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June 14th 1955

Mr. W. L. Allison
Phoenix Arizona

Dear Mr Allison:

It became necessary for me to be out of the city the past two weeks and that accounts for my delay in answering your letter of June 3rd instant. My Son in Law will in the future deliver my mail to me and there should not be much delay. ~~in the future.~~

My absence from home is only temporary and it should not be long before my return.

I had not known that you had been making tests at the Lake Shore. Personally that is alright with me altho I would not care to authorize it without first consulting my associates. Am pleased to note that your work has shown "some encouragement" and hope it continues to do so.

As to making a deal with some one else I will say, that while there has been inquiries regarding same, I have not corresponded with any one. And furthermore I have no intentions of doing so without first giving you a fair chance to prove to your satisfaction there is an opportunity of making a profit. However again I must hesitate in stating any definite time or plan. I favor your general plan, but

you must understand my position - that I must & should consult with others.

It is rather difficult for me to get out correspondence just at present - but while I am away from home my daughter will type my letters and sign for me. Her name is Mrs. Albert Farrington. Wishing you the best of luck, I remain

Yours very truly

N. Grant Leonard

20 So. Emmett St
Butte Montana

air Mail

DEER LODGE MONT. JUN 4 2PM 1955

VIA AIR MAIL

Mr. W. L. Allison
Phoenix
Arizona

#

Allison Steel Mfg. Co
P.O. Box 6067

June 3, 1955

Mr. N. Frank Leonard
20 South Emmet Street
Butte, Montana

Dear Friend:

I appreciated the promptness of your answer to my letter and I want you to know that we are doing quite a bit of test work on the Lake Shore Mine and the kind of a deal that I would like to have on this property is a deal whereby I would operate this mine on a royalty basis with a set figure for the purchase price - the royalty to apply on the purchase price.

Our test work shows some encouragement in the way of making a product that we could ship to the smelters on a small margin of profit, therefore the royalty would have to be kept down to about 5% of the net smelter returns after the deduction of the freight and the truck haul and I am hoping that you will write me a letter telling me that you will go along with me on this kind of a deal and that you and other interested parties will get together on the price.

Also, I would appreciate it very much if you would write me a letter telling me that you will not make a deal with anyone else until I have had the last look at it.

Thanking you, I remain

Very truly yours,

W. L. Allison
President

W P. S. I will assure you of one thing that if my tests do not prove satis-
L factory, after I get through, I will give you the results and I will release
A you from any contract you make with me. In other words, what I am try-
· ing to tell you is that if I can't work your mine on a profitable basis, I will
s turn it back to you in a hurry.
f

W. L. A.

cc- Frank M. Leonard - 4C - O.P.O.
Cananea, Son., Mexico Naco, Ariz.

June 1, 1955

Mr. W. L. Allison,

Allison Steel Mfg., Co.,

Phoenix, Arizona

De ar Mr. Allison:

I am in receipt of your letter of May 28 in regard to your inquiry concerning a deal on the Lake Shore Property. The title of this property is held by the Treasure State Mining Company, a Montana corporation. It is capitalized for fifty thousand shares of which my cousin Frank M. Leonard, Jr., and myself hold forty-seven thousand odd shares between us.

My cousin has informed me that he has left for a trip East and will not return until about June 15. This makes it necessary for me to avoid any definite committment about the terms of a proposed deal. I have always relied on my cousin's judgment, as he is familiar with conditions at the property. I, however, know he has always favored research work, in order to study the problem of metallurgy which is involved.

I do not know definitely what kind of a deal you wish and, under the circumstances, do not know just what to suggest. I will, however, state that I personally have a tendency to string along with you, in hope that something agreeable can be worked out between us, that would prove beneficial to all.

Yours very truly,

N. Frank Leonard

N. Frank Leonard

By: JF

NFL/JF

August 23, 1944

Mr. Frank M. Leonard, Sr.
c/o W. A. Bechtel Company
Naco, Arizona

Re: Lakeshore Mine

Dear Mr. Leonard:

I was pleased to receive your letter of July 27th replying to mine of recent date and glad to know that you have moved to the Mexican border where I hope that you are all enjoying good health and that everything is going well with you.

The information which you gave me concerning the water situation at Lakeshore and vicinity is very interesting and may prove quite important at some future time. I believe that during the next few years there may be important developments in reference to the leaching of oxidized copper ores, and I hope that some of these may be applied to Lakeshore, altho I realize that local conditions might make this somewhat difficult. I cannot say anything just as present but may be able to write you further at a later date.

Thank you for the information concerning the Standard Copper Mine, and from what you tell me, and information received from others, I am afraid that this property would not be attractive at present since it is obvious that a good deal of development work would have to be carried out before any substantial ~~quanty~~ quantity of ore could be estimated.

I am glad to learn that Frank, Jr. is still with the Cananea Company where operations should be very satisfactory after they complete their new plant, and certainly your grandson is growing rapidly.

The last news from Alden was to the effect that he has been taking part in the invasion of France, being attached to the headquarters staff of the First Army, and I imagine that he is having a wonderful experience and hope that he may come through all right. I do not believe that our losses in that area are likely to be heavy until we run up against the fortifications protecting Germany itself, and by that time the Hitler crowd may be down and out and the whole nation ready to quit. Let us sincerely hope so.

With best regards to all your family,

Sincerely,

GMC:ala

August 10th, 1944

NOTE FOR LAKE SHORE FILE

From letter received from Mr. Frank M. Leonard. 7/27/44

Not much can be stated positively about water in the vicinity of Lake Shore. The well at Kumali, three miles west of the mine and several hundred feet lower, is a government well put down for the Pagagoes. It has only a 6" pipe and my recollection is that water level is at 175', but I am not positive. There was only a 1 1/2 H.P. engine on the pump when I was there. Water level was not affected by the pumping. At the House mine a mile south of Lake Shore water came in at around 60' and stopped operations, and the same happened at the other property adjoining it to the southeast about 1/2 mile. At the Jack Rabbit water at 225 level stopped sinking. Two 9 Camerons could not handle it though they pumped for months. A big pump was ordered and delivered and laid at the mine many years but could not be lowered as the low pressure cylinder was larger than the shaft. This sounds phony but Royer and I from curiosity stopped there one day and took measurements. The telegraph operator who was running the mine switched operations and built a small smelter on a shaft 10' deep at Brownell about twenty miles south of there, but it was never blown in.

(Water in mine below 225' level
makes about 800 gals per day, by timer

From letter received from M. Frank M. Leonard, 7/27/44

The Standard Copper property is on the Silver Reef mountain southeast of the eastern workings of that property at about the same elevation and almost adjoining. It had 7 patented claims in a solid block. Taxes were paid for many years but finally stopped coming and the property must have reverted to the State, and may have been sold at auction to some speculative individual. You can easily find out from the county records in Florence. There is a shaft going down 120' in the hanging wall of a big vein and a crosscut running from the bottom straight back toward the footwall. It is at an incline of about 60 degrees into the mountain. I took a lot of samples, probably 50, including the dump, and my recollection is that the general average was close to two per cent copper. The crosscut did not reach the foot wall and I think it was about 80' from the bottom of the shaft to the end of the crosscut. You can see the dump from the old road going from town to the dry lake, and a well was dug close to the road which has water, I think at 40'., but it is not on the property. These are recollections from a long time ago and the record of my examination may be somewhere stored up in a garage but more likely may have been destroyed. I considered the property worthy of development at that time. No ore was ever shipped from the Standard up to the time I left Casa Grande and everything that came out of the shaft and several short drifts from it was on the dump.

Aug 3, '44

Cananea, Son. Mex.
July 27, 1944.

Dear Mr. Colvocoresses:-

It was certainly a pleasure to get your letter, which arrived yesterday, and to know that Alden is all right to date, and that he is married. We think of him a lot and hope he may soon be back home, and that we may have the great pleasure of seeing him and his wife. Please give them our very best wishes when you write.

Not much can be stated positively about water in the vicinity of Lake Shore. The well at Kumali, three miles west of the mine and several hundred feet lower, is a government well put down for the Papagoes. It has only a six inch pipe and my recollection is that water level is at 175 feet, but am not positive. There was only a 1 1/2 HP engine on the pump when I was there. Water level was not affected by the pumping. At the House mine a mile south of Lake Shore water came in at around sixty feet and stopped operations, and the same happened at the other property adjoining it to the southeast about half a mile. At the Jackrabbit water at 225 level stopped sinking. Two ~~No~~ 6,9 Camerons could not handle it though they pumped for months. A big pump was ordered and delivered and laid at the mine many years but could not be lowered as the low pressure cylinder was larger than the shaft. This sounds phony but Royer and I from curiosity stopped there one day and took measurements. The telegraph operator who was running the mine switched operations and built a small smelter on a shaft ten feet deep at Brownell about twenty miles south of there, but it was never blown in.

The Standard Copper property is on the Silver Reef mountain southeast of the eastern workings of that property at about the same elevation and almost adjoining. It had seven patented claims in a solid block. Taxes were paid for many years but finally stopped coming and the property must have reverted to the State, and may have been sold at auction to some speculative individual. You can easily find out from the county records in Florence. There is a shaft going down 120 in the hanging wall of a big vein and a crosscut running from the bottom straight back toward the footwall. It is at an incline of about sixty degrees into the mountain. I took a lot of samples, probably fifty, including the dump, and my recollection is that the general average was close to two per cent copper. The crosscut did not reach the foot wall and I think it was about 80 feet from the bottom of the shaft to the end of the crosscut. You can see the dump from the road going from town to the dry lake, and a old well was dug close to the road which has water, I think at 40 feet, but it is not on the property. These are recollections from a long time ago and the record of my examination may be somewhere stored up ina garage but more likely have been destroyed. I considered the property worthy of development at the time. No ore was ever shipped from the Stan-

ard up to the time I left Casa Grande and everything that came out of the shaft and several short drifts from itx was on the dump.

I think I have sent you before analysis of Lake Shore ores made at Inspiration by Aldrich on a general sample which gave 2.65% cu. for an estimated 500,000 tons. Hahn now says he has been sucessful in floating it, but no one seems interested. If you want any more information about it that I have you need only ask for it and it will be forthcoming.

The Tucson address is no good any more, as we gave up that house for good but left a forwarding address. My address now is Naco, Ariz. C/o W. A. Bechtel Co. Paco is still with that company and it is now expected that he is to remain with the Cananea Company when the new plant goes into operation. He certainly got a wonderful opportunity here and made good. I had to stop my work at La Brisca on account of war conditions and am simply lying around watching Paco work and my grandson grow. At 13 he is 5ft.8in, and broad in proportion. If priorities go into the discard I can get going again.

The family joins in sending best wishes and kindest regads to you and your family,

Sincerely,

Frank M. Leonard

RE: LAKE SHORE

COPY OF A TELEGRAM TO GEORGE M. COLVOCORESSES FROM J. J. JAKOSKY? September 15th, 1930.

"DETAILED SURVEY LAKE SHORE MINE DISCLOSES DISSEMINATED ORE OVER CONSIDERABLE AREA NEAR CONTACT BUT NO COMMERCIAL SIZE MASSIVE SULPHIDE DEPOSITS WITH DEPTH (STOP) PRELIMINARY SURVEY HOUSE CLAIM INDICATED NO LIME STONE AFTER HUNDRED THIRTY FIVE FEET DEPTH AND NO COMMERCIAL SULPHIDE (STOP) RECOMMEND DROPPING PROPOSITION (STOP) REGARDS . J. J. JAKOSKY"

******** **********

Extract from letter to J. J. Jakosky, International Geophysics, Inc. 3520 Schaefer St., Culver City, California.

from G. M. Colvocoresses.

Dear Jakosky:

"I am back in the office this morning and find your night letter of the 14th. I am disappointed that you did not find any body of sulphides at the LAKE SHORE, but think we must accept your opinion in this matter as condusive. At least I am quite satisfied to do so, although I cannot of course speak for Mr. Leonard.

"No doubt he has a large body of oxidized material, but I cannot figure how this could be operated with profit except when copper market conditions were unusually favorable, and, considering the present situation, I shall follow your advise and let the matter drop, unless Mr. Leonard can make some suggestion which seems constructive and interesting, in which event I will communicate with you further. I was never very much impressed with the HOUSE CLAIM but I am glad you went over this just to satisfy Lennard."

RE: LAKE SHORE:

Note By G. M. Colvocoresses, October, 1937.

Subsequent to writing the above I arranged to have a geophysical survey made by the International Geophysics Inc. and the preliminary examination was made in June of that year and was the basis for the enclosed report and map sent to me with Jakosky's letter of transmission dated July 8, 1930.

The findings seemed sufficiently encouraging to justify a more detailed survey which was made in September, 1930, as per Jakosky's telegram of September 15, 1930, and my letter of the same date. In view of the unfavorable result of this last work I did not feel disposed to go to the expense of having a final report and maps prepared for it appeared to me that, lacking any large body of sulphide ore the mine would only be attractive with copper at a far higher price than it was in the autumn of 1930.

I have personally examined this mine on several occasions and without having made any complete sampling have cut a number of samples which checked closely with those shown on the assay map. There is a substantial body of oxidized ore which can be cheaply mined but, until a cheap and effective method of treatment can be developed I doubt if copper could be produced for less than 10 to 12¢ per pound which does not seem to make the proposition attractive in view of the large capital expenditure and royalty or purchase price. I think that the treatment problem deserves further study by anyone who has confidence in the future of copper and can afford to investigate with a view to the future than than the immediate present.

G.M.C.

file Apl 1930 Oc (Revised)

NOTES ON LAKE SHORE MINE, NEAR CASA GRANDE, ARIZ.

This property is located in Pinal County about 30 miles south of the town of Casa Grande, and reached by a good road.

The ore occurs in a zone of crushed andesite along a granite contact, and development down to the 265' level has proved, or partially proved, a large body of oxidized material which has been thoroughly sampled on five different levels as shown in plan of workings attached.

The average grade of the exposed ore is about 2.5% copper as oxide and the tonnage has been variously estimated at from 300,000 to 500,000 tons. The lower figure represents more nearly the tonnage which can be considered as actually developed by the workings. The dimensions of the ore body are approximately 700' in length and 35 to 40' in width, but faulting prevents this body from constituting a continuous ore chute. Analysis of an average sample is approximately as follows:

Copper	-	2.90% (as oxide)
Iron	-	16.40
Insoluble	-	50.40
Lime	-	3.30
Sulphur	-	Nil

Additional ore has been indicated by drill holes and more recently by an extensive magnetic survey, on the basis of which the United Verde Copper Company are said to have calculated the probable ore reserve as approximately 1,500,000 tons, the grade, of course, being very uncertain.

Carbonate, Silicate & Oxide asso. with magnetite.

Below the oxidized zone, which apparently terminates a short distance below the 265' level, there are indications of sulphides since some sulphide ore was found in a winze and the general characteristics of the ore body make it appear probable that this represents an oxidized zone over a primary deposit of sulphide ore. The extent and character of the sulphides cannot be estimated at the present time, but it seems probable that the grade should be better than that of the oxidized section and that a very substantial tonnage is likely to exist and continue to considerable depth.

The value of the property considered as a large deposit of oxidized ore is problematic, but with cheap mining and recent improvements in the leaching process, it should be possible to work this portion of the property with a reasonable margin of profit.

The existance of a much more valuable body of sulphide ore could probably be indicated at slight expense by a geophysical survey, particularly an electrical or resistivity survey, and, if satisfactory results were obtained, these could be checked by a few drill holes and underground development work conducted from the present winze, which reaches a depth of 265', and from a downward extension of this winze which, according to reliable reports, should enter sulphide material some 15' below the winze level.

The mine is owned by Frank Leonard, of Casa Grande, who is an exceptionally reliable and reasonable man to do business with and who has had a long experience in mining operations both in United States and Mexico. Mr. Leonard is willing to dispose of

all his property, or a controlling interest, on terms which appear to me reasonable, and will give an option to any responsible company for a sufficiently long period of time to enable them to definitely determine the probable value of the property. I am of the opinion that chances are favorable to the development of a large body of sulphide ore, as well as a substantial extension of the known reserves of oxide material, and some portions of Leonard's property, other than those developed by underground workings appear to be very promising prospects.

The mine is well equipped with a small power plant and usual mining equipment, also substantial camp buildings, and operating conditions would be very favorable.

During recent years the Lake Shore has been examined by engineers representing a number of the larger companies, all of whom have been distinctly interested, but until recently Leonard's terms were not considered satisfactory. Last negotiations undertaken by the United Verde reached a point where satisfactory terms were agreed upon and the United Verde spent several thousand dollars in examination work, including the magnetic survey mentioned above, but the recent drop in the price of copper and generally unsettled condition of the copper industry apparently have prevented them from definitely closing a deal, and Mr. Leonard is now entirely free to do business with other parties, and has temporarily placed the property in my hands for presentation.

G. M. C

Phoenix, Arizona.
April 29, 1930.

file - Roger

Muffle Tests. Lake Shore

Ore Analysis

Cu	2.90%
Insol.	50.40%
Fe	16.40%
CaO	3.30%
S	nil

S

Test #	Ore gms.	Mesh	Salt gms.	S Gms	Temp.C	Time
57	25	120	2.5	**	850	1'
58	25	35	4.0	**	850	1'
59	25	35	4.0	**	850	1'
60	25	35	12.5	**	850	1'

Wt.Calcine	Assay Calcine Cu%	Extraction %
22.05	0.93	71.7
21.87	0.36	89.1
22.51	0.65	79.8
21.74	0.21	93.7

Humboldt, Oct. 1919.

INTERNATIONAL GEOPHYSICS INC.

3520 Schaeffer Street

Culver City, California.

July 8th, 1930.

Mr. George M. Colvocoresses,
1108 Luhrs Tower Building,
Phoenix, Arizona.

Re: LAKE SHORE MINE .

Dear Mr. Colvocoresses:

Enclosed herewith kindly find our report covering the preliminary geophysical work at the Lake Shore Mine, near Casa Grande, Pinal County, Arizona.

Our preliminary survey was not sufficient to definitely establish the existence or non-existence of a sulphide zone with depth, but the results are favorable and we will carry out a complete survey at the earliest possible date. Unless you have reason to change our plans, we will try to do this work immediately after completing your work at Meteor Crater. At that time we will have complete equipment with us and the work will be carried far enough to give a definite answer as to the existance of a sulphide zone.

While at the Lake Shore Mine Mr. Leonard mentioned the advisability of our doing similar geophysical work on two or three adjacent properties which were owned by them. If this meets with your approval, I would appreciate your taking the matter up direct with Mr. Leonard, and we will try to plan our work here so as to allow sufficient time for the survey of the other properties.

Attached herewith kindly find a signed copy of your letter of June 9th, addressed to Mr. Leonard, relative to our agreements covering the engineering, geophysical and sales prices of the property."

Very truly yours,

INTERNATIONAL GEOPHYSICS,INC.,

by: J. J. Jakosky

LAKE SHORE MINE.

INTRODUCTION:

This report covers the preliminary geophysical survey conducted to determine the possible existance of a sulphide zone of mineralization beneath the oxide ore body and to determine whether conditions justify a more complete geophysical survey.

GENERAL GEOLOGY.

The Lake Shore Mine is located about 30 miles south of Casa Grande Arizona, at the base of, and on the west side of the small Late Mountain Range. The Lake Shore Group comprises 50 claims; 3 of which---covering most of the developments and improvements--have been patented.

Mineralization in this locality occurs along a granite andesite contact. The granite, outcrops as a small stock at the base of the mountain range, is evidently intrusive and it is believed that mineralization occurred along the contact at or subsequent to the time of intrusion. Near the Lake Shore Mine the ground in the vicinity of the contact is considerably broken and fractured. The fractured ground contains limestone and other sedimentaries. Limestone is said to occur at several places along the contact and to show evidences of mineralization. At the Lake Shore Mine this broken ground constitutes a trough or wedge, between the andesite and the granite contacts. Near the mine workings these contacts are covered by alluvium which extends out into the valley to the west. The depth of this wash varies from 20 to 50 feet, according to our geophysical data.

