.1	8.0	15.6	.26	10.0
	6,000	.1	8.0	15.6	.26	10.0

While the above represent substantial exploration and are very conservative, especially since this is what their taxes are based upon, it is not fully conclusive. Mining costs, metallurgical techniques and markets must be developed. However these do show the substantial amounts of ore left in the mines.

Howard H. Heilman examined the Golconda Mine in great detail. He measured the reserves in numerous structures and defined those reserves as follows:

Virginia	350,000 tons
Tub	400,000
Little Jimmie	150,000
Peach Triangle	350,000
Golconda	300,000
Prosperity	80,000
Primrose	80,000
Blackfoot	90,000
	<u>1,800,000</u>

Mr. Heilman values these ores as follows:

Zinc	16%
Lead	.5%
Copper	.5%
Gold & Silver	\$120.00/T*

* Bases on \$300/oz gold and \$6.00/oz silver.

The whole emphasis that comes from the Golconda reports is that the mine was shut down when the fire occurred and once stopped was not restarted. The stopes that were in production are in approximately the same situation as when the mine closed.

Tonnages as indicated above were confirmed by H. G. Humes and The American Metal Company. Grades in their estimates ran higher in lead and copper and slightly lower in zinc.

Mr. Eldon Lee
9 Jun 82
Page 5

Dump samples on the Golconda were taken and measurements of tonnage were made. The measured tonnages are as follows:

Chats	15,000 tons
Lower Blackfoot	3,000
Middle Blackfoot	7,000
Upper Blackfoot	500
Prosperity	8,000
Tub	3,000
Silver	7,000
Tails	20,000
Golconda	30,000
	<u>93,500</u>

Of the dump ore, approximately 6,000 tons of it will not meet \$65/T gross metal value criteria leaving some 87,500 tons.

Samples taken by CEC have confirmed some of the grades quoted. The ongoing program of sampling each dump by complete trenching and then metallurgical testing the sampled material will accurately prove not only the tonnage and assay of each dump, but will also define what can be recovered from these dumps.

Metallurgically the ores in the Wallapai District are best treated by flotation. Recoveries as follows can be expected on ores that are freshly mined:

Lead and Silver	90-95%
Copper and Gold	85-90%
Zinc	75-85%

Ores that have been oxidized by weathering (e.g. dump ores) are also best treated by flotation unless the weathering is severe. One might expect a 5% reduction in recovery, but otherwise the treatment should be unaffected.

Gravity separation means can also be used on the Wallapai ores. Recoveries are lower, but oxidation has no effect. Some cases of highly oxidized ores yield higher recoveries than flotation, but these are not very important in the district.

Ores with high sulfides should never be treated by leaching techniques. This is a waste of time, money and resources.

The most important item in determining the best method of treatment is metallurgical testing. Ores, even ores from similar mines, must be tested and the parameters for optimum treatment established. A few dollars spent on professional metallurgical testing will save hundreds of thousands in the final analysis.

Summarizing one can state that dump ores and tailings in the district that will meet a \$65/T gross metal value are substantial. If the reports issued by competent personnel quoted herein are correct the tonnage is in excess of 300,000 tons. While CEC is

NAME: EL ORO (OLD NAME COPPER AGE) COUNTY: MOHAVE

2 miles S.E. Chloride

T23N R 18W SEC. 11 EL. 4180' DISTRICT: WALLAPAI CHLORIDE
CHLORIDE 7 1/2'
Mineralization: Zn Pb Cu, Sb, Ag

Geology:

Type Operation: 350' ²⁵⁰⁰ pln 2550 tunnel

Production: 6000 tons 1901-78, 3000 1982-89, 26610 Cu 24,575 lbs Pb

References: Mohave Co. Mineral P 20, Mohave Co. Minerals P 20

Mohave County Card File

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Copper Age ✓

Date Sept. 20, 1954

District Mineral Park - Mohave Co.

Engineer Mark Gemmill

Subject: Present Status

Mr. Fred Larsen ✓ who represents himself to be the present owner is trying to find means to finance some work on the property. It has been idle for several years.

LARSEN, FRED
Chloride, Ariz.

Mr. Larsen represents himself to be the present owner of the -

COPPER AGE MINE - Mineral Park Dist. 9-20-54
Mohave County.

See (El. Oro Mine - file)

Los Angeles. 13 Calif.

Aug. 22nd. 1950

Department of Mineral Resources,
Phoenix, Arizona.

Dear Mr. Dunning;

This is one of Arizona dormant mines, patented some 40 years ago, and ties into the Bisbee and Planet holdings, located in the Bill Williams Mining District, Yuma County, Arizona. It is about 21 miles from R.R.

In 1945 Phelps Dodge Corp. made a test run of the ore, that shows fair value in copper - SiO₂ - Aluminum - Gold and some Silver.

This property has 426 feet of tunnel and a 96 foot shaft. All equipment was taken off, years ago.

Have been thinking strongly of opening up, since Copper has come up to a working price.

If the above is in line with your program, I would appreciate your questionnaire.

The notice was in the August 18 Pay Dirt.

Very truly yours.

Wm. Hemleben
Wm. Hemleben

320 W. 5th. St.

11/23/50
1/20/51
1/20/51

Dear Mr. Dunning:-

I passed up opening the
Contract in 1944. As I was
offered the opening up of the
C.L. Q 10, near Chloride Ariz.
Started May 1st and finished Sept. 15-
1945. State records will show
my work. Tris + rails - water & air line
for 1500' cans under one, ready for
mining. This I turn over to the new
owners. on the above date
in the five months of operation with
as high as 10 men employed. had the
medical ever been call for service.

Sincerely,
Wm. H. Hinkle

COPPER AGE

Pb, Zn, Cu, Ag

Mohave

8 - 7

T 23 N, R 18 W

L. F. Coolidge, Greenwood, Calif.

'42

COOLIDGE, L. F.
Greenwood, Calif.

10-3-42

See COPPER AGE MINE, Mohave County
Re - report by Elgin Holt -- property owned by Coolidge

NAME OF MINE: ~~COPPER~~ AGE
OWNER:

COUNTY: Mohave
DISTRICT:
METALS: Cu, Au

OPERATOR AND ADDRESS

MINF STATUS

Date:

3/46

Robt. Morgan, Kingman

Date:

3/46

Shipping

NAME OF MINE: ~~TL~~ ORO
OWNER:

COUNTY: Mohave
DISTRICT: Chloride
METALS: Pb, Zn, Ag

OPERATOR AND ADDRESS

MINF STATUS

Date:

7/45

A. Dibert, Gen. Mgr., Chloride

10/45

Wm. Hemleben, Box 275

3/46

Robt. Morgan, Kingman

Date:

7/45

Shipping

HEMLEBEN, WILLIAM
320 W. 5th St.
Los Angeles 13, Calif.

'50

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine COPPER AGE MINE ✓

Date October 3, 1942.

District Mineral Park, Mohave Co.

Engineer Elgin B. Holt

Subject: PRODUCTION POSSIBILITY SURVEY

OWNER: L. F. Coolidge, Greenwood, Calif. ✓

METALS: Zinc, lead, copper, antimony and silver. ✓

LOCATION

The Copper Age group of seven claims is located around two miles S. E. of Chloride, Arizona. It was operated by a company over 30 years ago, and a large amount of development work was done. Also around 5,000 tons of ore were milled in a plant now dismantled.

DEVELOPMENT WORK

The group has been developed by a shaft 350 feet deep and by a tunnel 2,300 feet long on vein, starting from foot of hill and connecting with bottom of shaft 1,700 feet from tunnel portal. This tunnel follows a vein from 2.5 feet to 3 feet wide of sulphide ore of milling grade. Also, there are two levels on vein, which are run from shaft above the main tunnel level mentioned. The ground stands well and most of the mine workings are in fair condition; but the long tunnel would have to be cleaned out, timbered here and there and a new car track installed, before stoping of ore could start.

REPORTS, MAPS, ETC.

Mr. W. C. Babcock, Kingman, Arizona, has on file complete reports by reliable engineers concerning this property, including an assay map by George F. Coerner and a complete report by Oscar H. Hershey.

ORE RESERVES

The Copper Age property is a mine with considerable ore blocked out and plotted on the assay map referred to. As this ore consists of zincy complex sulphides, it could not be treated economically at the time it was developed due to the fact that there was no metallurgical process in use at that time whereby the various metals could be recovered. At the present time, this ore could be treated by selective flotation and two products could be made, to wit: A zinc concentrate which would be shipped to Amarilla, Texas; and a lead-silver concentrate, which would be marketed to the El Paso Smelting Works. In Hershey's report, he estimates 100,000 tons of ore blocked out in the mine, and discusses the assay values of same as follows: "A representative sample of sulphide ore, that will indicate the general character of the material that will make up the bulk of the ores developed, assayed: 0.02 ounce gold, 6.6 ounces silver, 2.1% lead, 0.10% copper, 4.7% zinc, 2.2% antimony, 24.5% iron, 16.8% silica, 26.8%

sulphur, 0.05% lime, and 1.0% manganese".

COMPARISON

Tennessee-Schuylkill mill heads for the entire year of 1941, averaged as follows: 0.071 ounce gold, 2.63 ounces silver, 5.44% lead, and 6.56% zinc. Hence, it will be noted that while Tennessee ore averages higher in lead and zinc, Copper Age Ore runs higher in silver. Also, as antimony is a strategic metal, I see no reason why the 2.2% of antimony in Copper Age ore cannot be isolated and recovered as a separate product by adding an antimony section to the proposed selective flotation plant. Again, it will be noted that the said 100,000 tons of ore are already blocked out, which considerable cost has already been met; so the only cost to be considered in removing this ore would be the cost of stoping the same.

TWO IDLE FLOTATION MILLS AVAILABLE

There are two idle flotation mills in the vicinity of the Copper Age mine, either one of which could be remodeled and used to treat ore from the said property. I refer to the Arizona-Magma mill, on the one hand, and the Keystone mill, on the other. The Arizona-Magma mill is a 75-ton bulk flotation plant, and the Keystone mill has a daily capacity of 125 tons, more or less. The latter is also a bulk flotation plant. Both mills are in splendid condition and either one can be purchased at a reasonable figure or rented. I am sure the Keystone mill can be rented, from what I have learned.

PROPOSED SET UP

Here is a splendid set up for anyone who can furnish operating money with which, first, to recondition the Copper Age mine at a probable cost of \$25,000, and with which to remodel say the Keystone mill to a selective flotation plant, with a capacity of 125 tons per day, at a cost of around \$15,000. Also, around \$25,000 new operating capital would be needed in order to cover all operating costs until returns would begin to come in from the smelters. Broadly, I would say that \$65,000 would be sufficient to put such a project on a paying basis. Also, once the Keystone mill could be put in operation, after it has been remodeled to a selective flotation plant, as outlined, other mines in this immediate neighborhood, with considerable zinc-lead ore reserves, could be taken over and put in shape at no great expense to produce additional ore for such a mill. One bet would be the Keystone mine itself, which has been worked profitably to the 400-foot level. Deeper work is needed at this property in order to block out new ore reserves. However, while the Copper Age mine could be put on a paying basis, as outlined, it might be well to consider a far more extensive project in this area and which would consist of taking in the Keystone mine, the Evahom mine, the Pinkham mine, the Pay Roll mine, the Hidden Treasure mine and other properties in this immediate neighborhood, all of which are large potential producers of zinc-lead-copper-gold-silver ores. The capital needs for an enlarged project like this would run anywhere from one million to a million five hundred thousand dollars, as I have already outlined in my report concerning the operations of the Davenport Mining & Reduction Company. Should

such an enlarged project be considered by anyone, then and in that event, I would recommend that the Keystone mill be remodeled, as set forth above, and used as a pilot mill, while new work is being carried out on the various properties mentioned. Such a pilot plant, which would consist of remodeling the Keystone mill as stated, could be put in successful operation within 90 days time, or less, after active work starts, with a view to carrying out this proposed project.

Elgin B. Holt.

COPPER AGE MINE

Owner: L. F. COOLIDGE
Address: Greenwood, California

NOTE: This mine is already developed by shaft and a long tunnel. It may be classed as a "near shipper".

LOCATION: The Copper Age group of 7 claims is located about two miles S.E. of Chloride, Mohave County, Arizona.

DEVELOPMENT WORK: The group has been developed by several shafts, from 20' to 350' deep and by a tunnel 2,300' long starting from foot of hill and connecting with bottom of main shaft 1,700' from tunnel portal. The said tunnel follows a 2' to 3' vein of low grade Cu, Ag, Au sulphide ore, the value of which is not available.

MILL: About 5,000 tons of ore were treated in a mill now dismantled.

POTENTIAL ORE: Probably 75 tons of milling ore could be produced from property if said ore should be found of commercial grade. This mine, however, is a copper property and would hardly fit in the picture of a property that could provide ore for a lead smelter.

E. B. Holt

Kingman, Arizona
September 9, 1939

Temporary Scanning Page Insert

File Name EL ORO

MILS Number 122C

Object Replaced:

Oversize Plate(s)
Number Stored in "Jacket" 3

Report Dividers:
Number if Appropriate _____

Photographs to Chief Engineer Office:
Number if Appropriate _____

Old Fragile Paper Document:
Document Dated _____

Other _____

Page Number _____

note

Report Date 1918

Pages were
Found to Be
In NO ORDER.

Pages Numbered
But not in
sequence
with
Content.

Scanned
3-2-06

NOTES
Reboard Date / d/18

Pages to go
Found to go
IN NO ORDER

Pages remaining

But not in

sequence

with

Content

N

EC ORD
122 C

2004
3-5-00

FIRST ANNUAL REPORT

Arizona Ore Reduction Company

General Metals Company

*Issued from the Office of the President
1002 Citizens National Bank Bldg.
Los Angeles, California
January 1st, 1918*

PHYSICAL AND FINANCIAL REPORT

ARIZONA ORE REDUCTION COMPANY

Organized Under the Laws of the State of Arizona.

Capitalized for \$750,000. Par Value One Dollar Per Share.

