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THE AMERICAN METAL COMPANY, LIMITED
61 BROADWAY
NEW YORK 6, N. Y.

TELEPHONE BOWLING GREEN 9-1800
CABLE ADDRESS: EFFLUX, NEW YORK

LAKE SHORE
PINAL CO.

PLEASE ADDRESS REPLY TO **EXPLORATION DIVISION**

SUBJECT:

March 15, 1956

Mr. E. N. Pennebaker
P. O. Box 817
Scottsdale, Ariz.

Dear Penny:

It certainly will be interesting to know what your thoughts are about the area in the vicinity of Lake Shore Mine after you have flown the area and done further investigation. It seems to me that it would not be out of order to have Howard Twitty investigate the situation with the Papago Indians to find out exactly what would be required of us should we wish to obtain a concession or similar permit arrangement for exploration in that vicinity.

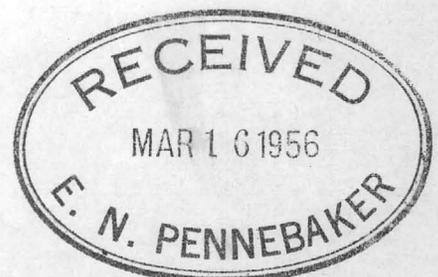
There will be very little lost if we do not wish to go ahead and we will be a step further in the event we should want to follow up in this area.

Kindest regards.

Sincerely,

Jack A. James
Jack A. James

JJ:LL



March 12, 1956

Mr. Jack A. James
Mgr., Exploration Division
The American Metal Co., Ltd.
61 Broadway
New York 6, N. Y.

Dear Jack:

I have at hand your letter of March 9 with regard to Lewisohn Copper in the Helvetia district south of Tucson. I shall go to Tucson next Monday, March 19, and spend a few days looking around the country. I am sure that I can go on the property for a look, but we shall have to see whether these people will tell what they have actually found.

A week ago another Arizona property was brought to my attention by a friend in the metallurgical business. This is the Lake Shore mine, which lies in a beeline about 22 miles northwest of A.S. & R's Silver Bell (and along the projection of its trend). This friend told me that one of the uranium companies now controlled the Lake Shore and had about 1 million tons at about 2% copper in reserve and were finding more ore by current drilling. This is nothing particularly new, as similar reserves were claimed a number of years ago. The ore is oxidized and its treatment is a metallurgical problem. The mineralization is in schist not far from granite.

What interested me was that this party said that the ore body was under about 50 feet of soil cover and was loaded with magnetite. This sounds like something similar to Pima and might be a natural for the magnetometer. At present there is a great deal of activity at Pima and in the Helvetia district, but I suspect that it is still quiet at Lake Shore.

Lake Shore is on the Papago Reservation. Until recently there were no complications in prospecting and staking claims on this reservation; however, Congress gave the unclaimed mineral rights back to the Papagos last year. But it might be possible to get a concession-like area from the Papago Tribal Council that would cover possible extensions around Lake Shore. We would need to have Howard Twitty look into this if we became interested.

At one time the Joint Venture was interested in the Lake Shore, but the owner had someone else on the string and would have nothing to do with us.

Mr. Jack A. James - Page 2 - March 12, 1956

I plan on driving out to this area as soon as possible and may take a chartered flight over it. If a Pima-like situation is developing, now is the time to get in before the mob (I think).

All of the above, unfortunately, is going to delay that Michigan report a little longer. I had planned on starting same next week, but now these trips appear more urgent. Also, I have been on Amco work almost solidly during 1956 and shall soon have to get busy for some other customers.

With kind regards,

Yours sincerely

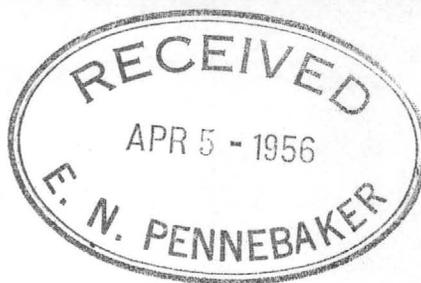
E. N. Pennebaker

ENP:mc

THE AMERICAN METAL COMPANY, LIMITED

61 BROADWAY
NEW YORK 6, N.Y.

TELEPHONE BOWLING GREEN 9-1800
CABLE ADDRESS: EFFLUX, NEW YORK



PLEASE ADDRESS REPLY TO

SUBJECT:

JAJ/ms
April 2, 1956

Mr. E. N. Pennebaker
P. O. Box 807
Scottsdale, Arizona

Dear Penny:

I have read your letters of March 27 relative to the Lake Shore Mines and Duval areas with great interest. I particularly appreciate your review of the leached outcrop characteristics that are apparently associated with the Duval orebody. I would judge that 30M tons in the area you mention as 3,000' x 1500' would require an ore thickness of something like 90', this ore being under approximately 100' of barren capping which means Duval could have a very attractive 1 to 1 stripping ratio. Does such a ratio as this appear feasible as a result of your on-the-spot examination?

With respect to the Lake Shore proposition, we have not yet of course discussed the possibility of contacting the Lake Shore people to see whether they would be interested in having assistance with their prospecting or, for that matter, whether the results of the work done to date are sufficiently encouraging to make Amco seriously interested. You infer the prospecting and mining rights concessions are so nebulous in the minds of the Papago that it could be conceivably some time before these arrangements could be made. In the interim, the only opportunity to get on the ground is through arrangements with people now holding mineral rights which, of course, brings us right back to the Lake Shore people.

May I have your thoughts on the Lake Shore people, the job they are doing, the probable merits of the prospect and whether you believe there may be a place for Amco in this picture. I do not believe that such a contract should supplement our interest in extension ground and neither do I believe we should put all our eggs on the extension possibilities.

I am not at all familiar with the area west of Magma Junction and some 6 miles northwest of Florence, but expect to review this information in the joint venture files. I will reserve comment until a later date.

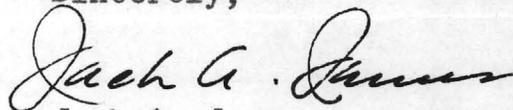
Mr. E. N. Pennebaker

2.

I think it is well for you to complete the Michigan Report as soon as possible because we hope to have exploration activities under way soon, we hope by June. Except for the added information we would like to have relative to the Lake Shore, I believe other activities can come to a standstill in deference to the Michigan Report.

With kindest regards.

Sincerely,

A handwritten signature in cursive script that reads "Jack A. James". The signature is written in dark ink and is positioned above the printed name.

Jack A. James

LAW OFFICES
GUYNN & TWITTY
TITLE & TRUST BUILDING
PHOENIX, ARIZONA

C. LEO GUYNN
HOWARD A. TWITTY
RALPH B. SIEVWRIGHT

April 27, 1956

Mr. E. N. Pennebaker
P. O. Box 817
Scottsdale, Arizona

Re: Papago Indian
Reservation

Dear Penny:

Enclosed is a photocopy of a report
of Axel Z. Johnson, Field Engineer of the Depart-
ment of Mineral Resources, in which you may be
interested.

Best regards.

Sincerely yours,

GUYNN & TWITTY

By *Howard A. Twitty*

HAT:ec
Enclosure



STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA



Tucson, Arizona,
April 7, 1956

To Roger I. C. Manning, Director,
Department of Mineral Resources,
Mineral Bldg., Fairgrounds,
Phoenix, Arizona.

Report of my visit to the Papago Indian Reservation Office at Sells, Ariz. --- APR. 2, 1956/

References See previous reports on this subject under dates of Jan. 23 and Mar. 8, 1956.

Information from visit on April 2, 1956

I again conferred with Mr. T. A. Wilson, Realty Assistant, and Mr. Harry W. Gilmore, Superintendent of the Papago Indian Agency.

Mr. Wilson showed us two letters, both under date of Mar. 19, 1956, from Glen L. Emmons, Commissioner, Bureau of Indian Affairs, Washington, D. C., said letters being addressed to Frederick M. Haveland, Area Director, Phoenix, Arizona.

The first letter stated that the Papago Tribal Council's Resolution No. 843 was placed before the Commissioner of Indian Affairs for consideration and that the Office of the Solicitor of Indian Affairs rendered an opinion on same on Feb. 2, 1956. This opinion stated that, since the Papago Constitution contains no provision under which the Papago Tribal Council may pass resolutions or ordinances pertaining to mineral leases, the Papago Tribal Council acted without authority, and Resolution No. 843 was therefore returned without action by the Commissioner of Indian Affairs, or by the Secretary of the Interior. The letter further stated that the present Constitution for the Papago Reservation, in regard to their tribal lands, deals only with the surface and that mineral leases are not definitely mentioned in their present Constitution. The letter then suggests that action be taken by the Papago Tribal Council to amend their Constitution in order to give them authority to make mineral leases, said leases to be subject to the approval of the Secretary of the Interior, as provided for in the Act of May 11, 1938.

The second letter suggested that the Papago Tribal Council make an amendment to their Constitution in order to give them authority to lease tribal lands for minerals, subject to the approval of the Secretary of the Interior. It was stated that such an amendment must contain a request that the Secretary of the Interior shall submit such an amendment to an election of the qualified voters of the Tribe. On receipt of such an amendment, passed by a majority vote of the Tribal Council, the Secretary of the Interior will issue an order for this election to be held.

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, PHOENIX
PHOENIX, ARIZONA

Page 2.

It was explained that 3 reservations are included in the Constitution of the Papago Tribe ----- (1) Papago or Bolls, (2) Gila Bend, and (3) San Xavier, and that the Papago Council is composed of two representatives from each of 11 districts (Gila Bend and San Xavier included). Also it was explained that a District Council of 5 members is also established for each of the 11 districts. It was also stated by Mr. Wilson that, according to the Constitution of the Papago Tribe, any amendments to same can not be considered before their annual meeting some time next January.

In reading the previously mentioned letters from Glen L. Bunnis, and further discussing the contents with Mr. Wilson and Mr. Gilmore, I received the impression that the passage of an amendment to the Papago Constitution, along the lines suggested by Glen L. Bunnis, will require a long time and, most likely, will not be accomplished at all, due to the strict requirements specified by the U. S. Bureau of Indian Affairs.

No doubt, Mr. Wilson and Mr. Gilmore ~~of the same impression~~ ^{of the same impression}, as they do not, now, seem interested in the drafting of "Provisions and Regulations to govern Prospecting Permits and Mineral Leases on the Papago Indian Reservation", in which the Tribal Council could approve only after a change in their present Constitution.

On the other hand, they claim that they have the authority now to issue prospecting permits and mineral leases under the present Federal laws governing Tribal lands, subject to the approval of the Bureau of Indian Affairs on each individual permit and lease. They stated that they are now going ahead with this.

The Federal rules and regulations governing Tribal lands are about as follows:

- (1) Prospecting permits issued call for a bond of \$5,000 per permit. They are non-exclusive, and after a prospector has found an ore deposit (often after the expenditure of a lot of time and money), the ore deposit is advertised for competitive bids.
- (2) Leases are usually granted by competitive bidding to the highest bidder, at so much per acre bonus, except in special cases or conditions, where it is believed a negotiated contract will better serve the interests of the Tribe.
- (3) Leases are for not more than 10 years, and for not more than 960 acres, with an annual rental of \$ 1.00 per acre per year, but charges in the above requirements may be made with the approval of the Commissioner of the Bureau of Indian Affairs.
- (4) A bond is required.
- (5) No assignment or sub-lease can be made, except with the approval of the Commissioner of the Bureau of Indian Affairs.

I was also informed that a lease application on a copper deposit on the reservation is now being processed. This calls for a negotiated bonus of \$ 10,00 per acre. On account of the fact that the lease applicant owns some patented claims in the center of the proposed lease area, this lease was not opened for competitive bidding.

Mr. Gilmore expressed his opinion that he believed it would take about 6 months for the Bureau of Indian Affairs to grant a lease, after the bonus had been determined either by competitive bidding or direct negotiation.

Respectfully submitted, *Carl Z Johnson* Field Engineer

LAW OFFICES
GUYNN & TWITTY
TITLE & TRUST BUILDING
PHOENIX, ARIZONA

C. LEO GUYNN
HOWARD A. TWITTY
RALPH B. SIEVWRIGHT

May 12, 1956

Mr. E. N. Pennebaker
P. O. Box 817
Scottsdale, Arizona

Dear Penny:

Enclosed is one copy of each of the Township Plats for Township 10 South, Range 4 East and Township 10 South, Range 5 East. There are no supplemental Township Plats and you will note that the area in Township 10 South, Range 5 East which is of interest to you is unsurveyed.

Also enclosed is a copy of two district sheets and a copy of five mineral surveys, covering the mining claims shown on the two district sheets. We are mailing a copy of the Township Plats and district sheets to Tom Moore.

Sincerely yours,

GUYNN & TWITTY

By 

HAT:hg
Enclosures
cc: Tom Moore

Panel CO 5 / Prima
Twp. 9 + 10 + (11) R - 4 + 5 E

" 10 S R 2 E

18
10
60
40

28
15
43

- #1 lease Sec 31 - 10 S - R 5 E

- #2 lease ^{Prima} S 1/2 Sec 36 " - R 4 E

Prima - N 1/2 Sec 6 10 S - R 5 E

- #3 lease - Prima N 1/2 Sec 25 10 S - R 4 E

Bureau of Mines
Report of Investigations 4706



E. N. Pennelaker

INVESTIGATION OF THE LAKE SHORE
COPPER DEPOSITS, PINAL COUNTY, ARIZ.

BY T. M. ROMSLO

**INVESTIGATION OF THE LAKE SHORE
COPPER DEPOSITS, PINAL COUNTY, ARIZ.**

BY T. M. ROMSLO

* * * * * **Report of Investigations 4706**



**UNITED STATES DEPARTMENT OF THE INTERIOR
Oscar L. Chapman, Secretary
BUREAU OF MINES
James Boyd, Director**

Work on manuscript completed March 1950,. The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Report of Investigations 4706."

July 1950

E. N. Pennelaker

INVESTIGATION OF THE LAKE SHORE COPPER DEPOSITS,
PINAL COUNTY, ARIZ.

by

T. M. Romslo^{1/}

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^{1/} Mining engineer, U. S. Bureau of Mines, Tucson Branch,
Minerals Division, Tucson, Ariz.

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INTRODUCTION AND SUMMARY

The Lake Shore property, located in the early 1880's, contains copper-bearing deposits that have been developed by surface excavations, underground workings, and churn-drill holes. Intermittent operation of the property ended in 1929 with a total recorded production of 280,000 pounds of copper.

The property is near the foot of the Slate Mountains, which are made up mainly of schist, probably the Pinal formation of pre-Cambrian age. In the mine area there are a few outcrops of granite, which is exposed over a large area east of the property. Other outcropping rocks on the property are limestone, quartzite, and diabase. The limestone and quartzite probably are the Mescal and Troy formations of pre-Cambrian and Cambrian age, respectively.

The predominant copper mineral is chrysocolla, a hydrous silicate that occurs mainly as fracture filling in bedded schist. It is also the principal copper mineral in the shear zone at the schist-granite contact and in limestone southeast of the main workings.

Investigation of the Lake Shore property by the Bureau of Mines included both topographic and geologic mapping, exploratory drilling, and metallurgical test work. One diamond-drill hole and five churn-drill holes were completed for a total of 2,872.5 feet. Drilling started January 19 and was completed May 13, 1949.