The ore exposed at present is entirely of an oxidized nature, consisting of carbonates, silicates and oxides of copper, associated with magnetite, and has an average grade of about 2.75 per cent copper. Because of the metallurgical difficulties involved in treatment, the exploitation of this deposit has not been considered a commercial project to date.

DEVELOPMENT.

The main entry is a vertical shaft, 235 feet deep, adjacent to and west of the granite contact. The shaft is located in andesite and oxide ore. Five short levels have been run from the shaft at different depths and from these levels numerous crosscuts have been made. From the information given by these openings and drill hole data, the tonnage of estimated oxidized copper ore is about 400,000 tons.

No sulphide ore has been developed. In a drift from a winze sunk 50 feet below the 225 ft. level, sulphides were exposed along the granite contact. These sulphides occurred in bunches and streaks along the bottom of the drift over a width of 5 to 6 feet. They consisted of chalcopyrite and bornite, and are said to have contained 6 to 8 % of copper. These were partially oxidized giving some evidence that they represented the top of a sulphide zone. Influx of water stopped operations and prevented determinations of the extent of the sulphides. The winze is under water at the present time.

This occurrance of sulphides, together with the evidence of leaching that has gone on in the oxidized material above, furnish data for presupposing the existence of a sulphide zone beneath the oxide zone, and the possibility that secondary enrichment has taken place. Should such a sulphide zone exist in commercial magnitude, the property should be considered worthy of future development and exploitation.

PREVIOUS GEOPHYSICAL WORK.

The only geophysical work conducted prior to the present work, was a magnetometer survey, under the direction of the United Verde Mining Co. The work, being entirely magnetic, gave no indications as to the possibility of a sulphide zone existing at depth. The magnetic work however, did indicate that the area of ore occurrance extended considerably beyond that known from the present workings, and it was estimated that the amount of ore present was in the neighborhood of 1,500,000 tons.

PRESENT ELECTRICAL SURVEY.

Inasmuch as magnetic work had already been done, it was considered sufficient for purposes of a preliminary survey, to employ one electrical method. For this work the potential apparatus developed by this company was employed. This system is of the low frequency type employing a differential circuit using five electrodes connecting with the ground. The system is of exceptionally high sensitivity and excellent for work under conditions encountered in this area.

During the short time available for this preliminary work, only two sets of conductivity or potential studies were made. No underground measurements were made, and no detailed study made of a real or subsurface geology.

The measurements were made along two lines, bearing due north, at stations "A" and "B" and data obtained to depths of 900 ft. The set-up point for station "A" is located about 400 feet west of the granite contact and near drill hole No. 4. The set-up point for "B" is located 100 feet due east of the main shaft, and about 150 feet west of the granite contact. This station is located approximately 225 feet vertically above the bottom of the trough previously mentioned and formed by the intersection of the converging andesite and granite contacts; and also almost directly above the point where sulphides were found in the crosscuts.

The general results of this work are illustrated graphically, the curves showing the variation in potential distribution with depth of penetration. The greater the conductivity of the area (the higher the percentage of sulphides present) the lower is the potential. A detailed analysis of the curves is given herewith in order to show method of interpreting data from this type of survey.

The attached map of the property was taken from a survey and map prepared by Mr. Frank M. Leonard, Jr., The potential curves are plotted to the right of the claim map.

ANALYSIS OF CURVE "A".

The section represented by this curve is, for its entire depth, in material of very good conductivity. This material undoubtedly a combination of surface wash the crushed zone of irregularly mineralized, oxidized, and moist material between the andesite and granite contacts. The water level is shown at about 250 feet by the curve. The low values shown by the curve are probably due to the fact that when the measured section first includes the water table, it is almost entirely made up of the low resistant crushed and altered zone; the andesite and granite not coming into the measurements appreciably until greater depths are reached. Assuming a contact dip of 60 degs. as shown near the surface, the granite should be in place at about 800 feet vertical depth beneath the station "A". The inclusion of either andesite or granite in the section would result in an increasing resistivity or greater potential value on the curve, since the two rocks have values of unit resistivity considerably higher than that of the crushed and mineralized material, as shown by our laboratory studies. The andesite, however, is considerably altered near the ore zone, so that it is not likely that its inclusion in the section would increase the resistivity materially for the smaller depths. Inclusion of the granite, which is altered to a much less extent near the surface, will increase the resistivity.

After the low value shown at the 250 foot depth, the conductivity decreases again and is fairly constant. At 800 feet there is a rise. This rise may be due to the lateral inclusion of the more resistant granite. That such should be the case is somewhat indicated by the curve for "B" which is about 250 feet nearer the contact, and shows increasing and higher values of resistivity (lower values of conductivity) for the greater depths.

If this increase can be attributed to the inclusion of granite, the decreasing potential value from 600 to 825 feet, and the lower values at 900 feet, which is the lowest value exhibited by the curve, become quite significant, and are possibly due to the existance

of sulphides along the granite contact at depth. Upon the same hypothesis, as the section becomes deeper the conductivity should decrease again due to inclusion of more and more granite, and possibly andesite. It is seen that the conductivity does decrease again beyond 825 feet.

ANALYSIS OF CUVE "B".

This curve shows generally higher potential values than does curve "A". This may be due to the inclusion of more granite with an increase of depth. The water level is shown at about 250 ft. by the curve. The curve shows a general trend toward higher values of potential with increased depths. However, between depths of 375 feet and 700 feet there is a change indicating a better conductivity. Beyond 700 feet, the potential increases quite appreciably, due probably to a greater inclusion of granite.

The change between the 375 and 700 foot depths indicates the inclusion of better conductive ground between these depths. This may be due to the presenceof sulphides, or it may merely be due in part or entirely to the presence of the better conducting fractured zone to the west. See analysis of curve "A". Due to the complicated geological conditions existing in the area definite interpretation cannot be made from the two curves obtained during this preliminary survey.

CONCLUSIONS AND RECOMMENDATIONS.

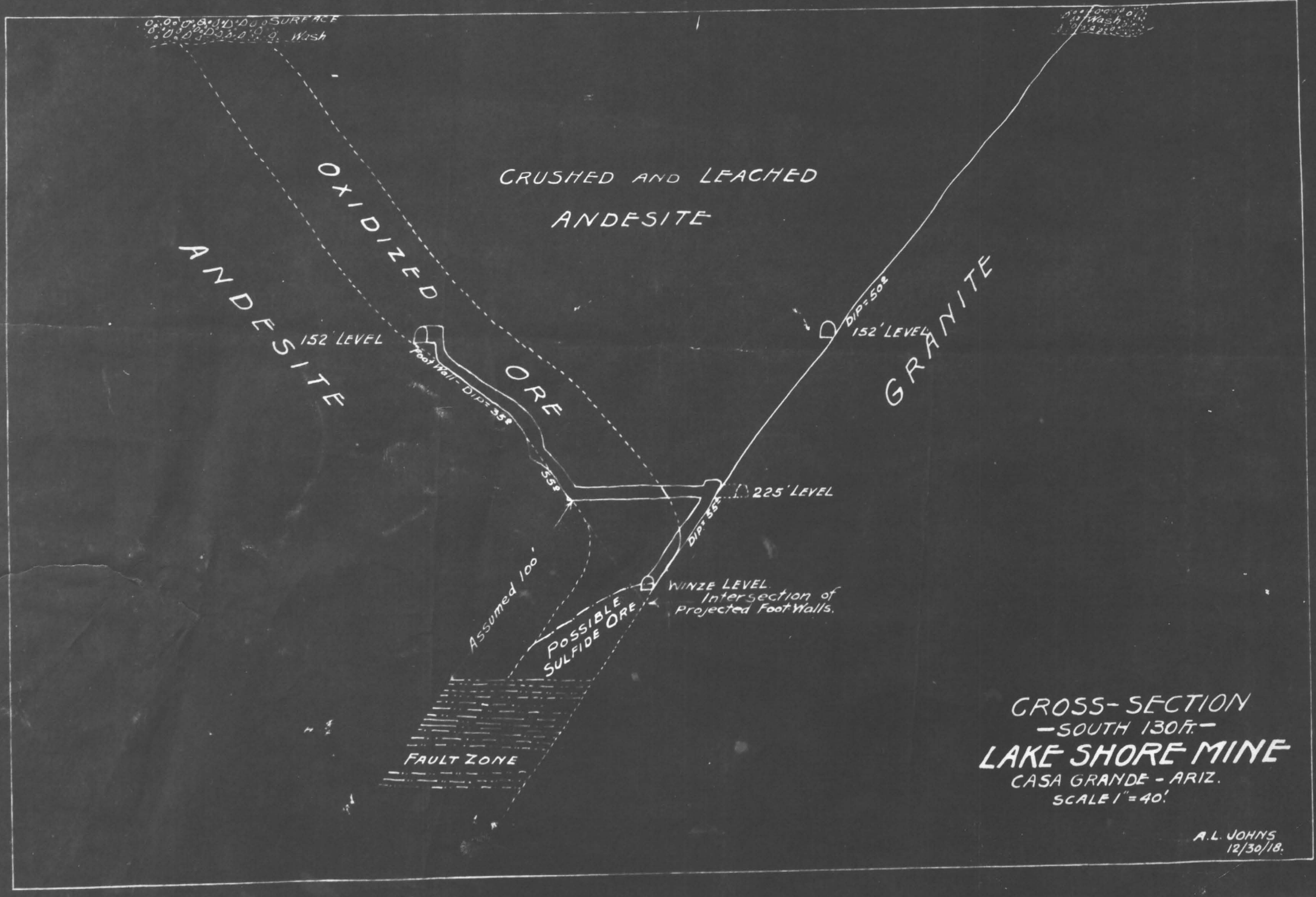
The data obtained in this brief survey has been insufficient to definitely determine the existance of non-existance of a sulphide zone at depth.

As shown by curve "A" there exists on the property a conductive zone along the granite contact extending from about 300' to a depth of about 900 ft., beyond which depth no measurements were made during this preliminary work. This high conductivity is due to the presence of a fractured and crushed zone of altered, irregularly mineralized material in which leaching has taken place. Evidence of present electrolytic action is found in the presence of high ground currents, and this current may have some relation to the present

leaching action and possible sulphide occurrance.

Although the results of this preliminary survey are not conclusive as proving the existance of a sulphide zone with depth, due to insufficiency of data, but are believed to fully warrant the future employment of a complete geophysical survey, including electrical and magnetic studies..

INTERNATIONAL GEOPHYSICS, INC.


SURFACE
Wash
Wash
OXIDIZED ORE
CRUSHED AND LEACHED ANDESITE
ANDESITE
GRANITE
152' LEVEL
Foot Wall - Dip = 35°
35°
DIP = 50°
152' LEVEL
225' LEVEL
DIP = 55°
Assumed 100'
POSSIBLE SULFIDE ORE
WINZE LEVEL
Intersection of Projected Foot Walls.
FAULT ZONE
CROSS-SECTION
-SOUTH 130ft.-
LAKE SHORE MINE
CASA GRANDE - ARIZ.
SCALE 1" = 40'
A.L. JOHNS
12/30/18.

30 So. Main St.
P. O. Box 1889

JACOBS ASSAY OFFICE

REGISTERED ASSAYERS

Phone 2-0813

Certificate No. 57744 Tucson, Arizona, June 7th, 1955

Sample Submitted by Mr. Allison Steel Mfg. Co. By Mr. Freeman

SERIAL	SAMPLE MARKED	GOLD Ozs. per ton ore	GOLD Value per ton ore *	SILVER Ozs. per ton ore	COPPER Per cent Wet Assay	LEAD Per cent Wet Assay	Per cent Wet Assay
143442	Heads	0.01	$ 0.35	0 3/10	2.58		
43	- 10 mesh	0.01	0.35	0 3/10	2.55		
44	Float Prod	0.02	0.70	0 4/10	3.11		
45	Sink Prod.	0.01	0.35	0 2/10	2.26		
		Lake Shore Dump					

* Gold Figured $35.00 per oz. Troy

Charges $ 11.00

Very respectfully,

Ben B. Jacobs

Copy handed Selim

PRELIMINARY EXAMINATION OF THE LAKE SHORE MINE

INTERNATIONAL GEOPHYSICS - INC.
LOS ANGELES & CULVER CITY, CALIF.

May 13, 1926.

Mr. Louis E. Reber, Jr.,

Jerome, Arizona.

Dear Reber:

Referring to our interrupted conversation of yesterday, the Western Metallurgical Company started to investigate the Lake Shore property back in 1919. At that time we were furnished with reports which indicated that there were developed approximately 500,000 tons of 3% copper ore, and there were possibilities of developing a much larger tonnage.

We experimented with a treatment of this ore by chloridizing volatilization and obtained very good results, which indicated that we could recover somewhat upwards of 90% of the copper contained, and with working costs, including coarse crushing, of about $2.50 a ton, to concentrate this ore into a fairly high grade fume. These cost figures do not include any mining expense.

We subsequently investigated the Lake Shore mine, which I visited in person three or four times, and were unable to check the original estimates as to tonnage and grade, although there is certainly a limited quantity that will run better than 3% and a small quantity of 4% to 5% ore might be mined.

Leonard always believed that underneath the oxidized ore would be found a large body of sulphide ore, and as you may recall there was one place where a little sulphide ore

was showing in a winze below his bottom level.

At one time we thought quite seriously of erecting a small chloridizing volatilization plant in the vicinity of the Lake Shore Mine, where we hoped to treat at least the better grade ore from the Lake Shore and some ores from other properties and prospects in that district which gave promise of becoming producers in a short while, but the continued low price of copper discouraged us from ever going ahead with this project.

Should you be seriously interested in this mine, I will be glad to give you in detail all information in my possession, and if you should decide to develop and operate it we would certainly be glad to co-operate in solving the treatment problem, and I believe that our volatilization process would perhaps give better results than any other on this particular class of ore.

I meant to speak to you yesterday concerning the McCracken, or Signal, Mine, south of Yucca. This property, which you visited some time ago, is now tied up by reason of the bankruptcy of the Signal Mines Company, and although the Western Metallurgical Company has a lease and bond we cannot operate under present conditions.

I believe that this mine has real merit, and have made arrangements whereby I think it can eventually be combined with the Otsego, or Navajo, property, which lies to the south, and consists of an extension of the McCracken vein.

The two mines together should be worked economically and might produce a substantial tonnage of lead silver ore which could be treated in the Signal mill.

To work out this combination and and clear the Signal Company of the bankruptcy complications would probably require a larger amount of money than the Western Metallurgical Company is able to raise without additional financing, which we do not intend to undertake, and we would be glad to co-operate with any larger concern that might be interested in this situation and eventually to either work with them or turn over to them our interest at a reasonable figure.

Since your company has now embarked on a policy of investigating mining properties, I would like you to have every possibility of looking into this McCracken situation, which I believe you might find quite interesting.

I understand that Bill Gohring is going to make a thorough sampling of the Navajo in the near future, and if the results of his work are favorable this should make the proposition even more attractive than I consider it at the present time. Our Engineer thoroughly sampled the Signal Mine last year, and I would be glad to show you results of his work, also records concerning the production and treatment at any time that you may care to investigate, that is, after June 1st, as I shall probably be away from Humboldt until about that time.

With best personal regards,

GMC-s Sincerely yours,

J. J. JAKOSKY
CONSULTING ENGINEER

M. BRENNER
PHYSICIST

L. H. HENDERSON
V. P. PENTEGOFF
GEOLOGICAL ENGINEERS

CLYDE H. WILSON
MINING ENGINEER

INTERNATIONAL GEOPHYSICS, INC.

CONSULTING GEOPHYSICISTS

GENERAL OFFICES
ARCHITECTS BUILDING

PHONE MU-4405
LOS ANGELES, CALIF.

LABORATORIES
3520 SCHAEFER STREET
CULVER CITY, CALIF.
OXFORD 8044

FILE NO.

July 8th, 1930.

Copied

Mr. George M. Colvocoresses,
1108 Luhrs Tower Building,
Phoenix Arizona.

Re: LAKE SHORE MINE.

Dear Mr. Colvocoresses:

Enclosed herewith kindly find our report covering the preliminary geophysical work at the Lake Shore Mine, near Casa Grande, Pinal County, Arizona.

Our preliminary survey was not sufficient to definitely establish the existance or non-existance of a sulphide zone with depth, but the results are favorable and we will carry out a complete survey at the earliest possible date. Unless you have reason to change our plans, we will try to do this work immediately after completing your work at Meteor Crater. At that time we will have complete equipment with us and the work will be carried far enough to give a definite answer as to the existance of a sulphide zone.

While at the Lake Shore Mine Mr. Leonard mentioned the advisability of our doing similar geophysical work on two or three adjacent properties which were owned by them. If this meets with your approval, I would appreciate your taking the matter up direct with Mr. Leonard, and we will try to plan our work here so as to allow sufficient time for the survey of the other properties.

Attached herewith kindly find a signed copy of your letter of June 9th, addressed to Mr. Leonard, relative to our agreements covering the engineering, geophysical and sales prices of the property.

Very truly yours

INTERNATIONAL GEOPHYSICS, INC.,
By J. J. Jakosky
J. J. Jakosky

JJJ/EC

Copy to Mr. Frank M. Leonard,
Casa Grande Arizona.

June 9, 1930.

Mr. Frank Leonard,
Casa Grande,
Arizona.

Dear Mr. Leonard:

Referring to our past conversations and correspondence regarding the LAKE SHORE MINE, and the suggestion which I made in reference to cooperation of International Geophysics, Inc., of which Mr. J. J. Jakosky is Manager, and myself, in helping you place this property:

Mr. Jakosky and his assistant have just returned from Meteor Crater and have a few days to spare, and they are willing to make a trip to your mine and a brief preliminary survey by geophysical methods, which they feel should give some valuable data in reference to the possibility of sulphide ore underlying the oxidized portion of your vein.

Mr. Jakosky and I have discussed the arrangement in referemce to compensation or commission as agreed upon between you and me when you were last in Phoenix, and it seems as if some slight modification would be in order. I would therefore like to suggest the following as a basis of an agreement between us:

> Preliminary investigation to be made by Mr. Jakosky and assistant as indicated and without expense to you, except that you will give them such assistance as in your power and board while at your Camp.

If results of this examination are satisfactory to Mr. Jakosky, he will agree to return later with proper equipment and assistance to make a complete and thorough geophysical survey of your property, and I will agree to come down soon after I return from the East (which will be early in July) and thoroughly examine your mine from an engineering standpoint, so in cooperation with Mr. Jakosky a complete report can be prepared, embodying the results of the geophysical investigation and my own examination, together with such data as has been accumulated in the past.

Mr. Jakosky's Company and I will furnish you with copies of this report and complete information, and, thereafter will use our best efforts to find a purchaser for your mine on the basis of the terms which you outlined to me on May 21st, namely:

$300,000 for 100% interest
or $200,000 for 90% interest
or $150,000 for 80% interest

The terms of payment to be agreed upon later, but it being understood that you will not object to a portion of the purchase price being deferred in the event of your dealing with thoroughly responsible people.

In case we put through a deal of this kind, we shall be entitled to increase these figures by a sufficient amount to provide for a fair and reasonable commission.

You to remain entirely free to continue your efforts, either directly or through others, to dispose of your property but with the understanding and agreement that in the event of your making such a sale you will protect Mr. Jakosky's Company and myself to the extent of $10,000.00 as a commission, which shall be paid to us pro rata as payments are made to you.

We believe that it is better to have a fixed sum indicated rather than, as I suggested, to double the amount of

the fee which we would normally charge for examinations of this kind which we propose to make at our own expense, and I think you will agree that this is a fair and reasonable proposition. If so, will you kindly sign two copies of this letter under the term "accepted", one of which will be retained by Mr. Jakosky, who will present this letter, and the other he will forward back to me.

I sincerely hope that the geophysical work will come up to all of our expectations and may be preliminary to some satisfactory and mutually profitable transaction. You will understand that the preliminary survey which Mr. Jakosky will make during the next few days is in fact a part and parcel of the complete study of the property which he proposes to make ~~and~~ under the terms of this agreement, and in which I propose to cooperate, and therefore it should be understood that the agreement becomes effective immediately upon signature. Mr. Jakosky will give you the fullest information concerning the results of the preliminary work in case this might be useful in any negotiations which you may have on hand.