OFFICERS

R. M. MARTIN	- - - - -	President
GEORGE F. GOERNER	- -	Vice-President and Consulting Engineer
C. B. GUITTARD	- - - - -	Secretary
L. B. WOOD	- - - - -	Treasurer

DIRECTORS

R. M. MARTIN	L. B. WOOD
GEORGE F. GOERNER	W. C. FRY
C. B. GUITTARD	J. W. BROCKMAN
P. M. WALKINSHAW	

Los Angeles, Cal., Jan. 1st, 1918.

Mr. R. M. Martin, President,
Arizona Ore Reduction Company,
1002 Citizens Nat'l. Bank Bldg.
Los Angeles, Calif.

Dear Sir:

Pursuant to instructions from the board of directors, issued to me through you, you will find herewith report on the property controlled by this company.

I have endeavored to follow your suggestion to make this report as complete as possible in order that those interested in the company, living at a distance, may be furnished with full details in convenient form. I have also borne in mind that most of our stockholders are unfamiliar with technical mining, and have reduced the report to terms that will make it clear to that class of readers. Portions of it will necessarily be a repetition of previous reports, the new material being made up of changes that have taken place since those reports were issued.

The expectations of the company as to being upon a producing and paying basis long before this have not been realized. This, however, has been almost entirely the result of conditions brought about directly or indirectly, by a world-war rather than through any lack of diligence on the part of the company or to any shortcomings of the property itself. There has never been a time in the history of the mining industry when it has been more difficult to obtain prompt deliveries on iron and steel material, heavy machinery and supplies.

Fortunately operations have continued without interruption despite these setbacks, and a careful review of the following report will develop the fact that the progress made, in the way of ore reserves opened up, surface construction and equipment installed, have been accomplished upon a very small expenditure as mining operations usually go. And when we view the fact that this company has acquired an asset within less than two years of fully two million dollars worth of ore available on a development expenditure of less than one hundred thousand dollars, there is but little room left for criticism.

Very respectfully,

George F. Goerns.

Consulting Engineer.

GEOLOGY AND MINERALOGY

The district is distinctively eruptive insofar as its mineralized belt is concerned. The flats extending out from the foothills to and beyond the town of Chloride have had but little development and show no mineralization of consequence. It is within the eruptive belt that the important producing properties lie. The outcroppings are in most cases very prominent, standing up conspicuously above the common plain of the country.

The country formation must be assigned to the pre-Cambrian rocks, the granite, gneiss and schists predominating with an occasional intrusion of diabase and altered porphyry. Biotite is also abundant.

The principal veins throughout the district have a general strike from northwest to southeast, with a dip to the north that varies all the way from the vertical to 70 or 80 degrees.

The vein system on this particular group of claims consists of one parallel veins designated as the Blossom, Blossom No. 2, Gold Lead, Gold Lead No. 2, Bridle Trail, Zella, the Last Dollar, the Copper Age and the Grand Boy. Most of these veins may be traced for the entire length of the claims and give a total of 3,000 to 5,000 feet on each vein. Other veins may be traced for a few hundred to a couple of thousand feet each. At some points the veins will dip under the formation and the overburden is too heavy to follow them on the surface. Occasional branches from the veins form junction points at which the ore bodies attain unusual width and the ore of better than average grade. This has been proven particularly in the case of the Last Dollar vein, which intersects the Copper Age at about 300 feet east from the main working shaft. In the workings below, the ore body formed by this junction is fully six feet wide and of very good grade.

For a better understanding of the trend of this vein system, and the relation of one vein to the other, reference is made to Map No. One attached to this report.

Some slight faulting of the veins is here and there discernable. This does not, however, present any serious problems. The ore bodies hold a fairly true course and are easily followed.

The croppings consist of a brownish iron-stained, sheared and cemented quartz with a width on the surface of one to twenty feet. The ore streak will vary throughout the property from the surface to the lower workings, all the way from a few inches to six feet, with a safe average of two feet.

There are numerous shallow workings on the surface along these ledges. The work has in nearly all instances exposed ore of shipping or milling grade. The superficial character of this entire vein system

Extending the first and second levels on the Copper Age vein westward, and the first, second and third levels eastward.

Connecting the different levels by raises at every 150 feet, thus blocking the ore on four sides.

Sinking the main working shaft to 1,000 feet in depth.

Drifting in each direction at every 150 feet and connecting the different levels by raises as above.

The east drift, first level, is now in for a length of 391 feet from the shaft and is being driven at the rate of 150 feet per month. In another 200 feet the cross-cut tunnel will be started to intersect the six veins paralleling the Copper Age on the north, and drifting in each direction, sinking and raising will begin as soon as these connections are made. See Map No. One.

Barring setbacks and delays from unforeseen causes all of these veins will have been opened up by cross-cut within less than a year from the date of this report. That this work will prove up an almost inexhaustible supply of ore is well within the probabilities, and that a plant of a thousand tons capacity per day could be kept in operation for years to come is reasonably certain.

Up to the present time the ore extracted has been entirely from development. No stoping has been done and the reserves have been kept intact. Pursuing the plan of operations above outlined will keep the plant supplied with ore from development alone and furnish a heavy tonnage in advance of requirements. An improvement in the value, the volume and the general character of the ore on the more important veins and at the junction points may well be expected; while an increase in values with deeper workings may also be assumed from the history of the district in the case of properties that have reached a thousand feet or more in depth.

The mill is completed and will treat 250 tons of crude ore per day of twenty-four hours. Before this can be done, however, the pipeline from the company's water-right to the mill must be laid. A settling tank to hold 150,000 gallons of water must also be constructed at the mill. This, with the reservoir now in use, will give a tankage in excess of 300,000 gallons. This supply, augmented by the daily flow from the water-right and the two shafts, will provide sufficient water for all purposes.

The above improvements can probably be completed by February 15th. From that time on the mill should be in constant operation to its full capacity and on a producing and paying basis.

Respectfully submitted,

GEORGE F. GOERNER,
Consulting Engineer.

Los Angeles, Cal.,
January 1st, 1918.

DRAINAGE AND WATER SUPPLY

This entire locality is drained by the Colorado river and its tributaries. The distance from Chloride to the Colorado is about twenty-five miles and this river is the main source of water supply for this region. Numerous gulches extending from all directions to the river throughout the district carry more or less water during the rainy season and following the melting of mountain snows. But this supply is erratic and uncertain. Operating properties have usually depended upon the waters from springs and deep shafts for camp and milling purposes. The shortage of water has been one of the drawbacks to the district.

The main working shaft of this property at 366 feet depth has yielded at times thirty gallons of water per minute and the 275-foot shaft on the Grand Boy No. One claim as high as sixty gallons per minute. At other times the supply would not be one-tenth of this. During the present season the volume throughout the district has been less than normal and this company has been obliged to acquire additional water rights as a precaution against shortage in the future. This water consists of living springs located about two miles due east from the company's plant. It will require a pipeline of approximately 12,000 feet to convey the water to the mill and will give a fall of about 700 feet in that distance. This water is being developed in order to get the benefit of its full volume and the indications now are that the total supply from the water right, together with the flow from the two shafts will be sufficient for all purposes.

There will pass through the mill when running to full capacity of 250 tons per day, about 250,000 gallons, or 1,000 gallons per ton of ore handled. Of this quantity there will be pumped back for re-use about sixty-five percent, or 162,500 gallons. So that the actual daily new requirement is only 87,500 gallons and is well below the supply which appears to be available for a plant of the present capacity. It is more than likely that the two shafts will furnish an increased supply as greater depth is attained.

ACREAGE AND TITLE

The company's property consists of eleven claims with the following acreage:

The Copper Age.....	15.1	acres
The Blossom	20.	"
The Blossom No. 2.....	19.	"
The Grand Boy.....	15.	"
The Grand Boy No. 2.....	20.	"
The Zella	20.	"

Engine and compressor room built of corrugated iron roofing and siding.

Housing for main power plant consists of cement foundations and piers, heavy timber supports, corrugated iron siding and roofing; brick masonry for boiler housing.

Purchasing Agent's house in Chloride, built of frame, four rooms, bath and screen porch, completely furnished, water connections and electric lights.

- 5 Hardsocq machine drills.
- 2 Ingersoll machine drills.
- 2 Waugh valveless machine drills.
- 1 Power hack saw.
- 1 Power drill press.
- 4 two-ton side dumping mine cars.
- 5 half-ton end dumping mine cars.
- 1 Electric mine locomotive.

All necessary picks, shovels, single and double-jacks, tool steel, mine rails, light and heavy hardware and supply of staple lumber.

The tramway from the tunnel entrance to the dump is lighted by electricity, the electric wires being extended as the tunnel advances.

UNDERGROUND DEVELOPMENT

The greater part of the development has been on the Copper Age vein and this work will be set forth in detail. The other veins traversing the property have all shown favorable indications on such slight development as has been done. This consists of numerous pits, shallow shafts, open-cuts and trenches dug on the surface. Samples taken from the ore exposed in these workings have shown encouraging values. A comparison of these veins with the Copper Age vein, and a comparison of the general character of the ore, its values, the wall and ledge conditions, are strong evidences that the same results are likely to be met on further development as have been found on the Copper Age vein. In any event, these parallel veins offer as inviting a field for exploration as the Copper Age vein did at the time this company took possession.

The following description will be better understood by reference to Map No. Two, which will show the values encountered, together with the width of the ore shoot taken every ten feet.

The working shaft is located on the Copper Age vein about the center of the Copper Age claim. The shaft is sunk vertically on the vein to a depth of 366.63 feet and the ore proven continuous for the entire distance. This is a single compartment shaft from the collar to the first level and a double compartment shaft from that point to

pursued a slightly irregular course; so that at times the tunnel is in the ore and at other times alongside of it. A cross-cut has been made at 300 feet from its portal and in this cross-cut at 16 feet from the center of the tunnel the ore was encountered. At 400 feet from the portal a raise was made on a slight incline from the tunnel to the surface, a height of 95 feet in the ore. At 700 feet from the portal the ore has swung back into the tunnel and the same at 1,000 feet. At 900 feet a stringer of very good ore twelve inches wide crosses the tunnel.

The 213 feet westward from the shaft in the third level is all driven on the ore. The ore in this drift for the greater part will give an average of nearly two feet. (See Block E under the title of "Ore Reserves—Tonnage and Values"). There is nevertheless a decided improvement in volume at the face, where it is a strong three feet wide, and a drill driven through the ore about 20 feet back from the face showed it to be five feet in width at that point. The indications are that the same heavy ore shoot will be encountered a little farther to the west as was found in the upper levels.

This shoot has, therefore, been definitely proven in the third level for the entire distance to date of 1700 feet, with the extreme east face still in the ore.

The total footage in this tunnel to date is 1241 feet, leaving 459 feet still to be opened before the tunnel is serviceable from the shaft to the mill. At the present rate of development this should be completed by the middle of February next, 1918.

The ore and waste are now being handled through a cross-cut tunnel driven northward from the surface through the first level, a distance of 380 feet. At 334 feet the Copper Age vein was struck.

Surface work on the Copper Age vein indicates a continuity of this ore body for at least 5,000 feet on this property, while the seven other veins paralleling it can be traced all the way from 500 to 4000 feet lineally on the group.

The extent of mineralized territory within this vein system offers excellent opportunities for future exploration work.

ORE RESERVES—TONNAGE AND VALUES

The tonnage and values available in the work described above are arrived at in the following manner:

Reference to Map No. 2 will give the approximate value of the ore at the points indicated; also the average width of the ore taken at various points where exposed. In the drifts the width has been taken by actual measurement every ten feet along the shoot, as shown on the map.

tion of more than 40,000 tons of ore from the district during 1914, and it would appear both safe and wise to accept this figure.

Map No. Two should also be consulted for a confirmation of the values and measurements adopted in the following estimate of ore in reserve.

The work has been divided into seven blocks designated as Blocks A, B, C, D, E, F and G:

Block A is the block extending from the collar of the shaft downward 159.28 feet to the first level; then westward 297 feet to the face of the drift directly under the collar of the "raise." Taking the average width of the ore on the surface, in the shaft, in the drift and overhead drifts, we have an ore shoot 3.12 feet wide with nine cubic feet to the ton of ore in place. This will give for Block "A" 16,399 tons exposed on four sides, considering the surface work along the vein.

Block B is the block extending from the collar of the shaft downward 159.28 feet to the first level; then eastward 391 feet, with the same cubic contents per ton and an average of 2.92 feet in width. This gives 20,205 tons proven on four sides.

Block C is the block extending 105.51 feet downward from the first to the second level, and 297 feet westward from the shaft, to which point it has been proven in the first and third levels and partially in the second. The average width of the ore is 2.70 feet. Giving 9,400 tons developed on three sides.

Block D is the block extending downward 105.51 feet from the first to the second level and 391 feet eastward, with an average width of 3.07 feet, or 14,072 tons measurable on three sides for the greater part of the block.

Block E is the block extending downward from the second to the third level 91.84 feet and 297 feet westward from the shaft, with an average width of 1.88 feet, and will give 5,697 tons, also measurable on three sides for the greater part of the block.

Block F is the block extending downward from the second to the third level 91.84 feet and eastward 185 feet, having an average width of 3 feet. This gives 5,663 tons, exposed on two sides only.

Block G consists of the ore that has been proven by work on the surface westward from a point 297 feet from the shaft, to which point it has also been proven in the first and third levels. Then continuing westward to the portal of the third level, a distance of 1,403 feet. The average depth from the surface to the third level within this 1,403 feet is 156 feet, and the average width of the ore 2 feet, giving 48,637 tons for Block G.

to a receiving bin between the tunnel entrance and the mill. From this point they are trammed to the crusher floor. Plans are now under way to send these ores direct to the mill by belt conveyor from the receiving bin and do away with the present costly tramping system.

The finer material passes to a 200-ton bin and the coarse material into a 7x24 Sturtevant jaw crusher; then to the same bin. About one-half of the material is elevated from this bin and crossed over to an opposite bin of the same capacity.

From these bins the material is screened and everything fine enough to pass 40-mesh is by-passed direct to the sump. From here it is elevated by a centrifugal sand pump to Allen cone classifiers and then to the concentrating tables by gravity. Material too coarse to pass 40-mesh is delivered direct from the bins to two 5x4 Standard ball mills, where it is ground to pass 40-mesh and pumped to the classifiers as above.