ACKNOWLEDGMENTS

These investigations were initiated in 1942 when O. M. Bishop, formerly a mining engineer of the Bureau of Mines, examined the property with the object of determining ore reserves and obtaining samples for metallurgical tests. Appreciation is extended to Frank M. Leonard, Jr., one of the owners of the property, for accompanying the engineer during the examination, for relating the history of the property, and for supplying an assay map of the mine workings and assay graphs of the churn drill holes. Later in the same year, T. C. Denton, also a former mining engineer of the Bureau, obtained additional samples for metallurgical tests.

The Bureau wishes to thank Nels P. Peterson of the U. S. Geological Survey for mapping both the surface and the underground geology during brief visits to the property in January and March 1949.

The investigations made during the Bureau's drilling program were supervised by J. H. Hedges, Chief, Tucson Branch, Mining Division, and analytical work was by Ray Stiles, under J. Bruce Clemmer, chief, Tucson Branch, Metallurgical Division. Metallurgical tests by the Bureau in 1942 and 1943 were made at the Salt Lake City station with H. G. Poole in charge. Clemmer and

Carl Rampacek conducted the tests at Tucson in 1949 and prepared the text on metallurgical tests. Transit surveys of the surface and underground workings, started by the author, were completed by M. H. Berliner, mining engineer of the Tucson Branch, Bureau of Mines.

Acknowledgment is made to the Indian Service of the Department of the Interior for grading an entry road to the mine and for providing a source of domestic and drilling water from a well at the nearby Indian Village of Komelik.

LOCATION AND ACCESSIBILITY

The Lake Shore mine is in the Papago Indian Reservation and the Casa Grande mining district, Gila and Salt River Base Line and Meridian, secs. 25 and 36, T. 10 S., R. 4 E., Pinal County, Ariz. (fig. 1). It may be reached from Casa Grande, a town on the Southern Pacific Railroad and State Highway 80, by traveling southwestward 28.2 miles on a well-maintained dirt road and thence 2.6 miles east on a desert road to the property.

PHYSICAL FEATURES AND CLIMATE

The Lake Shore mine is on the southwest piedmont of the Slate Mountains at an altitude of about 1,800 feet. The mountain range trends northwestward and reaches its maximum altitude of 3,330 feet at Prieta Peak, about 2 miles north of the mine.

Vegetation is of the desert variety, typical of the lower altitudes of southern Arizona. Palo Verde trees and Saguaro cactus are prominent.

Winters are mild and summers are hot. At Ajo, about 60 miles west of the property, the annual mean temperature is 71°, with a range from 17° to 115°. The annual precipitation averages about 9.3 inches.

PROPERTY AND OWNERSHIP

The Lake Shore property consists of three patented lode mining claims: the Arizona, Copper Bell, and Isabella (fig. 2). N. Frank Leonard, Butte, Mont., owns 96 percent of the stock of the Hidden Treasure Mining Co., which is the holder of the property.

There are no buildings or equipment on the property.

HISTORY AND PRODUCTION

The mine was located early in the 1880's by Trout and Atchinson. A shaft was sunk, and some drifting was done before 1884, when the property was abandoned because of failure of the copper market. In 1905, B. S. Wilson relocated the mine and shipped some ore sorted from the dump. In 1914 he sold the property to Frank M. and Charles Leonard. A new shaft was sunk to the 225-foot level, and development of the ore body was started on three levels. In 1917 the Atlas Development Co., Chicago, Ill., leased the mine and shipped 850 tons of 5.2 percent copper ore to a smelter at Sasco, Ariz. In 1919,

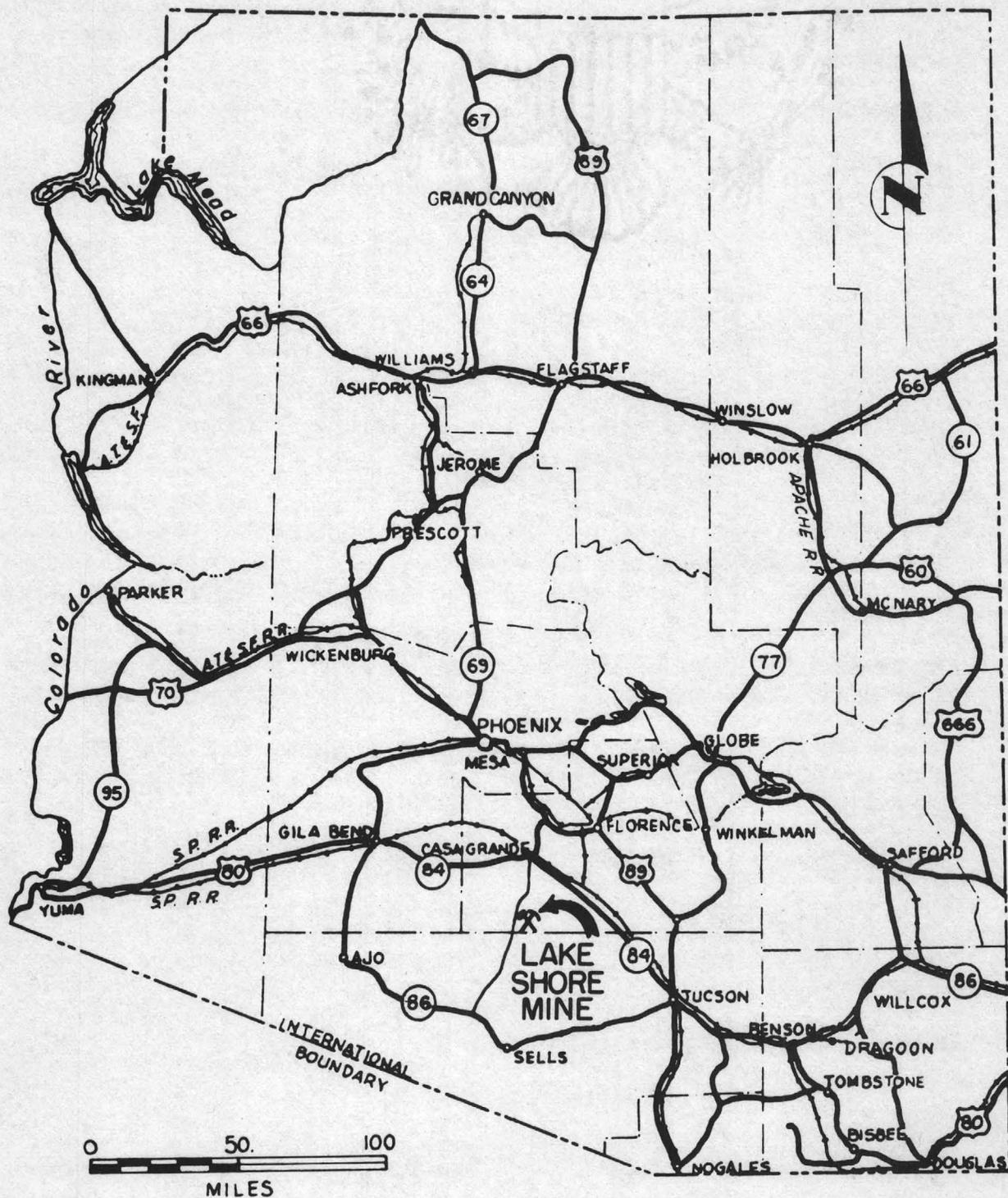


Figure 1. - Location map, Lake Shore copper project, Pinal County, Ariz.

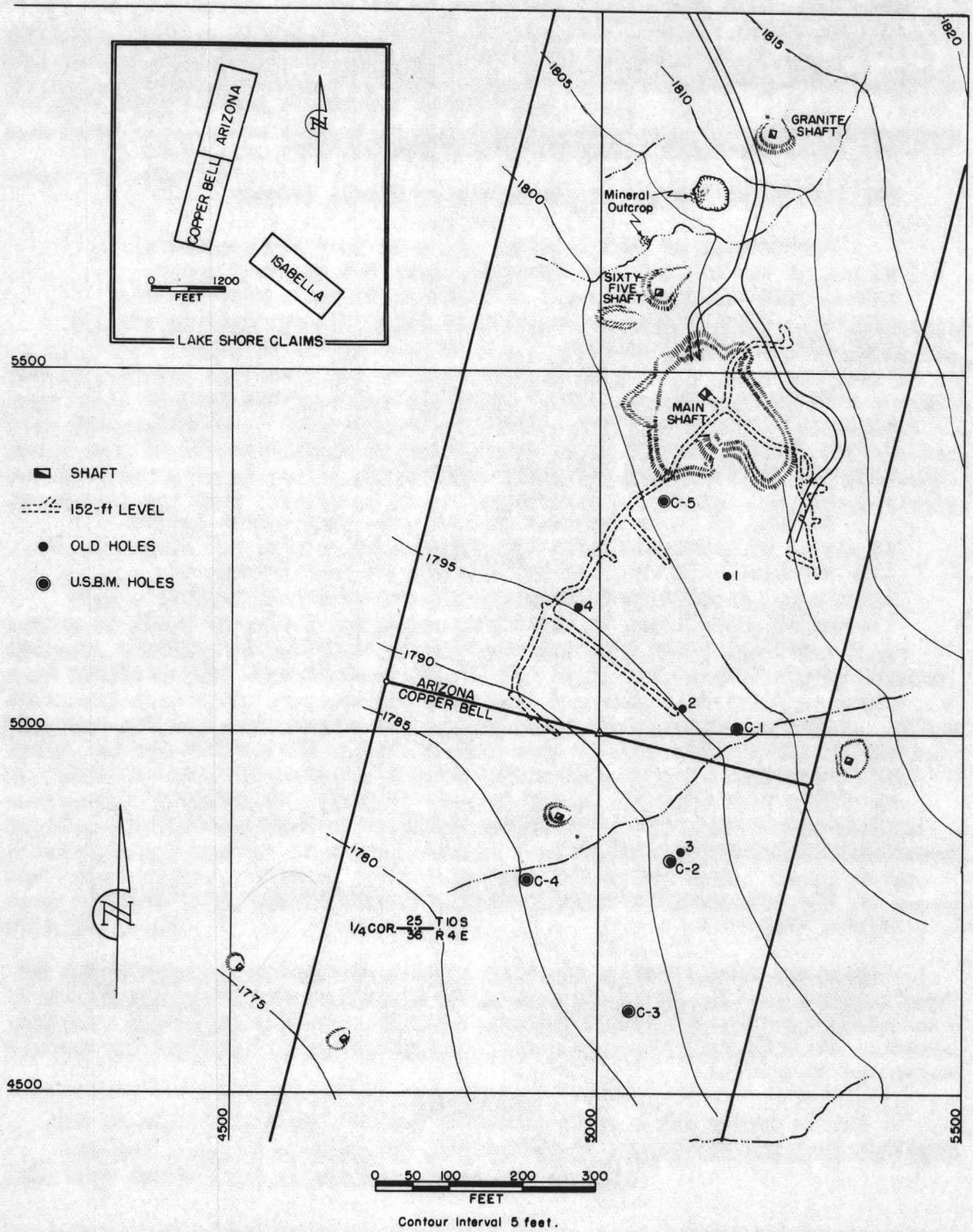


Figure 2. - Surface map, Lake Shore copper deposits, Pinal County, Ariz.

after terminating the lease, the Leonards drilled 5 churn drill holes and sank two winzes. During this period 12 tons of 15 percent copper ore in sulfide form was mined from the schist-granite contact zone on the 285-foot level. The last reported production was in 1929, when ore was trucked from the mine dump to Casa Grande for shipment.

Total production from the property is reported to have been 280,000 pounds of copper.^{2/}

GEOLOGY

General

The Slate Mountains are composed mainly of schist, tentatively identified as the Pinal formation of pre-Cambrian age. Biotite granite has intruded the schist near the southwest end of the mountain range. It crops out over a very small area on the Isabella claim and is prominently exposed east of the Lake Shore property. Other rock exposures on the property are confined to a small area of altered schist on the Arizona claim and to limestone, quartzite, and diabase on the Isabella claim. The limestone and quartzite are probably the Mescal and Troy formations of pre-Cambrian and Cambrian age, respectively.

Deposits

Copper mineralization is associated with a fault that has an average strike of about S. 11° W. and a dip of 60° to 70° west (figs. 3 and 4). Granite, probably an integral part of the intrusive mass, forms the block east of the fault. On the west side of the fault is a bed of highly altered, intensely fractured, fine-grained rock that has been classified as schist. A thin bed of quartzite is spottily present near the base of the schist. Underlying the schist is an intensely altered mass of rock tentatively classified as andesitic lava or tuff. Part of this formation can be identified megascopically as andesite. Spottily present in the andesite is a very fine-grained unidentified rock of light color and stony appearance. Of similar occurrence and texture is a dark-colored rock tentatively identified as basalt. The schist strikes about S. 37° W. and dips 37° to 45° east. South of the main shaft, a comparatively small body of granite is in contact, on the west, with the fault.

Copper mineralization occurs sparingly throughout the bedded rocks but is concentrated mainly at the base of the schist and in the fault zone. The planes of the fault and the planes of the bedded rocks diverge to form a trough that plunges to the southwest at an angle of about 24°.

Mineralogy

The following is an analysis of a 158-pound sample submitted to the Salt Lake City Station for metallurgical testing in 1942.

^{2/} Elsing, M. J., and Heineman, R.E.S., Arizona Metal Production: University of Ariz. Bull. 140.

Insol.	Oxide								
	SiO ₂	Fe	CaO	S	Cu	Cu*	Al ₂ O ₃	Zn	Pb
49.4	37.1	17.5	5.1	Nil	2.3	2.15	6.5	Nil	Nil

*Soluble in dilute H₂SO₄ saturated with sulfur dioxide.

The late R. E. Head,^{3/} of the Bureau of Mines, stated:

Examination of thin sections prepared from representative pieces of the ore indicate that basically two types of copper association are represented. In addition to the copper-bearing material, there appears to be also an indeterminate quantity of rock that is virtually free of copper.

In the one type of copper occurrence, the ground mass is almost entirely quartzitic. Chrysocolla, the copper silicate, occurs in this type of rock as a filling in fractures both in the rock itself and in the quartz particles.

In some of these fracture fillings the chrysocolla occurs as masses of hairlike fibers intermixed with calcite and clay-like material. In addition to this type of association, the chrysocolla is also present as a shell or coating on many of the quartz particles. In some cases, aggregates of very small quartz particles are cemented together with chrysocolla, which occurs as films so thin as to amount to scarcely more than stains.

In the other type of association, the chrysocolla is distributed uniformly through the claylike ground mass in the form of minute veinlets and also as fracture fillings. This association of chrysocolla with the gangue is very intimate, and examination of thin sections showed that the individual clay particles were ringed with copper carbonate.

The ore contains an appreciable quantity of magnetic iron oxide, magnetite.

Subsequent investigation of other samples of the ore in connection with metallurgical testing showed the copper to be present mainly in the silicate form as chrysocolla and some diopside. Also present is a yellowish copper mineral, which is probably a silicate. A trace of sulfide-copper is present mainly as chalcocite.

A little pyrite and a small amount of native copper were seen in the cuttings from the fault zone at churn-drill hole C-2.

^{3/} Head, R. E. (deceased), Preliminary Microscopic Examination of oxidized ore from the Lake Shore Mines, Arizona: August 1942.