I am sorry that I cannot be with Mr. Jakosky in this visit to the Lake Shore but I am obliged to leave for the East tomorrow and will hope to see you soon after my return. It is quite possible that I may be able to ~~being~~ bring the Lake Shore matter up with the Eastern parties of whom I previously spoke to you and if Mr. Jakosky's preliminary examination is satisfactory I will act as quickly as possible. Personal regards.

Accepted:

Frank R. Leonard

Sincerely,

S. Z. Colcord

J. J. JAKOSKY
CONSULTING ENGINEER

M. BRENNER
PHYSICIST

L. H. HENDERSON
V. P. PENTEGOFF
GEOLOGICAL ENGINEERS

CLYDE H. WILSON
MINING ENGINEER

INTERNATIONAL GEOPHYSICS, INC.

CONSULTING GEOPHYSICISTS

GENERAL OFFICES
ARCHITECTS BUILDING

PHONE MU-4405
LOS ANGELES, CALIF.

LABORATORIES
3520 SCHAEFER STREET
CULVER CITY, CALIF.
OXFORD 8044

FILE NO.

PRELIMINARY

GEOPHYSICAL SURVEY

OF THE

LAKE SHORE MINE

PINAL COUNTY

ARIZONA.

-o-

JUNE 10, 11, 1930.

LABORATORIES,
INTERNATIONAL GEOPHYSICS, INC.
3520 SCHAEFER STREET
CULVER CITY, CLAIF.

J. J. JAKOSKY
CONSULTING ENGINEER

M. BRENNER
PHYSICIST

L. H. HENDERSON
V. P. PENTEGOFF
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Cpm

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CONSULTING GEOPHYSICISTS

GENERAL OFFICES
ARCHITECTS BUILDING

PHONE MU-4405
LOS ANGELES, CALIF.

FILE NO.

copied

INTRODUCTION.

This report covers the preliminary geophysical survey conducted to determine the possible existance of a sulphide zone of mineralization beneath the oxide ore body and to determine whether conditions justify a more complete geophysical survey.

GENERAL GEOLOGY.

The lake Shore Mine is located about 30 miles south of Casa Grande Arizona, at the base of, and on the west side of the small Late Mountain Range. The Lake Shore Group comprises 50 claims; 3 of which -- covering most of the developments and improvements-- have been patented.

Mineralization in this locality occurs along a granite andesite contact. The granite, outcrops as a small stock at the base of the mountain range, is evidently intrusive and it is believed that mineralization occured along the contact at or subsequent to the time of intrusion. Near the Lake Shore Mine the ground in the vicinity of the contact is conciderably broken and fractured. The fractured ground contains limestone and other sedimentaries. Limestone is said to occur at several places along the contact and to show evidences of mineralization. At the Lake Shore Mine this broken ground constitutes a trough or wedge, between the andesite and the granite contacts. Near the mine workings these contacts are covered by alluvium which extends out into the valley to the west. The depth of this wash varies from 20 to 50 feet, according to our geophysical data.

The ore exposed at present is entirely of an oxidized nature, consisting of carbonates, silicates and oxides of copper, associated with magnetite, and has an average grade of about 2.75 percent copper. Because of the metallurgical difficulities involved in treatment, the exploitation of this deposit has not been considered a commercial project todate.

DEVELOPMENT.

The main entry is a vertical shaft, 235 feet deep, adjacent to and west of the granite contact. The shaft is located in andesite and oxide ore. Five short levels have been run from the shaft at different depths and from these levels numerous crosscuts have been made. From the information given by these openings and drill hole data, the tonnage of estimated oxidized copper ore is about 400,000 tons.

No sulphide ore has been developed. In a drift from a winze sunk 50 feet below the 225 foot level, sulphides were exposed along the granite contact. These sulphides occured in bunches and streaks along the bottom of the drift over a width of 5 to 6 feet. They consisted of chalcopyrite and bornite, and are sait to have contained 6 to 8 percent of copper. These were partially oxidized giving some evidence that they represented the top of a sulphide zone. Influx of water stopped operations and prevented determinations of the extent of the sulphides. The winze is under water at the present time.

This occurance of sulphides, together with the evidence of leaching that has gone on in the oxidized material above, furnish data for presupposing the existence of a sulphide zone beneath the oxide zone, and the possibility that secondary enrichment has taken place. Should such a sulphide zone exist in commercial magnitude, the property should be considered worthy of future development and exploitation.

PREVIOUS GEOPHYSICAL WORK.

The only geophysical work conducted prior to the present work,was a magnetometer survey, under the direction of the United Verde Mining Company. The work, being entirely magnetic, gave no indications as to the possibility of a sulphide zone existing at depth. The magnetic work however did indicate that the area of ore occurance extended considerably beyond that known from the present workings, and it was estimated that the amount of ore present was in the neighborhood of 1,500,000 tons.

PRESENT ELECTRICAL SURVEY.

Inasmuch as magnetic work had already been done, it was considered sufficient for purposes of a preliminary survey, to employ one electrical method. For this work the potential apparatus developed by this company was employed. This system is of the low frequency type employing a differential circuit using five electrodes connecting with the ground. The system is of exceptionally high sensitivity and excellent for work under conditions encountered in this area.

During the short time available for this preliminary work, only two sets of conductivity or potential studies were made. No underground measurements were made, and no detailed study made of areal or subsurface geology.

The measurements were made along two line, bearing due north, at stations "A" and "B", and data obtained to depths of 900 feet. The set-up point for station "A" is located about 400 feet west of the granite contact and near drill hole No. 4. The set-up point for "B" is located 100 feet due east of the main shaft, and about 150 feet west of the granite contact. This station is located approximately 225 feet vertically above the bottom of the trough previously mentioned and formed by the intersection of the converging andesite and granite contacts; and also almost directly above the point where sulphides were found in the crosscut.

The general results of this work are illustrated graphically, the curves showing the variation in potential distribution with depth of penetration. The greater the conductivity of the area (the higher the percentage of sulphides present) the lower is the potential. A detailed analysis of the curves is given herewith in order to show method of inter preting data from this type of survey.

The attached map of the property was taken from a survey and map prepared by Mr. Frank M. Leonard, Jr., The potential curves are plotted to the right of the claim map.

ANALYSIS OF CURVE "A".

The section represented by this curve is, for its entire depth, in material of very good conductivity. This material undoubtedly a combination of surface wash and the crushed zone of irregularly mineralized, oxidized, and moist material between the andesite and granite contacts. The water level is shown at about 250 feet by the curve. The low values shown by the curve are probably due to the fact that when the measured section first includes the water table, it is almost entirely made up of the low resistant crushed and altered zone; the andesite and granite not coming into the measurements appreciably until greater depths are reached. Assuming a constant dip of 60° as shown near the surface, the granite should be in place at about 800 feet vertical depth beneath the station "A". The inclusion of either andesite or granite in the section would result in an increasing resistivity or greater potential value on the curve, since the two rocks have values of unit resistivity considerably higher than that of the crushed and mineralized material, as shown by our laboratory studies. The andesite however is considerably altered near the ore zone, so that it is not likely that its inclusion in the section would increase the resistivity materially for the smaller depths. Inclusion of the granite, which is altered to a much less extent near the surface, will increase the resistivity.

After the low value shown at the 250 foot depth, the conductivity decreases again and is fairly constant. At 800 feet there is a rise. This rise may be due tothe lateral inclusion of the more resistant granite. That such should be the case is somewhat indicated by the curve for "B" which is about 250 feet nearer the contact, and shows increasing and higher values of resistivity (lower values of conductivity) for the greater depths.

If this increase can be attributed to the inclusion of granite, the decreasing potential value from 600 to 825 feet, and the lower values at 900 feet, which is the lowest value exhibited by the curve, become quite significient, and are possibly due to the existance of sulphides along the granite contact at depth. Upon the same hypothesis, as the section becomes deeper the conductivity should decrease again due to inclusion of more and more granite, and possibly andesite. It is seen that the conductivity does decrease again beyond 825 feet.

ANALYSIS OF CURVE "B".

This curve shows generally higher potential values than does curve "A". This may be due to the inclusion of more granite with an increase of depth. The water level is shown at a bout 250 feet by the curve. The curve shows a general trend toward higher values of potential with increased depths. However, between depths of 375 and 700 feet there is a change indicating a better conductivity. Beyond 700 feet, the potential increases quite appreciably, due probably to a greater inclusion of granite.

The change between the 375 and 700 foot depths indicates the inclusion of better conductive ground between these depths. This may be due to the presence of sulphides, or it may merely be due in part or entirely to the presence of the better conducting fractured zone to the west. See analysis of curve "A". Due to the complicated geologlical conditions existing in the area definite interpretation can not be made from the two curves obtained during this preliminary survey.

CONCLUSIONS AND RECOMMENDATIONS.

The data obtained in this brief survey has been insufficient to definitely determine the existance or non-existance of a sulphide zone at depth.

As shown by curve "A" there exists on the property a conductive zone along the granite contact extending from about 300 feet to a depth of about 900 feet, beyond which depth no measurements were made during this preliminary work. This high conductivity is due to the presence of a fractured and crushed zone of altered, irregularly mineralized material in which leaching hastaken place. Evidence of present electrolytic action is found in the presence of high ground currents, and this current may have some relation to the present leaching action and possible sulphide occurance.

Although the results of this preliminary survey are not conclusive as proving the existance of a sulphide zone with depth, due to insufficiency of data, but are believed to fully warrant the future employment of a complete geophysical survey, including electrical and magnetic studies

L. W. WICKES
ENGINEER OF MINES
1206 PACIFIC MUTUAL BUILDING
LOS ANGELES 14, CALIFORNIA

Lake Shore file

April 17, 1947

Mr. George M. Colvocoresses
1102 Luhrs Tower
Phoenix, Arizona

Dear Mr. Colvocoresses:

Thank you for your note of April 14th.

Our records do not show that anyone from this office ever made any detailed investigation of the Lake Shore. It is entirely possible that Col. Seeley W. Mudd visited the ground many years ago but, if so, it was only in a most casual and incidental manner.

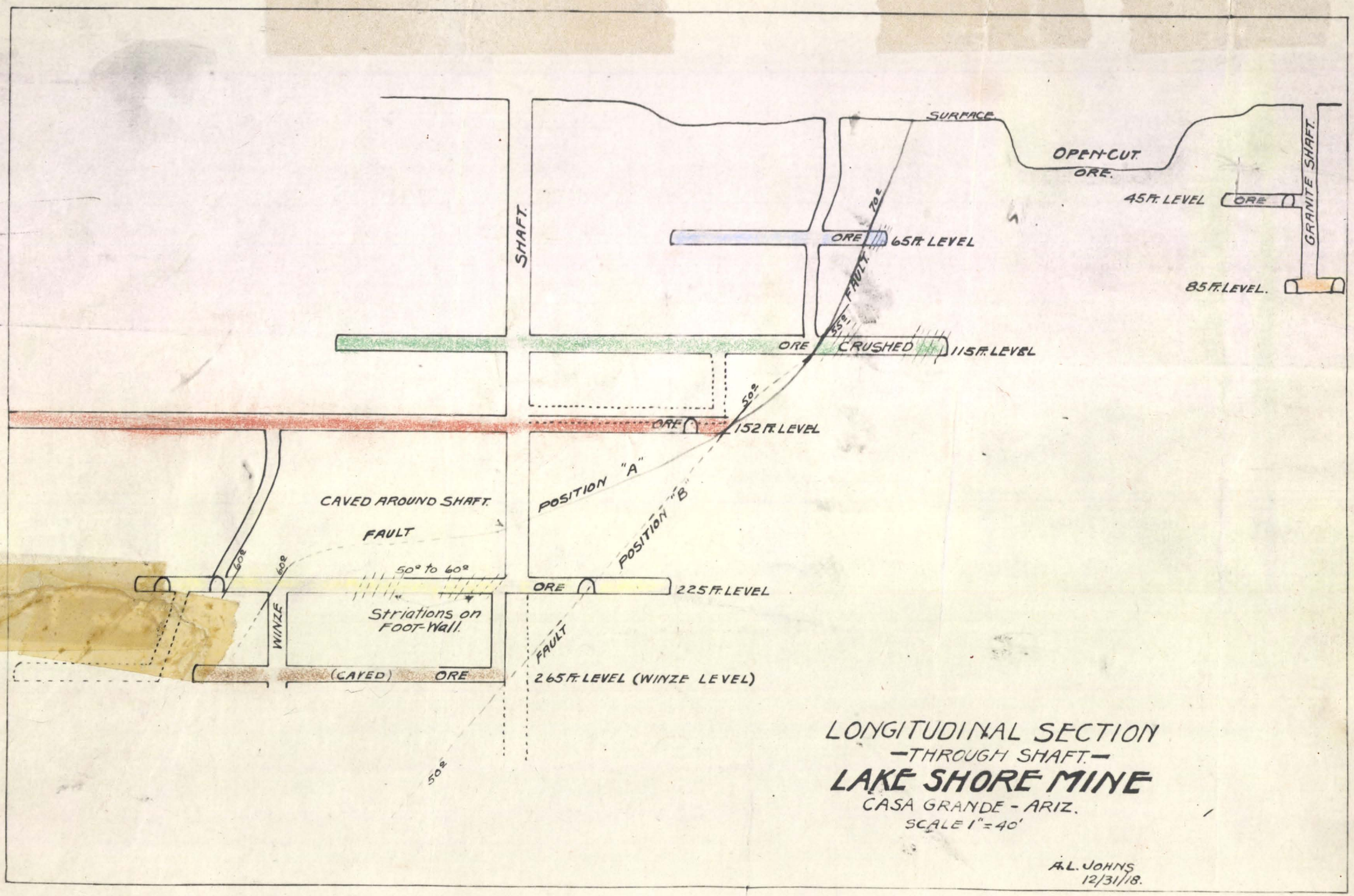
I have no knowledge of any friction that may have existed in the past or any reason therefor. On the other hand, previous inquiries regarding the property have ended with the same sort of a reply as was given you by Frank M. Leonard, Jr.

There seems to be nothing to do but to let the matter drop. Your courtesy, however, is appreciated.

Faithfully yours,

L. W. Wickes

LWW:crl



LONGITUDINAL SECTION
—THROUGH SHAFT.—
LAKE SHORE MINE
CASA GRANDE - ARIZ.
SCALE 1"=40'

A.L. JOHNS
12/31/18.

STATEMENT BY OWNER:: LAKE SHORE MINE.

The Lake Shore Mine is situated 30 miles south of Casa Grande, a town on the Southern Pacific Railway, The road from town to the mine is level, and is the usual Arizona desert road. Under ordinary conditions the trip is comfortably made by automobile in an hour and a half. The difference in elevation between the mine and the railroad at Casa Grande is 750 feet, the rise very evenly distributed throughout the thirty miles.

The mine is located in flat country at the base of a small mountain range. The surface is accessible at all places, with probably not a difference of 50 ft. in elevation between any two points. It is covered by the usual desert vegetation, greasewood, palo verde, sahuaro and ironwood.

There is a contact between andesite and granite traceable for three miles on the surface, with lime showing at various places directly on the contact. It is the generally accepted belief that the granite is an intrusion, and that mineralization occurred along the contact at or subsequent to the intrusion.

There are outcrops of ore at various places along the contact. The property known as the Lake Shore Mine covers several of these, only one of which has had development of any consequence. There are fifty claims in the group, three of which, covering most of the development and improvements, have been patented. The property is owned by Frank M. Leonard; there is no corporation; taxes are fully paid; and there is no indebtedness.

The principal development is a shaft 235 feet in depth, perpendicular, from the bottom of which there is a crosscut to the granite contact, the shaft being in andesite and ore. From a drift along the granite contact a winze was sunk to the depth of 50'. A short drift from the bottom of this winze, directly on the contact showed sulphides, but the development at this point was not sufficient to prove anything as to their extent. This work was stopped by water.

From the shaft described five levels have been run at different intervals and there are numerous crosscuts, practically all work being in ore. The ore body thus outlined has been exposed for about one thousand feet in length, and is from sixty to one hundred feet in width. There has been no failure of the ore in lateral extension nor in depth. Competent engineers have estimated the quantity of ore that may fairly be considered to have been placed in sight by this development as one million tons, of an average grade of 2.65% copper. There are very small values in gold, altho picked pieces from the sulphides gave erratic assays in gold as high as twelve dollars. The sulphides were chalcopyrite and bornite, both primary and secondary. The whole tonnage referred to above, however, is made up entirely of carbonates, silicates and oxides. Probably 10,000 tons of ore from 4 to 10 per cent copper has been shipped from the mine at various times.

There are three other outcrops on the contact that may be expected to produce as good or better results under development as the one on which the work described has been done, but the chief interest now is to determine the location of the sulphides below water level, as the evidence of leaching warrants the expectation of secondary enrichment.

The property is equipped witha Fairbanks-Morse 25 HP hoist, 165 cu. ft. Chicago Pneumatic air compressor, all necessary tools, adequate buildings, including laboratory, all in excellent condition ready for immediate use. More than $200,000 has been expended under the present ownership in purchase and development.

Copied

LAKE SHORE MINE

A letter dated September 17th, 1919, written by Mr. F. W. Royer to Mr. Colvocoresses states that a Mr. A. L. Johns may shortly be expected at Humboldt to leave in person a sample of ore from the Lake Shore Mine for testing by the Chloride-Volatilization process. Mr. Royer states the property belongs to Mr. Frank M. Leonard and himself, and at present they have it under option to the Marcus Daly Estate. Mr. Henry Crawford and Mr. Johns are looking after the work at the property. He says "We have upward of a million tons of ore developed in this Mine which I believe is an ideal class for treatment by the process you are working on."

On September 23rd 1919 we had a visit from Mr. Johns who brought a letter of introduction from Mr. H. E. Crawford, 1026 Citizens National Bank Building, Los Angeles. This letter Crawford signed as General Manager for the CINCO MINAS COMPANY, and Mr. Johns stated that Crawford was technical manager generally for the mining activities for the Marcus Daly Estate and that he, Johns, had served as an Engineer for Crawford for some years past. Mr. Johns left with us a 100 pound sample said to be representative of the ore developed in the Lake Shore Mine, and on this sample I told him we would run a series of muffle tests for extraction by the C.-V. process and advise Mr. Crawford of the results.