There are nine of these Allen classifiers in use in the plant. They act as classifiers and dewaterers; also as separators of the slimes from the coarser sands. They are automatic in operation, require no power and need practically no attention.

The concentrating floor has two double-deck Wilfley tables, two single-deck Wilfleys and two Eccleston tension tables. On these tables the material is separated into first grade concentrates carrying principally lead, silver and gold values. Also the middling concentrates carrying gold, silver, zinc, copper and antimony.

The slimes are collected in two classifiers, from which they are delivered to the auxiliary plant for further treatment.

The tailings are dewatered and conveyed to the tailings dump by a canvas belt conveyor.

These ores will concentrate at the rate of one ton of lead-silver-gold concentrates from 25 tons of crude ore; or ten tons of concentrates in 24 hours on a 250-ton milling basis.

The middlings will be at the rate of one ton for eleven tons of crude ore; or $27\frac{1}{2}$ tons of middlings in 24 hours on a 250-ton milling basis.

The products from the 250 tons of crude ore, therefore, will consist of ten tons of first grade concentrates; $27\frac{1}{2}$ tons of middlings and 6 tons of slimes, representing a gross market value of about 66 per cent of the original values contained in the ores.

The above returns are based upon laboratory tests and experimental mill runs.

It would, therefore, appear that simple concentration alone does not yield a satisfactory extraction and that some further treatment is

MINE EXPENSE PER DAY ON 250 TONS DAILY OUTPUT

30 miners at \$5.00 each.....	\$150.00
30 muckers at \$4.50 each.....	135.00
3 enginemen at \$5.50 each.....	16.50
3 hoist men at \$5.50 each.....	16.50
1 blacksmith at	5.50
1 blacksmith helper at	4.50
3 candles to each underground man (66 men) equal 198 candles at 3 cents each.....	5.94
5 lbs. powder per miner equals 150 lbs. at 25 cents lb.....	37.50
12 ft. fuse per miner equals 360 ft. at 2 cents per ft.....	7.20
4 caps per miner equals 120 caps at 2 cents each.....	2.40
536 gals. crude oil at 6 cents per gallon.....	32.16
50 gals. distillate at 23 cents per gallon.....	11.50
Lubricating greases, per day, estimated at.....	2.50
Laboratory work and supplies.....	7.50
Pumping, 2 shifts at \$5.50 each.....	11.00
Ore delivery to mill estimated at 10 cents per ton.....	25.00
Ore sorting 50 cents per ton on 250 tons.....	125.00
Total	<u>\$595.70</u>

MILL EXPENSE PER DAY ON 250 TONS DAILY OUTPUT

One mill foreman at.....	\$ 6.00
3 helpers on each shift (9 helpers) at \$4.50 each.....	40.50
3 concentrator men at \$5.00 each.....	15.00
Mill supplies, repairs and renewals.....	15.00
Mill power	12.00
Marketing product, \$1.25 per ton of crude ore.....	312.00
Total	<u>\$400.50</u>

RECAPITULATION

Total Daily Mine Expense	\$ 595.70
Total Daily Mill Expense	400.50
Superintendence and administration	25.00
Fire insurance, accident insurance, taxes and depreciation.....	25.00
Plant royalties, \$1.00 per ton.....	250.00
Total Daily Mine and Mill Expense.....	<u>\$1296.20</u>

GENERAL METALS COMPANY

Organized Under the Laws of the State of Arizona.

Capitalized for \$500,000. Par Value One Dollar Per Share.

NOTE

The mineral ground under consideration in this report is owned by the General Metals Company.

The Arizona Ore Reduction Company owns seventy-seven percent of the stock of the General Metals Company.

ENGINEER'S REPORT

LOCATION AND ACCESSIBILITY

The mineral holdings controlled by this company are located in the Chloride mining district, Mohave county, Arizona. The property is three and three-fourths miles by automobile road and one and three-fourths miles by trail southeast from the town of Chloride and the terminus of the Chloride branch of the Atchison, Topeka and Santa Fe Railway. This branch connects with the main line at Kingman, the county seat, a distance of twenty-seven miles from Chloride. A spur from the Chloride branch brings the railroad within one and one-half mile from the company's reduction plant, making the freight haulage to the property nominal. There is direct telephone service from the mine and mill to all important points in Arizona.

TOPOGRAPHY

This is decidedly of a desert character and the country typical of this region of the Southwest for a distance of perhaps a hundred miles in any direction. The valleys, or desert stretches, cover about as much of the territory as do the mountain ranges. Such mountains usually rise rapidly from the level plains, but carry a great deal of material eroded from above and this overburden gives the appearance of gentle slopes to many of the hillsides. The upright cliffs and terraces so characteristic of mountains whose structure is made up largely of sedimentary rocks are not common here. On the contrary the hills are largely composed of rocks of crystalline and metamorphic character and provide greater regularity to the slopes and ridges, although occasionally off in the distance may be seen familiar forms of broken, tooth-shaped outcrops, sharp ravines and almost perpendicular escarpments. At times the fantastic contours and varied colors so noticeable in a country totally lacking in timber stand out in picturesque contrast with the bleak and almost barren valleys.

The boundaries of the district are somewhat irregular and give to it an area of about six miles in diameter.

The average elevation for the district will probably not exceed 4,000 feet and at this particular property the greatest altitude is about 4,500 feet.

There are as a rule several light snowfalls and occasionally heavy storms during the winter; but in the main the climatic conditions are favorable and there is no time in the year when operations are compelled to stop because of the weather, except on the surface and only then for two or three days at a stretch.

is identical with that of the Copper Age vein, where the principal development has been done and a depth of 366 feet attained. However, the veins which appear to give the greatest promise have not been given the attention which they warrant and to date have been neglected.

These veins are fissures encased within walls of granite. The filling is of quartz with a clay gouge of one to six inches on either side and usually all matter between the gouge is clean milling ore.

The ores carry gold, silver, lead, copper and zinc and, scattered here and there, a small percentage of antimony. The better copper values have generally been found near the surface, though this metal is still in evidence in small quantities in the lower levels, and it is possible that with further development the zinc will diminish and give place to greater enrichment in copper. There is an abundance of oxides and carbonates on the surface which are displaced by sulphides at shallow depths, the sulphide ores appearing at 50 to 60 ft. from the surface. The copper in the lower workings is found in the form of chalcopyrite with some bornite and chalcocite. The lead is decidedly galena and the zinc a sphalerite. Some arseno-pyrite and occasionally molybdate of lead are found among the primary minerals and with the secondary minerals some hornsilver, argentite and ruby silver.

A representative sample of the ores from the sulphide zone gave the following analysis and will indicate the general character of the material that must make up the bulk of the ores handled:

Gold, .07 oz.; silver, 13.43 oz.; lead, 3.60% ; copper, .10% ; zinc, 7.40% ; antimony, 3.20% ; iron, 24.5% ; silica, 16.8% ; arsenic, trace ; sulphur, 26.8% ; lime, .05% ; manganese, 1.0%.

The predominating commercial metals throughout this district and their proportion one to the other can perhaps best be given by reference to the "United States Mines Report on Gold, Silver, Copper, Lead and Zinc in Arizona in 1914," in which the Chloride (sometimes called the "Wallapai district") and the Union Basin are grouped as one, they being immediately contiguous and credited with the following record. This is the latest official data available.

Producing mines	17
Tons of ore produced.....	40,514
Value of gold produced	\$57,331
Ounces of silver produced.....	123,365
Pounds of copper produced.....	18,297
Pounds of lead produced.....	3,708,102
Pounds of zinc produced (spelter)	9,553,050
Number of tons of ore concentrated.....	35,028
Number of tons concentrates produced from same.....	18,428
Tons gold, silver, copper, lead, zinc ores shipped.....	1,153
Average value of ore per ton.....	\$18.75

FINANCIAL STATEMENT
of the
ARIZONA ORE REDUCTION COMPANY
December 31, 1917

ASSETS

Notes Receivable	\$ 15,000.00	
Open Acct. General Metals Co.....	24,679.72	
385,000 Shares, General Metals Co.....	385,000.00	
Process and Water Rights.....	365,000.00	
Plant and Equipment.....	115,970.37	\$905,650.09
	<hr/>	

LIABILITIES

Capital Stock	\$750,000.00	
Resources in Excess of Liabilities.....	155,650.09	\$905,650.09
	<hr/>	

The Grand Boy Fraction.....	5.6	"
The Zella Fraction9	"
The Last Dollar.....	12.0	"
The Wedge	10.8	"
The Ish Ge Bible.....	14.6	"
Total	153.	acres

These claims have heretofore been held by annual assessment work. Application for patent has been made and negotiations are now being conducted for procuring government deed. The preliminary and amended surveys have been completed by U. S. Deputy Mineral Surveyor. The final issue of patent from the government is due about the end of the present year, 1918. The titles have been passed upon by the company's attorneys, abstract brought down to date and the property turned over to the company by quit claim deed.

Reference is made to Map No. One, on which is shown the general plan of the location of these claims, the vein system which they control, the location of buildings, roadways, reservoir and reduction plant.

SURFACE IMPROVEMENTS AND EQUIPMENT

These consist of just such machinery, buildings and material as have been required to carry operations to the present point and are being added to from time to time as needed.

The mill is a modern concentrating plant with a capacity of 250 tons per day of twenty-four hours. Length 145 ft.; width 120 ft.; height to cone 40 ft.; to eaves 18 ft. This is a good piece of construction, substantially built and has been tried out sufficiently to demonstrate that it will do good work. Further reference to the equipment in this plant and its operation will be found in this report under the caption of "Ore Treatment." Reference is also made to Map No. Three, which is a general flow sheet of the plant. This building has cement foundations and piers, heavy timber supports and corrugated iron roofing and siding.

The power plant consists of one 310 H. P. Quincy-Corliss steam engine, with two 160 H. P. horizontal tubular boilers. Fuel, crude oil. This power is used in driving the mill, the air compressors, the pumps and drill sharpener.

Also one 100 H. P. West Coast gas engine installed in mill as auxiliary power in order that the mill may be kept in operation in case of accident or shut-down to the main power.

One 35 H. P. West Coast gas engine used for driving roasting cylinder to the auxiliary plant described under "Ore Treatment."

the third level. At some point between the second and third levels the vein takes a slight pitch to the north and at the third level is ten feet off from the vertical, but appears to be vertical again at this depth. From the third level downward this will be a three-compartment shaft; that is, two compartments for hoisting and one for water pipe, air pipe and ladderway.

At 120 feet from the surface a short drift was extended east and west on the vein, the distance between faces being 41 feet.

At 152.28 feet a drift has been extended eastward for 391 feet and westward for 297 feet. At about 175 feet westward from the shaft an offset was encountered which pitched the vein a little to the south and out of place. At 20 feet beyond this point a turn to the south brought the drift into the ore again. This gives an unbroken ore shoot at this point of 688 feet in length with both faces still in the ore. This is known as the first level. At 215 feet west from the shaft and 365 feet east "raises" have been made to the surface in the ore.

In another 200 feet of work the east drift will have reached the point where a cross-cut tunnel will be made northwesterly at an angle of about 45 degrees with a view of cross-cutting the six veins paralleling the Copper Age on the north. The approximate distance between these veins is shown on Map No. One. A cross-cut 668 feet in length will therefore intersect seven veins.

The second level extends east and west from the shaft at a depth of 264.79 feet from the collar, or 105 feet below the first level. This has been driven on the vein for 185 feet eastward from the shaft and 185 feet westward and gives an unbroken shoot 370 feet in length, with both faces still in the ore. At the west face of this level, however, the same offset noted in the level above is now appearing, and while a portion of the vein is continuous clear to the face, the greater part of it will have to be picked up to the south as in the first level.

The third level is an adit level, beginning on the surface of the Copper Age vein at a point 1700 feet westerly from the shaft and 356.63 feet below its collar. To date this level has been extended on the ore westerly from the shaft 213 feet and is being driven at the rate of five feet per day. From the eastern end, or portal, it has reached a length of 1028 feet and continuing at the rate of five feet per day, making a headway of 300 feet per month in this drift. This is to be used as a working tunnel and is six feet wide by eight feet high. The ores and waste from the upper levels will be lowered to this tunnel and those from below will be hoisted to it and trammed direct to the mill or waste dump. It is being driven with a grade of nine-tenths of one percent and provides good drainage.

This drift, or third level, was started on the vein. The vein has

In addition to the samples noted on map, 192 tons were passed through the crushing plant and divided up into separate sample lots.

The values have in all instances been arrived at by ignoring the present high price of metals and adopting a figure that will allow a safe margin for any ordinary fluctuations in market quotations. Gold is placed at \$20 per ounce; silver at 50 cents per ounce; lead at 5 cents per pound; copper at 20 cents per pound; zinc at 7 cents and antimony at 15 cents per pound. (The value of the antimony is included in the results for the reason that the auxiliary plant is designed to recover the greater part of the antimony contents). No account is taken of gold when less than one dollar is shown in the assay; nor of silver when less than one ounce; nor of lead, copper, zinc or antimony when less than one per cent.

In sampling, the ores have been taken just as they would be sorted for shipping or milling and the extra cost of sorting taken into account in the estimate of expenses.

The values are taken entirely from samples from the Copper Age vein, as this is the only vein where the ore has been systematically blocked out. They represent samples taken from workings on the surface; samples taken in the shaft from the collar to the present depth; samples from all the drifts every few feet from face to face, as well as from the "raises" and from the different ore dumps and bins made up of ores extracted during development. Each and every sample comprised ten to twenty-five pounds of ore, crushed to pass a six-mesh screen, then quartered and reduced to a one-pound sample and every sample assayed separately.

Eighty-five samples were taken in the manner described. The average of these samples was \$26.98 per ton gross.

In sampling the 192 tons of crushed ore, the high grade ores were first sorted out and eliminated previous to crushing and the remaining product sampled after crushing to an inch and smaller. These samples were then divided into 13 lots, each lot representing about twenty pounds of crushed ore. The average of the 13 lots was \$14.72 per ton after discarding the higher grade ores.