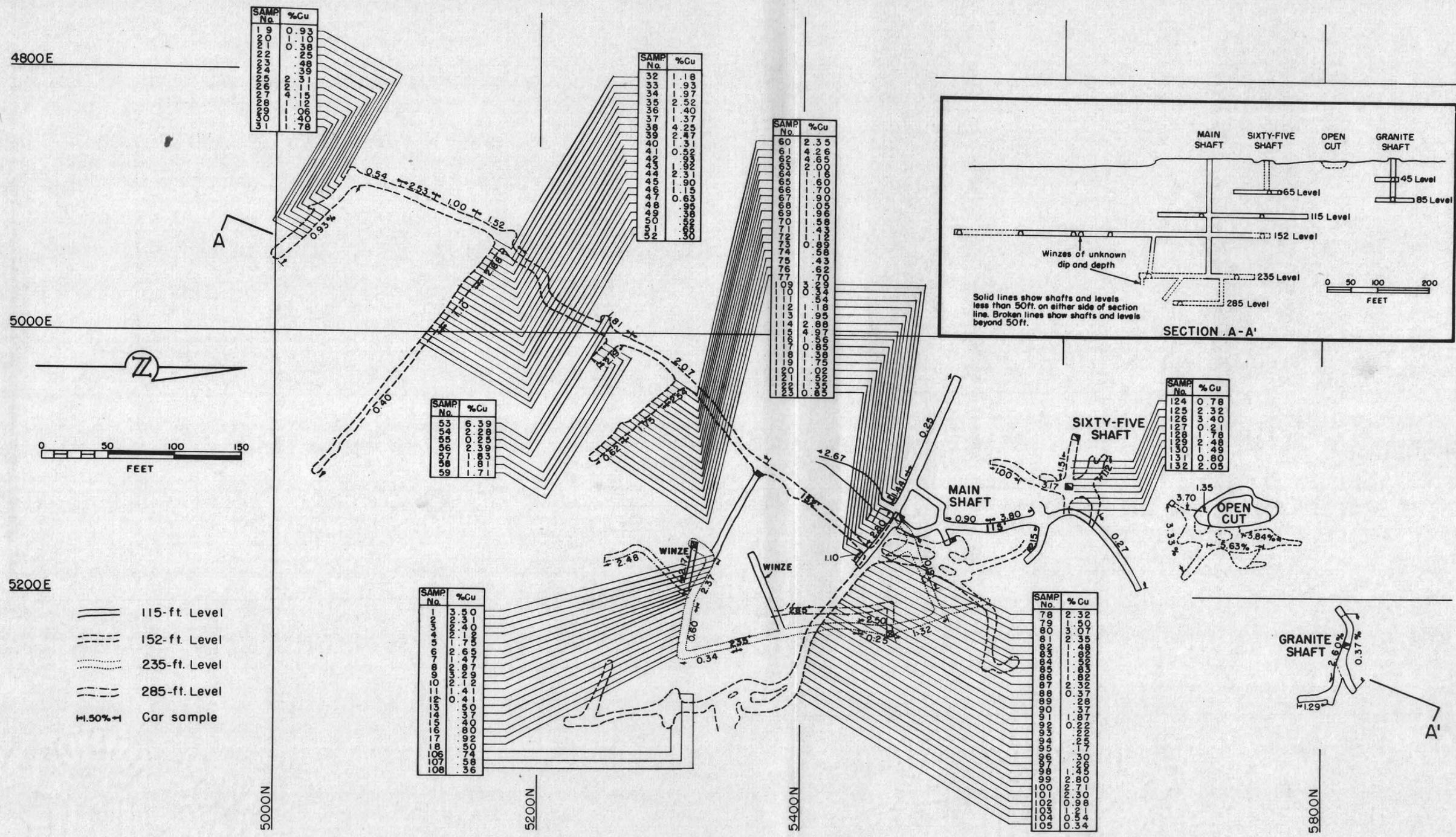


Figure 4. - Assay map, Lake Shore copper deposits, Pinal County, Ariz.

MINE WORKINGS (figs. 2, 3, and 4)

The main shaft is vertical and fully timbered into a 4-foot square hoisting compartment and a 2-1/2- by 4-foot manway compartment. It is 235 feet deep and at present is accessible to the water that stands at 221 feet below the collar of the shaft. Levels at depths from the surface of 115, 152, and 235 feet have been opened from the shaft, whereas the bottom or 285-foot level has been developed from two winzes sunk from the 235-foot level. Lineal development on the four levels consists of over 2,700 feet of drifts and crosscuts. Near the footwall of the bedded deposit are two small stopes on the 115-foot level and two on the 152-foot level (fig. 3). Another small stope on the 152-foot level is in the schist-granite contact zone.

The Sixty-Five shaft and the Granite shaft, both inaccessible, are situated 130 feet northwest and 350 feet northeast of the main shaft, respectively. The Sixty-Five shaft, 65 feet deep, has one level at its bottom. The Granite shaft has two levels - one at a depth of 45 feet and the other at its bottom of 83 feet. About midway between the two shafts is an open cut in the only surface exposure of ore on the property. It was the source of several cars of ore.

A longitudinal section through the main workings is shown on the assay map (fig. 4).

In addition to the above workings, there are several shallow shafts and pits.

WORK BY THE BUREAU OF MINES

Field Work

During examination of the mine by the Bureau of Mines in 1942, sampling was confined to the 115- and 152-foot levels, because the lower workings were flooded with the water, which stood at 228 feet below the collar of the shaft. Seven channel samples were cut to duplicate corresponding samples that are similarly numbered on figure 4. In addition, six samples, each weighing 25 to 55 pounds, were cut from six crosscuts. These, also, were channel samples and, with the exception of sample 100, were cut from channels that carry similar numbers. Sample 100 represents the material exposed in a section of the crosscut on the 115-foot level. Analyses of the samples are shown in table 1.

TABLE 1. - Analyses of channel samples

Level	Sample	Width, feet	Percent copper
115.....	114	5	3.54
115.....	115	5	4.39
115.....	116	5	1.90
152.....	61	5	2.69
152.....	62	5	2.18
152.....	63	5	2.81
152.....	64	5	1.28
115.....	100	38	2.69
115.....	113-116	20	2.17
152.....	25-31	35	1.90
152.....	32-39	40	2.27
152.....	60-63	20	2.56
152.....	78-87	50	1.74

A 158-pound sample was made of the six large samples for metallurgical tests. Later in the same year four additional samples were taken for metallurgical testing. Each of these represented 50 continuous feet of crosscut and ranged in weight from 272 to 619 pounds. They were taken from crosscuts at the shaft on the 115- and 152-foot levels and from the first and second crosscuts south of the shaft on the 152-foot level.

Active work on the exploratory project started November 22, 1948. The first truck loads of equipment and supplies, after being assembled and conditioned in Tucson, were hauled to the mine on December 6. While a complete camp to accommodate 25 to 30 men was being built and equipped, work was started on rehabilitation of the main shaft. Shaft work consisted of replacing the collar and second sets of timbers and making minor repairs to both the hoisting and manway compartments. A tripod was placed over the shaft, and a hoist was installed. Two 210-c.f.m. compressors were placed near the shaft, and an air line was installed to the site of diamond drill hole D-1. Track was laid, the drill station was drilled and blasted, and the muck was trammed to the shaft and hoisted to the surface in buckets. While the diamond drill hole was being drilled, the air line and track were advanced, and two more drill stations were drilled and blasted. The muck from these stations was hoisted to the surface after diamond drilling was completed. A total of about 100 tons of broken rock was removed from the mine.

A transit survey of the surface and underground workings started while the camp was being built showed that available maps could be used for laying out the drilling program. This work, as completed, included plumbing the main shaft, transit surveys of the 115- and 152-foot levels, and topographic surveys of the area shown in this report, the Isabella claim, and a 25-acre area adjoining the Isabella claim on the east.

Diamond drilling, consisting of one hole completed at a depth of 203.5 feet, was started January 19 and completed March 18. A vertical section through the hole is shown in figure 5, and the assays of samples are given in the log of the hole that is appended to this report. Original plans included diamond-drilling 6 or 8 holes from underground stations, each designed to

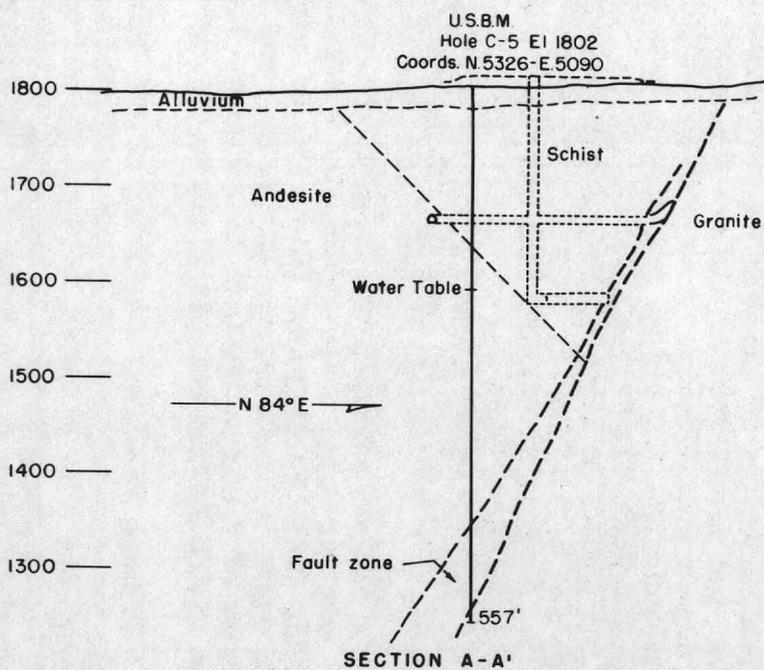
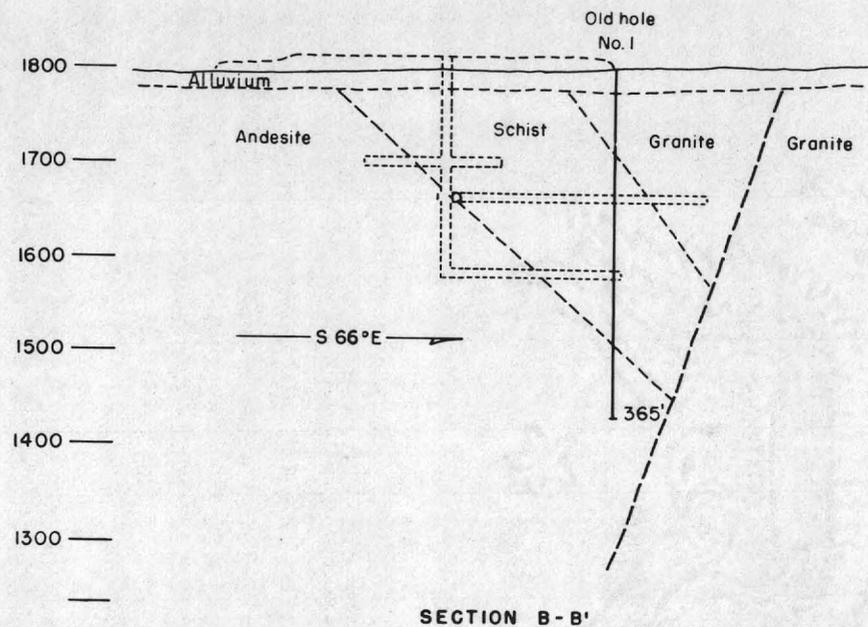
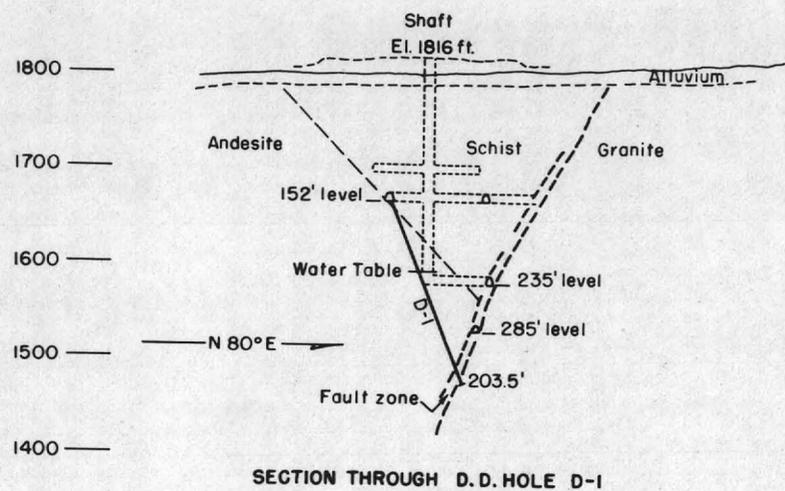


Figure 5. - Geologic sections, Lake Shore copper deposits, Pinal County, Ariz.

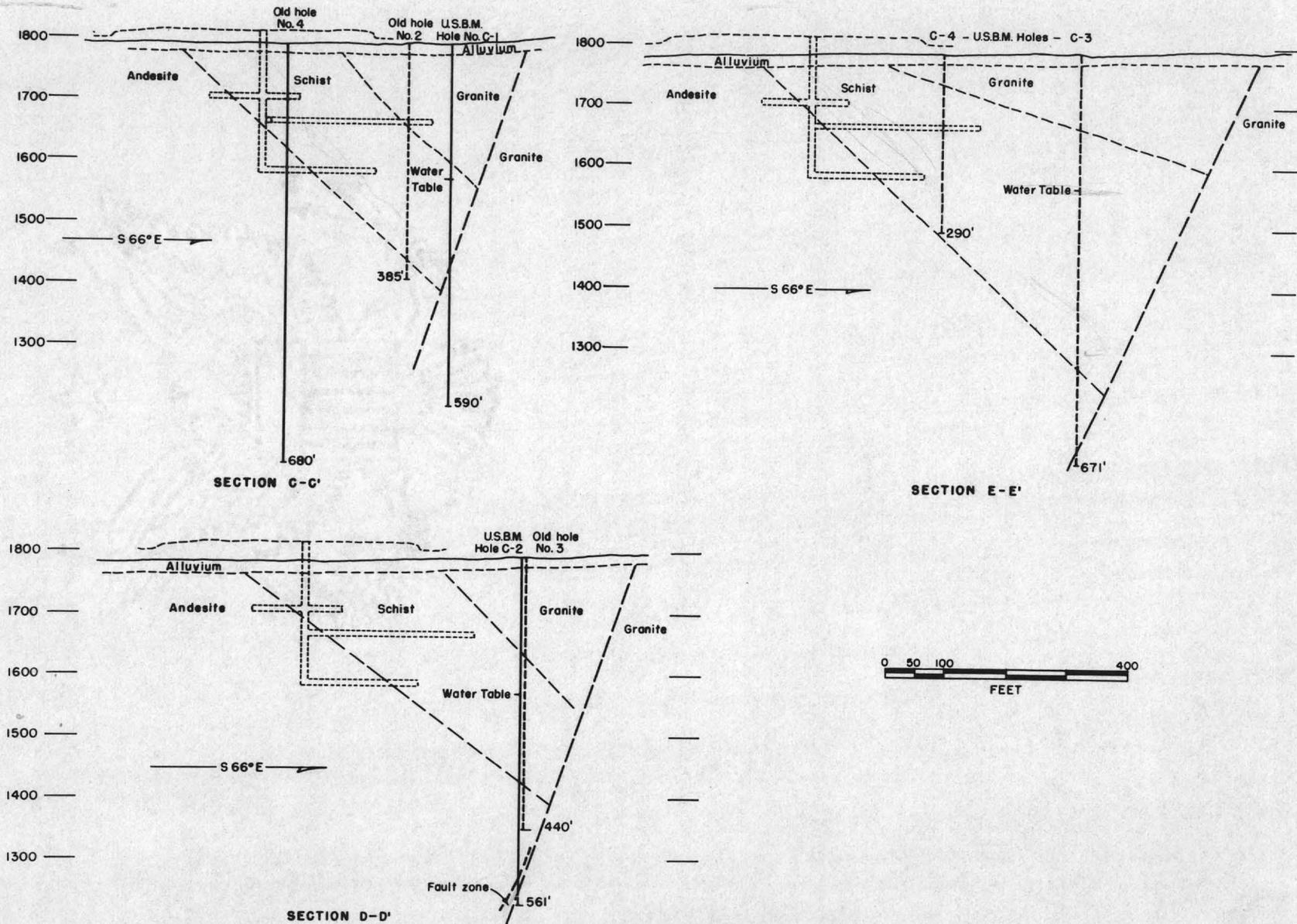


Figure 7. - Geologic sections, Lake Shore copper deposits, Pinal County, Ariz.

intersect the fault zone below the water table at intervals along the strike of the fault. Diamond drilling was terminated upon completion of one hole because costs were excessive to both the contractor and the Government. From the collar of the hole to the fault zone the rock is intensely fractured, and core recovery averaged about 6 percent. In general, after drilling a section of the rock the hole would close in as soon as the core barrel was removed.