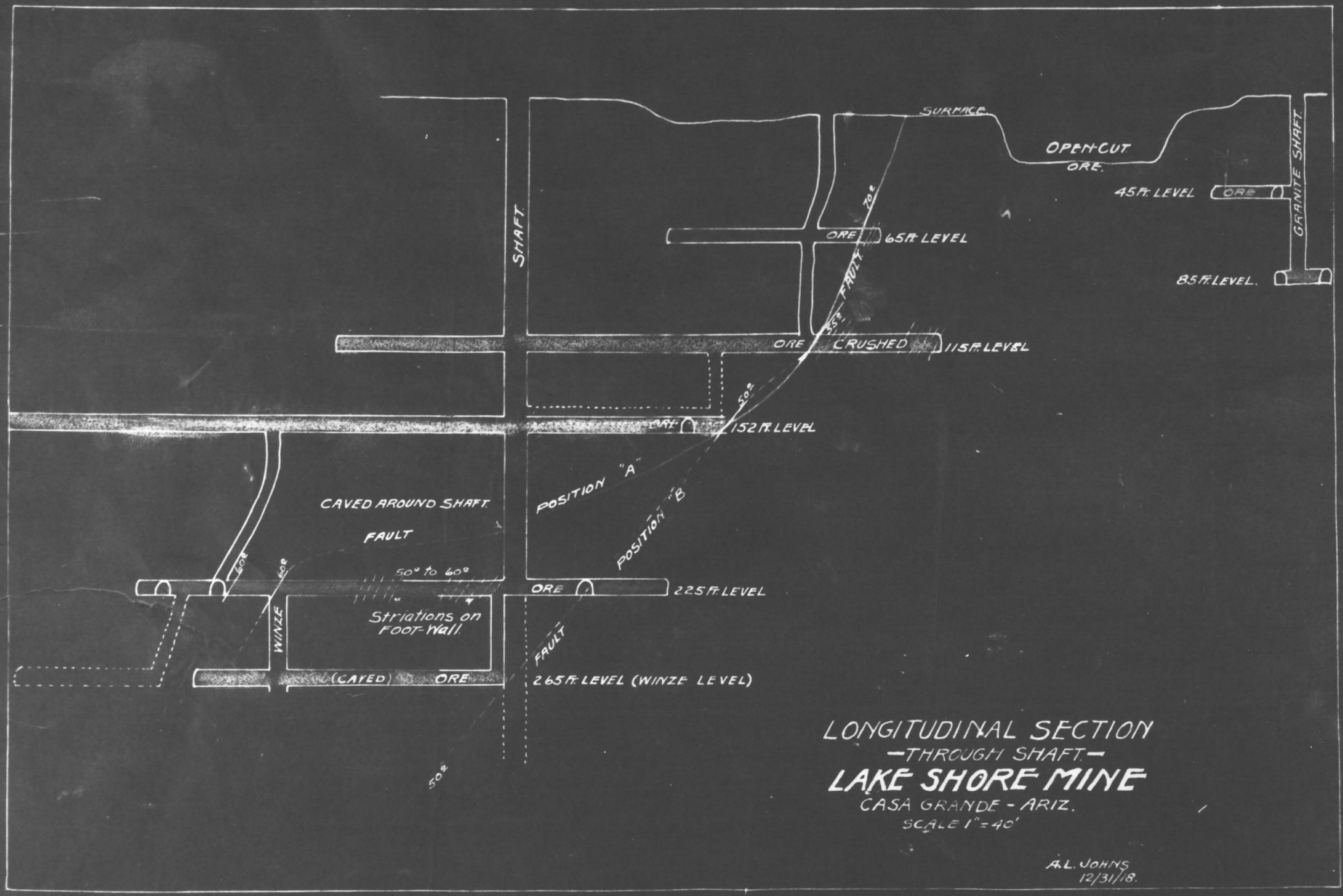
Mr. Johns states that the Lake Shore Mine is situated some thirty miles from the Railroad Station of Casa Grande, Ariz. on the Southern Pacific Railroad. He states that development work on the property in the nature of one or more shafts and various drifts and cross-cuts therefrom have developed an ore body carrying 700,000 to 1,000,000 tons of oxidized copper ore averaging 2 ½ % copper with good likelihood of the mine's ultimately producing two or three times that amount of similar ore. As I understand it, there is supposed to be at least 700,000 tons of ore that could be classed as blocked out and could be measured up. The ore body is said to be developed for a length of 700 ft. and to average 35 to 40 ft. in width. At one end of the workings the ore shoot is cut off by a fault and has not been picked up beyond. The other end of the workings is said to be still in ore, and the blocked out tonnage could be easily added to by extending the drifts at this point. The deepest shaft reaches a depth of 300 ft. 225 The ore on this level is entirely oxidized and further a winze was sunk 100 ft. from the 300 ft. level, and passed entirely thru oxidized material with the exception that near the bottom some bunches of chalcopyrite were encountered, but no sulphide ore body of importance has yet been found in the property.

The ore occurs in schist along a granite contact. Some churn drilling has been done indicating the existence of a large oxidized ore body as described above of probable

commercial tenor, say 2 ½ % copper to a depth of 300 to 400 feet below the surface and below this ore body no sulphides have been encountered, but a rock was found oxidized and much leached and carrying only .2 or .3 of a percent copper. The churn drill holes were so placed that they explored the ground for a couple of hundred feet below the ore body passing into the foot wall granite at a depth of around 500 to 600 feet.

Mr. Johns stated that it had been their early hope that the property would prove to hold a very large tonnage of ore, sufficient to justify the construction of a railroad branch to it, but that since development work had demonstrated that while there was every possibility of there being a couple of million tons or more of oxidized ore of fair grade in the Mine, there would certainly not be a large enough tonnage to treat profitably by sulphuric acid leaching with its requisite heavy outlay for plant, and they hope that the C-V process will afford a solution to the problem.

E.S. Smith



LONGITUDINAL SECTION
—THROUGH SHAFT.—
LAKE SHORE MINE
CASA GRANDE - ARIZ.
SCALE 1" = 40'

A.L. JOHNS
12/31/18.

RE: LAKE SHORE MINE

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Mr. Johns states that the Lake Shore Mine is situated some 20 miles from the Railroad Station of Casa Grande, Ariz. on the Southern Pacific Railroad. He states that development work on the property in the nature of one or more shafts and various drifts and crosscuts therefrom have developed an ore body carrying 700,000 to 1,000,000 tons of oxidized copper ore averaging 2½% copper with good likelihood of the mine's ultimately producing two or three times that amount of similar ore. As I understand it, there is supposed to be at least 700,000 tons of ore that could be classed as blocked out and could be measured up. The ore body is said to be developed for a length of 700 ft. and to average 35 to 40 ft. in width. At one end of the workings the ore shoot is cut off by a fault and has not been picked up beyond. The other end of the workings is said to be still in ore, and the blocked out tonnage could be easily added to by extending the drifts at this point. The deepest shaft reaches a depth of 225 ft. The ore on this level is entirely oxidized and further a winze was sunk 100' from the 300 ft. level and passed entirely thru oxidized material with the exception that near the bottom some bunches of chalcopyrite were encountered, but no sulphide ore body of importance has yet been found in the property.

The ore occurs in schist along a granite contact. Some churn drilling has been done indicating the existence of a large oxidized

ore body as described above of probable commercial tenor, say 2½% copper to a depth of 300 to 400 ft. below the surface and below this ore body no sulphides have been encountered, but the rock was found oxidized and much leached and carrying only .2 or .3 of a percent copper. The churn drill holes were so placed that they explored the ground for a couple of hundred feet below the ore body passing into the foot wall granite at a depth of around 500 to 600 ft.

Mr. Johns stated that it had been their early hope that the property would prove to hold a very large tonnage of ore, sufficient to justify the construction of a railroad branch to it, but that since development work had demonstrated that while there was every possibility of there being a couple of million tons or more of oxidized ore of fair grade in the mine, there would certainly not be a large enough tonnage to treat profitable by sulphuric acid leaching with its requisite heavy outlay for plant, and they hope that the C-V process will afford a solution to the problem."

E. S. SMITH

C O P Y

April 8, 1920.

Mr. F. B. Church,
#1016 West Ninth Street,
Los Angeles, California.

Dear Sir:

I have received yours of April 7, and the maps forwarded under separate cover.

These maps are not my own work, and I simply gave them to you so that you could get a general idea of the property from them. They happened to be the only maps I had here with me, and I had not examined them carefully myself. They were prepared by one of Crawford's men, and seem to have data from different samplings on them. I never made any tonnage calculations from these maps. I presumed that you would make your own examination, and that any information I might give you would be simply preliminary to your own investigation. The mine is only 15 hours from Los Angeles, and I have a cook and a representative there at all times, and automobiles for transportation, and every part of the mine is open, except for the short level from the bottom winze, which is under water, but can be pumped in a couple of days. I have at the mine various other maps and samplings which are open to your inspection, and am willing to go down with your engineers at any time, to help them as much as possible in an examination.

The quantity of water of which I told you, about eight hundred gallons per day, has been pumped from the mine for many months successively, at all seasons of the year. I could not tell exactly the amount of ore that has been shipped from the mine, as much of it was taken out before my ownership, but I think it safe to say that ten thousand tons of ore of a grade from six to nine percent has been shipped from the property.

Mr. Frank Royer, #1212 Hollingsworth Building, has a number of maps of the mine, which you can see in his office, and he can go into the question of tonnages with you, if you wish to do that in advance of your own examination. He left Tuesday for Nevada but I think will be back in Los Angeles tomorrow. He lives at the Bryson apartments and you can call him up there if he is not in his office.

Yours very truly,

(Signed) FRANK M. LEONARD.

I got an attack of facial neuralgia and ulcerated tooth driving down from Los Angeles Monday evening, and have been in bed since, but expect to be all right in a couple of days.

F.M.L.

RE: LAKE SHORE

EXTRACT FROM LETTER--

to F. B. Church, from Frank M. Leonard, April 8, 1920.

"The quantity of water of which I told you, about eight hundred gallons per day, has been pumped from the mine for many months successively, at all seasons of the year. I could not tell exactly the amount of ore that has been shipped from the mine, as much of it was taken out before my ownership, but I think it safe to say that ten thousand tons of ore of a grade from six to nine per cent has been shipped from the property."

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COPY OF A

Letter from United Verde Copper Co. to Mr. Frank Leonard, Casa Grande. March 22. 1930.

"I am enclosing an extract from Mr. Benedict's letter to me of March 15th, which is more or less in justification of his statement that the recent magnetic survey would increase the tonnage to approximately a million and a half. In the event that any more detailed report is supplied me, I will be glad to give you the information. (signed) W. V. DECamp."

******

Extract from letter to W. V. DeCamp from P. C. Benedict, Cananea, Sonora, March 15, 1930.

"Besides extending the known ore body to the south about 400' the magnetic survey indicated some other small patches of ore in the vicinity of the present main workings but not tapped by the present work. It is on the basis of this that I wired you that we could increase the tonnage to about a million and a half tons."

"In addition to this, 2500' in a southeasterly direction from the main workings is a magnetic outcrop in limestone showing some limonite and oxidized copper, It goes under wash on both ends. The width appears to be about 25', the exposed length about two hundred. There have been some shallow pits and shafts sunk on this. The magnetic indications showed that the zone did not continue northerly appreciably beyond the exposure but probably continued southerly 250' beyond the exposure with a possibility of continuing southerly even further.

Thus this showing may reasonably be expected to have alength of around 500'. The average copper content of the exposed part appears to be spotty and low. It is all oxidized and there may be more of the black copper oxide or copper pitch (as at the main ore body) than is readily recognizable and it was in this locality that I wanted to do some sampling before passing upon this showing."

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Extract from letter from U. S. Smelting Refining & Mining Exploration Co, 55 Congress St. Boston, Mass. to Frank Leonard, Written from Salt Lake City, Utah, May 17th, 1921

"You letter of the 12th was forwarded to me here. As I remember the sulphide ore in the drift from the winze was partially oxidized indicating that you are about on the top of the sulphides. I do not recall the exact copper content, but think it was about 6% or 8%. It occurred in bunches and streaks in the bottom of the drift, and was about 5 to 6 feet wide. The crosscut back to the west from this drift was all in broken, crushed, mineralized limestone, which gave strong indications of faulting and no re-l placement. If this is not correct, I wish you would put me right in this matter. That is my memory of it. I shall be glad to give such a description to anyone interested." (signed) F. B. Weeks.

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Letter from United Verde Copper Co., Jerome, Arizona, to Mr. Frank Leonard, March 13th, 1930.

" I wired Benedict recently to ascertain exactly his opinion regarding the Lake Shore Property, and he has suggested that the magnetic survey indicates the possibility of an appreciable increase in ore resefves, even up to 1,500,000 tons. However, prior to this recent work, we went over the details of costs very carefully and, from the standpoint of acid leaching, it looks as tho the acid consumption, plus transportation of same, would make this method of treatment prohibitive. We, therefore, undertook some investigation along the line of ammonia leaching, and found that it also would not be satisfactory from an extraction standpoint on ores of this character.

"However, a Mr. McKaskill, a Salt Lake City engineer, is supposed to have a process for treating such oxidized copper ores, and we are endeavoring to contact him by correspondence at the present time to see whether or not his process is applicable to ores of this character.

"I fully realize that all of our delay in this matter is of much concern to you, and that eventually we must do one of two things, either give up the idea of developing this property further, or accept same and undertake immediate work. In other words, we would like to see something done on the property, but cannot see our way clear with our present knowledge of the metallurgy connected with the operation. I therefore feel that it is unfair for you to continue holding up this deal and, in fairness to you, believe it would be advisable for you to undertake a deal with the other parties you mention.

"In regard to the work we have done on this property, you may be sure that it will be held strictly confidential, and that, if any information is given, it will be inclined towards a favorable viewpoint which I have held on the property at all times, due to the hopes I had of eventually working out the many problems." (signed) W. V. DeCamp.

April 14, 1947

Mr. Frank M. Leonard, Jr.
4C-O.P.O.
Naco, Arizona

RE: Lake Shore

Dear Frank:

Thanks for your letter of April 11 and I am sorry that you do not feel that you would care to negotiate with the Coronado Company concerning your property. You are doubtless correct in believing that the mine will not prove attractive until a certain ~~method~~ successful method of treating the ore has been developed.

However, it has been my experience that the treatment of every complex ore is a law unto itself and that you cannot predict the result of any method of treatment until it has been applied to the particular mine which is under investigation.

Mr. Wickes wrote me a short time ago that although they had frequently heard of the Lake Shore, his company had never had any details nor made any thorough investigation so that it would appear that Seeley Mudd must have kept his notes and report to himself after having visited the mine with your father.

If any large company should be interested in the Lake Shore, I am very certain that in addition to carrying on additional exploration of the ore body they would also make extensive metallurgical tests either right on the ground or on large average samples which would be sent to some testing plant.

Perhaps you have it in mind to carry out such a program yourself and in that case I certainly wish you the very best of luck. Meantime, please forget about my interest in the Lake Shore as I have written the Coronado people that there is no opportunity for them to make any investigation.

Alden was sorry that you and he had such a short visit when you passed through Superior, but he hopes to see you at a later time and when neither one of you is in so much of a hurry. He attended the meeting of a branch of the A.I.M.E. at Jerome and Humboldt last Friday and Saturday, and returned here yesterday after a very pleasant and instructive trip.

You may be interested to know that just this morning I received a letter from our old friend, Don Reed, who is at present located with the Department of the Interior, Bureau of Mines, at Collegepark, Maryland, Apparently he and his family are quite well and he has recently been engaged in drilling and other exploration work in the New England states and further south along or near the East Coast. He says that he had some success in locating magnetites and that he expects to have the Bureau publish a paper which he has written for them.

Best personal regards to you and your family.

Sincerely,

GMC: IM

FRANK M. LEONARD. JR.
MINING ENGINEER

April 11, 1947.
Cananea , Sonora, Mexico.

Mailing address------40- O.P.O.
Naco, Arizona.

4/14
47

Mr. G. M. Colvocoresses,
1102 Luhrs Tower,
Phoenix, Arizona.

Dear Mr. Colvo,

I am not interested in dealing with the Coronado people. My father spent twenty years of his life in fruitless negociation. My contention is that the mine will remain as it is, an attractive frozen asset, till metallurgical developments solve its treatment difficulties. Individuals and companies will weigh the existing data and turn it down in the final analysis simply because it is not economic. I have not been able to formulate a working plan because of this, nor has anyone else. I will gladly consider any plan of this nature and if convinced of its soundness will start from there.

My father told me that Seeley Mudd once spent over a week at Lake Shore with him and made him an offer for the property. I am almost sure that L.W. Wickes was also on the property. In any event this company already has considerable data from Mr. Mudd's original examination.

I was certainly glad to see Alden unchanged. I was afraid the war would show its deteriorating effects upon him even though he was not injured, but such is not the case. He seemed to me just like the same young man I always knew. I did not have the opportunity to meet his wife but trust I will have the pleasure in the near future. I invited them both to spend the week end in Cananea and hope they can come down soon. I am sure Alden can learn much from the operation here as well as spend a pleasant week end.

Sincerely

Frank M. Leonard

April 14, 1947

Mr. L. W. Wickes
1206 Pacific Mutual Building
Los Angeles 14, California

RE: Lake Shore

Dear Mr. Wickes:

In reference to previous correspondence I was somewhat surprised to receive this morning a letter from the present owner, Frank M. Leonard, Jr., in which he said that he did not care to do business with the Coronado Company.

He went on to say that his father, who owned the mine for several years, told him that Mr. Seeley Mudd once spent a week at the Lake Shore and had made some kind of an offer for the property. Evidently the offer was not satisfactory. Perhaps young Leonard may have been prejudiced by something which his father may have told him about the negotiations; although I knew Leonard, Sr. for many years and always thought him a very fine, if somewhat opinionated, old gentlemen.

Young Leonard seems to think that there will be no possibility ~~for~~ his disposing of the property until the metallurgical treatment of the ore has been solved in a satisfactory manner and evidently does not realize that if your company or any other large company should think well of the ore body, you would undoubtedly carry on extensive experiments in reference to its treatment.

As matters stand, it seems that the matter can only be allowed to drop and I am sorry that the outcome of our correspondence is so unsatisfactory to both parties concerned.

Yours very truly,

GMC:IM

April 9, 1947

Mr. L. W. Wickes
1206 Pacific Mutual Building
Los Angeles 14, California

RE: Lake Shore Mine

Dear Mr. Wickes:

This will acknowledge yours of the 7th inst. replying to mine of the 2d in reference to the above named property.

I assumed that this mine had doubtless been brought to the attention of your company at intervals since I think that it has been examined on various occasions by a great number of engineers, but I note that you have never made any thorough investigation.

I think that I shall be able to answer, at least to a certain extent, the questions asked in your letter by referring to my file, excepting in respect to the terms on which the property might be acquired and in that regard I have written to the owner and upon receipt of his reply will write you more fully regarding the said property.

Yours very truly,

GMC:IM

L. W. WICKES
ENGINEER OF MINES
1206 PACIFIC MUTUAL BUILDING
LOS ANGELES 14, CALIFORNIA

April 7, 1947

Mr. George M. Colvocoresses
1102 Luhrs Tower
Phoenix, Arizona

Dear Mr. Colvocoresses:

Re: Lake Shore Mine

Thank you very much for your letter of April 2 regarding our old acquaintance, the Lake Shore. That property has been coming into the office intermittently for thirty years or more.

We never have had a great deal of detail concerning the showing and it has never been presented in a manner which warranted our making an investigation. We would be very glad to know more about it, particularly the terms under which it could be acquired.

Some of the questions we have asked in the past and which have never been answered are:

1. Ratio of overburden to ore in the oxidizing zone
2. Precious metal content
3. Results of metallurgical tests which we believe have been made
4. Depths of oxidizing zone
5. Character of the material below the oxidizing zone

Your courtesy in the matter will be appreciated.

With best wishes,

Faithfully yours,

L. W. Wickes

LWW:nv

April 8, 1947

Mr. Frank M. Leonard
4C-O. P. O.
Naco, Arizona

RE: Lake Shore Mine

Dear Frank:

Referring to our recent correspondence on this subject, it happens that some months ago I had considerable correspondence with the Coronado Lead and Zinc Company of Los Angeles which is in effect the company that now operates the various properties once controlled by Seeley Mudd and of which his son, Harvey Mudd, is President.

These people were looking for a large, low grade orebody and they decided not to go ahead with the development of the mine concerning which we had corresponded.

Later on it occurred to me that a somewhat similar and perhaps a more favorable condition existed at the Lake Shore and so I took the liberty of suggesting that they might do well to look into your property.

Their engineer, L. W. Wickes has now asked me a number of questions concerning the Lake Shore all of which I think I can answer, provided you are agreeable to have me do so, excepting only in respect to the terms on which they might secure a lease or option, and that information is something with which you will have to supply me if you care to do so.

You know enough about the terms on which large mining companies want to do business to realize that the Coronado people would probably ask for a fairly long-time option but during that period would agree to expend a substantial amount of money for exploration and development and also in all probability to pay to the owners a certain stipulated minimum monthly rental or royalty.

This last provision is something which I always insist on in the case of properties whose owners I represent and right now I have three properties under lease where the lessee pays such a minimum rental.

If you are not interested in negotiating with the Coronado people, just say so and we will drop the matter entirely, but otherwise I hope that you will give me some idea respecting the terms which you would consider and also I may have to ask you for some additional technical information as the negotiations make further progress.

Glad that you saw Alden for a short time in Superior and hope that you and your family are all very well.

Sincerely,

GMC:IM

Should you decide that this might be a good policy on the part of your Coronado Company, please, let me hear from you and suggest what further preliminary information you would desire and advise me whether or not you would like to be put in touch with the owner who has been dodging a number of promoters and other people of that type, but expresses himself as very willing to do business with any reputable mining company.