This gives a total of 98 samples taken from the Copper Age vein with an average of \$25.36 per ton gross.

In the absence of any opportunity to date, however, for sampling these ores by milling on an extensive tonnage basis, as an element of safety the estimates of the earning capacity of the property, as well as the value of the ore reserves developed, have been based on the average for the entire district of \$18.75 per ton gross, as determined by the United States government statistics from a produc-

RECAPITULATION

Block A	16,399	tons
Block B	20,205	"
Block C	9,400	"
Block D	14,072	"
Block E	5,697	"
Block F	5,663	"
Block G	48,637	"
Total	120,073	"
Plus loose ores extracted.....	2,000	"

Total estimated tonnage available to date.....122,073 "

At \$18.75 per ton, estimated gross value to date.....\$2,288,868.75

The above figures may be regarded as a conservative estimate in view of the fact that no account has been taken of ores below the third level. Nor has any account been taken of ores eastward beyond the present drifts, although the ore has been proven on the surface for fully 2,000 feet beyond these drifts.

While the ore tabulated above cannot all be technically termed "ore blocked out," it is nevertheless developed in such a manner that it has been definitely located. It is available for stoping and is being added to from day to day as the work progresses.

It should also be borne in mind that this estimate is on one vein only; while there are seven other veins which parallel the present one, at least four of which are equal in importance, from surface indications, to the one now being developed.

ORE TREATMENT

The complex character of this ore necessitates careful dressing and some deviation from usual milling practice before the metals can be profitably marketed. Shipping the crude ore to any of the southwestern smelters would mean a high treatment charge and penalties that would be almost prohibitive. The percentage of zinc contained is enough to justify its recovery, although the smelters contiguous to this district make no payment for this commodity, while the long freight haul would make shipment to the zinc smelters of the middle west out of the question. There is also enough antimony in some of these ores to come within the smelter penalty and valuable enough to convert into a commercial product.

The ores are, however, essentially a concentrating proposition and the mill is primarily a concentrating plant.

The ores will be trammed from the working tunnel (third level)

✓

necessary in order to produce a revenue commensurate with the values in the ore and the cost of operation.

The middlings and slimes having been reduced to a product containing but a small amount of lead, will be automatically fed by screw conveyor from the concentrating plant to the auxiliary plant. From here they will pass through a revolving cylinder 20 feet long and 5 feet in diameter, lined with firebrick, and operated under continuous feed and discharge. In this cylinder the zinc and antimony are volatilized and passed off through a cooling chamber, then into precipitation chambers, where they are collected in the form of zinc and antimony dust and shipped direct to chemical companies. This process will be operated under patents controlled by the Arizona Ore Reduction Company within the State of Arizona. It is especially adapted to these complex ores carrying zinc and antimony.

The remaining contents of the cylinder feed will consist of copper, iron, small gold and silver values and silica. This is now in the form of a cinder, which is fed automatically to a small Herman ball mill, where it is ground to pass 30-mesh and sent over an Eccleston concentrating table. Having been reduced to a question of merely separating a light and fragile gangue from the copper and iron metal, the concentrate produced is a clean smelting product consisting almost entirely of copper and iron with small gold and silver values.

So that under this method of operation the plant will turn out three marketable products, viz:

A lead-silver-gold concentrate.

A copper-iron concentrate.

A zinc-antimony dust.

And will represent a recovery of 85 percent of the original ore values.

OPERATING COSTS AND REVENUE

In the following estimate of expense consideration has been given to the present cost of labor and material, and while these fluctuate from time to time, it is generally conceded that they are unusually high in the Chloride district at this date. During some months some of these items will be higher and some will be lower; but in the aggregate they will not change greatly from the totals shown and may be accepted as correct. They are rather over than under the average costs and will cover a reasonable amount for exploration work. The estimates are based upon the cost and returns per ton of crude ore for mining, milling and marketing an output of 250 tons per day of 24 hours. Decreasing the output would increase the cost per ton, while an increase in the output would bring a corresponding decrease in the cost per ton.

EXPENSE PER TON

Mining	\$2.38
Milling	1.60
All other expenses.....	1.20
	<hr/>
Total cost per ton.....	\$5.18

This ore will yield an extraction of 85 per cent of its gross value by the present method of treatment, which would reduce an \$18.75 ore to \$15.94 and leave the following result:

Average value of ore per ton.....	\$18.75
Less loss in extraction, 15 per cent.....	2.81
	<hr/>
Net recovery	\$15.94
Less total cost of doing business per ton.....	5.18
	<hr/>
Net profit per ton.....	\$10.76

Giving a daily net revenue on a 250 ton output of \$2,690.00.

This revenue is proportioned between the two companies in the following manner:

The Arizona Ore Reduction Company receives from the General Metals Company a compensation of \$10.00 per ton for reducing and marketing these ores. From this \$10.00 is deducted the cost of milling, marketing and executive expense of \$2.80 per ton, leaving to the credit of the Arizona Ore Reduction Company a profit of \$7.20 per ton; or \$1800.00 per day on a 250 ton output.

There remains \$5.94 gross to the credit of the General Metals Company after deducting 15 per cent loss in extraction. From this must be deducted their mining cost of \$2.38 per ton, leaving a profit to the General Metals Company of \$3.56 per ton, or \$890.00 per day.

This is a net earning capacity to the credit of the Arizona Ore Reduction Company in excess of seven per cent per month on its entire capital stock of \$750,000.

And 5¼ per cent per month to the credit of the General Metals Company on its capital stock of \$500,000, of which seventy-seven per cent is owned by the Arizona Ore Reduction Company. This brings the monthly net earning of the Arizona Ore Reduction Company to better than eleven per cent.

FUTURE OPERATIONS

Plans have been outlined for extensive development on all of the veins belonging to this property and the work is already well under way. This consists of:

2
11
6/11/15

The hoisting is at present being done with two small air lifts, one at each compartment of the working shaft.

The blacksmith shop consists of forge run under compressed air; one Sullivan pneumatic drill sharpener; one Buffalo portable forge and full complement of tools.

The air is distributed to the machine drills and pumps through one Chicago Pneumatic Compressor, 741 cubic foot capacity. There is also one 350 cubic foot air compressor, Chicago Pneumatic Tool type, and one Gardner-Rix 150 cubic foot compressor. These two small machines are used as auxiliary compressors in case of temporary shut-down to the large one.

The assay office is a complete laboratory 15x36 feet, built of frame with cement foundations and floor. Equipped with power crusher and pulverizer and all necessary appliances and chemicals. The equipment is new and the laboratory conveniently arranged with ample shelf, table and cupboard room.

The water is at present being delivered by pipelines from shafts to the reservoir. This reservoir is built of cement, is 65 feet by 45 feet, with a depth of 7 feet and will contain 153,000 gallons of water. Water connection is made from the reservoir to the mill, a distance of 1475 feet with a fall of 200 feet. This pipeline begins with six inch pipe at the receiving point, reduced to four inches and finally to three at the delivery point. Fire hose is placed at several points throughout the works for fire protection.

The air line is a four inch cast iron casing extending from the compressor room to the working shaft, the water shaft, the blacksmith shop and the working tunnel, with air receivers installed at four convenient points.

There is one 4-ton Moreland auto freight truck; one 5-passenger Dodge car and one 7-passenger Hudson car.

One General Superintendent's frame house, with 4 rooms, bath, store room and screen porch, completely furnished; water piped into house.

Company boarding house for employes, accommodating 45 men at a time, with kitchen and all utensils and tableware complete.

One 2-room frame house with drawing equipment for mechanical engineer.

One employes' bunk-house, 12x20 feet.

One employes' bunk-house, 12x24 feet.

Powder magazine 12x24 feet, built of cement with corrugated iron roofing.

Frame store house for hardware supplies, 8x14 feet.

Blacksmith shop built of frame.

22

FIRST ANNUAL REPORT

Arizona Ore Reduction Company

General Metals Company

*Issued from the Office of the President
1002 Citizens National Bank Bldg.
Los Angeles, California
January 1st, 1918*

PHYSICAL AND FINANCIAL REPORT

ARIZONA ORE REDUCTION COMPANY

Organized Under the Laws of the State of Arizona.

Capitalized for \$750,000. Par Value One Dollar Per Share.

OFFICERS

R. M. MARTIN	- - - - -	President
GEORGE F. GOERNER	- -	Vice-President and Consulting Engineer
C. B. GUITTARD	- - - - -	Secretary
L. B. WOOD	- - - - -	Treasurer

DIRECTORS

R. M. MARTIN	L. B. WOOD
GEORGE F. GOERNER	W. C. FRY
C. B. GUITTARD	J. W. BROCKMAN
P. M. WALKINSHAW	

2

GENERAL METALS COMPANY

Organized Under the Laws of the State of Arizona.

Capitalized for \$500,000. Par Value One Dollar Per Share.

NOTE

The mineral ground under consideration in this report is owned by the General Metals Company.

The Arizona Ore Reduction Company owns seventy-seven percent of the stock of the General Metals Company.

Los Angeles, Cal., Jan. 1st, 1918.

Mr. R. M. Martin, President,
Arizona Ore Reduction Company,
1002 Citizens Nat'l. Bank Bldg.
Los Angeles, Calif.

Dear Sir:

Pursuant to instructions from the board of directors, issued to me through you, you will find herewith report on the property controlled by this company.

I have endeavored to follow your suggestion to make this report as complete as possible in order that those interested in the company, living at a distance, may be furnished with full details in convenient form. I have also borne in mind that most of our stockholders are unfamiliar with technical mining, and have reduced the report to terms that will make it clear to that class of readers. Portions of it will necessarily be a repetition of previous reports, the new material being made up of changes that have taken place since those reports were issued.

The expectations of the company as to being upon a producing and paying basis long before this have not been realized. This, however, has been almost entirely the result of conditions brought about directly or indirectly, by a world-war rather than through any lack of diligence on the part of the company or to any shortcomings of the property itself. There has never been a time in the history of the mining industry when it has been more difficult to obtain prompt deliveries on iron and steel material, heavy machinery and supplies.

Fortunately operations have continued without interruption despite these setbacks, and a careful review of the following report will develop the fact that the progress made, in the way of ore reserves opened up, surface construction and equipment installed, have been accomplished upon a very small expenditure as mining operations usually go. And when we view the fact that this company has acquired an asset within less than two years of fully two million dollars worth of ore available on a development expenditure of less than one hundred thousand dollars, there is but little room left for criticism.

Very respectfully,

George F. Joernst

Consulting Engineer.

ENGINEER'S REPORT

LOCATION AND ACCESSIBILITY

The mineral holdings controlled by this company are located in the Chloride mining district, Mohave county, Arizona. The property is three and three-fourths miles by automobile road and one and three-fourths miles by trail southeast from the town of Chloride and the terminus of the Chloride branch of the Atchison, Topeka and Santa Fe Railway. This branch connects with the main line at Kingman, the county seat, a distance of twenty-seven miles from Chloride. A spur from the Chloride branch brings the railroad within one and one-half mile from the company's reduction plant, making the freight haulage to the property nominal. There is direct telephone service from the mine and mill to all important points in Arizona.

TOPOGRAPHY

This is decidedly of a desert character and the country typical of this region of the Southwest for a distance of perhaps a hundred miles in any direction. The valleys, or desert stretches, cover about as much of the territory as do the mountain ranges. Such mountains usually rise rapidly from the level plains, but carry a great deal of material eroded from above and this overburden gives the appearance of gentle slopes to many of the hillsides. The upright cliffs and terraces so characteristic of mountains whose structure is made up largely of sedimentary rocks are not common here. On the contrary the hills are largely composed of rocks of crystalline and metamorphic character and provide greater regularity to the slopes and ridges, although occasionally off in the distance may be seen familiar forms of broken, tooth-shaped outcrops, sharp ravines and almost perpendicular escarpments. At times the fantastic contours and varied colors so noticeable in a country totally lacking in timber stand out in picturesque contrast with the bleak and almost barren valleys.

The boundaries of the district are somewhat irregular and give to it an area of about six miles in diameter.

The average elevation for the district will probably not exceed 4,000 feet and at this particular property the greatest altitude is about 4,500 feet.

There are as a rule several light snowfalls and occasionally heavy storms during the winter; but in the main the climatic conditions are favorable and there is no time in the year when operations are compelled to stop because of the weather, except on the surface and only then for two or three days at a stretch.

GEOLOGY AND MINERALOGY

The district is distinctively eruptive insofar as its mineralized belt is concerned. The flats extending out from the foothills to and beyond the town of Chloride have had but little development and show no mineralization of consequence. It is within the eruptive belt that the important producing properties lie. The outcroppings are in most cases very prominent, standing up conspicuously above the common plain of the country.

The country formation must be assigned to the pre-Cambrian rocks, the granite, gneiss and schists predominating with an occasional intrusion of diabase and altered porphyry. Biotite is also abundant.

The principal veins throughout the district have a general strike from northwest to southeast, with a dip to the north that varies all the way from the vertical to 70 or 80 degrees.

The vein system on this particular group of claims consists of some parallel veins designated as the Blossom, Blossom No. 2, Gold Lead, Gold Lead No. 2, Bridle Trail, Zella, the Last Dollar, the Copper Age and the Grand Boy. Most of these veins may be traced for the entire length of the claims and give a total of 3,000 to 5,000 feet on each vein. Other veins may be traced for a few hundred to a couple of thousand feet each. At some points the veins will dip under the formation and the overburden is too heavy to follow them on the surface. Occasional branches from the veins form junction points at which the ore bodies attain unusual width and the ore of better than average grade. This has been proven particularly in the case of the Last Dollar vein, which intersects the Copper Age at about 300 feet east from the main working shaft. In the workings below, the ore body formed by this junction is fully six feet wide and of very good grade.

For a better understanding of the trend of this vein system, and the relation of one vein to the other, reference is made to Map No. One attached to this report.

Some slight faulting of the veins is here and there discernable. This does not, however, present any serious problems. The ore bodies hold a fairly true course and are easily followed.

The croppings consist of a brownish iron-stained, sheared and cemented quartz with a width on the surface of one to twenty feet. The ore streak will vary throughout the property from the surface to the lower workings, all the way from a few inches to six feet, with a safe average of two feet.