Repeated cement jobs on portions of the hole failed, and in these cases it was necessary to drive the casing ahead. Attempts to advance the hole by blasting also failed. The contractor also tried unsuccessfully to keep the hole open and to consolidate the ground ahead of the bit by freezing. This operation consisted in using fuel oil cooled by dry ice as the circulating medium. Little trouble was experienced in penetrating the fault zone, where core recovery averaged 3.6 percent. The diamond drill was operated two shifts daily for 6 days a week. Double-tube core barrels 5 and 10 feet long were used. Drilling data for the hole, which was numbered D-1, follow:

Diamond-drilling data

Hole	Depth, ft.	Stand- pipe (3-inch)	Feet							
			Drilled			Reamed		Cased		Cemented
			NX	BX	AX	BX to NX	AX to BX	BX	AX	
D-1	203.5	11.0	34.0	94.0	64.5	33.0	18.0	78.0	157.0	146.5

Churn drilling, consisting of five holes for a total depth of 2,669 feet, was started January 13 and completed May 13, 1949. The rock was easy to drill, but, being ravelly, it was generally necessary to carry casing close to the bottom of the hole. The drill was operated two or three shifts daily, mainly on a two-shift basis, for 6 days a week.

Pertinent drilling data are given in table 2, and the logs of holes drilled by the Bureau are appended. Assay graphs of four of the churn-drill holes put down by the owners in 1919 are shown in figure 6.

Sections through the churn drill holes are shown on figure 7.

Drill-hole samples for analysis totaled 295, of which 56 were from the diamond-drill hole and 239 were from the churn-drill holes. Drill cuttings were dried, weighed, and reduced in size with a Jones splitter, and core samples were weighed and split. One half of each core sample and the samples of drill cuttings were sent to Tucson for analysis. The other half of the core was placed in core boxes, which were stored in the Bureau core house in Tucson. Two large samples of muck from the diamond-drill stations also were sent to Tucson for metallurgical tests.

Three thousand lineal feet of road work was done. This consisted of repairs to existing roads and building new roads to drilling sites but does not include 2.6 miles of 20-foot-wide road from the Casa Grande-Ajo road to the mine, which was built by the Indian Service of the Interior Department.

All drill holes were capped with a Bureau marker showing project number, hole number, and date of completion.

hole number, and date of completion.
 All drill holes were cased with a 1 1/2 inch diameter casing pipe.

3790
 The first hole was drilled by the Division of Geology and Mineral Resources, and was completed in 1954. It was drilled to a depth of 590 feet and was cased with 1 1/2 inch diameter casing pipe.

The second hole was drilled by the Division of Geology and Mineral Resources, and was completed in 1954. It was drilled to a depth of 561 feet and was cased with 1 1/2 inch diameter casing pipe.

The third hole was drilled by the Division of Geology and Mineral Resources, and was completed in 1954. It was drilled to a depth of 671 feet and was cased with 1 1/2 inch diameter casing pipe.

The fourth hole was drilled by the Division of Geology and Mineral Resources, and was completed in 1954. It was drilled to a depth of 290 feet and was cased with 1 1/2 inch diameter casing pipe.

The fifth hole was drilled by the Division of Geology and Mineral Resources, and was completed in 1954. It was drilled to a depth of 557 feet and was cased with 1 1/2 inch diameter casing pipe.

The total depth of all holes drilled is 2,669 feet.

TABLE 2. - Churn-drilling data

Churn-drill hole	Depth	Feet										
		Drilled, bit size (inches)				Cased, pipe size (inches)				Reamed, bit size (inches)		
		12	10	8	6	12	10	8	6	10-12	8-10	6-8
C-1...	590.0	250.0	115.0	225.0		20.0	382.0			50.0	6.0	
C-2...	561.0	155.0	105.0	200.0	101.0	12	205.0	452.5	546.0	20.0	31.0	15.0
C-3...	671.0	250.0	90.0	160.0	171.0	194.0	321.0	477.0	641.0	67.0	46.0	111.0
C-4...	290.0	250.0	40.0			31.0						
C-5...	557.0	175.0	250.0	105.0	27.0	155.0	412.5	466.0	526.0	169.0		
	2,669.0	1,080.0	600.0	690.0	299.0	412.0	1,320.5	1,395.5	1713.0	306.0	83.0	126.0

D-1 303-2 11.0 34.0 24.0 10.0
 Hole Depth ft. (3-inch) pipe casing

Drilling was done for the hole with a 3-inch pipe casing. The hole was drilled to a depth of 590 feet and was cased with 1 1/2 inch diameter casing pipe. The casing was cemented in place and the hole was filled with water. The hole was used for geophysical surveys and for the collection of water samples.

Copper Analyses

The Lake Shore samples were analyzed for copper by conventional procedures. Total copper was determined by the long iodide method, using a mixture of hot concentrated hydrochloric, nitric, and sulfuric acid for decomposition of the minus 100-mesh samples. Samples that contained 0.5 percent or more of copper were reassayed for acid-soluble copper with a 5-percent solution of sulfuric acid saturated with sulfur dioxide to dissolve the copper silicates, oxides, and carbonates. Common practice is to report the acid-soluble assay as "oxide" copper, and the difference between the total and oxide assays is reported as "sulfide" copper.

Although such analyses would indicate that many of the Lake Shore samples contain 0.5 percent or more of sulfide copper, microscopic examination failed to reveal more than a trace of copper sulfides. Furthermore, the sulfur content of the samples was too small to account for this quantity of copper. Subsequent examination and microchemical tests on sink-float fractions of the Lake Shore ore indicated that this copper is associated with the gangue minerals as minute inclusions of an unidentified copper mineral that is somewhat more refractory toward leaching than chrysocolla.

The total and acid-soluble copper contents of samples from holes drilled by the Bureau are shown in the logs.

Metallurgical Tests^{4/}

The five samples from an examination of the mine in 1942 were submitted to the Salt Lake City Station for metallurgical tests. An analysis of a 158-pound character sample is shown in the section on mineralogy of the ore. The analyses of the other samples are given in table 3. The samples from crosscuts Nos. 1 to 3 on the 152-foot level, numbered to the south from the crosscut at the shaft, were identified as Nos. Ar-4.1, Ar-4.2, and Ar-4.3, respectively, and the sample from the 115-foot level was numbered Ar-4.4.

The Salt Lake City metallurgical tests revealed that the mineral association in the samples was too intimate for beneficiation by ore-dressing methods. Acid leaching of the ore was not attractive owing to the presence of lime, which caused excessive acid consumption. Tests employing the reducing-roast and ammonia-leach process extracted as much as 86 percent of the copper. In these tests, minus 20-mesh material was roasted with coke in an atmosphere of natural gas for 1 hour at 500° to 600° C. to reduce the copper. The samples were then cooled to 180° C. and quenched in water. Leaching was carried out at 25 percent solids in a combination air-mechanical agitation tank for 4 hours, using a 10 percent solution of ammonium hydroxide and ammonium carbonate in equal parts, containing the equivalent of 0.3 pound potassium cyanide per ton of ore. The leach residues were filter-washed with ammonia and water.

^{4/} Prepared by Carl Rampacek and J. Bruce Clemmer, metallurgists, Bureau of Mines, Tucson Branch, Metallurgical Division, Tucson, Ariz.

TABLE 3. - Analyses of metallurgical samples

Sample	Insol.	Percent										Oz./ton		Cu soluble in 10% solution (24 hr.)	
		SiO ₂	Fe	CaO	S	Zn	Pb	Cu	Ox Cu*/	Al ₂ O ₃	MgO	Au	Ag	H ₂ SO ₄	NH ₄ OH
4.1	45.7	31.6	17.1	7.9	.08	Nil	Nil	1.71	1.60	7.9	11.3	Nil	Tr.	1.33	Nil
4.2	62.9	41.6	5.35	10.7	.07	0.15	Nil	1.29	1.28	9.9	10.6	Nil	Tr.	1.25	Nil
4.3	35.4	25.8	29.2	5.2	<.05	Nil	Nil	2.18	1.79	3.6	11.3	Nil	Tr.	1.75	Nil
4.4	66.2	54.6	7.25	4.5	<.05	Nil	Nil	1.66	1.59	5.7	9.7	Nil	Tr.	1.32	Nil

* / Copper soluble in dilute sulfuric acid saturated with sulfur dioxide.

Metallurgical tests were made subsequently at the Tucson station on a composite sample taken from drill stations 1, 2, and 3 on the 152-foot level. Analysis of the sample gave 3.51 percent total copper, 2.96 percent acid-soluble copper, 8.25 percent iron, 1.73 percent calcium carbonate, 0.04 percent sulfate-sulfur, and 0.01 percent sulfide-sulfur. The copper was present predominately as chrysocolla and diopside, with only traces of sulfides and carbonates.

Batch flotation of the ore ground to pass 65 or 200 mesh made with conventional sulfide and nonsulfide collecting agents failed to effect separation. The trace of sulfides, largely chalcocite, floated readily, but recovery of the chrysocolla and diopside was poor, regardless of the conditions employed.

Acid leaching and leach-precipitation-flotation of the sample also were investigated. The results of a number of bottle leaching tests are summarized in table 4. The tests on portions of the ore ground to pass 10, 20, and 65 mesh were made at 50 percent solids with different quantities of acid and various contact periods.

The leaching tests revealed that about 375 pounds of acid, 4.1 times the theoretical based on the acid-soluble copper content of the feed, were required for a good extraction of copper from the 10, 20, and 65-mesh feeds. Although the finer material leached more rapidly, a 24-hour contact was essential for an 88 to 90 percent extraction of the total copper. The acid consumed varied from 4.1 to 4.4 pounds per pound of copper extracted. Neither longer leaching nor use of more acid materially improved copper extraction. cursory tests on charges of the ore ground to 200 mesh gave slightly higher copper extractions but not enough to justify the added cost of finer grinding.

Although the chrysocolla in the ore is amenable to leaching, long contact with excessive acid is required to dissolve the 0.5 percent or more of copper that is intimately associated with the gangue. Tests were made to determine if the refractory copper could be extracted within a reasonable period by employing stronger acid solutions. The dry ore was mixed with the desired quantity of acid and enough water to give an agglomerated or pasty charge containing about 75 percent solids. A 50 percent acid solution proved adequate, but more concentrated acid was used in some of the tests. The agglomerated charges were permitted to stand at room temperature for various lengths of time and then were leached 15 minutes with water to extract the solubilized copper. Tests were made on 10-, 20-, and 65-mesh feeds with 375 pounds of acid per ton and varying the contact period from 1 to 24 hours. The stagnant leaching of the agglomerated charges gave copper extractions almost identical to those of bottle leaching at 50 percent solids, as recorded in table 4.

Although stagnant leaching of the acid-agglomerated charges at room temperature failed to improve extraction of the refractory copper, supplementary tests revealed that moderate heating of the agglomerules expedited solution of the copper for an improved recovery. The results of several tests on 10-, 20-, and 65-mesh portions of the ore are summarized in table 5. The charges were mixed for about 5 minutes with the quantity of acid shown and just enough water to form agglomerules. These were heated in a muffle

furnace to give a substantially dry sulfated product, which was subsequently leached with water for 15 minutes to extract the copper. For convenience, the sulfated products were leached at 33 percent solids. In other tests, however, leaching at 50 percent solids gave equally good results, and it seems likely that adequate leaching could be obtained in even thicker pulps.

TABLE 4. - Bottle leaching of Lake Shore ore.

Leaching time, hr.	Mesh feed	H ₂ SO ₄ added, lb./ton	H ₂ SO ₄ consumed		Extraction, percent of total copper
			Lb./ton	Lb/lb of copper extracted	
1	65	105	102	3.8	38.5
1	65	155	151	3.7	58.7
1	65	205	180	3.4	75.5
1	65	260	198	3.6	78.3
1	65	310	209	3.7	80.9
1	65	360	210	3.6	82.3
1	65	410	219	3.8	82.3
1	65	205	180	3.4	75.5
2	65	205	183	3.3	78.1
4	65	205	195	3.4	80.3
1	65	375	201	3.5	82.3
4	65	375	231	3.8	87.3
8	65	375	239	3.8	88.6
12	65	375	247	4.0	89.2
24	65	375	259	4.1	90.0
1	20	375	198	3.6	77.8
4	20	375	232	3.9	84.3
8	20	375	250	4.2	84.9
12	20	375	264	4.3	87.2
24	20	375	275	4.4	89.7
1	10	375	171	3.4	72.6
4	10	375	212	3.7	82.3
8	10	375	228	3.8	84.9
12	10	375	236	3.9	86.0
24	10	375	258	4.2	88.3

Although stagnant leaching of the acid-aggglomerated charges at room temperature failed to improve extraction of the refractory copper, supplementary tests revealed that moderate heating of the agglomerates expedited solution of the copper for an improved recovery. The results of several tests on 10-, 20-, and 65-mesh portions of the ore are summarized in table 5. The charges were mixed for about 5 minutes with the quantity of acid shown and just enough water to form agglomerates. These were heated in a muffle

TABLE 5. - Results of acid-sulfating tests.

Mesh of feed	Sulfating treatment			H ₂ SO ₄ consumed.		Extraction, percent of total copper
	H ₂ SO ₄ added, lb./ton	Furnace temp., °C.	Time, Min.	Lb./ton	Lb/lb of copper extracted	
10	375	25	60	195	3.7	75.4
10	375	250	7.5	328	5.7	81.8
10	375	250	15	352	5.9	84.9
10	375	250	30	366	6.1	85.2
20	375	25	60	224	4.0	79.5
20	375	250	7.5	344	5.6	87.7
20	375	250	15	364	5.9	87.5
20	375	250	30	375	6.0	88.6
65	375	25	60	233	4.0	83.6
65	375	75	7.5	264	4.2	89.5
65	375	75	15	300	4.6	92.0
65	375	75	30	318	4.9	92.6
65	375	250	7.5	351	5.3	94.0
65	375	250	15	375	5.7	94.0
65	375	250	30	375	5.8	94.2
65	375	400	7.5	368	5.6	93.7
65	375	400	15	375	5.8	92.3
65	375	400	30	375	5.9	90.6
65	105	250	15	105	2.9	50.7
65	155	250	15	155	3.0	72.9
65	205	250	15	205	3.5	84.9
65	310	250	15	310	4.8	92.0
65	375	250	15	375	5.7	94.0
65	410	250	15	410	6.2	94.3

The tests demonstrated that moderate heating of an agglomerated or pasty charge converts the copper to the sulfate form, which is amenable to rapid leaching with water. Provided enough acid was used, a 7.5- to 15-minute heat at temperatures between 75° and 400° C. permitted good extraction of the copper from the 10-, 20-, and 65-mesh feeds. The optimum temperature for sulfating the Lake Shore ore appears to be about 250° C. Although a temperature of 400° C. is permissible, a higher temperature dehydrates the sulfate and necessitates leaching of the calcine with weak acid. Virtually all of the acid employed in the sulfating procedure is consumed. No free acid, or only minor quantities, was found in the leach liquors. The moderate heat treatment increases solution of the clay and iron minerals in the ore, and the acid consumed per pound of copper dissolved is higher than in bottle leaching. The greater consumption of acid, however, is offset by the higher extraction of copper and the shorter treatment period required. The sulfated charges from tests made at 250° C. were compact and dry, regardless of the quantity of acid used. The calcines produced at lower sulfating temperatures were slightly moist. No difficulty was experienced in leaching the calcines, as they slaked readily upon addition of water, and the copper sulfate dissolved

rapidly. The leached residues thickened readily and were much easier to filter than those from the bottle leaching tests. The mild heat treatment apparently dehydrates the colloidal silica and increases the filtration rate.