Trusting that all is going very well with you and your associates, I remain,

Yours very truly,

GMC:IM

Lake Shore Mine

April 2, 1947

Mr. L. W. Wickes
1206 Pacific Mutual Building
Los Angeles 14, California

Dear Mr. Wickes:

About a year ago we had considerable correspondence in reference to the Reymert silver mine in which you seemed, for a time, to be quite interested. Am glad to say that the Reymert is now being developed by some other parties who are going to reopen the Alaska Shaft down to the 400' level and then carry on some further work on that level and probably at greater depth. In due course of time we shall probably find out if there is any zone of secondary enrichment or if primary ores, perhaps containing lead and copper, occur below the oxidized zone.

This letter is in reference to another property which, I believe, merits investigation by a large company particularly in view of the recent increase in the price of copper.

I refer to the Lake Shore Mine located about 30 miles south of Casa Grande in Pinal County and doubtless you have some data in your files regarding this property.

Briefly the ore body occurs near the surface and is oxidized down to a depth of over 200' being developed by shafts and drifts several years ago. The geologist for one of the large mining companies estimated that there were probably 1,500,000 tons of partially developed ore with an average copper grade of 2.35%. Other estimates, which I consider more dependable, indicate a smaller tonnage but an average grade of from 2.65% to 2.75% copper. The minerals are mainly copper carbonates, silicates and oxides associated with magnetites.

Much of the ore could be mined from the surface and at a low cost per ton, but the metallurgy is obviously quite complicated and none of the processes which were tried out prior to 1930 proved satisfactory.siSince that time the mine has been idle and I understand that the water is now up on the 235' level. Incidentally while there is no large flow of water in the mine itself there is reason to believe that ample quantity for a large mill or leaching plant could be obtained from wells located not more than two or three miles away.

I have recently been in correspondence with the owner of this property with whom I am on very friendly terms and although I have absolutely no financial interest in the Lake Shore, I at one time spent quite a large amount of money for investigations including a geophysical survey and I have a considerable amount of technical data including assay maps etc. which ought to have some value to anyone who cares to give the property serious consideration.

March 19, 1947

Mr. Frank M. Leonard, Jr.
4C-O.P.O.
Naco, Arizona

RE: Lake Shore Mine

Dear Frank:

Thanks for your letter of March 17 and I am sure that you were wise in not dealing with any promoters or agents in respect to the Lake Shore.

If I am in a position to write you again in regard to this property, you may be sure that I shall be acting as the representative of a responsible mining company who will take care of any considerations that may be coming to me.

Of course the value of the Lake Shore depends upon the price of copper and the ability of the operators to make a good recovery of values at a reasonable cost, and there have been substantial improvements in metallurgical practices during the past few years. I am well satisfied that there is a large body of low grade ore on your property which in all probability the treatment would require considerable additional study.

Referring to your intention to visit Alden in Superior on Friday of this week, I believe that he is at present working on afternoon shift so that he would probably be underground after 3:00 p.m. and he has recently moved to temporary quarters having rented a little house on the south bank of Queen Creek which, I believe, is No. 418 Church Street; although I am not sure, and the place is not easy to find as there are very few signs on the streets or numbers on the houses.

His wife and baby are at present in Phoenix as he expects to obtain better living quarters after April 1 when they will rejoin him.

Glad to learn that you and your family are well and will hope to write you again before very long.

Sincerely,

GMC: IM

FRANK M. LEONARD, JR.
MINING ENGINEER

6

Cananea, Sonora, Mexico.
March 17, 1947.

Mailing address--40- O.P.O.
Naco, Arizona.

Mr. G. M. Colvocoresses,
1102 Luhrs Tower,
Phoenix, Arizona.

Rec'd 4/19/47

Dear Mr. Colvo,

I received your letter of Feb. 25, two weeks ago and my not answering sooner is due partly to tardiness. I awaited the outcome of recent negociations involving the Lake Shore Mine, so that I might inform you. Unfortunately , I cannot do so in this letter, but would be glad to consider any proposition you might make.

Since the recent advance in the price of copper, I have had many inquiries regarding Lake Shore. Most of these have come from agents who are merely looking for a commission, and have no interest whatsoever in the property. As a matter of policy I have flatly refused to consider any of them. I believe the mine is well enough advertised and known in mining circles to attract principals. I have been approached by mining companies who are looking for a place to dig and build a concentrator. At the present writing one of these concerns is making metallurgical tests on Lake Shore Ore.

Lake Shore is little changed underground excepting that the 235 level is now under water. The collar set in the main access shaft remains in the same miserable condition, but the remainder was intact and in good condition the last time I saw it. There are no buildings, machinery, or improvements of any kind on the property. The workings can be entered thru the "65" shaft. I have paid the taxes to date on the three patented claims which cover the principal showing.

The mine at present is a frozen asset having but an intangible potential value. It is true there is a small developed tonnage, but it will remain worthless until modern metallurgical practice makes its concentration an actual fact. When that time comes the value ceases to be potential entirely. I cannot see any other future for the mine and frankly I would prefer to wait till such a time rather than part with the title at a sacrifice. I believe that someday, and not in the too distant future, copper silicates will become amenable to flotation. I am keeping abreast of recent developments along these lines.

I am planning to attend the meeting of the AIME, "Open Pit" sub-division at Miami, Arizona this Friday and Saturday. As I will drive thru Superior on my way there, I intend to call on Alden and his wife, if only for a few minutes. Unfortunately Mrs. Leonard cannot accompany me as she is remaining in Cananea to take care of her mother, who lives with us and is too advanced in years to make the trip comfortably.

Sincerely
Frank M. Leonard Jr.

Lake Shore Mine file

935 N. Olsen,
Tucson, Ariz.
Sept. 3, 1942.

Dear Mr. Colvocoresses:-

The ~~XXXXXXXXX~~ process Hahn worked out on Lake Shore ore was a flotation process and means a concentration of about thirty to one. There is no idea whatever of leaching. It would only require a crushing plant and flotation cells, and the concentrates, very high grade, would be shipped to a smelter. There is ore enough in sight to run a two hundred ton plant for more than ten years. If the government could get any quicker copper than that, it would be some place that nobody knows about yet.

Just as soon as I know that there is absolutely firm ground beneath this treatment theory, something ca n be done about it through connections in Washington far above the Bureau of Mines. Hahn wrote me that he was ready to go into detail about it, and he is certainly a much abler metallurgist than any one in government employ.

Any time you might be writing to this house be sure and tell us about your son. He is a strong favorite in this family, and Paco and Mary Gertrude are anxious to know about him at all times.

With best regards,

Yours sincerely,

Frank M. Leonard

RE: LAKE SHORE MINE.

Extract from letter to G. M. Colvocoresses from Frank M. Leonard, February 23, 1931.

"I have been hearing lately about the development of a new process in Rhodesia for the treatment of low grade copper carbonate and silicate ores which seems interesting. It begins like your volatilization process with a light roast with salt, but the method of recovery of the copper is different. Powdered coal is mixed withthe charge and the copper precipitates on it in the form of small globules which are recovered by flotation, the resulting concentrates going as high as 60 to 75% copper. Only from 10 to 20 pounds of salt per ton is required and from 20 to 30 pounds of coal. What do you think of this in connection with Lake Shore? You will remember that the recovery by volatilization on these ores was very high. We have an excellent road now, and could handle the incoming and outgoing freight for a two hundred ton plant with two trucks, ordinary, at not over $1.50 per ton freight from Casa Grande. On our last work Reo trucks handled seven tons per load, before the road was built, and had no difficulty in making two trips per day regularly. I will make some figures about the costs and let you know."

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Extract from letter to Walter A. Schmidt from G. M. Colvocoresses, March 3, 1931.

" I have yours of February 26th and since writing you last have received a letter from Leonard at the Lake Shore Mine, from which I quote as follows:

"' I received your letter of the 24th. My attention was first called to the process I mentioned to you in my last letter by a letter written by Mr. Oliver C. Ralston of the United Verde Research Dept., to Mr. P. C. Benedict, which was forwarded to me by Mr. Benedict,. The United Verde people have had samples of Lake Shore ore at various times to which they have applied different tests, without making any specially interesting discoveries. The paragraph of Mr. Ralston's letter referring to this matter is as follows, the letter being dated October 6th, 1930:

"' A rather expensive process is now being developed in England which is called the "Segregation Process" and demands ore of at least 3 or 4% grade, but otherwise of about the characteristics of this Lake Shore. It involves mixing powdered coal and salt with the ore, and heating in a closed vessel for about 15 minutes to above a red heat. The copper volatilizes from the ore, and is reduced to globules around the coal dust particles. The ore is then treated by flotation to float off these little globules of metallic copper with the carbon and a concentrate of over fifty per cent is possible. If Lake Shore could average 3 to 4 per cent copper we might try the scheme. Let me know what you think.'""

March 3, 1931.

Mr. Walter A. Schmidt,
1016 West 9th Street,
Los Angeles, California.

Dear Walter:

I have yours of February 26th and, since writing you last, have received a letter from Leonard, at the Lake Shore Mine, from which I quote as follows:

> "I received your letter of the 24th. My attention was first called to the process I mentioned to you in my last letter by a letter written by Mr. Oliver C. Ralston, of the United Verde Research Department, to Mr. P. C. Benedict, which was forwarded to me by Mr. Benedict. The United Verde people have had samples of Lake Shore ore at various times to which they have applied different tests, without making any specially interesting discoveries. The paragraph of Mr. Ralston's letter referring to this matter is as follows, the letter being dated October 6th, 1930:
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"I did not make any reply to this, and have not yet done so but I have lately heard about this process from several sources. In the Engineering and Mining Journal of January 26th there is an article on 'Progress in Flotation Practice and Equipment' by S. J. Swainson, of the Technical Department of the American Cyanide Company, which refers to the process. In this article occurs the following paragraph which I will copy in case you might not have the Journal at hand when you get this letter.

> "'Although, for the present, the floating of metallic copper is confined to the Michigan copper country, recent development in the treatment of lowgrade oxide copper ores indicated that a new field may be opened. In Northern Rhodesia a new process under development reduces the copper to the metallic state, and then separates it by flotation. The ore, ground to 10 mesh, is heated to remove moisture and other volatile constituents. Then the calcine is mixed with common salt and heated to 600 to 700 deg. C. in a reducing atmosphere, reducing the copper to the metallic state. The charge is then chilled, reground, and sent to flotation. Microscopic inspection of the flotation concentrate shows the copper to be present as fine metallic grains in association with small quantities of carbon and a negligible amount of gangue. The advances recently made in the flotation of metallic copper have been valuable in the development of this process.'

"In Michigan they are floating .2 to .3 tails of native copper up to a 60% concentrate. The rest of this process looks very reasonable to me, and it is simply a question of costs. The transportation conditions here are greatly improved, and one Reo truck can handle twenty tons in and out per day. I presume you have some data on the cost of roasting up to a red heat through your experience with volatilization. I have no definite plan in mind, nor any further information, but what I have seemed interesting and I thought I would pass it along to you.

I will try to find out something more regarding the process which Leonard describes, but I am inclined

to think that this would prove rather expensive and would be unlikely to result in a very high percentage of copper recovery. However, I do think that this matter may be worth following up, for, sooner or later, some economical method of treating such an ore as Leonard's is sure to be devised and, since this process embodies some of the procedure contemplated in our old C.V. Method, it should be of especial interest to Western Metallurgical, and possibly might be turned to commercial advantage in due course of time.

We are still having trouble in our Crater deal for, although the Pittsburgh people are so far very fine and appear entirely ready to proceed, some of our own crowd are putting up objections which it may be hard to overcome. It seems as if a deal of this kind never could go through smoothly and people who one day are quite willing to abandon everything suddenly feel that they are not getting a square deal and adopt a different attitude when an outsider comes along and shows interest. I suppose this is human nature but it is certainly keeping me on the hot stove for the present and I fear I shall not be able to get over to California any time this month, unless, as may happen, the situation changes quite suddenly.

Best regards.

Sincerely,

GMC:EBH.

March 14, 1947

Lake Shore file

Mr. Frank M. Leonard Jr.
c/o P.C.
Naco, Arizona (?) Cananea, Sonora, Mejico

Dear Frank:

Apparently I have failed to write to you in December in order to convey the compliments of the Christmas season and our very best wishes for a happy and prosperous New Year; however I hope that this letter will reach you, and Mrs. Colvo and I join in all good wishes to you and Mrs. Leonard and your boy.

In reference to your Lake Shore Mine of which I assume you are still entirely or largely the owner, I would like to know something concerning the present situation. Apparently mining is due for a pick-up now that government controls have been largely or entirely removed and the prices of the base metals have advanced to a reasonable figure.

I find that there are quite a number of people who are considering the development of copper mines, and as you know there have been substantial advances in the method of treating both oxidized and sulphide ores.

I presume that conditions at the Lake Shore are not very different from when we corresponded on the subject a number of years ago, but probably the shaft and underground workings have now caved in to a considerable extent, and if you would be interested in negotiating with responsible people who might desire a property of this character, I would be glad if you would inform me concerning any recent developments and the present situation.

Alden is still with the Magma Copper Company and getting along very nicely, and his wife and baby girl are in the best of health.

With best regards to you all.

Sincerely,

GMC: IM

PS The above is a copy of a letter which I wrote to you on February 25 and addressed to Naco. Since no reply has been received, I think that it may have gone astray and am sending this letter in duplicate addressing both Naco and Cananea.

February 25, 1947

Mr. Frank M. Leonard, Jr.
C/o 4C.
Naco, Arizona

Lake Shore Mine File

Dear Frank:

Apparently I have failed to write to you in December in order to convey the compliments of the Christmas season and our very best wishes for a happy and prosperous New Year; however I hope that this letter will reach you and Mrs. Colvo and I join in all good wishes to you and Mrs. Leonard and your boy.

In reference to your Lake Shore Mine of which I assume you are still entirely or largely the owner, I would like to know something concerning the present situation. Apparently mining is due for a pick-up now that government controls have been largely or entirely removed and the prices of the base metals have advanced to a reasonable figure,

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Alden is still with the Magma Copper Company and getting along very nicely, and his wife and baby girl are in the best of health.

With best regards to you all.

Sincerely,

GMC

GMC: IM

4/26.37

Casa Grande, Arizona.
April 22, 1937.

Mr. Geo. M. Colvocoresses,
1102 Luhrs Tower,
Phoenix, Arizona.

Dear Mr. Colvocoresses:-

Received yours of the 21st this morning and, as always, was pleased to hear from you. The Lake Shore is available, and not tied up in any way. I simply made up my mind to forget about it for a long period, and the recent rise in copper has not gotten me excited one little bit. I do not see how it can be more than a little flurry, but then there are a whole lot of things about copper that I do not see, and a back sight shows they were there all the time. Hahn wrote me about five years ago that he could float the oxides and silicates in the ore, and his figures worked out at about five cents per pound of copper with a hundred ton plant, but at that time it was runing a great physical risk to even suggest a copper development to anyone with money left.

Can you refer me to anyone who knows about the market for diatomaceous earth, and for mica? Friends of mine are asking about them and I would like to get information.

Have just gotten back from an examination in Sonora, the Cinco de Mayo, near El Tigre, and am going back into the Nacozari district Saturday. Am still pushing that placer property near Magdalena with some prospects of results. Paco still with the Highway Department and is in charge of that construction on the main highway into Tucson from the north. He got away a couple of weeks to help me in Chihuahua and Durango, and I want him again but he can not get away at present.

With kind regards,

Sincerely,

Frank M. Leonard

all his property, or a controlling interest, on terms which appear to me reasonable, and will give an option to any responsible company for a sufficiently long period of time to enable them to definitely determine the probable value of the property. I am of the opinion that chances are favorable to the development of a large body of sulphide ore, as well as a substantial extension of the known reserves of oxide material, and some portion of Leonard's property, other than those developed by underground workings appear to be very promising prospects.

The mine is well equipped with a small power plant and usual mining equipment, also substantial camp buildings and operating condition would be very favorable.

During recent years the Lake Shore has been examined by engineers representing a number of the larger companies, all of whom have been distinctly interested, but until recently Leonard's terms were not considered satisfactory. I am told that the Calumet & Arizona Co. once offered $200,000 whichLeonard refused. Last negotiations undertaken by the United Verde reached a point where satisfactory terms were agreed upon and the United Verde spent several thousand dollars in examination work, including the magnetic survey mentioned above, but the recent drop in the price of copper and generally unsettled condition of the copper industry apparently have prevented them from definitely closing a deal.

G. M. COLVOCORESSES

Phoenix, Arizona
April 29, 1930.

August 31, 1942

Mr. Frank M.Leonard
935 North Olsen
Tucson, Arizona

Re: Lake Shore Mine - file

Dear Mr. Leonard:

I was greatly interested in your letter of August 27th on the above subject and I can sympathize with you in your attempt to do business with the Bureau of Mines which like everything else that is under the control of the ridiculuous Ickes is naturally in a terrible mess. In this part of the counrty everybody seems to agree with you in feeling that they should have left Gardner in charge in this district with which he was so well acquainted instead of replacing him by Hedges who may be a very good man but is entirely off his beat and will have to be educated by degrees before he can be expected to accomplish anything worth while.

I do not know that I can suggest anything very constructive as a help to the solution of your problem but my own correspondence in regard to copper properties has been almost entirely with Frank A. Ayer, Assistant Chief, Copper Branch, War Production Board, Washington, D. C. Ayer was formerly employed in responsible capacities by the Phelps-Dodge Corporation and therefore he is not one of the brain trusters who secured his entire mining knowledge and experience in some college class room and he has been trying hard to increase the copper output of the state and to help the closed down mines to resume their activities during this emergency. If you should write to him direct and give him a brief statement of the facts and the results of previous investigations of your Lake Shore Mine I think that you might obtain some results but it appears to me that it may be difficult to get a Government interest if it seems likely that further metallurgical experiments would be necessary to establish a satisfactory treatment of the ore and that a large leaching plant would have to be built for that purpose. The point is that they are trying to bring out immediate production and unless they could be convinced that there would be a substantial output of copper within the next eight to twelve months I am afraid that they would pass by the Lake Shore and favor the other mines which merely require equipment and can begin production at an earlier date.

I do not recall exactly the conditions at the Lake Shore but it seems to me that some of your ore which was located near the surface might be mined quite cheaply and if you could arrange to ship a higher than average grade it is possible that this might go direct to a smelter and secure a favorable treatment charge so that no local concentration would be required.

I have been working on a somewhat similar problem in respect to the

Twin Buttes Mines south of Tucson but they have a much higher grade of ore or at least their former shipments averaged better than 5% copper and their transportation problem is not so serious. However, there is a fairly general feeling that the bonus price for copper will have to be lifted to about 20¢ per pound and in that event I should think that the Lake Shore ought to be able to ship with some degree of profit provided the mining cost can be reasonably low.

The above is merely a suggestion to which I know that you will give consideration and if there is any way in which I could be of assistance I should be only too glad to do the best I could.

Sorry to learn that Frank Jr. had had a run in with poison ivy which must have interfered with the enjoyment of his fishing trip but I hope that he has now completely recovered and I send best regards to him and his wife and their little boy who must now be growing up very rapidly.

Sincerely,

GMC:CG

Lake Shore File

935 N. Olsen,
Tucson, Ariz.

Aug 27th.
1942

Mr. Geo. M. Colvocoresses,
1102 Luhrs Tower,
Phoenix, Arizona.

Dear Mr. Colvocoresses:-

The Bureau of mines here became interested in Lake Shore about two and a half months ago. Mr. E. B. Gardner had reports on the property from the files of Phelps-Dodge and United Verde. I promised cooperation in every day, and took his engineers to the mine. I gave them the tonnage at one million, and the assay value 2.65% which were the estimates of E. P. Ryan now gen man. of El Potosi for Howe Sound, and Frank H. Lerchen, who had been in charge of the property at one time for six months. Gardner's engineers reported 2.35% cu. and probable tonnage considerably more than one million. Gardner assured me that the Bureau would do something about it. Samples were sent to Salt Lake for treatment tests.