There are numerous shallow workings on the surface along these ledges. The work has in nearly all instances exposed ore of shipping or milling grade. The superficial character of this entire vein system

is identical with that of the Copper Age vein, where the principal development has been done and a depth of 366 feet attained. However, the veins which appear to give the greatest promise have not been given the attention which they warrant and to date have been neglected.

These veins are fissures encased within walls of granite. The filling is of quartz with a clay gouge of one to six inches on either side and usually all matter between the gouge is clean milling ore.

The ores carry gold, silver, lead, copper and zinc and, scattered here and there, a small percentage of antimony. The better copper values have generally been found near the surface, though this metal is still in evidence in small quantities in the lower levels, and it is possible that with further development the zinc will diminish and give place to greater enrichment in copper. There is an abundance of oxides and carbonates on the surface which are displaced by sulphides at shallow depths, the sulphide ores appearing at 50 to 60 ft. from the surface. The copper in the lower workings is found in the form of chalcopyrite with some bornite and chalcocite. The lead is decidedly galena and the zinc a sphalerite. Some arseno-pyrite and occasionally molybdate of lead are found among the primary minerals and with the secondary minerals some hornsilver, argentite and ruby silver.

A representative sample of the ores from the sulphide zone gave the following analysis and will indicate the general character of the material that must make up the bulk of the ores handled:

Gold, .07 oz.; silver, 13.43 oz.; lead, 3.60% ; copper, .10% ; zinc, 7.40% ; antimony, 3.20% ; iron, 24.5% ; silica, 16.8% ; arsenic, trace; sulphur, 26.8% ; lime, .05% ; manganese, 1.0%.

The predominating commercial metals throughout this district and their proportion one to the other can perhaps best be given by reference to the "United States Mines Report on Gold, Silver, Copper, Lead and Zinc in Arizona in 1914," in which the Chloride (sometimes called the "Wallapai district") and the Union Basin are grouped as one, they being immediately contiguous and credited with the following record. This is the latest official data available.

Producing mines	17
Tons of ore produced.....	40,514
Value of gold produced	\$57,331
Ounces of silver produced.....	123,365
Pounds of copper produced.....	18,297
Pounds of lead produced.....	3,708,102
Pounds of zinc produced (spelter)	9,553,050
Number of tons of ore concentrated.....	35,028
Number of tons concentrates produced from same.....	18,428
Tons gold, silver, copper, lead, zinc ores shipped.....	1,153
Average value of ore per ton.....	\$18.75

Extending the first and second levels on the Copper Age vein westward, and the first, second and third levels eastward.

Connecting the different levels by raises at every 150 feet, thus blocking the ore on four sides.

Sinking the main working shaft to 1,000 feet in depth.

Drifting in each direction at every 150 feet and connecting the different levels by raises as above.

The east drift, first level, is now in for a length of 391 feet from the shaft and is being driven at the rate of 150 feet per month. In another 200 feet the cross-cut tunnel will be started to intersect the six veins paralleling the Copper Age on the north, and drifting in each direction, sinking and raising will begin as soon as these connections are made. See Map No. One.

Barring setbacks and delays from unforeseen causes all of these veins will have been opened up by cross-cut within less than a year from the date of this report. That this work will prove up an almost inexhaustible supply of ore is well within the probabilities, and that a plant of a thousand tons capacity per day could be kept in operation for years to come is reasonably certain.

Up to the present time the ore extracted has been entirely from development. No stoping has been done and the reserves have been kept intact. Pursuing the plan of operations above outlined will keep the plant supplied with ore from development alone and furnish a heavy tonnage in advance of requirements. An improvement in the value, the volume and the general character of the ore on the more important veins and at the junction points may well be expected; while an increase in values with deeper workings may also be assumed from the history of the district in the case of properties that have reached a thousand feet or more in depth.

The mill is completed and will treat 250 tons of crude ore per day of twenty-four hours. Before this can be done, however, the pipeline from the company's water-right to the mill must be laid. A settling tank to hold 150,000 gallons of water must also be constructed at the mill. This, with the reservoir now in use, will give a tankage in excess of 300,000 gallons. This supply, augmented by the daily flow from the water-right and the two shafts, will provide sufficient water for all purposes.

The above improvements can probably be completed by February 15th. From that time on the mill should be in constant operation to its full capacity and on a producing and paying basis.

Respectfully submitted,

Los Angeles, Cal.,
January 1st, 1918.

GEORGE F. GOERNER,
Consulting Engineer.

FINANCIAL STATEMENT
of the
ARIZONA ORE REDUCTION COMPANY

December 31, 1917

ASSETS

Notes Receivable	\$ 15,000.00	
Open Acct. General Metals Co.....	24,679.72	
385,000 Shares, General Metals Co.....	385,000.00	
Process and Water Rights.....	365,000.00	
Plant and Equipment.....	115,970.37	\$905,650.09
	<hr/>	

LIABILITIES

Capital Stock	\$750,000.00	
Resources in Excess of Liabilities.....	155,650.09	\$905,650.09
	<hr/>	

DRAINAGE AND WATER SUPPLY

This entire locality is drained by the Colorado river and its tributaries. The distance from Chloride to the Colorado is about twenty-five miles and this river is the main source of water supply for this region. Numerous gulches extending from all directions to the river throughout the district carry more or less water during the rainy season and following the melting of mountain snows. But this supply is erratic and uncertain. Operating properties have usually depended upon the waters from springs and deep shafts for camp and milling purposes. The shortage of water has been one of the drawbacks to the district.

The main working shaft of this property at 366 feet depth has yielded at times thirty gallons of water per minute and the 275-foot shaft on the Grand Boy No. One claim as high as sixty gallons per minute. At other times the supply would not be one-tenth of this. During the present season the volume throughout the district has been less than normal and this company has been obliged to acquire additional water rights as a precaution against shortage in the future. This water consists of living springs located about two miles due east from the company's plant. It will require a pipeline of approximately 12,000 feet to convey the water to the mill and will give a fall of about 700 feet in that distance. This water is being developed in order to get the benefit of its full volume and the indications now are that the total supply from the water right, together with the flow from the two shafts will be sufficient for all purposes.

There will pass through the mill when running to full capacity of 250 tons per day, about 250,000 gallons, or 1,000 gallons per ton of ore handled. Of this quantity there will be pumped back for re-use about sixty-five percent, or 162,500 gallons. So that the actual daily new requirement is only 87,500 gallons and is well below the supply which appears to be available for a plant of the present capacity. It is more than likely that the two shafts will furnish an increased supply as greater depth is attained.

ACREAGE AND TITLE

The company's property consists of eleven claims with the following acreage:

The Copper Age.....	15.1	acres
The Blossom	20.	"
The Blossom No. 2.....	19.	"
The Grand Boy.....	15.	"
The Grand Boy No. 2.....	20.	"
The Zella	20.	"

The Grand Boy Fraction.....	5.6	"
The Zella Fraction	9	"
The Last Dollar.....	12.0	"
The Wedge	10.8	"
The Ish Ge Bible.....	14.6	"
Total	53.0	acres

These claims have heretofore been held by annual assessment work. Application for patent has been made and negotiations are now being conducted for procuring government deed. The preliminary and amended surveys have been completed by U. S. Deputy Mineral Surveyor. The final issue of patent from the government is due about the end of the present year, 1918. The titles have been passed upon by the company's attorneys, abstract brought down to date and the property turned over to the company by quit claim deed.

Reference is made to Map No. One, on which is shown the general plan of the location of these claims, the vein system which they control, the location of buildings, roadways, reservoir and reduction plant.

SURFACE IMPROVEMENTS AND EQUIPMENT

These consist of just such machinery, buildings and material as have been required to carry operations to the present point and are being added to from time to time as needed.

The mill is a modern concentrating plant with a capacity of 250 tons per day of twenty-four hours. Length 145 ft.; width 120 ft.; height to cone 40 ft.; to eaves 18 ft. This is a good piece of construction, substantially built and has been tried out sufficiently to demonstrate that it will do good work. Further reference to the equipment in this plant and its operation will be found in this report under the caption of "Ore Treatment." Reference is also made to Map No. Three, which is a general flow sheet of the plant. This building has cement foundations and piers, heavy timber supports and corrugated iron roofing and siding.

The power plant consists of one 310 H. P. Quincy-Corliss steam engine, with two 160 H. P. horizontal tubular boilers. Fuel, crude oil. This power is used in driving the mill, the air compressors, the pumps and drill sharpener.

Also one 100 H. P. West Coast gas engine installed in mill as auxiliary power in order that the mill may be kept in operation in case of accident or shut-down to the main power.

One 35 H. P. West Coast gas engine used for driving roasting cylinder to the auxiliary plant described under "Ore Treatment."

Engine and compressor room built of corrugated iron roofing and siding.

Housing for main power plant consists of cement foundations and piers, heavy timber supports, corrugated iron siding and roofing; brick masonry for boiler housing.

Purchasing Agent's house in Chloride, built of frame, four rooms, bath and screen porch, completely furnished, water connections and electric lights.

- 5 Hardsocq machine drills.
- 2 Ingersoll machine drills.
- 2 Waugh valveless machine drills.
- 1 Power hack saw.
- 1 Power drill press.
- 4 two-ton side dumping mine cars.
- 5 half-ton end dumping mine cars.
- 1 Electric mine locomotive.

All necessary picks, shovels, single and double-jacks, tool steel, mine rails, light and heavy hardware and supply of staple lumber.

The tramway from the tunnel entrance to the dump is lighted by electricity, the electric wires being extended as the tunnel advances.

UNDERGROUND DEVELOPMENT

The greater part of the development has been on the Copper Age vein and this work will be set forth in detail. The other veins traversing the property have all shown favorable indications on such slight development as has been done. This consists of numerous pits, shallow shafts, open-cuts and trenches dug on the surface. Samples taken from the ore exposed in these workings have shown encouraging values. A comparison of these veins with the Copper Age vein, and a comparison of the general character of the ore, its values, the wall and ledge conditions, are strong evidences that the same results are likely to be met on further development as have been found on the Copper Age vein. In any event, these parallel veins offer as inviting a field for exploration as the Copper Age vein did at the time this company took possession.

The following description will be better understood by reference to Map No. Two, which will show the values encountered, together with the width of the ore shoot taken every ten feet.

The working shaft is located on the Copper Age vein about the center of the Copper Age claim. The shaft is sunk vertically on the vein to a depth of 366.63 feet and the ore proven continuous for the entire distance. This is a single compartment shaft from the collar to the first level and a double compartment shaft from that point to

the third level. At some point between the second and third levels the vein takes a slight pitch to the north and at the third level is ten feet off from the vertical, but appears to be vertical again at this depth. From the third level downward this will be a three-compartment shaft; that is, two compartments for hoisting and one for water pipe, air pipe and ladderway.

At 120 feet from the surface a short drift was extended east and west on the vein, the distance between faces being 41 feet.

At 152.28 feet a drift has been extended eastward for 391 feet and westward for 297 feet. At about 175 feet westward from the shaft an offset was encountered which pitched the vein a little to the south and out of place. At 20 feet beyond this point a turn to the south brought the drift into the ore again. This gives an unbroken ore shoot at this point of 688 feet in length with both faces still in the ore. This is known as the first level. At 215 feet west from the shaft and 365 feet east "raises" have been made to the surface in the ore.

In another 200 feet of work the east drift will have reached the point where a cross-cut tunnel will be made northwesterly at an angle of about 45 degrees with a view of cross-cutting the six veins paralleling the Copper Age on the north. The approximate distance between these veins is shown on Map No. One. A cross-cut 668 feet in length will therefore intersect seven veins.

The second level extends east and west from the shaft at a depth of 264.79 feet from the collar, or 105 feet below the first level. This has been driven on the vein for 185 feet eastward from the shaft and 185 feet westward and gives an unbroken shoot 370 feet in length, with both faces still in the ore. At the west face of this level, however, the same offset noted in the level above is now appearing, and while a portion of the vein is continuous clear to the face, the greater part of it will have to be picked up to the south as in the first level.

The third level is an adit level, beginning on the surface of the Copper Age vein at a point 1700 feet westerly from the shaft and 356.63 feet below its collar. To date this level has been extended on the ore westerly from the shaft 213 feet and is being driven at the rate of five feet per day. From the eastern end, or portal, it has reached a length of 1028 feet and continuing at the rate of five feet per day, making a headway of 300 feet per month in this drift. This is to be used as a working tunnel and is six feet wide by eight feet high. The ores and waste from the upper levels will be lowered to this tunnel and those from below will be hoisted to it and trammed direct to the mill or waste dump. It is being driven with a grade of nine-tenths of one percent and provides good drainage.

This drift, or third level, was started on the vein. The vein has

pursued a slightly irregular course; so that at times the tunnel is in the ore and at other times alongside of it. A cross-cut has been made at 300 feet from its portal and in this cross-cut at 16 feet from the center of the tunnel the ore was encountered. At 400 feet from the portal a raise was made on a slight incline from the tunnel to the surface, a height of 95 feet in the ore. At 700 feet from the portal the ore has swung back into the tunnel and the same at 1,000 feet. At 900 feet a stringer of very good ore twelve inches wide crosses the tunnel.

The 213 feet westward from the shaft in the third level is all driven on the ore. The ore in this drift for the greater part will give an average of nearly two feet. (See Block E under the title of "Ore Reserves—Tonnage and Values"). There is nevertheless a decided improvement in volume at the face, where it is a strong three feet wide, and a drill driven through the ore about 20 feet back from the face showed it to be five feet in width at that point. The indications are that the same heavy ore shoot will be encountered a little farther to the west as was found in the upper levels.

This shoot has, therefore, been definitely proven in the third level for the entire distance to date of 1700 feet, with the extreme east face still in the ore.

The total footage in this tunnel to date is 1241 feet, leaving 459 feet still to be opened before the tunnel is serviceable from the shaft to the mill. At the present rate of development this should be completed by the middle of February next, 1918.

The ore and waste are now being handled through a cross-cut tunnel driven northward from the surface through the first level, a distance of 380 feet. At 334 feet the Copper Age vein was struck.