Copper extraction in the acid-sulfating tests decreased with increasing coarseness of the feed. Incomplete extraction of the copper in the 10- and 20-mesh feeds may be attributed to slow diffusion of acid through the particles during the short agglomerating and heating periods. Acid-sulfating gave somewhat lower extractions on coarse feeds than bottle leaching. As regards the time required for comparable copper extractions, however, acid-sulfating is superior. The results of several tests by the two procedures are given in table 6.

TABLE 6. - Comparison of acid sulfating and bottle leaching of 10-, 20-, and 65-mesh ore.

Mesh of feed	Method	H ₂ SO ₄ added, lb./ton	H ₂ SO ₄ consumed		Extraction, percent of total copper
			Lb./ton	Lb./lb. of copper extracted	
10.....	15-min. acid sulfating and 15-min. water leach.	375	352	5.9	84.9
10.....	8-hour bottle leach.	375	228	3.8	84.9
20.....	15-min. acid sulfating and 15-min. water leach.	375	364	5.9	87.5
20.....	12-hour bottle leach.	375	264	4.3	87.2
65.....	15-min. acid sulfating and 15-min. water leach.	375	375	5.7	94.0
65.....	72-hour bottle leach.	412	377	5.6	93.8

Supplementary tests were made to observe the deportment of the ore toward leaching-precipitation-flotation. The results of a typical leach-float test employing bottle leaching are given in table 7. The ore was ground in a rod mill to pass 65 mesh and leached for 2 hours at 50 percent solids, 205 pounds of sulfuric acid being used per ton of ore. Part of the free acid remaining in the pulp was neutralized with hydrated lime, and the cement copper was then precipitated with iron nails. After neutralization of substantially all the remaining free acid, the cement copper was floated, Minerac A being used as the collector. Single-cleaning of the rougher froth yielded a cement copper concentrate that assayed 71.42 percent copper and represented a recovery of 73.2 percent. Leach-flotation of 200-mesh portions of the ore gave almost identical results. Depending on the reagents employed, 76 to 80 percent of the copper was recovered as a rougher product assaying 35 to 40 percent copper. Inability to obtain a higher copper recovery by leach-flotation can be attributed to incomplete dissolution of the refractory copper silicate rather than to inferior flotation of the cement copper. The copper content of flotation tailings and of residues from comparable leaching tests were almost identical.

TABLE 7. - Bottle leaching-precipitation-flotation of 65-mesh ore.

Product	Weight, percent	Assay, percent total copper	Distribution, percent total copper
Copper concentrate.....	3.5	71.42	73.2
Middling.....	9.3	1.77	4.8
Rougher froth.....	12.8	20.82	78.0
Tailing.....	87.2	0.86	22.0
Composite.....	100.0	3.42	100.0

Reagent	Pounds per ton				
	Leaching	Precipitation	Flotation		
			Conditioner	Rougher	Cleaner
H ₂ SO ₄	206	-	-	-	-
Ca(OH) ₂	-	16.0	24.0	-	-
Minerac A.....	-	-	0.2	-	-
Pine oil.....	-	-	-	0.04	0.02
		Iron nails			
Time (min.)...	120	15 30	5 2.5	5	2.5
pH.....	1.75	2.85 3.40	4.90 -	4.5	5.0

Other tests were made with more acid in the leaching step in an effort to obtain more complete extraction of the copper. The tests were not successful. The large quantity of free acid remaining in the leached pulp vitiated both precipitation and flotation of the cement copper. Prohibitive quantities of lime were required to neutralize the acid, and the pulps became so contaminated with salts that flotation of the cement copper was incomplete. When neutralizing steps were omitted, precipitation of the copper was incomplete, and much iron was dissolved by the free acid. The iron salts and residual acid inhibited subsequent flotation of the copper. These and other tests demonstrated that excess acid must be avoided in conventional leach-float procedures.

Precipitation-flotation tests also were made on acid-sulfated charges. The results of a typical test made on the 65-mesh feed and employing 375 pounds of acid per ton for sulfating are given in table 8. The acid-agglomerated ore was heated 15 minutes at 250° C. and then leached 15 minutes with water at 50 percent solids. As the leach pulp was substantially free of acid, the neutralizing steps before copper precipitation and flotation were not necessary. Single-stage cleaning of the rougher froth yielded a cement copper concentrate that assayed 69.7 percent copper and represented a recovery of 89.7 percent; the rougher concentrate accounted for 90.7 percent of the copper. Flotation of the cement was excellent and copper losses in the tailings were due primarily to presence of undissolved silicates.

Excellent results also were obtained on acid-sulfated charges of the ore by precipitating the copper during the water-leaching step. Simultaneous leaching and precipitation gave a somewhat finer and darker-colored cement copper than two-stage treatment, but it was readily amenable to flotation.

TABLE 8. - Precipitation-flotation of acid-sulfated ore.

Product	Weight, percent	Assay, percent total copper	Distribution, percent total copper
Copper concentrate.....	4.4	69.70	89.7
Middling.....	4.9	0.71	1.0
Rougher froth.....	9.3	33.35	90.7
Tailing.....	90.7	0.35	9.3
Composite.....	100.0	3.42	100.0

Reagent	Sulfating treatment	Water extrac- tion ^{1/}	Precipi- tation	Pounds per ton		
				Conditioner	Rougher	Cleaner
H ₂ SO ₄	375		-	-	-	-
Minerac A.....			-	0.30	-	-
Pine oil.....			-	0.04	0.04	-
			Iron nails			
Temperature, °C. .	250					
Time, minutes.....	15		30	2.5	5	2.5
pH.....		3.15	3.15	3.5	3.5	3.6

^{1/} 15-minute agitation with water at 50 percent solids at room temperature.

Summary and Conclusions of Metallurgical Tests

The Lake Shore ore is refractory toward leaching. A long contact period with a large excess of acid is necessary to obtain a high copper extraction. Acid-sulfating at temperatures between 75° and 400° C. is superior to conventional leaching. Acid-sulfating requires more acid than flood or trickle leaching but is offset by the higher copper extraction and the shorter treatment period required. On other less refractory ores, the quantities of acid required for acid sulfating and bottle leaching were almost identical.

The leach liquors from conventional leaching of the Lake Shore ore contain much free acid, whereas, those from acid-sulfated charges were virtually free of acid. In leaching-precipitation or leaching-precipitation-flotation procedures, where free acid in the leach liquor or ore pulp is objectionable, acid sulfating should have merit.

Flotation of the Lake Shore ore by usual sulfide and nonsulfide collectors was ineffective. Leach-precipitation-flotation gave good copper recoveries. In conjunction with the leach-float procedure, acid-sulfating was superior to bottle leaching. When using flood or trickle leaching, the excess acid remaining in the pulp must be partly neutralized before precipitation and flotation of the cement copper. As virtually no free acid remains in the acid-sulfated pulps, the neutralizing steps before precipitation and flotation are unnecessary, thus simplifying the procedure. Simultaneous leaching and precipitation of the copper from acid-sulfated charges also gave good results.

DRILL-HOLE LOGS

Hole D-1

Location: N. 5391, E. 5119
 Elevation of collar: 1,664 ft.
 Depth: 203.5 ft.

Dip: -73°

Bearing: N. 80° E.

Date: 1/19 to 3/18/49

Footage		Feet	Percent copper		Oz./ton		Description and remarks
From-	To-		Total	Acid-soluble	Au	Ag	
0	11.0	11.0	1.48	1.48			Schist.
11.0	16.0	5.0	.26				Andesite.
16.0	21.0	5.0	.28				Do.
21.0	26.0	5.0	.25				Do.
26.0	32.0	6.0	.44				Do.
32.0	35.0	3.0	.40				Do.
35.0	40.0	5.0	.33				Do.
40.0	45.0	5.0	.34				Do.
45.0	50.0	5.0	.25				Do.
50.0	53.0	3.0	.20				Do.
53.0	58.0	5.0	.21				Do.
58.0	61.5	3.5	.20				Do.
61.5	65.5	4.0	.24				Do.
65.5	70.5	5.0	.20				Do.
70.5	75.5	5.0	.17				Do.
75.5	78.0	2.5	.18				Do.
78.0	81.5	3.5	.17				Do.
81.5	86.2	4.7	.18				Do.
86.2	88.2	2.0	.18				Do.
88.2	90.7	2.5	.18				Do.
90.7	94.6	3.9	.28				Do.
94.6	99.6	5.0	.14				Do.
99.6	104.9	5.3	.17				Do.
104.9	110.0	5.1	.17				Do.
110.0	115.0	5.0	.18				Do.
115.0	120.0	5.0	.19				Do.
120.0	125.0	5.0	.17				Do.
125.0	127.0	2.0	.10				Do.
127.0	132.0	5.0	.17				Do.
132.0	137.0	5.0	.13				Do.
137.0	140.0	3.0	.19				Do.
140.0	145.0	5.0	.19				Do.
145.0	148.3	3.3	.19				Do.
148.3	153.3	5.0	.22				Do.
153.3	156.7	3.4	.16				Do.
156.7	161.7	5.0	.14				Do.
161.7	163.7	2.0	.13				Do.
163.7	168.5	4.8	.13				Do.
168.5	173.5	5.0	.13				Do.
173.5	178.5	5.0	1.45	1.20			Shear zone.
178.5	180.5	2.0	.46	.25			Do.
180.5	185.5	5.0	.83	.57	} Tr	0.1	Do.
185.5	189.2	3.7	.89	.60			Do.
189.2	193.5	4.3	.68	.42			Do.
193.5	203.5	10.0					Do.
							Granite.

Hole C-1

Location: N. 5007, E. 5188
 Elevation of collar: 1,796 ft.

Location: N. 5007, E. 5188
 Depth: 590.0 ft.
 Date: 1/13 to 2/4/49

Footage			Percent copper		Description and remarks
From-	To-	Feet	Total	Acid-soluble	
0	20	20.0			Sand and gravel.
20	193	173.0			Weathered granite.
193	195	2.0	0.31		Schist and clay.
195	205	10.0	.33		Schist.
205	215	10.0	.36		Schist, water table at 211.0 ft.
215	225	10.0	.32		Schist.
225	235	10.0	.31		Do.
235	245	10.0	.27		Do.
245	250	5.0	.34		Do.
250	255	5.0	.26		Do.
255	265	10.0	.36		Do.
265	275	10.0	.41		Do.
275	285	10.0	.39		Do.
285	295	10.0	.27		Do.
295	305	10.0	.35		Do.
305	310	5.0	.39		Do.
310	315	5.0	.42		Do.
315	320	5.0	.43		Do.
320	325	5.0	.61	0.36	Do.
325	330	5.0	.57	.29	Do.
330	335	5.0	.51	.28	Do.
335	340	5.0	.34		Quartzite and schist.
340	345	5.0	.36		Do.
345	350	5.0	.28		Do.
350	355	5.0	.38		Do.
355	360	5.0	.39		Do.
360	365	5.0	.25		Contact - schist and granite.
365	370	5.0	.16		Schist and granite.
370	375	5.0	.14		Granite and schist.
375	380	5.0	.10		Do.
380	385	5.0	.14		Do.
385	550	165.0			Granite.
550	555	5.0			Shear zone, clay.
555	590	35.0			Granite.

Hole C-2

Location: N. 4813, E. 5098
 Elevation of collar: 1,792 ft.

Depth: 561.0 ft.
 Date: 2/11 to 3/5/49

Footage			Percent copper		Description and remarks
From-	To-	Feet	Total	Acid-soluble	
0	20	20.0			Sand and gravel.
20	155	135.0			Weathered granite.
155	165	10.0	0.23		Schist.
165	175	10.0	.22		Do.
175	185	10.0	.22		Do.
185	195	10.0	.23		Do.
195	205	10.0	.33		Do.
205	215	10.0	.32		Do.
215	225	10.0	.32		Schist, water table at 220 ft.
225	235	10.0	.31		Schist.
235	245	10.0	.48		Do.
245	255	10.0	.53	0.06	Do.
255	260	5.0	.51	.06	Do.
260	270	10.0	.62	.06	Do.
270	280	10.0	.46		Do.
280	290	10.0	.54	.06	Do.
290	300	10.0	1.03	.22	Do.
300	305	5.0	.57	.19	Do.
305	310	5.0	.50	.15	Do.
310	315	5.0	1.25	.55	Do.
315	320	5.0	.89	.40	Do.
320	325	5.0	.90	.33	Do.
325	330	5.0	.91	.31	Do.
330	335	5.0	.80	.28	Do.
335	340	5.0	.54	.17	Do.
340	345	5.0	.98	.29	Do.
345	350	5.0	.63	.19	Do.
350	355	5.0	.62	.18	Do.
355	360	5.0	.68	.21	Do.
360	365	5.0	.34		Do.
365	370	5.0	.31		Andesite.
370	375	5.0	.29		Do.
375	380	5.0	.26		Do.
380	385	5.0	.28		Do.
385	390	5.0	.62	0.09	Do.
390	395	5.0	.31		Do.
395	405	10.0	.24		Do.
405	415	10.0	.22		Do.
415	425	10.0	.22		Do.
425	435	10.0	0.26		Do.
435	445	10.0	.19		Do.
445	455	10.0	.15		Do.
455	460	5.0	.19		Do.
460	470	10.0	.18		Quartzite.
470	480	10.0	.18		Do.
480	490	10.0	.14		Do.

Hole C-2, Cont'd.

Footage			Percent copper		Description and remarks
From-	To-	Feet	Total	Acid-soluble	
490	500	10.0	0.16		Andesite.
500	510	10.0	.16		Do.
510	520	10.0	.23		Do.
520	525	5.0	.51	0.19	Shear zone.
525	530	5.0	.79	.48	Do.
530	535	5.0	.89	.63	Do.
535	540	5.0	1.43	.91	Shear zone. Little pyrite and native copper.
540	545	5.0	1.27	.57	Shear zone.
545	547	2.0	.74	.28	Schist.
547	550	3.0	.72	.30	Schist and granite.
550	555	5.0	.65	.27	Do.
555	561	6.0			Granite.

Hole C-3

Location: N. 4610, E. 5045
 Elevation of collar: 1,788 ft.

Depth: 671.0 ft.
 Date: 3/9 to 4/2/49

Footage			Percent copper		Description and remarks
From-	To-	Feet	Total	Acid-soluble	
0	10	10			Sand and gravel.
10	125	115.0			Weathered granite.
125	135	10.0	0.33		Schist.
135	145	10.0	.22		Do.
145	155	10.0	.31		Do.
155	165	10.0	.40		Do.
165	175	10.0	.32		Do.
175	185	10.0	.27		Do.
185	195	10.0	.23		Do.
195	205	10.0	.16		Do.
205	215	10.0	.10		Do.
215	225	10.0	.16		Schist, water table at 225 ft.
225	235	10.0	.17		Schist.
235	245	10.0	.22		Do.
245	255	10.0	.17		Do.
255	265	10.0	.16		Do.
265	275	10.0	.25		Schist, shear - much Fe oxide.
275	285	10.0	.25		Schist.
285	295	10.0	.27		Do.
295	305	10.0	.30		Schist, shear - much Fe oxide.
305	315	10.0	.32		Schist.
315	325	10.0	.25		Do.
325	335	10.0	.27		Schist, shear - much Fe oxide.
335	345	10.0	.22		Schist.
345	355	10.0	.20		Do.