At this point Ickes took the Bureau of Mines to pieces and threw away the pieces. Gardner was sent somewhere where there are no mines, the engineers were scattered to the different points of the compass and a man named Hedges came out to look after purely local matters. He says tests at Salt Lake were held up for further instructions. They saw Chrysocolla in the ore and understood they were supposed to test an oxide ore. They waited to be assured that the samples were really representative. All samples were from the crosscuts and drifts on the 115 and 152, and could be taken as representative of all ore to that depth. There is a winze running down on the footwall of the ore body south of the 152 crosscut, that represents a large part of the probable tonnage, and this ore , approaching the level where sulphides are expected, contains one-quarter of one per cent of sulphides, and less chrysocolla than the ore above. I suggested that a proportionate amount of this be added to the treatment sample, but Hedges said he did not wish to make the additional expenditure of getting the sample. It would cost him about $25, and I could get it myself for $10.. Instructions were sent to Salt Lake(at least I was so informed) to go ahead with the samples they had. About a month has elapsed but nothing has been heard about the matter.

I was promised the maps and reports made by the Bureau engineers but have not asked for them yet. Hedges seems completely indifferent about the matter. Some years ago, after the mine was shut down, Al Hahn wrote me from Garfield to sens him another sample. He was there working out a flotation treatment for the Anaconda Co. on the oxide lead ores that were coming into the smelter. The problem was solved and remembering Lake Shore he wrote me for a sample and tried it out. He claimed that it was a success on Lake Shore ore, but as copper was a drug on the market I could do nothing about it. When the Bureau of Mines showed interest, I wrote Hahn and he replied hastily, giving me a brief outline of the treatment, which I gave to the Bureau engineers and

presume they transmitted to Salt Lake with the samples. Hahn offered to send me more detailed information if it was needed. You may remember that he is the man who built the 10 ton pilot plant at Ajo, and worked out the first treatment, leaching, for the C. & A. He is one of my old and intimate friends.

Was glad to hear from you again, as always. Paco has been in camp at Alpine for ten days and came home yesterday the worse for wear owing to poison Ivy, but he caught a lot of fish together with the infection. He is still with the Highway Department. I have been spending most of my time in Sonora.

Am undecided about taking further steps in regard to Lake Shore as I do not believe I will get anywhere with the Bureau of Mineshere. We have some good friends in Washington who are way up among the political great, but I have never yet treid to mine with a political pull. I quite agree with what you say in your letter . Ten years ago the mine was not worth a sou marquí and ten years hence may be worth less, but if it could be gotten into production now on the bonus money others are getting, it could go on indefinitely. That is what happened at Ajo.

Paco joins me in sending best regards,

Yours sincerely,

Frank M. Leonard

Lake Shore

File

Casa Grande, Ariz.
May 10, 1937.

Mr. Geo. M. Colvocoresses,
1102 Luhrs Tower,
Phoenix, Ariz.

Dear Mr. Colvocoresses:-

Thanks for yours of the 26th ult. which I did not get until yesterday on account of absence from home..I am in the same boat as yourself regarding mica and diatomite, and in fact have never taken any interest in non-metallics of any nature. Now that I am traveling so much I have such things put up to me all the time and am going to find out about some of them. The addresses you give me will be useful.

The estimate I gave you of five cents per pound at Lake Shore is not wholly Hahn's. He worked out the treatment, which is a modification of the process he put in at Tooele for the Anaconda company, for the treatment of lead oxides and carbonates. When he sent me the figures I applied local costs, and we were both satisfied as to the results. I am sure my end of it was right. Hahn and I are old friends from Mexico and he was not figuring on financing me or anything else, being a technical guy and not a capitalist. The Lake Shore is open for business in the remote possibility that there ever is any business again. I am even more of a pessimist about copper than you seem to be. Have no confidence whatever in the present spurt. The copper being sold now is for speculative purposes and war reserves and will come back on the market and bust it later as it did before. Some rich outfit might buy a copper deposit and hold it on the theory that any natural resource is a better asset than currency on the verge of inflation, or one of the big companies might do it as a possible vague insurance against they know not what. Unless something like that happens I think Paco's kid may get something out of Lake Shore. He is six now and we are a long lived race. Paco was here yesterday and was pleased to be remembered, and sends you his best regards. You gave him his first job and he is not likely to forget it.

With kindest regards,

Sincerely, Frank M. Leonard

Lake Shore Mine

September 19, 1931

Mr. Frank M. Leonard,
Lake Shore Mine,
Casa Grande, Arizona.

Dear Mr. Leonard:

I have been slow in replying to your good letter of September 4th giving data regarding the costs of applying the Segregation Process at the Alaska Mine in Rhodesia.

Apparently the segregation costs ~~known~~ only are very close to $1.00 per ton, which as I understand it does not include the crushing and grinding and to which figure must be added the cost of floating the metalloids. I assume, therefore, that the entire cost of concentration would run from $2.00 to $2.50 per ton, which seems reasonable and might make this process attractive under normal conditions. However, I suppose that with copper selling at 7¢ you would hardly figure on applying this or any method of treatment to the Lake Shore ore and it will be something to hold over for future consideration, when markets improve.

I also note with interest that Hahn may be able to solve your problem and is making some further tests on the treatment of your ore and personally I think that some form of flotation will surely be devised which will be more economical than the rather complicated procedure involved in the Segregation Process.

Should Mr. Myron R. Walker come to Phoneix in his connection with the copper situation I hope that you will ask him to

pay me a visit as I should much like to talk with him concerning the plight of the high cost copper producers of this State with which I am particularly familiar. He may have seen an editorial in the last issue of the Mining Journal criticizing some statements attributed to Walker which may not be at all justified.

I presume that the reopening of the Kelly Mine at Randsburg will be principally for the purpose of mining and treating some of the gold bearing ore in the lower levels. I visited that property several years ago when it was producing high grade silver ore and recall that at that time the gold values were improving, but the extent of the gold ore had not been ascertained. I also believe that before long we may see some improvement in the price of silver which has a much better chance to pick up quickly than either copper or zinc.

I received Frank's letter of the 13th and am glad that he has some work on hand which will keep him busy until November 1st. If I can arrange for a hunting trip after that date I will certainly get in touch with him.

Can you give me any information regarding the Great Eastern Mine adjoining the Vekol or concerning Mr. Thomas G. Young, who is or was operating this property? Mr. Young called on me yesterday to discuss his situation and he evidently has a very high opinion of his property, but this seemed to be largely based on information given him concerning the old workings which, I understand, have been inaccessible for a number of years.

As I recall the Vekol produced high grade ore at one time, but is now pretty well worked out and they would hardly have discontinued operations without trying to acquire the Great Eastern ground if, as Young believes, their shoots of high grade ore run over the ground onto the Great Eastern property.

Any time that you or Frank are in Phoenix I hope you will not fail to pay me a visit.

Best personal regards,

Sincerely,

GMC:HG

FRANK M. LEONARD
MANAGER

P. O. BOX 527

LAKE SHORE MINE

CASA GRANDE, ARIZONA

Sept. 4, 1931

9/19, 31

Mr. Geo. M. Colvocoresses,
1108 Luhrs Tower,
Phoenix, Arizona.

Dear Mr. Colvocoresses:-

I received your letter of July 10, and have had no excuse to write you until now. I have a letter from the Minerals Separation people in London, enclosing a memorandum of costs of the Segregation Process at the Alaska mine in Southern Rhodesia, and I am enclosing you a copy of the memorandum, though they may have sent you the same thing. I have been informed that the Alaska mine has now been shut down except for this Segregation plant which is continuing its work.

You will note by the memorandum that costs here for charcoal, coal and salt will be considerably less than in Africa. The saving on coal may be considerable, as the moisture in this ore is less than half what must be eliminated at the Alaska. However, this might be offset by the cheap labor there, although it has been my experience that cheap labor generally has an opposite effect on the cost sheet.

I had a brief note from Hahn last week, the first time I have heard from him for some months. He says he has changed his reagent and is now successfully floating, in some cases, ores high in oxidised iron. He asked me to send him some more ore for testing purposes, which I have made haste to do. He has handled Lake Shore ore quite a bit, and thinks there is a chance, but very far from being a certainty. I think Hahn is about the brightest metallurgist in the business.

Had a pleasant visit last week from Myron R. Walker. He is in the employ of the Tariff Commission, and is visiting the big copper producers, getting inside information as to costs, etc. He has an accountant with him, and is acting under the authority of a Senate resolution, so they have to show him the books. I think his report will be interesting unless they bottle it up. He stayed around here about ten days, going to Ajo, Ray, etc, from here and returning. He is married to Mrs. Leonard's sister, and is a high type of engineer. I got quite a bit of information out of him, not connected with his work particularly.

Paco and I made a trip over to Randsburg and looked at the Kelly mine, which some friends of Royer have taken over. They are adding a ~~flotaxxxxxxxxxxxxxx~~ cyanide plant to the flotation mill already on the property, and we were figuring on taking a lease on one or two levels, and may do so later when the mill is ready.

With best regards,

Sincerely,

Frank M. Leonard

MEMO-ESTIMATED WORKING COSTS OF 50 TON PER DAY OF OXIDISED ORE COPPER SEGREGATION PLANT AT THE ALASKA MINE IN SOUTHERN RHODESIA/

ESTIMATED SEGREGATION COSTS ONLY

1- LABOUR (excluding Technical Control)

3-Europeans at 22/-per 8 hr. shift-	66/-per day
20- Natives per day at 1/6 """"	30/ "
Total	96/- "

	s.	d.	d.
Cost per ton ore treated equals-	1/	11.	44

It is to be noted that the Cost per Ton Treated for this item will decrease as the size of the plant is increased, also the above Labour should be sufficient for 100 Tons Ore Treated per Day.

2) MOTIVE POWER

Elevator
Reagent Crusging } Total of 15 H.P.Days equals 268.5 K. W. Hrs.
Furnace
Cooler

K. W. Hrs. per Ton Ore Treated equals 5.37

3) COAL FUEL CONSUMPTION

This varies with the moisture content of the original ore treated which has averaged at Alaska, 6%- 7%, with a fuel consumption of 6 1/2 % by Weight of Ore Treated. The Cost of Coal delivered at the Mine equals 33/6 per short ton.

	s.	d.
Total Cost per Day equals	108/	10.5
Cost per Ton Treated equals	2/	2.1

4) REAGENTS CONSUMPTION

Charcoal. 1.0% by weight of Ore Treated crushed to minus 60 mesh at 43/per short ton delivered at the mine..

	s.	d.
Total Cost per Day equals	21/	6
Cost per Ton Ore Treated equals	/5.16d.	

Salt. 0.3% by Weight of Ore Treated crushed to minus 30 mesh, at 160/ per short ton delivered at the mine.

	s.	d.
Total Cost Per Day equals	24/-	
Cost per Ton Ore Treated, equals	/5.75d.	

5) CONSUMPTION OF OIL AND GREASE? MAINTENANCE AND REPAIRS.
No detail figures relating to these items are available except Maintenance which is given at 6d. per Ton of Ore Treated.

As regards the subsequent Flotation treatment of the ore, this cost is the same as normal flotation treatment of Sulphide Ores.

(signed) W. H. Beasley.

A little study 1.00 p.t.

MEMORANDUM ON THE TREATMENT OF OXIDE COPPER ORE BY THE SEGREGATION PROCESS AT THE ALASKA MINE SOUTHERN RHODESIA.

Recent development with the Segregation Process at the above Mine gives marked improvement in practice in the grade of concentrates produced. This has been accomplished ~~xxx~~ by the reduction of the quantity of reggents used for the reaction, to .9% Carbon and 0.3% salt, and which does not in any way affect the ultimate recovery.

The complete analysis of a sample of these Concentrates recently received from the mine, is as follows:

SAMPLE NO/ B/ J/ 25

Allocation	%		
Cu (Metallic)	77.68		Total Copper
CuO	10.19	equals 8.14% Ox Cu	85.82%
Insol	5.38		
Carbon	4.18		
Fe203	1.08		
Al203(Acid Soluble)	0.03		
F205	0.05		
S	0.09		
CaO	0.70		
MgO	0.47		
TOTAL	99.85		

Silver 8.3 oz. per Short Ton

N. B. - The Alumina figure represents the amount soluble in HNO3 and HCl and not the total Alumina. The Insoluble contains the remainder of the Alumina, combined with silica as insoluble silicates.

(Signed) W. H. Beasley,

27th July, 1931.

FRANK M. LEONARD
MANAGER

P. O. BOX 527

LAKE SHORE MINE

CASA GRANDE, ARIZONA

Cpy

Feb
~~Sept.~~ 23, 1931.

Mr. Geo. M. Colvocoresses,
1108 Luhrs Tower,
Phoenix, Arizona.

Dear Mr. Colvocoresses:-

I have been hearing lately about the development of a new process in Rhodesia for the treatment of low grade copper carbonate and silicate ores which seems interesting. It begins like your volatilization process with a light roast with salt, but the method of recovery of the copper is different. Powdered coal is mixed with the charge and the copper preci pitates on it in the form of small globules which are recovered by flotation, the resulting concentrates going as high as sixty to seventy-five per cent copper. Only from ten to 20 pounds of salt per ton is required and from twenty to thirty pounds of coal. What do you think of this in connection with Lake Shore. You will remember that the recovery by volatilization on these ores was very high. We have an excellent road now, and could handle the incoming and outgoing freight for a two hundred ton plant with tw trucks, ordinary, at not over $1.50 per ton freight from Casa Grande. On our last work Reo trucks handled seven tons per load, before the road was built, and had no difficulty in making two trips per day regularly. I will make some figures about the other costs and let you know.

I hope you are back in Arizona now, and that you were successful in the business that called you east, although I would consider it a miracle if any money could be raised even to open a jack pot under the present conditions.

With best regards,

Sincerely,

Frank M. Leonard


Lake
Shore
Mine

thus diminishing the capacity. Experiments are now contemplated to determine the relationship between the adherence of the copper and the solution content in copper, acid, ferrous and ferric iron. The difficulties of removing the last traces of copper from solution are well known. Calculations are now being made to determine whether it will be better to add more launders or to re-circulate the exit liquors from the iron boxes. As any soluble copper in the exit solutions is lost, serious consideration is to be given to these features.

With this method of recovery of copper proven to be a commercial success, it is planned to extend the process to the treatment of original ore in place. Copper is now being produced at a cost of about 7c a pound, including all smelter charges. An idea of its possibilities and of the slight amount that cost will be raised by mining the ore in place may be obtained from the following figures from Peele. The old mining cost when the material was removed was given as 22c per ton of which 8.1c were for chute tending and 4.1c for loading. These latter two costs would be almost eliminated in the present scheme in which the bulk of the ore would be leached in place. If this can be done extremely low-grade deposits may be successfully beneficiated.

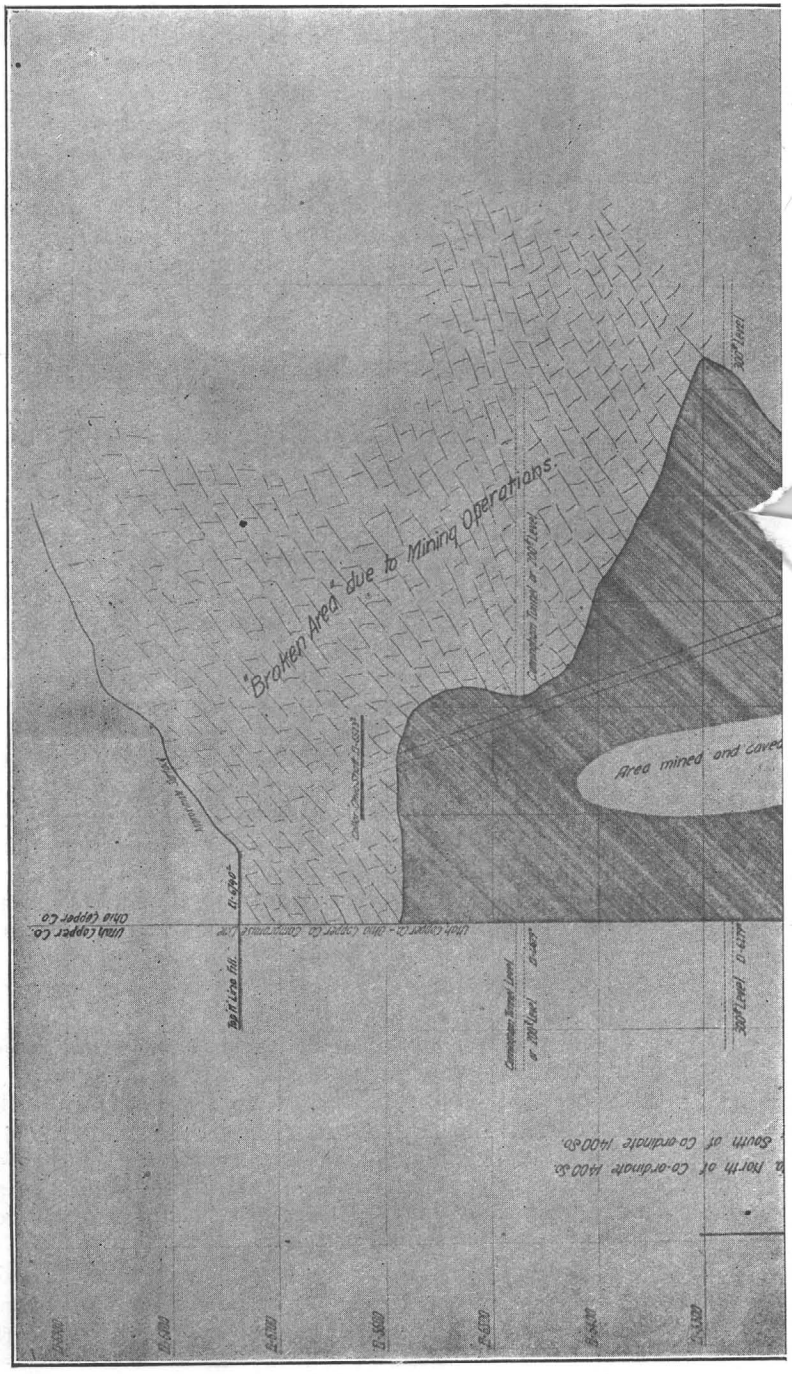
LEACHING
OF CAVED AREAS
OHIO COPPER MINE
BINGHAM CANYON, UTAH

By
THOMAS VARLEY, Superintendent
U. S. Bureau of Mines, Salt Lake City
and
G. L. OLDRIGHT, Hydrometallurgist
U. S. Bureau of Mines, Salt Lake City

Presented with the permission of the Director,
U. S. Bureau of Mines, at Utah Metal Mining Institute,
Salt Lake City, May, 5, 1923.

GARDINER CO. PRESS, SALT LAKE


Ohio Copper Company.
East and West Section
Looking North
On Co-ordinate 1400' South
Scale, 1 inch = 40 feet.
Westerly Limits Ohio Copper Co's Property.
Property of the Utah Copper C
Property of the Ohio Copper Co
400' Level
500' Level
750' Level
during Operations.
Ore Chute No 1
Ore Chute No 2
Ohio Copper Co's Incline Shaft
No 1 Ore Bins
Mascotte Tunnel Level
8300
8200
8100
8000
7900
7800
7700
7600
7500
7400
7300
7200



Leaching at Ohio Copper

The recent innovation of leaching low grade copper ores in place at the Ohio Copper Company's mine in Bingham Canyon, Utah, on an extensive scale, has caused nation wide interest in such practice and naturally thoughts of many metallurgists have been diverted along lines of the possible application of such a scheme for the reclamation of copper from low-grade oxidized deposits in other parts of the country. Natural conditional such as exist for economic operations of this process at the Ohio Copper will seldom be found. It will be noted by referring to the maps shown herewith, that the particular location of the body of ore in the surrounding country rock affords ideal conditions for the percolation of solutions from the surface down to the tunnel level where the copper taken into solution by the descending waters is precipitated in metallic form on scrap iron.

LOCATION

The mine is on the east side of the main Bingham Canyon opposite the Utah Copper mine, the particular portion in question being an area (approximately) 1400 feet N. and S. by 600 feet E. and W. The mine is 1200 feet deep and is connected on the 1200-foot level by a tunnel 13,000 feet long (large and equipped with electric haulage) to the concentration and flotation mill formerly used at Lark on the east side of the Oquirrh range.