Surface work on the Copper Age vein indicates a continuity of this ore body for at least 5,000 feet on this property, while the seven other veins paralleling it can be traced all the way from 500 to 4000 feet lineally on the group.

The extent of mineralized territory within this vein system offers excellent opportunities for future exploration work.

ORE RESERVES—TONNAGE AND VALUES

The tonnage and values available in the work described above are arrived at in the following manner:

Reference to Map No. 2 will give the approximate value of the ore at the points indicated; also the average width of the ore taken at various points where exposed. In the drifts the width has been taken by actual measurement every ten feet along the shoot, as shown on the map.

In addition to the samples noted on map, 192 tons were passed through the crushing plant and divided up into separate sample lots.

The values have in all instances been arrived at by ignoring the present high price of metals and adopting a figure that will allow a safe margin for any ordinary fluctuations in market quotations. Gold is placed at \$20 per ounce; silver at 50 cents per ounce; lead at 5 cents per pound; copper at 20 cents per pound; zinc at 7 cents and antimony at 15 cents per pound. (The value of the antimony is included in the results for the reason that the auxiliary plant is designed to recover the greater part of the antimony contents). No account is taken of gold when less than one dollar is shown in the assay; nor of silver when less than one ounce; nor of lead, copper, zinc or antimony when less than one per cent.

In sampling, the ores have been taken just as they would be sorted for shipping or milling and the extra cost of sorting taken into account in the estimate of expenses.

The values are taken entirely from samples from the Copper Age vein, as this is the only vein where the ore has been systematically blocked out. They represent samples taken from workings on the surface; samples taken in the shaft from the collar to the present depth; samples from all the drifts every few feet from face to face, as well as from the "raises" and from the different ore dumps and bins made up of ores extracted during development. Each and every sample comprised ten to twenty-five pounds of ore, crushed to pass a six-mesh screen, then quartered and reduced to a one-pound sample and every sample assayed separately.

Eighty-five samples were taken in the manner described. The average of these samples was \$26.98 per ton gross.

In sampling the 192 tons of crushed ore, the high grade ores were first sorted out and eliminated previous to crushing and the remaining product sampled after crushing to an inch and smaller. These samples were then divided into 13 lots, each lot representing about twenty pounds of crushed ore. The average of the 13 lots was \$14.72 per ton after discarding the higher grade ores.

This gives a total of 98 samples taken from the Copper Age vein with an average of \$25.36 per ton gross.

In the absence of any opportunity to date, however, for sampling these ores by milling on an extensive tonnage basis, as an element of safety the estimates of the earning capacity of the property, as well as the value of the ore reserves developed, have been based on the average for the entire district of \$18.75 per ton gross, as determined by the United States government statistics from a produc-

tion of more than 40,000 tons of ore from the district during 1914, and it would appear both safe and wise to accept this figure.

Map No. Two should also be consulted for a confirmation of the values and measurements adopted in the following estimate of ore in reserve.

The work has been divided into seven blocks designated as Blocks A, B, C, D, E, F and G:

Block A is the block extending from the collar of the shaft downward 159.28 feet to the first level; then westward 297 feet to the face of the drift directly under the collar of the "raise." Taking the average width of the ore on the surface, in the shaft, in the drift and overhead drifts, we have an ore shoot 3.12 feet wide with nine cubic feet to the ton of ore in place. This will give for Block "A" 16,399 tons exposed on four sides, considering the surface work along the vein.

Block B is the block extending from the collar of the shaft downward 159.28 feet to the first level; then eastward 391 feet, with the same cubic contents per ton and an average of 2.92 feet in width. This gives 20,205 tons proven on four sides.

Block C is the block extending 105.51 feet downward from the first to the second level, and 297 feet westward from the shaft, to which point it has been proven in the first and third levels and partially in the second. The average width of the ore is 2.70 feet. Giving 9,400 tons developed on three sides.

Block D is the block extending downward 105.51 feet from the first to the second level and 391 feet eastward, with an average width of 3.07 feet, or 14,072 tons measurable on three sides for the greater part of the block.

Block E is the block extending downward from the second to the third level 91.84 feet and 297 feet westward from the shaft, with an average width of 1.88 feet, and will give 5,697 tons, also measurable on three sides for the greater part of the block.

Block F is the block extending downward from the second to the third level 91.84 feet and eastward 185 feet, having an average width of 3 feet. This gives 5,663 tons, exposed on two sides only.

Block G consists of the ore that has been proven by work on the surface westward from a point 297 feet from the shaft, to which point it has also been proven in the first and third levels. Then continuing westward to the portal of the third level, a distance of 1,403 feet. The average depth from the surface to the third level within this 1,403 feet is 156 feet, and the average width of the ore 2 feet, giving 48,637 tons for Block G.

RECAPITULATION

Block A	16,399	tons
Block B	20,205	"
Block C	9,400	"
Block D	14,072	"
Block E	5,697	"
Block F	5,663	"
Block G	48,637	"
Total	120,073	"
Plus loose ores extracted.....	2,000	"

Total estimated tonnage available to date....122,073 "

At \$18.75 per ton, estimated gross value to date.....\$2,288,868.75

The above figures may be regarded as a conservative estimate in view of the fact that no account has been taken of ores below the third level. Nor has any account been taken of ores eastward beyond the present drifts, although the ore has been proven on the surface for fully 2,000 feet beyond these drifts.

While the ore tabulated above cannot all be technically termed "ore blocked out," it is nevertheless developed in such a manner that it has been definitely located. It is available for stoping and is being added to from day to day as the work progresses.

It should also be borne in mind that this estimate is on one vein only; while there are seven other veins which parallel the present one, at least four of which are equal in importance, from surface indications, to the one now being developed.

ORE TREATMENT

The complex character of this ore necessitates careful dressing and some deviation from usual milling practice before the metals can be profitably marketed. Shipping the crude ore to any of the southwestern smelters would mean a high treatment charge and penalties that would be almost prohibitive. The percentage of zinc contained is enough to justify its recovery, although the smelters contiguous to this district make no payment for this commodity, while the long freight haul would make shipment to the zinc smelters of the middle west out of the question. There is also enough antimony in some of these ores to come within the smelter penalty and valuable enough to convert into a commercial product.

The ores are, however, essentially a concentrating proposition and the mill is primarily a concentrating plant.

The ores will be trammed from the working tunnel (third level)

✓

19

to a receiving bin between the tunnel entrance and the mill. From this point they are trammed to the crusher floor. Plans are now under way to send these ores direct to the mill by belt conveyor from the receiving bin and do away with the present costly tramping system.

The finer material passes to a 200-ton bin and the coarse material into a 7x24 Sturtevant jaw crusher; then to the same bin. About one-half of the material is elevated from this bin and crossed over to an opposite bin of the same capacity.

From these bins the material is screened and everything fine enough to pass 40-mesh is by-passed direct to the sump. From here it is elevated by a centrifugal sand pump to Allen cone classifiers and then to the concentrating tables by gravity. Material too coarse to pass 40-mesh is delivered direct from the bins to two 5x4 Standard ball mills, where it is ground to pass 40-mesh and pumped to the classifiers as above.

There are nine of these Allen classifiers in use in the plant. They act as classifiers and dewaterers; also as separators of the slimes from the coarser sands. They are automatic in operation, require no power and need practically no attention.

The concentrating floor has two double-deck Wilfley tables, two single-deck Wilfleys and two Eccleston tension tables. On these tables the material is separated into first grade concentrates carrying principally lead, silver and gold values. Also the middling concentrates carrying gold, silver, zinc, copper and antimony.

The slimes are collected in two classifiers, from which they are delivered to the auxiliary plant for further treatment.

The tailings are dewatered and conveyed to the tailings dump by a canvas belt conveyor.

These ores will concentrate at the rate of one ton of lead-silver-gold concentrates from 25 tons of crude ore; or ten tons of concentrates in 24 hours on a 250-ton milling basis.

The middlings will be at the rate of one ton for eleven tons of crude ore; or 27½ tons of middlings in 24 hours on a 250-ton milling basis.

The products from the 250 tons of crude ore, therefore, will consist of ten tons of first grade concentrates; 27½ tons of middlings and 6 tons of slimes, representing a gross market value of about 66 per cent of the original values contained in the ores.

The above returns are based upon laboratory tests and experimental mill runs.

It would, therefore, appear that simple concentration alone does not yield a satisfactory extraction and that some further treatment is

necessary in order to produce a revenue commensurate with the values in the ore and the cost of operation.

The middlings and slimes having been reduced to a product containing but a small amount of lead, will be automatically fed by screw conveyor from the concentrating plant to the auxiliary plant. From here they will pass through a revolving cylinder 20 feet long and 5 feet in diameter, lined with firebrick, and operated under continuous feed and discharge. In this cylinder the zinc and antimony are volatilized and passed off through a cooling chamber, then into precipitation chambers, where they are collected in the form of zinc and antimony dust and shipped direct to chemical companies. This process will be operated under patents controlled by the Arizona Ore Reduction Company within the State of Arizona. It is especially adapted to these complex ores carrying zinc and antimony.

The remaining contents of the cylinder feed will consist of copper, iron, small gold and silver values and silica. This is now in the form of a cinder, which is fed automatically to a small Herman ball mill, where it is ground to pass 30-mesh and sent over an Eccleston concentrating table. Having been reduced to a question of merely separating a light and fragile gangue from the copper and iron metal, the concentrate produced is a clean smelting product consisting almost entirely of copper and iron with small gold and silver values.

So that under this method of operation the plant will turn out three marketable products, viz:

- A lead-silver-gold concentrate.
- A copper-iron concentrate.
- A zinc-antimony dust.

And will represent a recovery of 85 percent of the original ore values.

OPERATING COSTS AND REVENUE

In the following estimate of expense consideration has been given to the present cost of labor and material, and while these fluctuate from time to time, it is generally conceded that they are unusually high in the Chloride district at this date. During some months some of these items will be higher and some will be lower; but in the aggregate they will not change greatly from the totals shown and may be accepted as correct. They are rather over than under the average costs and will cover a reasonable amount for exploration work. The estimates are based upon the cost and returns per ton of crude ore for mining, milling and marketing an output of 250 tons per day of 24 hours. Decreasing the output would increase the cost per ton, while an increase in the output would bring a corresponding decrease in the cost per ton.

MINE EXPENSE PER DAY ON 250 TONS DAILY OUTPUT

30 miners at \$5.00 each.....	\$150.00
30 muckers at \$4.50 each.....	135.00
3 enginemen at \$5.50 each.....	16.50
3 hoist men at \$5.50 each.....	16.50
1 blacksmith at	5.50
1 blacksmith helper at	4.50
3 candles to each underground man (66 men) equal 198 candles at 3 cents each.....	5.94
5 lbs. powder per miner equals 150 lbs. at 25 cents lb.....	37.50
12 ft. fuse per miner equals 360 ft. at 2 cents per ft.....	7.20
4 caps per miner equals 120 caps at 2 cents each.....	2.40
536 gals. crude oil at 6 cents per gallon.....	32.16
50 gals. distillate at 23 cents per gallon.....	11.50
Lubricating greases, per day, estimated at.....	2.50
Laboratory work and supplies.....	7.50
Pumping, 2 shifts at \$5.50 each.....	11.00
Ore delivery to mill estimated at 10 cents per ton.....	25.00
Ore sorting 50 cents per ton on 250 tons.....	125.00
Total	<u>\$595.70</u>

MILL EXPENSE PER DAY ON 250 TONS DAILY OUTPUT

One mill foreman at.....	\$ 6.00
3 helpers on each shift (9 helpers) at \$4.50 each.....	40.50
3 concentrator men at \$5.00 each.....	15.00
Mill supplies, repairs and renewals.....	15.00
Mill power	12.00
Marketing product, \$1.25 per ton of crude ore.....	312.00
Total	<u>\$400.50</u>

RECAPITULATION

Total Daily Mine Expense	\$ 595.70
Total Daily Mill Expense	400.50
Superintendence and administration	25.00
Fire insurance, accident insurance, taxes and depreciation.....	25.00
Plant royalties, \$1.00 per ton.....	250.00
Total Daily Mine and Mill Expense.....	<u>\$1296.20</u>

EXPENSE PER TON

Mining	\$2.38
Milling	1.60
All other expenses.....	1.20
	<hr/>
Total cost per ton.....	\$5.18

This ore will yield an extraction of 85 per cent of its gross value by the present method of treatment, which would reduce an \$18.75 ore to \$15.94 and leave the following result:

Average value of ore per ton.....	\$18.75
Less loss in extraction, 15 per cent.....	2.81
	<hr/>
Net recovery	\$15.94
Less total cost of doing business per ton.....	5.18
	<hr/>
Net profit per ton.....	\$10.76

Giving a daily net revenue on a 250 ton output of \$2,690.00.

This revenue is proportioned between the two companies in the following manner:

The Arizona Ore Reduction Company receives from the General Metals Company a compensation of \$10.00 per ton for reducing and marketing these ores. From this \$10.00 is deducted the cost of milling, marketing and executive expense of \$2.80 per ton, leaving to the credit of the Arizona Ore Reduction Company a profit of \$7.20 per ton; or \$1800.00 per day on a 250 ton output.

There remains \$5.94 gross to the credit of the General Metals Company after deducting 15 per cent loss in extraction. From this must be deducted their mining cost of \$2.38 per ton, leaving a profit to the General Metals Company of \$3.56 per ton, or \$890.00 per day.

This is a net earning capacity to the credit of the Arizona Ore Reduction Company in excess of seven per cent per month on its entire capital stock of \$750,000.

And 5¼ per cent per month to the credit of the General Metals Company on its capital stock of \$500,000, of which seventy-seven per cent is owned by the Arizona Ore Reduction Company. This brings the monthly net earning of the Arizona Ore Reduction Company to better than eleven per cent.

FUTURE OPERATIONS

Plans have been outlined for extensive development on all of the veins belonging to this property and the work is already well under way. This consists of:

2
11
6/11/1919

The hoisting is at present being done with two small air lifts, one at each compartment of the working shaft.

The blacksmith shop consists of forge run under compressed air; one Sullivan pneumatic drill sharpener; one Buffalo portable forge and full complement of tools.