Hole C-3, Cont'd.

Footage			Percent copper		Description and remarks
From-	To-	Feet	Total	Acid-soluble	
355	365	10.0	0.23		Schist.
365	375	10.0	.20		Do.
375	385	10.0	.25		Do.
385	395	10.0	.15		Schist, shear - much Fe oxide.
395	405	10.0	.15		Schist.
405	415	10.0	.24		Do.
415	425	10.0	.18		Do.
425	435	10.0	.13		Do.
435	445	10.0	.12		Do.
445	455	10.0	.19		Do.
455	465	10.0	.14		Do.
465	475	10.0	.12		Do.
475	485	10.0	.13		Do.
485	495	10.0	.15		Do.
495	500	5.0	.18		Do.
500	510	10.0	.26		Do.
510	520	10.0	.23		Do.
520	530	10.0	.12		Andesite, shear - much Fe oxide.
530	540	10.0	.15		Andesite.
540	550	10.0	.14		Do.
550	560	10.0	.13		Do.
560	570	10.0	.12		Do.
570	580	10.0	.10		Do.
580	590	10.0	.14		Do.
590	600	10.0	.23		Andesite, shear - much Fe oxide.
600	605	5.0	.20		Andesite.
605	610	5.0	.24		Do.
610	615	5.0	.20		Do.
615	620	5.0	.14		Do.
620	625	5.0	.13		Do.
625	630	5.0	.18		Do.
630	635	5.0	.15		Do.
635	640	5.0	.14		Do.
640	645	5.0	.18		Do.
645	650	5.0	.26		Do.
650	655	5.0	.42		Andesite and granite.
655	660	5.0	.23		Granite and andesite.
660	671	11.0			Granite.

From-	To-	Feet	Total	Acid-soluble	Description and remarks
0	25	25.0	0.49		Schist.
25	35	10.0	.41		Do.
35	45	10.0	.40		Do.
45	55	10.0	.45		Do.
55	65	10.0	.41		Do.
65	75	10.0	.81	0.41	Do.

Hole C-4

Location: N. 4795, E. 4900
 Elevation of collar: 1,786 ft.

Depth: 290.0 ft.
 Date: 4/15 to 4/19/49

Footage			Percent copper		Description and remarks
From-	To-	Feet	Total	Acid-soluble	
0	10	10.0			Sand and gravel.
10	50	40.0			Weathered granite.
50	60	10.0	0.35		Schist.
60	70	10.0	.33		Do.
70	80	10.0	.32		Do.
80	90	10.0	.35		Do.
90	100	10.0	.30		Do.
100	110	10.0	.36		Do.
110	120	10.0	.35		Do.
120	130	10.0	.17		Do.
130	140	10.0	.58	0.11	Do.
140	150	10.0	.33		Do.
150	160	10.0	.27		Do.
160	170	10.0	.23		Do.
170	180	10.0	.47		Do.
180	190	10.0	.82	0.52	Do.
190	200	10.0	1.23	.76	Do.
200	210	10.0	1.50	.65	Do.
210	220	10.0	1.55	.90	Do.
220	225	5.0	1.75	1.16	Do.
225	230	5.0	1.02	.66	Schist, water table at 225 feet.
230	235	5.0	1.31	1.00	Schist.
235	240	5.0	3.05	2.80	Do.
240	245	5.0	2.31	1.95	Do.
245	250	5.0	1.94	1.27	Do.
250	255	5.0	1.51	.96	Do.
255	260	5.0	1.54	.98	Do.
260	265	5.0	1.75	.97	Do.
265	270	5.0	.61	.36	Schist and quartzite.
270	290	20.0			Quartzite.

Hole C-5

Location: N. 5326, E. 5090
 Elevation of collar: 1,801 ft.

Depth: 557.0 feet
 Date: 4/20 to 5/13/49

Footage			Percent copper		Description and remarks
From-	To-	Feet	Total	Acid-soluble	
0	25	25.0			Sand and gravel.
25	35	10.0	0.49		Schist.
35	45	10.0	.41		Do.
45	55	10.0	.40		Do.
55	65	10.0	.45		Do.
65	75	10.0	.87	0.41	Do.

Hole C-5 Cont'd.

Footage			Percent copper		Description and remarks
From-	To-	Feet	Total	Acid-soluble	
75	85	10.0	1.05	0.52	Schist.
85	95	10.0	1.18	.65	Do.
95	105	10.0	1.55	.96	Do.
105	115	10.0	2.10	1.19	Do.
115	125	10.0	1.69	1.00	Do.
125	135	10.0	1.76	1.10	Do.
135	140	5.0	2.21	1.14	Do.
140	145	5.0	2.08	1.16	Do.
145	150	5.0	1.87	1.13	Do.
150	155	5.0	2.15	1.41	Do.
155	160	5.0	1.65	1.39	Do.
160	165	5.0	.70	.39	Andesite.
165	175	10.0	.32		Do.
175	185	10.0	.26		Do.
185	195	10.0	.15		Do.
195	205	10.0	.15		Do.
205	215	10.0	.16		Do.
215	225	10.0	.10		Do.
225	235	10.0	.18		Andesite. Water table at 230 ft.
235	245	10.0	.16		Andesite.
245	255	10.0	.10		Do.
255	265	10.0	.14		Do.
265	275	10.0	.16		Do.
275	285	10.0	.16		Do.
285	295	10.0	.16		Do.
295	305	10.0	.15		Do.
305	315	10.0	.13		Do.
315	325	10.0	.18		Do.
325	335	10.0	.18		Do.
335	345	10.0	.20		Do.
345	355	10.0	.29		Do.
355	365	10.0	.19		Do.
365	375	10.0	.23		Do.
375	385	10.0	.18		Do.
385	395	10.0	.28		Do.
395	405	10.0	.20		Do.
405	415	10.0	.15		Do.
415	425	10.0	.15		Do.
425	430	5.0	.26		Do.
430	435	5.0	.08		Do.
435	440	5.0	.08		Do.
440	445	5.0	.95	0.67	Do.
445	450	5.0	.34		Do.
450	455	5.0	.19		Do.
455	460	5.0	1.88	1.73	Shear zone.
460	465	5.0	2.61	2.53	Do.

Hole C-5, Cont'd.

Footage			Percent copper		Description and remarks
Feet -	To -	Feet	Total	Acid-soluble	
465	470	5.0	1.78	1.55	Shear zone.
470	475	5.0	1.17	1.07	Do.
475	480	5.0	1.16	1.06	Do.
480	485	5.0	1.40	1.16	Do.
485	490	5.0	2.48	2.25	Do.
490	495	5.0	1.97	1.73	Do.
495	500	5.0	.91	.73	Do.
500	505	5.0	2.41	1.92	Do.
505	510	5.0	.50	.33	Do.
510	515	5.0	.73	.50	Do.
515	520	5.0	.73	.49	Do.
520	525	5.0	.18		Do.
525	530	5.0	1.54	1.26	Do.
530	535	5.0	2.98	2.31	Do.
535	540	5.0	3.06	2.51	Do.
540	545	5.0	2.09	1.65	Do.
545	550	5.0	.53	.38	Andesite and granite.
550	557	7.0			Granite.

Prospecting Permit

Pinal County

T9S; R4E

T10S; R2E

T9S; R5E

T10S; R4E

T10S; R5E

Pima County

T11S; R4E

T11S; R5E



Possible Leases

Lease No. 1

Seet. 31, unurveyed, T10S; R5E
(Pinal Co.)

Lease No. 2

S $\frac{1}{2}$ of Seet 36, T10S; R4E ✓
(Pinal Co.)

N $\frac{1}{2}$ of Seet 6, T10S; R5E ✓
Pima Co.

Lease No. 3

N $\frac{1}{2}$ of Seet. 25, T10S; R4E
Pinal Co.

LAKE SHORE MINE

This is a resume of the more important facts and information concerning the above mine.

PROPERTY

3 patented claims - Arizona, Copper Bell, Isabella - held by George A. Freeman and Dwight McClure under "Lease For Exploration Purposes And Option Agreement" from the owner, Treasure State Mining Co. These claims are located approximately 28 miles south of Casa Grande, Arizona, on the Papago Indian Reservation. The legal description is sections 25 and 36 T10S, R4E. They are only 2 miles from the main north and south hiway on the reservation and are easily accessible.

580 acres, more or less, under lease from the Papago Tribe to George A. Freeman, E. G. Frawley and Dwight McClure. This is the south $\frac{1}{2}$ of section 25 and the north $\frac{1}{2}$ of Section 36, less the 3 patented claims. The lease is now in transit to the Secretary of the United States Department of the Interior for his approval. A bonus of \$5,800.00 (\$10.00 per acre) was paid to the Papago Tribe to negotiate the lease.

Well site, at any location necessary to obtain water, right to drill well, right-of-way from well to operating area and right to use water granted to Freeman, Frawley and McClure. This is a completed contract with the Papago Tribe, as it does not require other approval.

Additional prospecting rights can be obtained from the Papago Tribe. This is of particular importance, because of the recent development of large mines in the area; plus, the fact that 3 major companies have applied for exploration rights on the Tribal land east of the reservation boundary.

REPORTS

U. S. Bureau of Mines report #4706, of July 1950, an Investigation of Lake Shore Mine. This gives data developed from sampling the old underground workings and several test holes drilled by the Bureau. Metallurgical work from tests completed at that time is included.

U. S. Bureau of Mines have continued their metallurgical work at the University of Arizona (some currently in process), but no formal report will be made until some future date. However, all results are available by personally contacting Bureau personnel at Tucson, Arizona.

Wisser and Cox, consulting geologists, wrote a report as of March 8, 1956. It includes data developed by exploratory holes drilled from January 1956 thru March 1, 1956.

Harmon Keyes, consulting engineer, wrote a report on the metallurgy of ore from the Lake Shore Mine on April 16, 1956. The data for this report includes some of the Bureau of Mines work at the University of Arizona thru March 1956, plus tests by Mr. Keyes.

The Booth Company, Inc., of Salt Lake City are completing their report on metallurgy based on several months of study and test work.

ORE RESERVE

The Wisser and Cox report shows 720,000 tons of 1.82% copper ore as blocked-out by drill holes and the old underground workings (approximately 2000 feet).

Additional drilling has raised this amount to 1,000,000 tons and probably to 1,300,000. This last amount is shown as "probable", because the drilling did not follow recommendations made by the Wisser and Cox report.

The above tonnage is on the Arizona and Copper Bell claims. One drill hole on the Isabella claim intersected 10 feet of 4% copper ore.

Drilling and geology indicates the main ore body on the Arizona claim extends outside the claim into Reservation land.

ADDITIONAL TEST WORK RECOMMENDED

Mine

30 additional rotary drill holes, totaling 5000' at \$2.00 per foot to complete necessary exploration of ore body. In completing this drill it will require assaying, engineering supervision, labor and miscellaneous expense and overhead.

Drilling - 5000' @ \$2.00	\$10,000.00
Assaying -	500.00
Miscellaneous -	4,500.00
Total	\$15,000.00

Metallurgy

The optimum ore size for leaching should be determined in a pilot plant operation to prove the conclusions of laboratory work.

The facilities of the U. S. Bureau of Mines, at the University of Arizona, are available and the use of these facilities, plus the Bureau assistance is the least expensive way of completing pilot plant tests.

1000 tons of ore may be necessary and such ore should be a representative sample. This will require opening a portion of the pit, mining ore, transporting it to Tucson, crushing and delivery to the test site.

The following costs are estimated:

Excavation and mining - 1000T	\$ 4,000.00
Transportation to Tucson - 500T @ \$8.00	4,000.00
Crushing and delivery - 500T @ \$3.00	1,500.00
Leaching pad - 2500 sq. ft.	500.00
*Solution pump	700.00

Assaying - outside checks and special	\$	100.00
Acid and iron		2,000.00
Tanks and misc. construction		500.00
Labor, to assist Bureau personnel		2,500.00
Review and report by consultant		500.00
	Total	\$ 16,300.00
Estimated saleable copper		<u>3,000.00</u>
	Net Cost	\$ 13,300.00

* This piece of equipment will be donated to Bureau and University laboratory upon completion of test.

Total additional work should not exceed \$30,000.00, prior to completing the design of a full scale plant.

PLANT COST

Most of the following prices have been confirmed by responsible firms. * These have been estimated, but not quoted firm. This plant should have a capacity of 1000 tons per day.

Water Well	\$	2,000.00
Water well pump (200 GPM)		5,000.00
4" water line - well to storage - 5000' @ \$1.50		7,500.00
75,000 gal. water tank		4,000.00
Barren solution pump (440 GPM-acid proof-80' head)		2,500.00
2" water and barren solution lines 3000' @ \$0.50 plus installation (plastic)		2,000.00
*24,000 gal. barren solution tank - lined		3,100.00
*170 ton acid storage tank		4,000.00
*Precipitation tanks - wood		15,000.00
Crusher - portable, complete unit		50,000.00
*(1) Air separator		10,000.00
Stacker conveyor (24" x 140')		4,000.00
Track, chutes, etc., for conveyor		2,000.00
Power unit (67.5KW, deisel powered)		13,000.00
Assay office (20' x 20')		1,250.00
Assay office supplies, testing equipment, pumps, PH meters, etc.		4,000.00
	\$	<u>129,350.00</u>
Freight, contingencies, misc. - 15%		19,402.50
	\$	<u>148,752.50</u>
(2) 87,000 sq. ft. asphalt leaching pad @ \$0.15		13,050.00
	\$	<u>161,802.50</u>

(1) This piece of equipment may not be necessary.

(2) This size pad will accommodate from 150,000 to 200,000 tons of ore. It will then be necessary to lay another pad, and move the crusher and conveyor, or to remove the ore from the pad.

The cost of a combination auto-oxidation acid plant and facilities to produce sponge iron from pyrite has been estimated by 2 engineers at \$350,000.00. This is not a confirmed price, but should be relatively close to actual cost.

Itemized cost - 1000 ton plant	\$ 161,802.50
Estimated cost - acid and iron plant	<u>350,000.00</u>
	\$ 511,802.50

It is contemplated that the mining and hauling will be done by contract. Should this be changed it will be necessary to purchase or lease-purchase such equipment.

OPERATING PROFIT

The cost of stripping, mining and hauling are based on firm bids.

Crushing and conveying costs are estimates at 150% of tentative prices received from contractors; also, checked against cost of similar operations.

Acid and iron costs are computed from firm prices on each item delivered to mine site.

Operating Costs - first year - buying acid and iron	per ton
Stripping	\$0.25
Mining & hauling to crusher	0.65
Crushing & Conveying	0.90
Acid - 170#/ton @ \$28.00/T	2.38
Iron - 1.7#/#Cu @ \$40.00/T	<u>0.80</u>
Total Direct Cost	\$4.98

Operating Costs - first year - making acid and iron	per ton
Stripping	\$0.25
Mining & Hauling to crusher	0.65
Crushing & conveying	0.90
Acid - @ \$18.00/T	1.53
Iron - @ \$20.00/T	<u>0.40</u>
Total Direct Cost	\$3.73

The following net smelter returns are computed using:

1. 1.8% ore head feed
2. 65% recovery of copper
3. Known freight and smelter charges
4. Estimated cost of hauling from mine to railroad at Case Grande
5. Arbitrary selling price of copper

The "Net At Mine" is before royalty, depletion, depreciation, executive overhead or tax.