PREVIOUS OPERATIONS

In 1917 and 1918-1919, the concentration and flotation plant of the company located at Lark operated on the higher grades of ore mined. In mining, care had to be exercised to maintain the grade of the ore around 1 per cent copper. About seven million tons were mined and milled at that time.

The low grade of the ore and the poor recovery by flotation, due to the oxidized copper, together with the high cost of supplies and the descending price of copper in 1918-1919 coming simultaneously, was the cause of the plant closing down at that time.

MINING METHODS*

During the period the mine was being operated, large tonnages of low-grade ore were developed ((too low grade to be milled) running from .3 to 1.3 per cent copper. It was estimated that about 25 per cent of the original ore was left and the remainder (now measured as leaching ore) comes from the walls outside the mined area, and the capping which has subsided. This area is estimated to contain approximately 38 million tons of rock with a content of .3 per cent copper. The particular area described contains 3 veins each dipping about 45°. The main shaft connecting the top of the property with the Mascotte tunnel is also inclined and the main raises are approximately at 45°. The mine was coved in blocks 100 feet square and 60 feet vertical distance between. These blocks were again subdivided by a system of finger raises making in plan blocks approximately 10 feet square. In order to start the caving all holes in each block were fired simultaneously and the sub-level pillars were likewise removed.

By reference to the attached sketches it will be noticed how the ore was drawn from the caved areas through the ore chutes to the ore bins on the Mascotte tunnel level. Incidentally, during the present leaching operations these ore chutes afforded ideal passages for the solutions from the caved area, giving them a common means of egress to the solution launders in the Mascotte tunnel.

GEOLOGICAL CONDITIONS [1] [2]

The original Upper Carboniferous limestone and sandstone beds at Bingham were fractured by a quartz monzonite intrusion which silcified the sandstone beds to quartzite and shattered the surrounding rock. The richest ore deposits which were in the limestone have been mined and it is the disseminated deposit in the monzonite and quartzite which constitutes the present ore bodies. The quartz monzonite disintegrates quite readily due to the alteration of its minerals, thus becoming porous which allows its minerals to be exposed to oxidation. The shattered quartzite, in comparison, is practically inert to technical attack and the copper minerals which are deposited in the fissures are subject to

*Mining Engineers Handbook, Robt. Peele, John Wiley and Sons.

Caving System at Ohio Copper Mine, C. G. Bamberger, Eng. and Min. Journal, April 6, 1912.

R. S. Schmidt, Mining and Scientific Press, March 6, 1915.

1Economic Geology of the Bingham Mining District, Utah, by Boutwell, Keith and Emmons, U. S. G. S. Prof. Paper No. 38.

2The Disseminated Copper Ores of Bingham Canyon, Utah, by J. J. Beeson, T. A. I. M. E. 54 (1916).

ditions as they exist in the mine. As long as simple water solutions are used there will be comparitive freedom from the trouble along this line but should it become necessary to re-use the tailing water from the iron boxes in the Mascotte Tunnel the necessity for acidulation would arise. The re-use of this water has been considered because it is difficult to remove the last trace of copper from solution. The iron in the solution, on oxidizing, furnishes an excellent solvent for oxidized copper in the ore body which would otherwise not be attacked by a simple water solution, particularly in areas furnishing no pyrite to make acid in place. The open nature of the entire workings makes it possible to add acid at any place in the circuit and to modify the solution in such ways as experience may prove necessary.

PRECIPITATION OF THE COPPER

Launders have been placed on either side of the 2½-foot gauge track of the electrified mine railway in the Mascotte Tunnel. A total of 3200 lineal feet of launder 32½ in.x 32½ in. in internal cross section have been installed and about 1400 feet of launder outside the tunnel are in use. The launders are built of 2 in. x 12 in. lumber and are of conventional design except that solution crossovers and gates are installed at intervals so that the liquor may be shunted to the one side or the other when it may be desired to remove the copper from a given section. There is a false bottom in the launders about a foot below the solution level so that the copper precipitated may collect beneath this grating. Loosely baled tinned scrap reject from the canning factories was first used, but they are now using detinned scrap from the Pacific Coast as the tin causes the copper to adhere too closely. About one pound of iron is consumed per pound of copper precipitated. Although the cost of the scrap is high, about $19 a ton f. o. b. Lark, the smaller quantity of iron needed, the saving in labor and the cleaner cement copper produced makes its use advisable.

The product has an excellent red color and is very high grade for cement copper, the February shipment running 92.06 per cent copper. The product is shoveled into mine cars between the launders, and is screend to remove any unused iron which may be in the precipitate. Other constituents of the cement copper are: (about) sulphur 2.24 per cent, iron 2.9 per cent, insol. 2.0 per cent, lead 0.12 per cent and there is some combined water.

The problems that have arisen in connection with the precipitation of the copper have been about as follows: In the head boxes the copper has adhered tightly to the iron

handling is of the simplest kind. A 4-inch pump directly connected to a 60 H. P. motor raises the water about 300 feet to launders over the caved area now located near the southern boundary of the property. These launders are about 150 feet in length and are made by nailing three 2 by 12-inch planks together so as to make a trough. The water is more or less distributed through two-inch holes in both sides of the launder.

The solution then percolates down through 1400 feet of caved area, enriching itself in copper until its arrival at the Mascotte Tunnel where it is run into the solution launders as explained. An analysis of the liquor before and after it has traversed the stopes shows the following:

Solution	Suspended Solids	Copper Cu	Iron Fe	Lime CaO	SO_4	Al_2O_3	Insol.	H_2SO_4	Iron Ferrous Fe	Iron Ferric Fe	Chlorine Cl.
Canyon Water....	.122	Tr.	.04	.14	.954	.35	.02	neutral			
Solution to head Iron ppt. Launder	.168	8.075	.53	.55	19.95	1.44	.078	.34	.32	.21	.096

(The results are in grams per litre)

It has been feared that the solutions might channel in going through the stopes and thus dissolve but little copper. The point had also been brought up that excessive solution loss due to leakage might also result. The peculiar shape of the ore body and the fact that its foot-wall has a talcose slickenside prevents excessive loss of solutions by leakage. That the solution does not follow channels is shown by the fact that a shift of only 10 feet in the launders at the surface causes a slackening in the flow of the solution arriving at the Mascotte Tunnel for a period about as long as it takes the solution to go through the stopes. When this new solution arrives at the Mascotte Tunnel its copper content is the same as the solution had after the lapse of a similar period of time when it was cycled before. Since this very small shift in launder spacing causes these results, it may be seen that the solution follows independent channels. But little sediment arrives at the Mascotte Tunnel which may be settled out, and this arrives only during the first half hour after the water which has been drained from a new area on the surface has reached the tunnel level. There is but little danger, then, of the ore body plugging, due to decomposition products from the rocks. The only other danger that might arise and cause plugging of the ore body would come from the precipitation of basic iron salts and this matter will be gone into experimentally at some length. Such a possibility could only be shown after a long period of operation or considerable experimental work along lines following the actual chemical attack. Microscopic determination show the copper disseminated in the quartzite to some extent, due to resilification. The quartz monzonite might furnish alteration products that would clog the ore body. The quartzite would furnish none. As the Ohio Copper ore body occurs at the contact of the original sandstone beds with the monzonite, the amount of monzonite present is not large and but little danger is anticipated along this line.

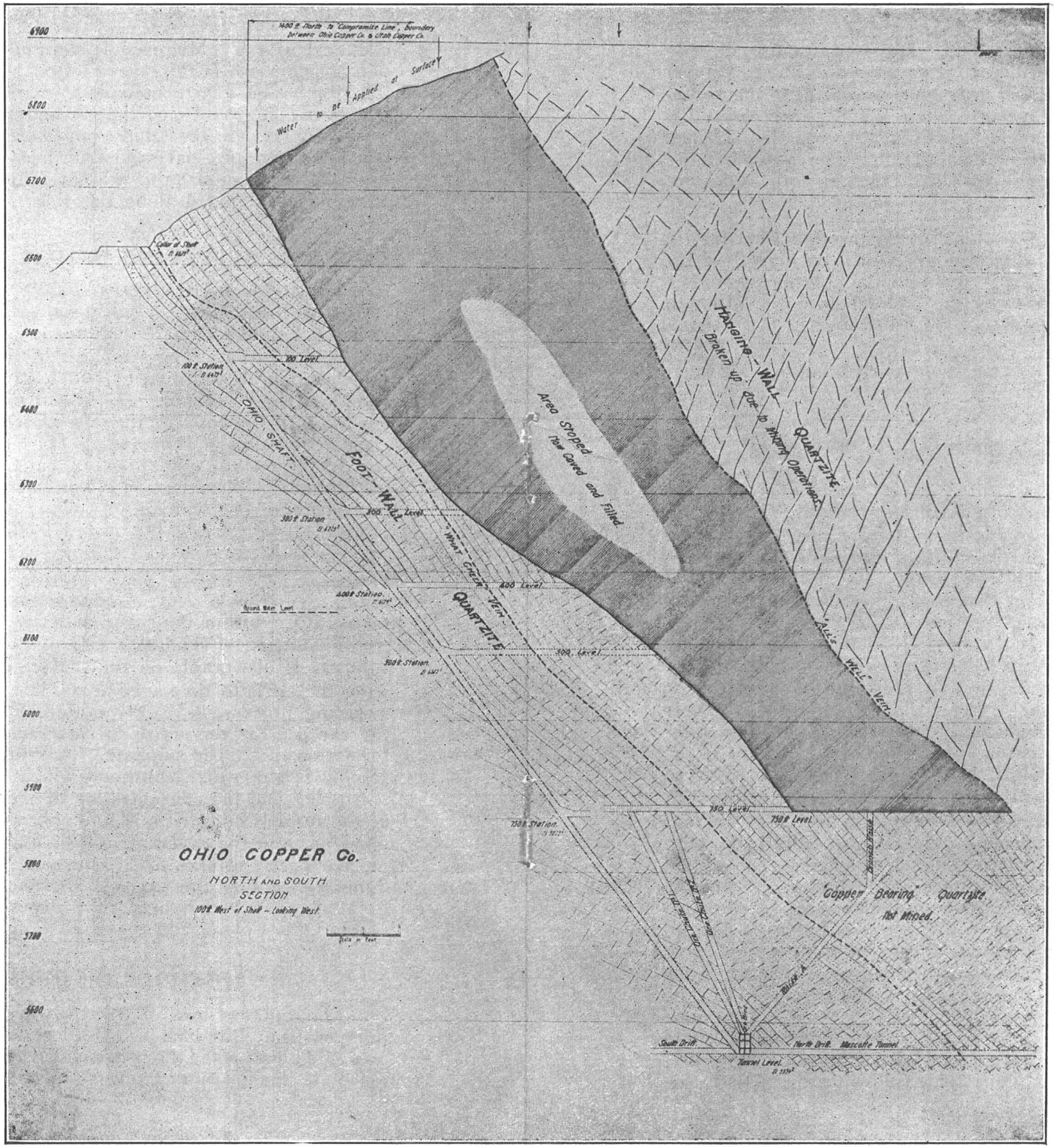
AGENCIES AFFECTING OXIDATION OF MINERALS

The highly shattered nature of the rock and the porosity of the ore body have already been noted. In addition, the variability of the climate insures alternating periods of wetness and dryness. The steepness of the hillside slopes and the elevation above Great Salt Lake give a low ground water level and these with the presence of pyrite greatly assist the oxidation of the copper minerals. Furthermore, as there is a rapid circulation of air from the Mascotte tunnel up through the caved area the oxidation is greatly accelerated. (An idea of the increase in oxidation given by free air circulation may be had by anyone watching a freshly cut face in an open cut mine.)

On leaving the main shaft entering the tunnels leading to the caved areas the temperature gradually increases, due to the oxidation of the sulphide minerals. The estimated temperature within the caved areas is from 80° to 90° F. An illustration of oxidation and of the formation of copper sulphate is observable on the surface of the tunnels leading from the shaft to the caved areas, large drops of water, or a sweating process, is readily noticeable. Further in toward the caved areas the entire surface becomes green, due to the formation of copper sulphate. It is this material which is soluble in the water solutions which percolate through the ore bodies and the concentration of such material on the face of the tunnels and drifts is no doubt similar to that which takes place in the caved areas which are hidden. Ore occuring compactly in place in a mine or lying closely packed in a dump (excepting the exposed surface) will oxidize with great slowness as has been shown by tests run on the dumps of the Ohio Copper and the Utah Copper Companies.

METHODS OF OPERATION

About 400 gallons of water a minute are now being pumped from Bingham Canyon over the top of the caved area and about 300 gallons are collected in the Mascotte Tunnel by drainage from various properties. The equipment for



1400 ft. North to "Compromise Line", Boundary between Ohio Copper Co. & Utah Copper Co.
Water to be Applied at Surface
Collar of Shaft
100 ft. Station
100 Level
OHIO SHAFT
FOOT-WALL
300 ft. Station
300 Level
"What Cheer" Vein
400 ft. Station
400 Level
QUARTZITE
500 ft. Station
500 Level
Area Stoped Now Caved and Filled
HANGING-WALL QUARTZITE
Broken up due to Mining Operations.
"Ace's Well" Vein
750 ft. Station
750 Level
Copper Bearing Quartzite Not Mined.
South Drift
North Drift Mascotte Tunnel
Tunnel Level
OHIO COPPER Co.
NORTH AND SOUTH SECTION
100 ft. West of Shaft – Looking West.
Scale in Feet
6900
6800
6700
6600
6500
6400
6300
6200
6100
6000
5900
5800
5700
5600

CONSOLIDATED ARIZONA SMELTING COMPANY
HUMBOLDT, ARIZONA

G. M. COLVOCORESSES,
GENERAL MANAGER
E. S. SMITH,
ASS'T GENERAL MANAGER

September
Twenty-fifth
1919

Mr. G. M. Colvocoresses,
319 Ocean Avenue,
Santa Monica, California.

Dear Mr. Colvo:

Enclosed you will find an extra copy of the Western Metallurgical Book's memorandum relative to the Lake Shore Mine; also copy of Mr. Crawford's letter of September 18th to you introducing Mr. Johns.

Mr. Johns and I talked for a couple of hours during which time I told him what I could of the Chloridizing-Volatilization Process and showed him our small layout which is about completed, being delayed only for the receipt of the brick for the kiln lining, and in response to Mr. Johns' inquiries, told him also something of the proposed make-up of the Western Metallurgical Company. Mr. Johns intended returning to the Mine at Casa Grande upon leaving here, but he seemed to think that there was considerable possibility that Mr. Crawford would like to come into the W. M. Co. if opportunity were afforded him, and he understood fully the work that had been done and the plans in prospect.

I told Mr. Johns that you would probably be back in Los Angeles shortly after the first of October, and he suggested that if you would care to consider Mr. Crawford

as a subscriber for the W.M.Co. that you call upon him to discuss the matter. In any event it is possible that you would like to meet Mr. Crawford and talk over with him the Lake Shore property which seems to offer good opportunity for operation by the C-V process.

Judge Gerard, former Ambassador to Germany who married one of Marcus Daly's daughters, is administrator of the Estate according to Mr. Johns and directs the financial policy thereof, and the ventures into which they enter. He is expected to be in Los Angeles between October 5th and 10th and Mr. Crawford is desirous of having at that time if possible, at least some preliminary report on the results of our volatilization tests on the Lake Shore Ore to place before Judge Gerard, and I told Mr. Johns I felt sure we could have something for him for that time.

Mr. Johns also spoke to me of another property that might offer an opportunity for the Western Metallurgical Company. It is located somewhere in the vicinity of Globe, Ariz., is ten miles from the railroad, and in about 1914 was under option to the Daly estate for the sum of $560,000. The Mine is described as occupying a small intrusion of monzonite in a dioritic country rock and development work and drilling by the Daly estate and others is said to have developed a half million tons of ore averaging almost 3% copper and indicating possibilities for a total tonnage of two to three tims that amount. The ore occurs as a small deposit of the disseminated type and averages where of

commercial grade about 190 ft. in thickness and covers an area some 600 ft. long by 200 ft. wide. The ore is largely chalcocite and commercial only in the zone of secondary enrichment, but some of it is of unusually good grade carrying 5 to 6 % copper and it will be noted that the general average as stated by Johns of almost 3 % is high for a deposit of this type.

The property as developed by the Daly Estate did not prove of sufficient size to warrant the purchase price asked and the option was accordingly relinquished. Since then a Company has been organized to work it and has mined and shipped to smelters a small amount of the higher grade ores, probably $100,000 worth but the company got into financial difficulties and the property has been sold for taxes for a comparatively small sum (about $30,000 I think).

Apparently Crawford's relations with the owners were not of a very pleasant nature and he now evidences no interest in the property in talking to Johns, altho he is said to consider it to have much merit and to be a good buy at the reasonable figure which Johns thinks it could now be obtained for. Johns feels that he can get copies of the reports on the property showing the drill hole logs and record of the sampling of the underground workings, and I suggested to him that we would be very glad indeed to investigate the property if he were able to place the whole thing before us in good shape with an option at a reasonable price and with copies of the reports and records of development work.

Yours very truly,

E.L.Smith

May 21, 1955

Mrs. Sophie Smith
County Recorder
Pinal County
Florence, Arizona

Dear Mrs. Smith:

We would like to know, at your earliest convenience, who now owns and who pays the taxes on the Lake Shore Mine located 35 miles south of Casa Grande.

We would also like to know the address of the party paying the taxes on this property.

Thanking you, we remain

Very truly yours,

ALLISON STEEL MANUFACTURING COMPANY

W. L. Allison
President

WLA.sef

May 21, 1955

Mr. Wiley Parsons
County Tax Assessor
Pinal County
Florence, Arizona

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May 28, 1955

Mr. Frank M. Leonard, Jr.
Mining Engineer
Cananea, Sonora, Mexico

Dear Friend:

Thank you for your very nice letter of May 26, 1955. I don't know anything about the attorney in Casa Grande, nor who is client could be - I can assure you of this.

My reason for looking into this property was because I know that they are going to build an amonia plant in Arizona someplace and it might be possible that if we could get amonia cheap enough and the price of copper stays high enough, this property might be worked at a profit and I want you to know that I am going to get ahold of your cousin, N. Frank Leonard in Butte, Montana and see if I can work out some kind of a deal with him.

I want to take this opportunity of thanking you for all past favors.

Very truly yours,

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JOBBERS, FABRICATORS AND ERECTORS
GALVANIZERS - HEAVY MACHINING

MILD STEEL
STRUCTURAL STEEL
REINFORCING STEEL
ORNAMENTAL IRON
STAINLESS STEEL
BODY STEEL
CRUCIBLE DRILL STEEL
MORSE TWIST DRILLS
BOLTS - - NUTS

MEMBER OF A. I. S. C.

ARIZONA DISTRIBUTORS
FENESTRA STEEL SASH • WAYNE ALL-STEEL BUSSES • GAR WOOD HOISTS
H. H. ROBERTSON CO. METAL DECKING • OVERLY DOORS AND FRAMES

19TH AVENUE AND SOUTHERN PACIFIC TRACKS
P. O. BOX 6067 ALPINE 8-7731
PHOENIX, ARIZONA

DUMP BODIES
TRUCK BODIES
SPRINGS
HARDWOODS
GRADER BLADES
METAL AWNINGS
FIRE ESCAPES
STEEL BUILDINGS
RADIO TOWERS

May 21, 1955

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County Recorder
Pinal County
Florence, Arizona

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Thanking you, we remain

Very truly yours,

ALLISON STEEL MANUFACTURING COMPANY

W L Allison

W. L. Allison
President

WLA.sef

I am informed by the Assessors Office this Information has been farwarded to yours May 23

Sophie M. Smith

ALLISON STEEL MANUFACTURING COMPANY

JOBBERS, FABRICATORS AND ERECTORS
GALVANIZERS - HEAVY MACHINING

MILD STEEL
STRUCTURAL STEEL
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Very truly yours,

ALLISON STEEL MANUFACTURING COMPANY

W. L. Allison
President

WLA.sef

We have this property in the name of the Treasure State Mining Co.

The 1954 taxes wereepaid by Mary S. Leonard. 4 C.L. G.O.P. Naco, Ariz.