The air is distributed to the machine drills and pumps through one Chicago Pneumatic Compressor, 741 cubic foot capacity. There is also one 350 cubic foot air compressor, Chicago Pneumatic Tool type, and one Gardner-Rix 150 cubic foot compressor. These two small machines are used as auxiliary compressors in case of temporary shut-down to the large one.

The assay office is a complete laboratory 15x36 feet, built of frame with cement foundations and floor. Equipped with power crusher and pulverizer and all necessary appliances and chemicals. The equipment is new and the laboratory conveniently arranged with ample shelf, table and cupboard room.

The water is at present being delivered by pipelines from shafts to the reservoir. This reservoir is built of cement, is 65 feet by 45 feet, with a depth of 7 feet and will contain 153,000 gallons of water. Water connection is made from the reservoir to the mill, a distance of 1475 feet with a fall of 200 feet. This pipeline begins with six inch pipe at the receiving point, reduced to four inches and finally to three at the delivery point. Fire hose is placed at several points throughout the works for fire protection.

The air line is a four inch cast iron casing extending from the compressor room to the working shaft, the water shaft, the blacksmith shop and the working tunnel, with air receivers installed at four convenient points.

There is one 4-ton Moreland auto freight truck; one 5-passenger Dodge car and one 7-passenger Hudson car.

One General Superintendent's frame house, with 4 rooms, bath, store room and screen porch, completely furnished; water piped into house.

Company boarding house for employes, accommodating 45 men at a time, with kitchen and all utensils and tableware complete.

One 2-room frame house with drawing equipment for mechanical engineer.

One employes' bunk-house, 12x20 feet.

One employes' bunk-house, 12x24 feet.

Powder magazine 12x24 feet, built of cement with corrugated iron roofing.

Frame store house for hardware supplies, 8x14 feet.

Blacksmith shop built of frame.

22

ARIZONA ORE REDUCTION CO

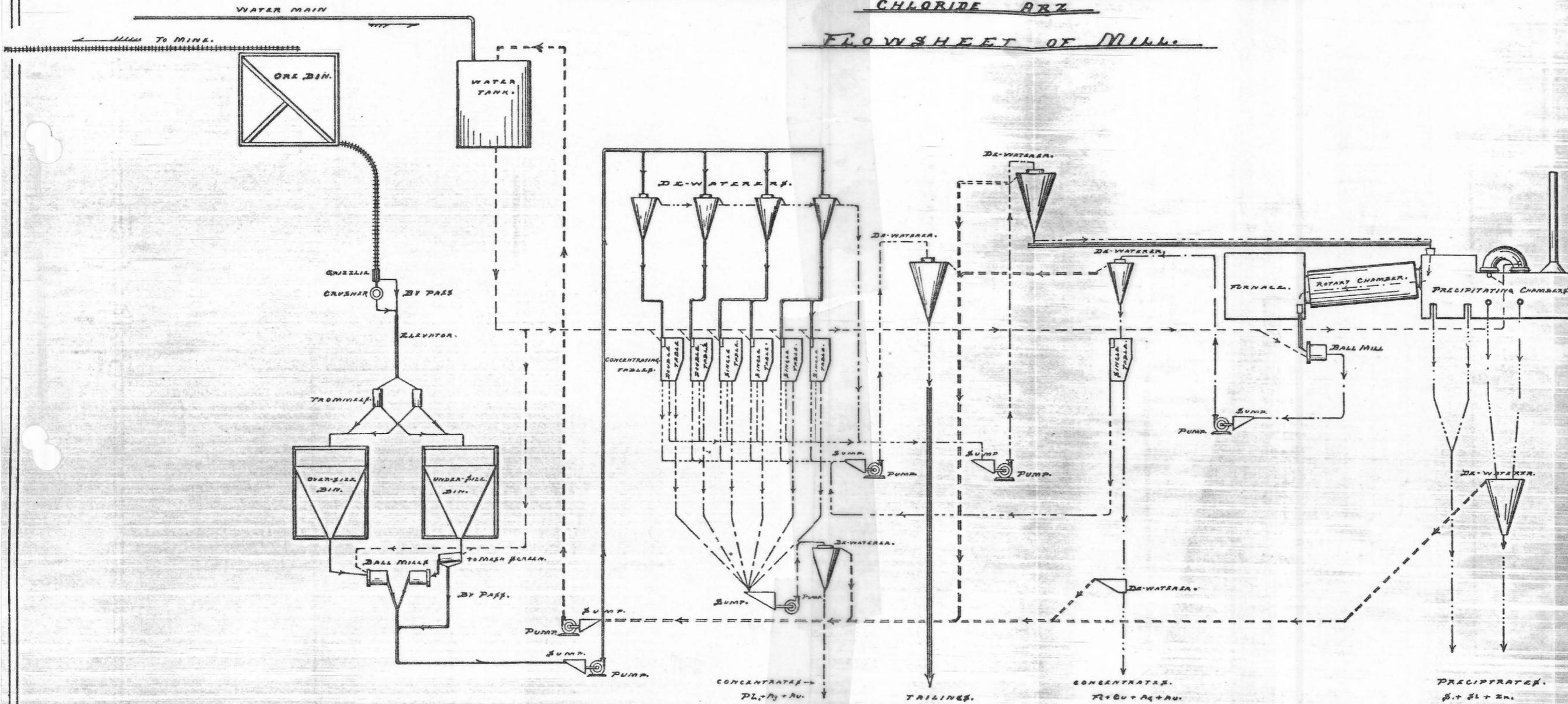
CHLORIDE ARZ

MAP No 3.

FLOWSHEET OF MILL.

FRANK NEWNAM, M. Eng.

DEC. 1917.



SYMBOLS

	DRY ORE
	WET "
	LEAD CONCENTRATE
	SLIDES
	TAILINGS
	CLINKER
	CONCENTRATE, Fe + Cu + Ag + Au
	TAILINGS
	PRECIPITATE, DRY
	PRECIPITATE, WET
	WATER
	RETURN WATER
	ELEVATOR
	CONVAYOR
	TRAMWAY
	DIRECTION OF FLOW

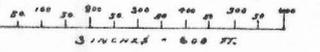
ARIZONA ORE REDUCTION COMPANY.

CHLORIDE ARZ.

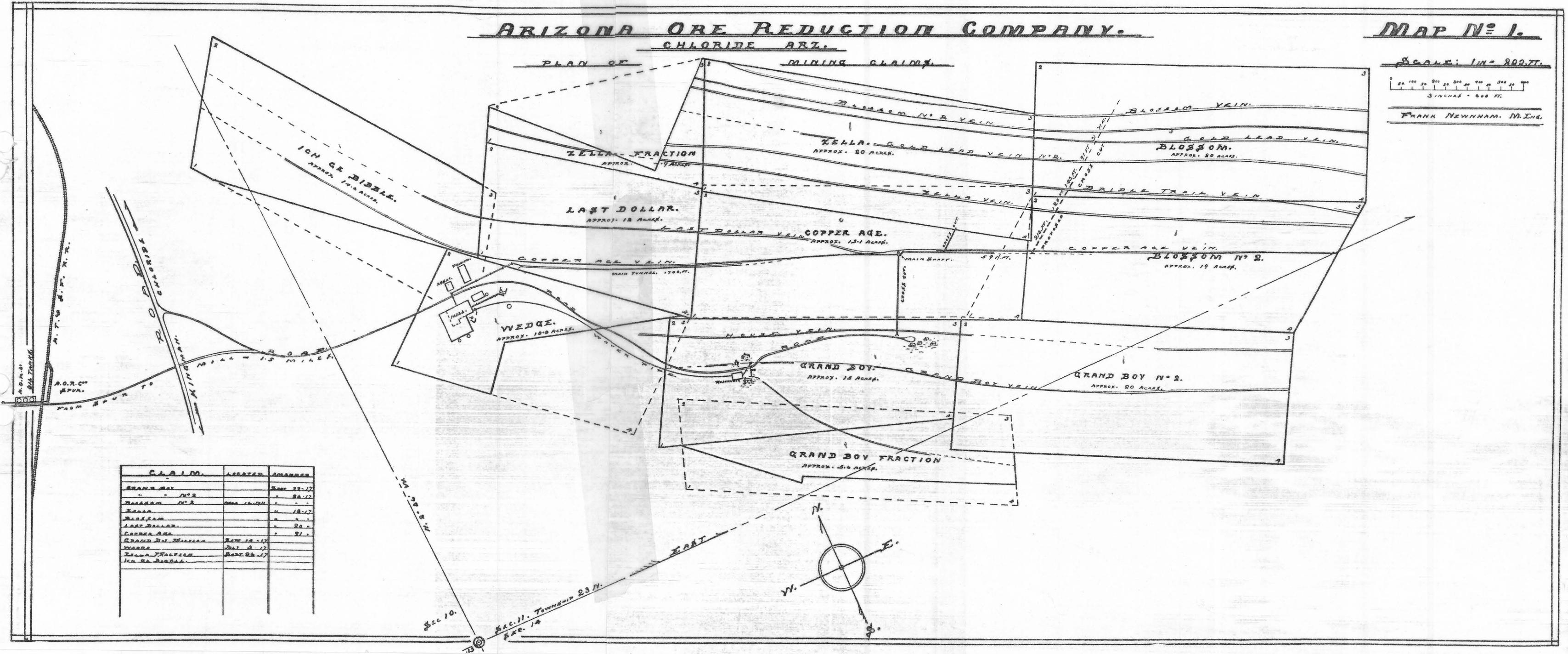
MAP N^o 1.

PLAN OF MINING CLAIMS.

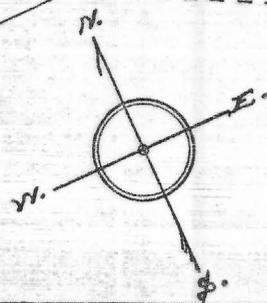
SCALE: 1 IN = 200 FT.



FRANK NEWNHAM, M. ENG.



CLAIM	LOCATED	MINES
GRAND BOY	Nov 22-17	
" N ^o 2	" 24-17	
BLISSARD N ^o 2	Nov 16-17	
ZELLA	" 18-17	
BLOSSOM	" "	
LAST DOLLAR	" 20 "	
COPPER AGE	" 21 "	
GRAND BOY FRACTION	Nov 22-17	
WEDGE	Nov 2-17	
ZELLA FRACTION	Nov 24-17	
ICH DE BIBBLE		



Sec. 10. Sec. 11. Township 23 N.
Sec. 14

ARIZONA ORE REDUCTION COMPANY.

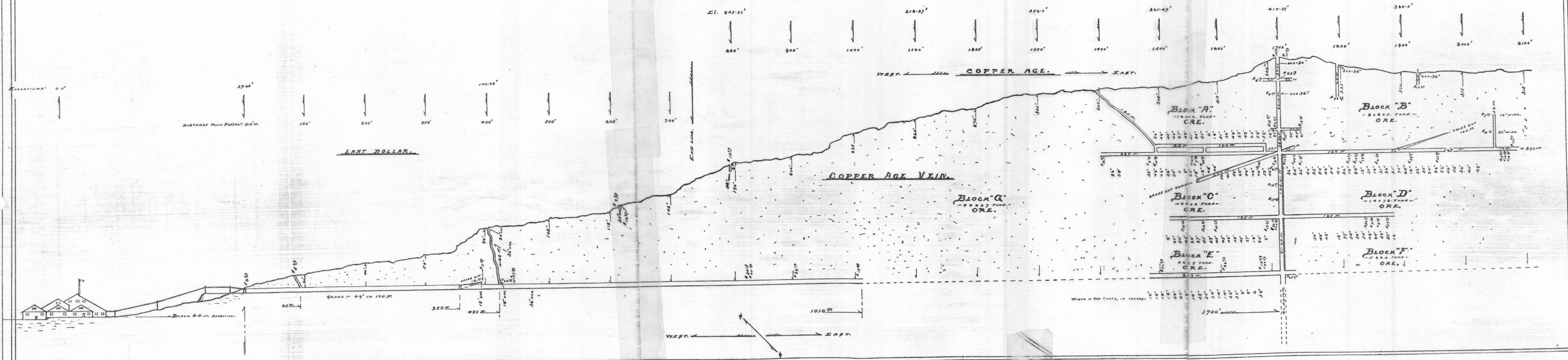
CHLORIDE, ARIZONA.

MAP OF UNDER-GROUND WORKINGS ETC.

MAP N^o 2.

SCALE: 1 INCH = 50 FT.

FRANK NEWNAM, M. ENG. DESIG.



I spent the morning with C.G. (Pat) Patterson at his home in Chloride, discussing mines and mine and mill dumps in the Cerbat Mt. Range. Pat owns the Copper Age mine (7 lode claims) located about $\frac{1}{2}$ mile northwest of the Pinkham mine. VBD WR 6/20/76

Fass, Doss and I drove to the Copper Age Mine. The dump there is a large one but contains very little mineralization. VBD WR 7/22/76

We drove to the Copper Age mine where we cut a sample from about 30 tons of ore mined about 1950. VBD WR 8/24/76

Rick Doss and I went underground at the Copper Age mine. The lower level is in good condition and can be sampled without unusual difficulty. VBD WR 9/21/76

George Fass, Mike Price and I started sampling the Copper Age mine between the Emerald Isle Mine and Chloride. VBD WR 10/20/76

We cut samples at the Copper Age mine. VBD WR 10/21/76

We continued sampling the Copper Age mine. VBD WR 10/22/76

Mike Price, George Fass and I continued cutting underground samples at the Copper Age Mine. VBD WR 10/25,26/76

We completed the sampling of the Copper Age Mine. VBD WR 10/27/76

KAP WR 2/13/81: Eldon Lee and Bill Baflaw of Archaean Mining, P.O. Box 104, Berthoud, Colorado 80513, reported that they are in the initial phase of starting up the Copper Age Mine, Mineral Park District, Mohave County. They plan start up of a mine/mill complex in the First Quarter of 1982, with a capital investment in the neighborhood of 4.2 Million Dollars. Plans include a selective flotation mill to handle 200-250 TPD. They have indicated 1.2 - 1.3 million tons of lead-silver-zinc ore. Typical assays are reported to be 17% lead, $6\frac{1}{2}$ tr.oz/ton silver, and 3-4% zinc. They plan to operate a small portable pilot mill until the mine/mill is completed. They are continuing to drill out and delineate the deposit. There is a possibility they might consider custom milling in the future. A visit should be made to the property.