<u>Price of Copper</u>	<u>Net Smelter Return</u>	<u>Direct Cost</u>	<u>Net At Mine</u>
\$0.46	\$9.21	\$3.73	\$5.48
0.435	8.64	3.73	4.91
0.405	7.95	3.73	4.22
0.375	7.27	3.73	3.54
0.235	4.08	3.73	0.35

<u>Price of Copper</u>	<u>Net Smelter Return</u>	<u>Direct Cost</u>	<u>Net at Mine</u>
\$0.46	\$9.21	\$4.98	\$4.23
0.435	8.64	4.98	3.66
0.405	7.95	4.98	2.97
0.375	7.27	4.98	2.29
0.30	5.56	4.98	0.58

LEASE AND OPTION - LEASES

The "Lease for Exploration Purposes and Option Agreement" on the 3 patented claims is between Treasure State Mining Co. and George A. Freeman and Dwight McClure.

The option has two prices:

1. Cash at time of purchase
 2. Payment on royalty basis
- \$300,000.00 or,
400,000.00

The royalty is on a sliding scale, based on the New York quoted copper price. The price levels and the percentages of royalty, based on "net smelter returns", are:

<u>Copper Price</u>	<u>Royalty %</u>
\$0.48 and over	12½%
0.479 down to 0.381	10%
0.38 and below	7½%

Minimum monthly royalty - \$1,000.00.

The Papago Tribe mining lease provides for the following:

1. 10% royalty, based on "net smelter returns".
2. An annual minimum rental, to be credited to royalties:
 - 1st year \$0.25 per acre
 - 2nd and 3rd years 0.50 per acre
 - 4th year & thereafter 1.00 per acre
3. Campsite area of not less than 20 acres at an annual rental of \$50.00 per acre.
4. Payment of \$10.00 per acre, per year, for 10 years, for all area used for dumping or in the "open pit". The total price for each acre is \$100.00 and said \$100.00 is fully due and payable in case of abandonment before end of 10 year period.

The Papago Tribe water agreement provides for an annual rental of \$50 per acre for the well site and right-of-way.

E. G. Frawley appears on both leases with the Papago Tribe - in addition to Freeman and McClure. Complete reassignment of all rights in said leases will be obtained from Mr. Frawley.

CORPORATION

Copper Queen Mining Co., a Nevada Corporation, has been formed. There has been no stock issued. The officers and directors are:

President - Vacant
Vice-Pres. - George A. Freeman
Sec. & Treas. - Dwight McClure
Directors - above 2 and Clarence J. Duncan

Mr. Duncan is a member of Jennings, Strauss, Salmon & Trask, attorneys for Freeman, McClure and Copper Queen Mining Co.

This Corporation is available for immediate use.

SALESPROPOSAL

It is the desire of Freeman and McClure to retain a participating interest in the operation of the mine.

During the past 3½ months the Lake Shore Mine has been improved or increased in value by:

1. Increased ore reserves - drilling shows an increase from 400,000 to over 1,000,000 tons.
2. Higher grade of ore - assay certificates show an average of 1.82% copper - up from between 1.65% and 1.70%.
3. Greater operating profit - metallurgical tests show a higher recovery (70% and over, compared to 65%) and lower reagent cost (acid consumption down to 5.5#, compared to 7#).
4. Additional land acquired - mining lease negotiated with Papago Tribe, including water rights.

\$50,000.00 plus was spent in accomplishing the above.

75% undivided interest in all rights now held by Freeman and McClure is offered.

The retained 25% shall receive ¼ of the "net profits", calculated as follows:

1. After deduction of royalties due Treasure State and/or the Papago Tribe;
2. Before state and federal income taxes;
3. Without deduction for ore depletion;
4. No administrative or travel costs, except those incurred at the mine itself shall be deducted;
5. No credit for payment of work performed by contract or for lease equipment shall be allowed in excess of the prevailing rate for such service or equipment.

Freeman and McClure shall further have the option to assign the retained 25% interest to Copper Queen Mining Co., for 25% of all issued capital stock calculated after the issuance of said 25%. If this corporation is not used, similar arrangements must be made with the operating entity.

Cash payment - \$30,000.00 total, in 2 equal payments of \$15,000.00 upon the granting of an exclusive exploratory time period or option and \$15,000.00 60 days later, if option is exercised.

The purchaser will assume all duties and obligations of Freeman and McClure under the Treasure State lease and option, and the Papago leases; and, furnish all capital required to put the mine into production at the rate of not less than 1000 tons per day. Both of the above shall be accomplished and carried on for the benefit of both seller and buyer and at no expense to seller.

The terms of "offering" are open to negotiation, if the prospective purchasers are interested in expanding their operations in this area - particularly northern Mexico and the Papago Reservation (refer to last paragraph under "Property", page 1). Freeman and McClure offer their full cooperation, provided the purchaser will make a firm commitment of sufficient funds to conduct exploration work and all properties are acquired for the benefit of both parties.

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Phoenix, Arizona
Telephone:
Alpine 8-7011

LAKE SHORE MINE

This is a resume of the more important facts and information concerning the above mine.

PROPERTY

3 patented claims - Arizona, Copper Bell, Isabella - held by George A. Freeman and Dwight McClure under "Lease For Exploration Purposes And Option Agreement" from the owner, Treasure State Mining Co. These claims are located approximately 28 miles south of Casa Grande, Arizona, on the Papago Indian Reservation. The legal description is sections 25 and 36 T10S, R4E. They are only 2 miles from the main north and south hiway on the reservation and are easily accessible.

580 acres, more or less, under lease from the Papago Tribe to George A. Freeman, E. G. Frawley and Dwight McClure. This is the south $\frac{1}{2}$ of section 25 and the north $\frac{1}{2}$ of Section 36, less the 3 patented claims. The lease is now in transit to the Secretary of the United States Department of the Interior for his approval. A bonus of \$5,800.00 (\$10.00 per acre) was paid to the Papago Tribe to negotiate the lease.

Well site, at any location necessary to obtain water, right to drill well, right-of-way from well to operating area and right to use water granted to Freeman, Frawley and McClure. This is a completed contract with the Papago Tribe, as it does not require other approval.

Additional prospecting rights can be obtained from the Papago Tribe. This is of particular importance, because of the recent development of large mines in the area; plus, the fact that 3 major companies have applied for exploration rights on the Tribal land east of the reservation boundary.

REPORTS

U. S. Bureau of Mines report #4706, of July 1950, an Investigation of Lake Shore Mine. This gives data developed from sampling the old underground workings and several test holes drilled by the Bureau. Metallurgical work from tests completed at that time is included.

U. S. Bureau of Mines have continued their metallurgical work at the University of Arizona (some currently in process), but no formal report will be made until some future date. However, all results are available by personally contacting Bureau personnel at Tucson, Arizona.

Wisser and Cox, consulting geologists, wrote a report as of March 8, 1956. It includes data developed by exploratory holes drilled from January 1956 thru March 1, 1956.

Harmon Keyes, consulting engineer, wrote a report on the metallurgy of ore from the Lake Shore Mine on April 16, 1956. The data for this report includes some of the Bureau of Mines work at the University of Arizona thru March 1956, plus tests by Mr. Keyes.

The Booth Company, Inc., of Salt Lake City are completing their report on metallurgy based on several months of study and test work.

ORE RESERVE

The Wisser and Cox report shows 720,000 tons of 1.82% copper ore as blocked-out by drill holes and the old underground workings (approximately 2000 feet).

Additional drilling has raised this amount to 1,000,000 tons and probably to 1,300,000. This last amount is shown as "probable", because the drilling did not follow recommendations made by the Wisser and Cox report.

The above tonnage is on the Arizona and Copper Bell claims. One drill hole on the Isabella claim intersected 10 feet of 4% copper ore.

Drilling and geology indicates the main ore body on the Arizona claim extends outside the claim into Reservation land.

ADDITIONAL TEST WORK RECOMMENDED

Mine

30 additional rotary drill holes, totaling 5000' at \$2.00 per foot to complete necessary exploration of ore body. In completing this drill it will require assaying, engineering supervision, labor and miscellaneous expense and overhead.

Drilling - 5000' @ \$2.00	\$10,000.00
Assaying -	500.00
Miscellaneous -	4,500.00
Total	\$15,000.00

Metallurgy

The optimum ore size for leaching should be determined in a pilot plant operation to prove the conclusions of laboratory work.

The facilities of the U. S. Bureau of Mines, at the University of Arizona, are available and the use of these facilities, plus the Bureau assistance is the least expensive way of completing pilot plant tests.

1000 tons of ore may be necessary and such ore should be a representative sample. This will require opening a portion of the pit, mining ore, transporting it to Tucson, crushing and delivery to the test site.

The following costs are estimated:

Excavation and mining - 1000T	\$ 4,000.00
Transportation to Tucson - 500T @ \$8.00	4,000.00
Crushing and delivery - 500T @ \$3.00	1,500.00
Leaching pad - 2500 sq. ft.	500.00
*Solution pump	700.00

Assaying - outside checks and special	\$ 100.00
Acid and iron	2,000.00
Tanks and misc. construction	500.00
Labor, to assist Bureau personnel	2,500.00
Review and report by consultant	500.00
	Total \$ 16,300.00
Estimated saleable copper	3,000.00
	Net Cost \$ 13,300.00

* This piece of equipment will be donated to Bureau and University laboratory upon completion of test.

Total additional work should not exceed \$30,000.00, prior to completing the design of a full scale plant.

PLANT COST

Most of the following prices have been confirmed by responsible firms. * These have been estimated, but not quoted firm. This plant should have a capacity of 1000 tons per day.

Water Well	\$ 2,000.00
Water well pump (200 GPM)	5,000.00
4" water line - well to storage - 5000' @ \$1.50	7,500.00
75,000 gal. water tank	4,000.00
Barren solution pump (440 GPM-acid proof-80' head)	2,500.00
2" water and barren solution lines 3000' @ \$0.50 plus installation (plastic)	2,000.00
*24,000 gal. barren solution tank - lined	3,100.00
*170 ton acid storage tank	4,000.00
*Precipitation tanks - wood	15,000.00
Crusher - portable, complete unit	50,000.00
*(1) Air separator	10,000.00
Stacker conveyor (24" x 140')	4,000.00
Track, chutes, etc., for conveyor	2,000.00
Power unit (67.5KW, deisel powered)	13,000.00
Assay office (20' x 20')	1,250.00
Assay office supplies, testing equipment, pumps, PH meters, etc.	4,000.00
	\$ 129,350.00
Freight, contingencies, misc. - 15%	19,402.50
	\$ 148,752.50
(2) 87,000 sq. ft. asphalt leaching pad @ \$0.15	13,050.00
	\$ 161,802.50

(1) This piece of equipment may not be necessary.

(2) This size pad will accommodate from 150,000 to 200,000 tons of ore. It will then be necessary to lay another pad, and move the crusher and conveyor, or to remove the ore from the pad.

The cost of a combination auto-oxidation acid plant and facilities to produce sponge iron from pyrite has been estimated by 2 engineers at \$350,000.00. This is not a confirmed price, but should be relatively close to actual cost.

Itemized cost - 1000 ton plant	\$ 161,802.50
Estimated cost - acid and iron plant	<u>350,000.00</u>
	\$ 511,802.50

It is contemplated that the mining and hauling will be done by contract. Should this be changed it will be necessary to purchase or lease-purchase such equipment.

OPERATING PROFIT

The cost of stripping, mining and hauling are based on firm bids.

Crushing and conveying costs are estimates at 150% of tentative prices received from contractors; also, checked against cost of similar operations.

Acid and iron costs are computed from firm prices on each item delivered to mine site.

Operating Costs - first year - buying acid and iron	per ton
Stripping	\$0.25
Mining & hauling to crusher	0.65
Crushing & Conveying	0.90
Acid - 170#/ton @ \$28.00/T	2.38
Iron - 1.7#/#Cu @ \$40.00/T	0.80
Total Direct Cost	<u>\$4.98</u>

Operating Costs - first year - making acid and iron	per ton
Stripping	\$0.25
Mining & Hauling to crusher	0.65
Crushing & conveying	0.90
Acid - @ \$18.00/T	1.53
Iron - @ \$20.00/T	0.40
Total Direct Cost	<u>\$3.73</u>

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Mine

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Drilling - 5000' @ \$2.00	\$10,000.00
Assaying -	500.00
Miscellaneous -	4,500.00
Total	\$15,000.00

Metallurgy

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Transportation to Tucson - 500T @ \$8.00	4,000.00
Crushing and delivery - 500T @ \$3.00	1,500.00
Leaching pad - 2500 sq. ft.	500.00
*Solution pump	700.00

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Acid and iron		2,000.00
Tanks and misc. construction		500.00
Labor, to assist Bureau personnel		2,500.00
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	Total	\$ 16,300.00
Estimated saleable copper		<u>3,000.00</u>
	Net Cost	\$ 13,300.00

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Water well pump (200 GPM)		5,000.00
4" water line - well to storage - 5000' @ \$1.50		7,500.00
75,000 gal. water tank		4,000.00
Barren solution pump (440 GPM-acid proof-80' head)		2,500.00
2" water and barren solution lines 3000' @ \$0.50 plus installation (plastic)		2,000.00
*24,000 gal. barren solution tank - lined		3,100.00
*170 ton acid storage tank		4,000.00
*Precipitation tanks - wood		15,000.00
Crusher - portable, complete unit		50,000.00
*(1) Air separator		10,000.00
Stacker conveyor (24" x 140')		4,000.00
Track, chutes, etc., for conveyor		2,000.00
Power unit (67.5KW, deisel powered)		13,000.00
Assay office (20' x 20')		1,250.00
Assay office supplies, testing equipment, pumps, PH meters, etc.		4,000.00
	\$	<u>129,350.00</u>
Freight, contingencies, misc. - 15%		19,402.50
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(2) 87,000 sq. ft. asphalt leaching pad @\$0.15		13,050.00
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Crushing and conveying costs are estimates at 150% of tentative prices received from contractors; also, checked against cost of similar operations.

Acid and iron costs are computed from firm prices on each item delivered to mine site.

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Mining & hauling to crusher	0.65
Crushing & Conveying	0.90
Acid - 170#/ton @ \$28.00/T	2.38
Iron - 1.7#/#Cu @ \$40.00/T	<u>0.80</u>
Total Direct Cost	\$4.98

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The royalty is on a sliding scale, based on the New York quoted copper price. The price levels and the percentages of royalty, based on "net smelter returns", are:

<u>Copper Price</u>	<u>Royalty %</u>
\$0.48 and over	12 $\frac{1}{2}$ %
0.479 down to 0.381	10%
0.38 and below	7 $\frac{1}{2}$ %

Minimum monthly royalty - \$1,000.00.

The Papago Tribe mining lease provides for the following:

1. 10% royalty, based on "net smelter returns".
2. An annual minimum rental, to be credited to royalties:
 - 1st year \$0.25 per acre
 - 2nd and 3rd years 0.50 per acre
 - 4th year & thereafter 1.00 per acre
3. Campsite area of not less than 20 acres at an annual rental of \$50.00 per acre.
4. Payment of \$10.00 per acre, per year, for 10 years, for all area used for dumping or in the "open pit". The total price for each acre is \$100.00 and said \$100.00 is fully due and payable in case of abandonment before end of 10 year period.

The Papago Tribe water agreement provides for an annual rental of \$50 per acre for the well site and right-of-way.