I hope this is the information that you desired.

W.F. Robinson
Seputy Assessor

May 24, 1955

Mrs. Mary S. Leonard
4 C. L. G. O. P.
Naco, Arizona

Dear Mrs. Leonard:

On June 24th, 1954 we wrote a letter to Frank M. Leonard regarding the Lake Shore Mining property, also known as the Treasure State Mining Company, and have not had a reply to our letter. A copy of that letter is enclosed herewith.

Please advise if you would be interested in considering a deal.

Very truly yours,

ALLISON STEEL MANUFACTURING COMPANY

By:
W. L. Allison
President

WLA.sef
Enc.

June 24, 1954

Mr. Frank M. Leonard
4C - O.P.O.
Naco, Arizona

Dear Friend:

I am writing you a letter to get a little bit more information on the Lake Shore Mine. You remember once before I corresponded with you in regards to this property. I can't help but believe that there is some way that some money could be made out of this property.

I have a very fine young chemist who works for me now and I think that maybe I would like to do a little work on this mine. Of course, before I did this I would want a letter from you first giving me the privilege to do this and giving me an option on a royalty basis and the price that you would ask for the property if at the end of a certain time I would want to take it over.

Now, if this property is available for a deal of this kind, I would be glad to hear from you.

I remain

Very truly yours,

ALLISON STEEL MANUFACTURING COMPANY

W. L. Allison
President

WLA.sef

FRANK M. LEONARD, JR
MINING ENGINEER

Mr. W.L. Allison
P.O. Box 6067,
Phoenix, Arizona.

40- O.P.O.,
Naco, Arizona.

May 28, 1955

Mr. N. Frank Leonard
20 South Emmet Street
Butte, Montana

Dear Sir:

I am sending you a copy of a letter I received from Mr. Frank M. Leonard, Jr. so that you kind of have an idea what has been going on.

I would like to know if you people would be interested in making some kind of a deal on this property and if so would you let me know what kind of a deal you have on it.

I remain

Very truly yours,

ALLISON STEEL MANUFACTURING COMPANY

By:
W. L. Allison
President

WLA.sef

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By:
W. L. Allison
President

WLA.sef

Frank M. Leonard, Jr.
Mining Engineer

CAnanea, Sonora, Mexico
May 26, 1955.

Mailing Address--~~01~~

4 C - O.P.O.
Naco, Arizona

Mr. W. L. Allison
Allison Steel Mfg. Co.,
P.O. Box 6067
Phoenix. Arizona.

Dear Mr. Allison:

I wish to acknowledge your letter to Mrs. Leonard of May 24 as well as a cbpy of one sent to me which was never received. Mail to Naco is forwarded to me in Cananea by private carrier, and may account for my not having received it.

I have but recently had two telephone conversations relative to the Lake Shore Mining property from an attorney in Casa Grande, Arizona named Raymond Peterson. Mr. Peterson guardedly avoided naming his client so I am unable to connect his inquiry with the arrival of your letter. Even though this is of no particular import, would you be kind enough to satisfy my curiosity?

Considerable work of a metallurgical nature has been done on Lake Shore ore, which up to the present time, has yielded nothing of an encouraging nature. It seems odd that a moderate sized orebody, such as exists at Lake Shore has proved so difficult of beneficiation by modern metallurgical methods. Your idea confining your efforts solely to the treatment of the ore is quite sound.

It would perhaps be better for you to write directly to my cousin, Mr. N. Frank Leonard, 20 South Emmet St., Butte, Montana who is in direct charge of the Treasure State Mining Co. affairs, and take up the matter with him, directly. It is extremely difficult for me, living in a foreign country, to act in other than an advisory capacity.

Yours truly,

(signed) Frank M. Leonard, Jr.

cc - N. Frank Leonard.

Frank M. Leonard, Jr.
Mining Engineer

CAnanea, Sonora, Mexico
May 26, 1955.

Mailing Address--

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cc - N. Frank Leonard.

FRANK M. LEONARD, JR

MINING ENGINEER

Cananea, Sonora, Mexico.
May 26, 1955.

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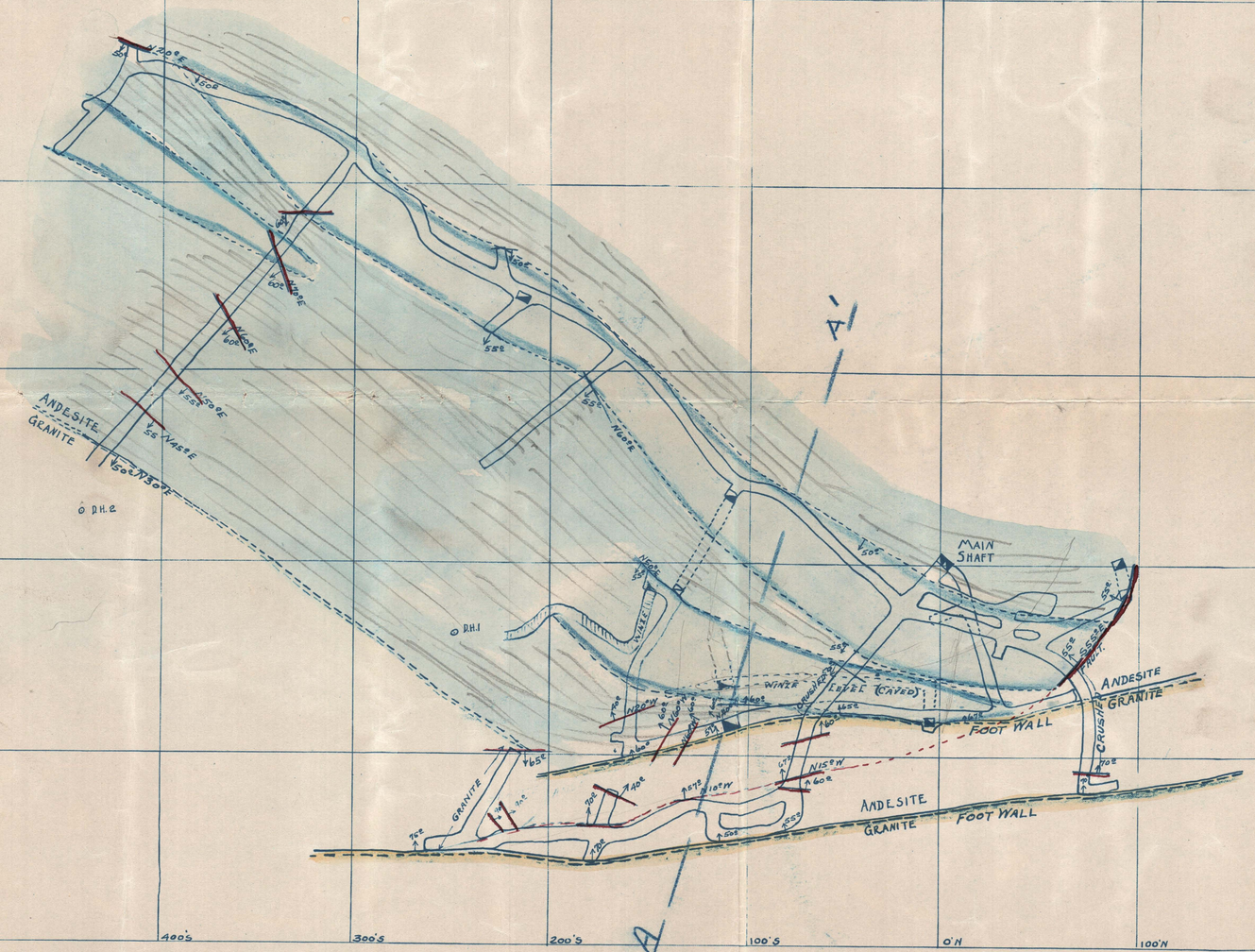
Yours truly

Frank M. Leonard

Frank M. Leonard Jr.

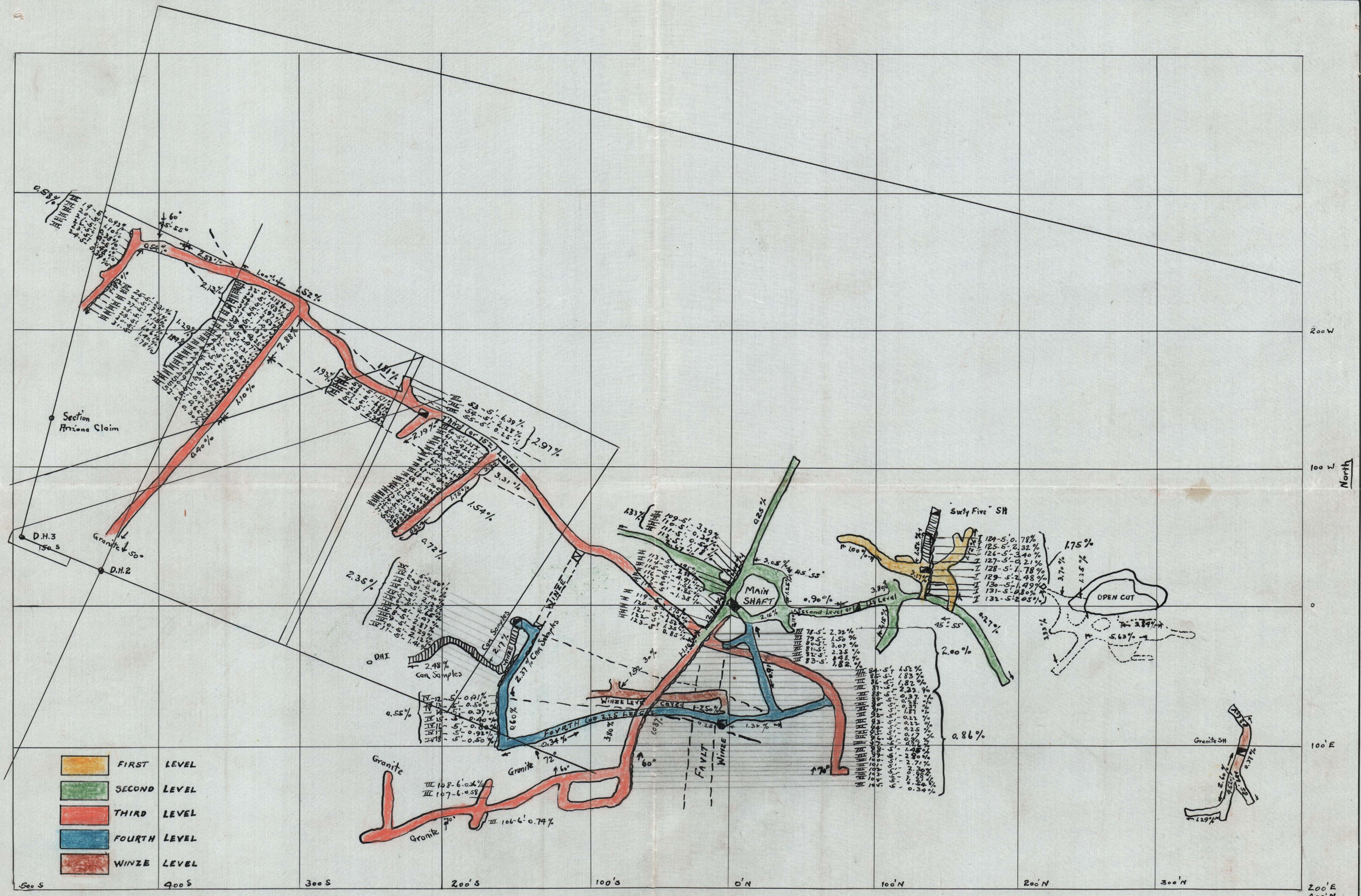
c. N.Frank Leonard



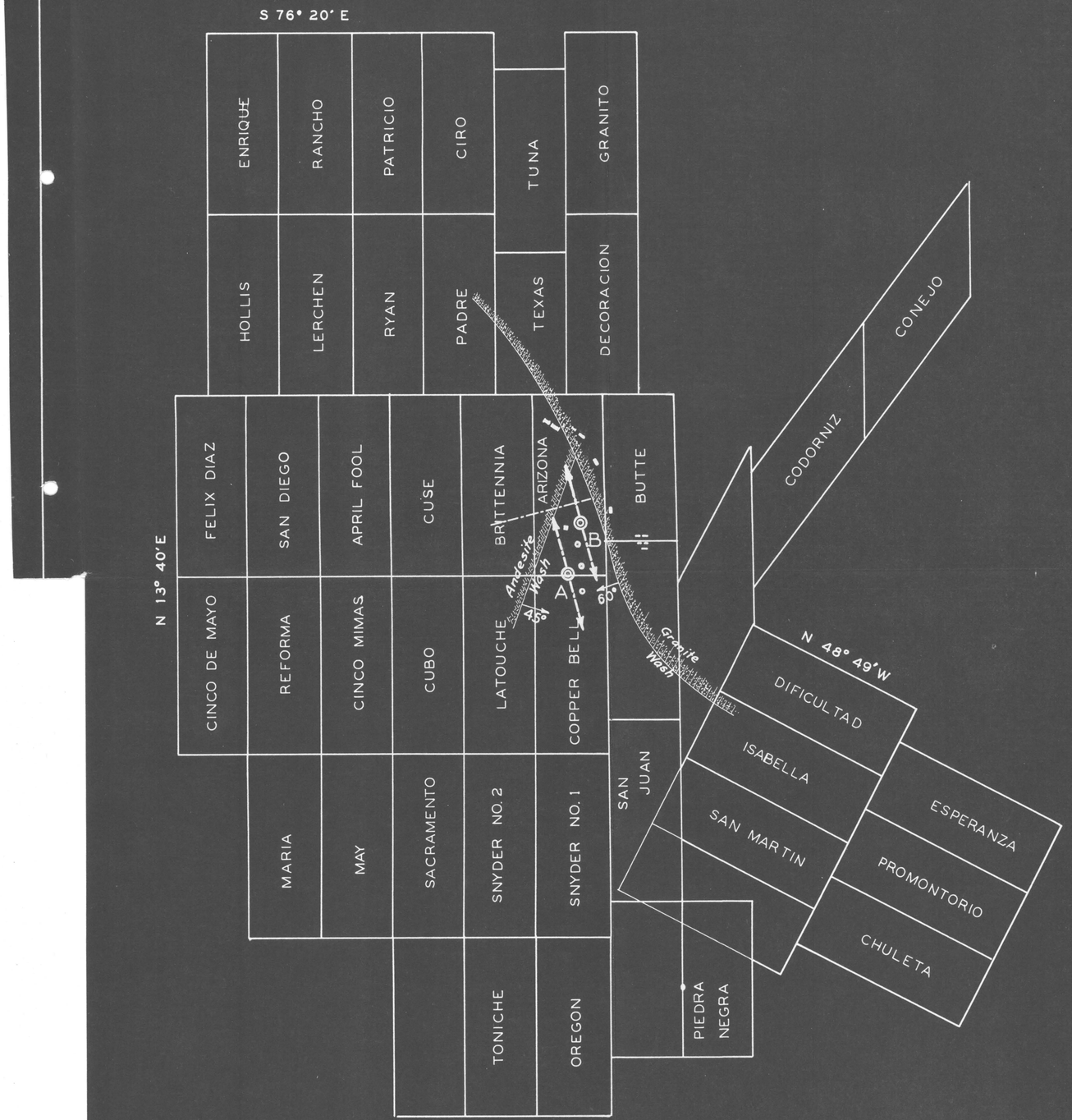
700' 600'S 500S 400'S 300'S 200'S 100'S 0'N 100'N 200'N 300'N 400'N 200'E 100'E 0 100'W 200'W 300'W 400'W NORTH

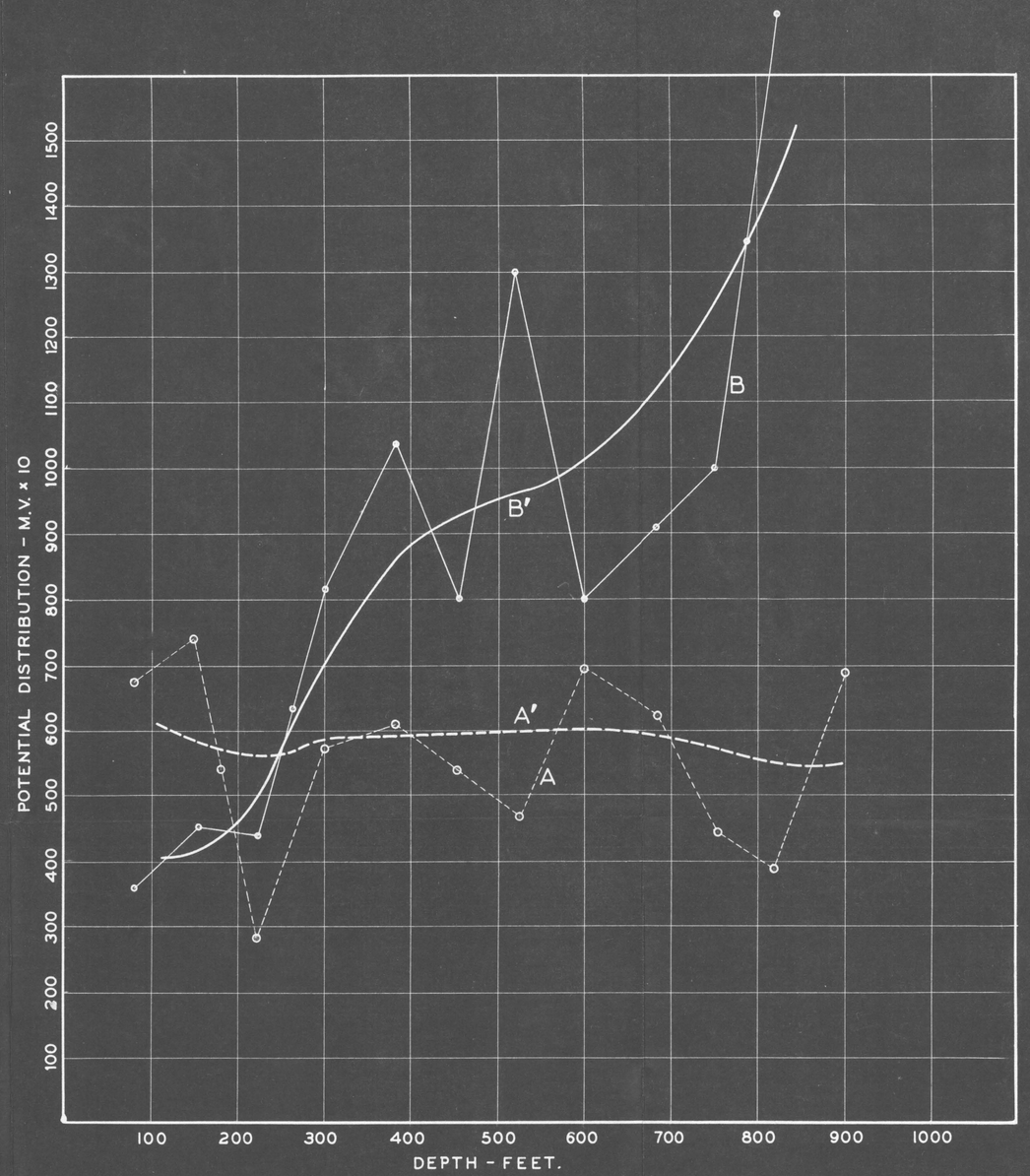
PLAN OF WORKINGS
THIRD AND FOURTH LEVELS
THE "LAKE SHORE" MINES
SCALE 1"=40'

No copy recd



PLAN OF WORKINGS
SCALE 1"=40' APPROXIMATELY
THE "LAKE SHORE" MINES
ARIZONA





INTERNATIONAL GEOPHYSICS - INC.

LOS ANGELES & CULVER CITY CALIF.

PRELIMINARY EXAMINATION

LAKE SHORE MINE

PINAL COUNTY - ARIZONA

JUNE 10 - 11 1930 SCALE: 1" - 600'

GEOLOGY -

ELECTRICAL DATA - C. H. WILSON.

MAGNETOMETER -

SURVEYING -

APPROVED BY - J. J. Jakosky

FILE NO. 76