RH

From "The Wallapai Project" by Mountain States Resource Development, Inc.
 Complete report in Tennessee-Schuylkill file.

Ore minerals are principally cerargyrite (silver), native gold, galena (lead) sphalerite (zinc), and chalcopyrite (copper). Some arsenopyrite occurs along with cerrusite and oxidized base metal minerals. One can consider this to be a typical "Rocky Mountain Lead, Zinc, Copper Ore."

In March 1977 Messers Dale and Rudy reported on their efforts to justify a custom mill for the small miners of Mohave County. They were funded by a government grant and did their work in conjunction with a number of governmental agencies. In the northern part of the district they report 256,700 tons of dump and tailing ore grading .018 to .103 oz/T gold, .66 to 6.63 oz/t silver, .03 to .16% copper, .13 to 1.79% lead and .50 to 3.56% zinc. They considered this to be proven ore.

It is interesting to note that this is only the northern part of the district and only includes materials that were easily accessible. Items like the buried table and jig tails at the Tennessee were not included.

H. Mason Coggin, a well known and respected mining engineer, evaluated the Copper Age group of claims in April, 1980. He measured many ore occurrences and interpreted a number of undeveloped one in the Copper Age group has a potential of 4.730 million tons averaging \$200/ton.

In the Hidden Treasure section of the property Mr. Coggin estimates .5 million tons of ore grading \$200/ton or better.

The Arizona Bureau of Mines lists the following known reserves in the Wallapai Mining District:

<u>Mine</u>	<u>Tons</u>	<u>% Cu</u>	<u>% Pb</u>	<u>% Zn</u>	<u>oz/T Au</u>	<u>oz/T Ag</u>
Banner	3841	.5	22.6	11.9	.21	7.4
	5000	.5	22.6	11.9	.21	7.4
Summit	25,000	.58	4.3	6.3	.066	4.5
	25,000	.58	4.3	6.3	.066	4.5
Golconda	40,000	.5	.5	14.0	.20	4.0
	40,000	.5	.5	14.0	.20	4.0
Fountain Head	1,250	.61	.65	16.4	.2	3.5
	3,750	.61	.65	16.4	.2	3.5
Detroit	1600	2.31	1.0	5.5	.01	7.2
	1600	2.31	1.0	5.5	.01	7.2
Wrigley	56,000	.1	9.0	.1	.1	.2
Tennessee	29,503	.1	4.1	8.2	.01	.2
	50,000	.1	4.1	8.2	.01	.2

Tennessee	100,000	.1	4.1	8.2	.01	.2
New Moon	11,000	.1	5.0	8.0	.05	7.5
	9,900	.1	5.0	8.0	.05	7.5
	10,000	.1	5.0	8.0	.05	7.5
Minnesota	900	.6	5.0	4.0	.01	.2
Lone Jack	2000	.19	5.51	4.66	.035	3.47
Copper Age	7,000	.1	3.6	7.3	.06	2.0
	7,000	.1	3.6	7.3	.06	2.0
Champion	570	.1	8.0	15.6	.26	10.0
	6,000	.1	8.0	15.6	.26	10.0
	6,000	.1	8.0	15.6	.26	10.0

While the above represent substantial exploration and are very conservative, especially since this is what their taxes are based upon, it is not fully conclusive. Mining costs, metallurgical techniques and markets must be developed. However these do show the substantial amounts of ore left in the mines.

Howard H. Heilman examined the Golconda Mine in great detail. He measured the reserves in numerous structures and defined those reserves as follows:

Virginia	350,000 tons
Tub	400,000
Little Jimmie	150,000
Peach Triangle	350,000
Golconda	300,000
Prosperity	80,000
Primrose	80,000
Blackfoot	90,000
	<u>1,800,000</u>

Mr. Heilman values these ores as follows:

Zinc	16%
Lead	.5%
Copper	.5%
Gold & Silver	\$120.00/T*

* Bases on \$300/oz gold and \$6.00/oz silver.

The whole emphasis that comes from the Golconda reports is that the mine was shut down when the fire occurred and once stopped was not restarted. The stopes that were in production are in approximately the same situation as when the mine closed.

Tonnages as indicated above were confirmed by H. G. Humes and The American Metal Company. Grades in their estimates ran higher in lead and copper and slightly lower in zinc.

Mr. Eldon Lee
9 Jun 82
Page 5

Dump samples on the Golconda were taken and measurements of tonnage were made. The measured tonnages are as follows:

Chats	15,000 tons
Lower Blackfoot	3,000
Middle Blackfoot	7,000
Upper Blackfoot	500
Prosperity	8,000
Tub	3,000
Silver	7,000
Tails	20,000
Golconda	30,000
	<u>93,500</u>

Of the dump ore, approximately 6,000 tons of it will not meet \$65/T gross metal value criteria leaving some 87,500 tons.

Samples taken by CEC have confirmed some of the grades quoted. The ongoing program of sampling each dump by complete trenching and then metallurgical testing the sampled material will accurately prove not only the tonnage and assay of each dump, but will also define what can be recovered from these dumps.

Metallurgically the ores in the Wallapai District are best treated by flotation. Recoveries as follows can be expected on ores that are freshly mined:

Lead and Silver	90-95%
Copper and Gold	85-90%
Zinc	75-85%

Ores that have been oxidized by weathering (e.g. dump ores) are also best treated by flotation unless the weathering is severe. One might expect a 5% reduction in recovery, but otherwise the treatment should be unaffected.

Gravity separation means can also be used on the Wallapai ores. Recoveries are lower, but oxidation has no effect. Some cases of highly oxidized ores yield higher recoveries than flotation, but these are not very important in the district.

Ores with high sulfides should never be treated by leaching techniques. This is a waste of time, money and resources.

The most important item in determining the best method of treatment is metallurgical testing. Ores, even ores from similar mines, must be tested and the parameters for optimum treatment established. A few dollars spent on professional metallurgical testing will save hundreds of thousands in the final analysis.

Summarizing one can state that dump ores and tailings in the district that will meet a \$65/T gross metal value are substantial. If the reports issued by competent personnel quoted herein are correct the tonnage is in excess of 300,000 tons. While CEC is

NAME: EL ORO (OLD NAME COPPER AGE) ✓

COUNTY: MOHAVE

2 miles S.E. Chloride

T23N R 18 W SEC. 11 E1. 4180'

DISTRICT:

CHLORIDE 7 1/2'

WALLAPAI
CHLORIDE

Mineralization: Zn Pb Cu, Sb, Ag

Geology:

Type Operation: 350' ²⁵⁰⁰ plus 2500 tons

Production: 5000 tons 1901-78, 324, 1062 oz. Ag, 266 lb Cu, 24.575 lb Pb

References: Mohave Co. Mineral P-20, Mohave Co. Mineral P-20

Mohave County Card File

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Copper Age ✓

Date Sept. 20, 1954

District Mineral Park - Mohave Co.

Engineer Mark Gemmill

Subject: Present Status

✓
Mr. Fred Larsen who represents himself to be the present owner is trying to find means to finance some work on the property. It has been idle for several years.

*Originals
copied
and replaced
3-1-06
W*

LARSEN, FRED
Chloride, Ariz.

Mr. Larsen represents himself to be the present owner of the -
COPPER AGE MINE - Mineral Park Dist. 9-20-54
Mohave County.

See (El. Oro Mine - file)

Dear Mr. Dunning;

This is one of Arizona dormant mines, patented some 40 years ago, and ties into the Bisbee and Planet holdings, located in the Bill Williams Mining District, Yuma County, Arizona. it is about 21 miles from R.R.

In 1945 Phelps Dodge Corp. made a test run of the ore, that shows fair value in copper -SiO₂ -Aluminum-Gold and some Silver.

This property has 426 feet of tunnel and a 96 foot shaft. All equipment was taken off, years ago.

Have been thinking strongly of opening up, since Copper has come up to a working price.

If the above is in line with your program, I would appreciate your questionnaire.

The notice was in the August 18 Pay Dirt.

Very truly yours.

Wm. Hemleben
Wm. Hemleben

320 W. 5th. St.

Had the
El. Ore on
lease in 1945

PRODUCTION POSSIBILITY
SURVEY

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

e/

TYPE - 2a

Mine COPPER AGE MINE ✓

Date October 3, 1942.

District Mineral Park, Mohave Co.

Engineer Elgin B. Holt

Subject:

PRODUCTION POSSIBILITY

SPECIAL

OWNER: L. F. Coolidge, Greenwood, Calif. ✓

METALS: Zinc, lead, copper, antimony and silver. ✓

LOCATION

The Copper Age group of seven claims is located around two miles S. E. of Chloride, Arizona. It was operated by a company over 30 years ago, and a large amount of development work was done. Also around 5,000 tons of ore were milled in a plant now dismantled.

DEVELOPMENT WORK

The group has been developed by a shaft 350 feet deep and by a tunnel 2,300 feet long on vein, starting from foot of hill and connecting with bottom of shaft 1,700 feet from tunnel portal. This tunnel follows a vein from 2.5 feet to 3 feet wide of sulphide ore of milling grade. Also, there are two levels on vein, which are run from shaft above the main tunnel level mentioned. The ground stands well and most of the mine workings are in fair condition; but the long tunnel would have to be cleaned out, timbered here and there and a new car track installed, before stoping of ore could start.

REPORTS, MAPS, ETC.

Mr. W. C. Babcock, Kingman, Arizona, has on file complete reports by reliable engineers concerning this property, including an assay map by George F. Goerner and a complete report by Oscar H. Hershey.

ORE RESERVES

The Copper Age property is a mine with considerable ore blocked out and plotted on the assay map referred to. As this ore consists of zinc complex sulphides, it could not be treated economically at the time it was developed due to the fact that there was no metallurgical process in use at that time whereby the various metals could be recovered. At the present time, this ore could be treated by selective flotation and two products could be made, to-wit: A zinc concentrate which would be shipped to Amarilla, Texas; and a lead-silver concentrate, which would be marketed to the El Paso Smelting Works. In Hershey's report, he estimates 100,000 tons of ore blocked out in the mine, and discusses the assay values of same as follows:

"A representative sample of sulphide ore, that will indicate the general character of the material that will make up the bulk of the ores developed, assayed: 0.02 ounce gold, 6.6 ounces silver, 2.1% lead, 0.10% copper, 4.7% zinc, 2.2% antimony, 24.5% iron, 16.8% silica, 26.8% sulphur, 0.05% lime, and 1.0% manganese".

COMPARISON

Tennessee-Schuylkill mill heads for the entire year of 1941, averaged as follows: 0.071 ounce gold, 2.63 ounces silver, 5.44% lead, and 6.56% zinc. Hence, it will be noted that while Tennessee ore averages higher in lead and zinc, Copper Age ore runs higher in silver. Also, as antimony is a strategic metal, I see no reason why the 2.2% of antimony in Copper Age ore cannot be isolated and recovered as a separate product by adding an antimony section to the proposed selective flotation plant. Again, it will be noted that the said 100,000 tons of ore are already blocked out, which considerable cost has already been met; so the only cost to be considered in removing this ore would be the cost of stoping the same.

TWO IDLE FLOTATION MILLS AVAILABLE

There are ~~xx~~ two idle flotation mills in the vicinity of the Copper Age mine, either one of which could be remodeled and used to treat ore from the said property. I refer to the Arizona-Magma mill, on the one hand, and the Keystone mill, on the other. The Arizona-Magma mill is a 75-ton bulk flotation plant, and the Keystone mill has a daily capacity of 125 tons, more or less. The latter is also a bulk flotation plant. Both mills are in splendid condition and either one can be purchased at a reasonable figure or rented. I am sure the Keystone mill can be rented, from what I ^{have} ~~have~~ learned.

PROPOSED SET UP

Here is a splendid set up for anyone who can furnish operating money with which, first, to recondition the Copper Age mine at a probable cost of \$25,000, and with which to remodel say the Keystone mill to a selective flotation plant, with a capacity of 125 tons per day, at a cost of around \$15,000. Also, around \$25,000 new operating capital would be needed in order to cover all operating costs until returns would begin to come in from the smelters. Broadly, I would say that \$65,000 would be sufficient to put such a project on a paying basis. Also, once the Keystone mill could be put in operation, after it has been remodeled to a selective flotation plant, as outlined, other mines in this immediate neighborhood, with considerable zinc-lead ore reserves, could be taken over and put in shape at no great expense to produce additional ore for such a mill. One bet would be the Keystone mine itself, which has been worked profitably to the 400-foot level. Deeper work is needed at this property in order to block out new ore reserves. However, while the Copper Age mine could be put on a paying basis, as outlined, it might be well to consider a far more extensive project in this area and which would consist of taking in the Keystone mine,

COPPER AGE MINE

the Evahom mine, the Pinkham mine, the Pay Roll mine, the Hidden Treasure mine and other properties in this immediate neighborhood, all of which are large potential producers of zinc-lead-copper-gold-silver ores. The capital needs for an enlarged project like this would run anywhere from one million to a million five hundred thousand dollars, as I have already outlined in my report concerning the operations of the Davenport Mining & Reduction Company. Should such an enlarged project be considered by anyone, then and in that event, I would recommend that the Keystone mill be remodeled, as set forth above, and used as a pilot mill, while new work is being carried out on the various properties mentioned. Such a pilot plant, which would consist of remodeling the Keystone mill as stated, could be put in successful operation within 90 days time, or less, after active work starts, with a view to carrying out this proposed project.

Elgin B. Holt.

Contracted in 1944. No 3 was
offered the opening up of the
C.L. Q10, near Chloride, Ariz.
Started May 1st and finished Sept. 15-
1945. ~~State~~ records will show if
any work. Ties + rails - water + air line
for 1500' cars under one, ready for
mining. This I turn over to the new
owners. on the above date
in the five months of operation with
as high as 10 men employed. had the
medical ever been call for service.

Sincerely
Wm. Hembler