E. G. Frawley appears on both leases with the Papago Tribe - in addition to Freeman and McClure. Complete reassignment of all rights in said leases will be obtained from Mr. Frawley.

CORPORATION

Copper Queen Mining Co., a Nevada Corporation, has been formed. There has been no stock issued. The officers and directors are:

President - Vacant
Vice-Pres. - George A. Freeman
Sec. & Treas. - Dwight McClure
Directors - above 2 and Clarence J. Duncan

Mr. Duncan is a member of Jennings, Strauss, Salmon & Trask, attorneys for Freeman, McClure and Copper Queen Mining Co.

This Corporation is available for immediate use.

SALES PROPOSAL

It is the desire of Freeman and McClure to retain a participating interest in the operation of the mine.

During the past 3½ months the Lake Shore Mine has been improved or increased in value by:

1. Increased ore reserves - drilling shows an increase from 400,000 to over 1,000,000 tons.
2. Higher grade of ore - assay certificates show an average of 1.82% copper - up from between 1.65% and 1.70%.
3. Greater operating profit - metallurgical tests show a higher recovery (70% and over, compared to 65%) and lower reagent cost (acid consumption down to 5.5#, compared to 7#).
4. Additional land acquired - mining lease negotiated with Papago Tribe, including water rights.

\$50,000.00 plus was spent in accomplishing the above.

75% undivided interest in all rights now held by Freeman and McClure is offered.

The retained 25% shall receive ¼ of the "net profits", calculated as follows:

1. After deduction of royalties due Treasure State and/or the Papago Tribe;
2. Before state and federal income taxes;
3. Without deduction for ore depletion;
4. No administrative or travel costs, except those incurred at the mine itself shall be deducted;
5. No credit for payment of work performed by contract or for lease equipment shall be allowed in excess of the prevailing rate for such service or equipment.

Freeman and McClure shall further have the option to assign the retained 25% interest to Copper Queen Mining Co., for 25% of all issued capital stock calculated after the issuance of said 25%. If this corporation is not used, similar arrangements must be made with the operating entity.

Cash payment - \$30,000.00 total, in 2 equal payments of \$15,000.00 upon the granting of an exclusive exploratory time period or option and \$15,000.00 60 days later, if option is exercised.

The purchaser will assume all duties and obligations of Freeman and McClure under the Treasure State lease and option, and the Papago leases; and, furnish all capital required to put the mine into production at the rate of not less than 1000 tons per day. Both of the above shall be accomplished and carried on for the benefit of both seller and buyer and at no expense to seller.

The terms of "offering" are open to negotiation, if the prospective purchasers are interested in expanding their operations in this area - particularly northern Mexico and the Papago Reservation (refer to last paragraph under "Property", page 1). Freeman and McClure offer their full cooperation, provided the purchaser will make a firm commitment of sufficient funds to conduct exploration work and all properties are acquired for the benefit of both parties.

George A. Freeman
Dwight McClure
P.O. Box 953
Phoenix, Arizona
Telephones:
Alpine 8-8941
Whitney 5-8203
Attorneys -
Jennings, Strouss, Salmon & Trask
Att: Mr. Clarence J. Duncan
6th Floor Title & Trust Bldg.
Phoenix, Arizona
Telephone:
Alpine 8-7011

THE AMERICAN METAL COMPANY, LIMITED
61 BROADWAY
NEW YORK 6, N.Y.

TELEPHONE BOWLING GREEN 9-1800
CABLE ADDRESS: EFFLUX, NEW YORK

PLEASE ADDRESS REPLY TO EXPLORATION DIVISION

SUBJECT:

April 5, 1956

Mr. E. N. Pennebaker
P. O. Box 817
Scottsdale, Ariz.

Dear Penny:

We have been unable to pinpoint the location of the Lake Shore property.

There are several references to this property in our files but none give a specific location. Can you fill us in on this problem.

Kindest regards.

Sincerely,

Jack A. James
Jack A. James

JJ:LL



April 9, 1956

Mr. Jack A. James
Mgr., Exploration Division
The American Metal Co., Ltd.
61 Broadway
New York 6, N. Y.

Dear Jack:

With reference to your letter of April 5, the Lake Shore mine is on the southwest slope of the Slate Mountains, one mile north of the Pinal County-Pima County line. It is about 27 miles south and a little west of Casa Grande.

It is located in Section 25, T10S; R4E.

The area of interest is shown on the Silver Reef Mountains quadrangle, edition of 1942, near its south edge.

I shall try to answer some of your other questions on Lake Shore in a few days after I collect some more information.

With best regards,

Yours sincerely

E. N. Pennebaker

ENP:mc

LAW OFFICES
GUYNN & TWITTY
TITLE & TRUST BUILDING
PHOENIX, ARIZONA

C. LEO GUYNN
HOWARD A. TWITTY
RALPH B. SIEVWRIGHT

March 23, 1956



Mr. E. N. Pennebaker
P. O. Box 817
Scottsdale, Arizona

Re: Indian Lands

Dear Penney:

Enclosed is a copy of some correspondence which Charlie Willis loaned me. I have arranged to have Charlie Willis keep me posted on any developments regarding regulations that may be issued by the Tribal Council of the Department of the Interior.

Sincerely yours,

GUYNN & TWITTY

By *Howard A. Twitty*

HAT:ec
Enclosures

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA



March 9, 1956

Mr. Axel L. Johnson
P. O. Box 5047
Tucson, Arizona

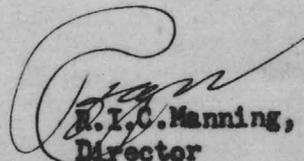
Dear Axel:

Thanks for your report on the Papago mining situation. This is extremely informative and I think you have done an excellent job.

I think it would be an excellent idea for the committee from the Tucson ASMSA to work with the Papago Indian Agency at Sells in preparing a set of rules and regulations regarding prospecting and mining on the reservation, and I think you should work with them in an advisory capacity.

This is an excellent opportunity to not only be of service to the Papago Indian Agency but to secure a set of rules and regulations that will be favorable to mining interests.

Cordially yours,


R. I. C. Manning,
Director

✓ cc: Mr. Willis

RICM:lp

Mineral Lands on the Papago Indian Reservation

The Papago Indian Reservation was closed to mineral entry effective 12:01 A.M., May 27, 1955 by Act of Congress (Public Law 47). All mining claims that were valid as of that date will remain valid so long as the mineral laws are complied with.

A claim is valid only if there was a proper location, a legal recording in the County Recorder's Office, a copy of the location notice filed in the Papago Agency Office within 90 days of the date of location with the grazing fee paid, and the fee paid annually prior to the anniversary date of the location. Non-compliance with any of these conditions will render the claim invalid.

The Papago Reservation is closed to prospecting, except under permit from the Papago Tribe. Applications for prospecting permits may be made in writing to the Papago Council, Sells, Arizona and letters of application should contain full details regarding the area and the type of mineral in which the applicant is interested.

Applications for mineral leases may be made in writing to the Papago Council, Sells, Arizona and the same details regarding the area and type of mineral, etc. applying to prospecting permits should be contained in letters of application.

Immediate action on applications is not to be expected, for it will not be possible to begin consideration of them until such time as the Central Office in Washington has acted on the tribal resolution pertaining to prospecting permits and mineral leases. Title 25, Section 186.27a of the Code of Federal Regulations states in part as follows: "A prospecting permit will not give the permittee any preference right to a lease, unless specifically so stated in the permit, and all permits granting a preference right to a lease must comply with all the laws and regulations applicable to mineral leases on tribal Indian lands." Whether or not permits and leases will be advertised for sale or negotiated remains to be decided.

Title 25-Indians, Section 186.15, amendments approved Nov. 28, 1955 fixes the royalty rates for minerals other than oil or gas as follows: "Unless otherwise authorized by the Commissioner of Indian Affairs, the minimum rates for minerals shall be as follows: (b) for gold and silver the lessee shall pay quarterly or as otherwise provided in the lease, a royalty of not less than 10 percent to be computed on the value of bullion as shown by mint returns after deducting forwarding charges to the point of sale; and for copper, lead, zinc, and tungsten, a royalty of not less than 10 percent to be computed on the value of ores and concentrates as shown by reduction returns after deducting freight charges to the point of sale."

Priority of consideration of applications in general, will be the date on which the applications are received in the Papago Tribal Office, Sells, Arizona.

Feb 6 1956

March 2, 1956

Mr. Axel Johnson,
P. O. Box 5047,
Tucson, Arizona.

Dear Axel:

We are getting inquiries relative to the future status of mining on the Papago Reservation. I understand you have been making an investigation of the subject and possibly you have some information as to what their plans are. Any information you can send us on the status of mining on the Papago Reservation relative to the decisions of the Tribal Council on requirements for one to get a permit and locate claims on the Reservation and on what basis the claims could be brought into production and what royalty would have to be paid, and any other information which would permit us to intelligently answer questions on what they are going to do.

The last information we had was that there has been no action and no decisions, therefore no efforts at mining on the Papago lands.

Anything you can give us on the subject will be greatly appreciated.

Thanking you, and with kindest regards, I am

Sincerely,

Charles F. Willis

CFW:VSM

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA



Tucson, Arizona,
March 8, 1956.

To Roger I. C. Manning, Director,
Department of Mineral Resources,
Mineral Bldg., Fairgrounds,
Phoenix, Arizona.

Report of my visit to the Papago Indian Reservation Office at Sells, Ariz.-- Mar. 6, 1956.

References See report of my previous visit there on Jan. 20, as reported Jan. 23.

Information from visit on Mar. 6 to get further information

I first conferred with Mr. T. A. Wilson, Realty Assistant, who has been assigned to handle the prospecting permits and mineral leases for the Papago tribe. Later, I also conferred with Mr. Harry W. Gilmore, the Superintendent of the Papago Indian Agency.

Mr. Wilson informed me that the situation in regard to said prospecting permits and mineral leases remain virtually the same as it was on Jan. 20th, at the time of my last visit. The Papago Indian Agency is still awaiting a decision from the Bureau of Indian Affairs at Washington, D. C., in regard to the approval of Tribal Resolution No. 843 of Oct. 2, 1955 (see enclosed copy of same). I was informed that Mr. Harry W. Gilmore, Supt. of the Papago Agency, has made several requests for the approval of this Resolution, addressing such requests to Mr. F. M. Haverland, Area Director--Office of Indian Affairs, Phoenix, Arizona. Mr. Haverland, in turn, has made certain recommendations in regard to this Resolution by letter to the Commissioner, Bureau of Indian Affairs, Washington, D. C., viz.--

- (1) Letter, under date of Oct. 26, 1955, with recommendation that Resolution No. 843 not be approved.
- (2) Letter, under date of Nov. 28, 1955, revising the previous recommendation to the effect that Resolution No. 843 be not rescinded.
- (3) Letter, under date of Feb. 3, 1956, containing a decision to the effect that the Papago lands must be leased under Secretarial approval under existing regulations.

After obtaining the above information from Mr. Wilson, I discussed the situation further with Mr. Harry W. Gilmore, Superintendent, Mr. Wilson also being present during this discussion. It was the opinion of Mr. Gilmore and agreed to by Mr. Wilson that the Papago Indian Agency should start at once to make out definite Rules and Regulations to govern Prospecting Permits and Mineral Leases on the Papago Indian Reservation, containing definite fees, rentals, acreage limitations, royalty provisions, etc. and then present these to the Tribal Council for their approval. In regard to this, it was also their opinion that they would necessarily not be forced by existing law (Title 25--Section 186.15, amend. 11/28/55) to charge a 10 % royalty, but that the Commissioner of Indian Affairs, Washington, D. C. would approve a royalty, which they would recommend.

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA



Page 2.

Mr. Gilmore and Mr. Wilson then stated that they did not have the technical and legal knowledge and experience to draft a set of Rules and Regulations to govern Prospecting Permits and Mineral Leases on the Papago Indian Reservation, and asked me to help them with suggestions and recommendations. I informed them that, after several months of study by a representative Committee, a bill has been introduced in the State Legislature, which, when enacted into law, will govern prospecting permits and mineral leases on all lands on which the State of Arizona owns the mineral rights. I suggested to them that many of the provisions in regard to fees, rentals, acreage limitations, and royalties covering prospecting permits and mineral leases, contained in this bill, could be incorporated, with perhaps slight modifications, in a set of similar Rules and Regulations to govern prospecting permits and mineral leases on the Papago Indian Reservation.

They stated that they would, very much, like to have a copy of the State bill, and I furnished them with a copy of this.

Suggestions in regard to future action on the matter

I think it might be advisable for the Tucson A. S. M. O. A. Council to send a Committee to assist the Papago Indian Agency at Sells in preparing a set of Rules and Regulations for Prospecting Permits and Mineral Leases on the Papago Reservation, and also to confer with the Papago Tribal Council in regard to same. I intend to discuss this matter with some of the more active members of the Tucson Council.

I would also like to have your opinion in regard to what work that I, as the field engineer for the Department of Mineral Resources, should do towards giving the Papago Agency assistance with such Rules and Regulations.

Enclosures

- (1) Resolution No. 843 of the Papago Council---Oct. 2, 1955 (1 copy)
- (2) Mineral Lands on the Papago Indian Reservation -- Feb. 6, 1956 (3 copies)

Respectfully submitted,

Axel L. Johnson, Field Engineer,
P. O. Box 5047, Tucson, Arizona.

RESOLUTION
OF
THE PAPAGO COUNCIL

COPY

RESOLUTION NO. 843

WHEREAS: Congress has by Public Law 47 closed the Papago Reservation to mineral entry, and the Gila Bend and San Xavier Reservations have never been open to mineral entry, and

WHEREAS: Section 3(d) of Article V of the Constitution of the Papago Tribe authorizes the tribe to promulgate Ordinances covering leases, and

WHEREAS: Ordinance No. 15 of the Papago Council regulates the use and occupancy of tribal lands by non-members of the Papago Tribe by setting up the procedures for leasing tribal land to non-members, and

WHEREAS: When Ordinance No. 15 was enacted, the leasing of land for mining purposes was not contemplated and therefore not specifically provided for, and

WHEREAS: There are now no tribal provisions for the issuance of prospecting permits, and

WHEREAS: There is immediate and pressing need for setting up procedures for the issuance of prospecting permits and mineral leases in conformity with Federal Regulations, and

WHEREAS: If each application for a prospecting permit or a mineral lease must be approved individually by the Papago Council, and the District Council of the District involved, the resulting confusion and delay will seriously impede the issuance of these permits and leases to the financial disadvantage of the Papago people, and

WHEREAS: It is without question that one-half of any revenue accruing from tribal lands from the use of the surface must go to the District in which the land is located and one-half to the Tribe and,

WHEREAS: The minerals underlying tribal land are the property of all members of the tribe and therefore all rents and royalties accruing therefrom must go to the Tribe.

NOW, THEREFORE BE IT RESOLVED BY THE PAPAGO COUNCIL: That Ordinance 15 be hereby amended by the addition of the following; The Chairman of the Papago Council be hereby authorized to issue prospecting permits and execute mineral leases on Papago Tribal land for and on behalf of the Papago Tribe, in conformity with applicable Federal regulations, PROVIDED, That prospecting permits shall be issued to members of the Papago Tribe without charge, unless the member is employed by, or partnership or acting for a non-member.

BE IT FURTHER RESOLVED: That all mineral leases of tribal land shall provide that the use of the surface of the land covered by such leases, but not necessary for mining purposes, shall be reserved to the Papago Tribe, and that such leases shall further provide that the portion of the surface used by the lessee as a camp site shall be leased at the rate of \$50.00 per acre or fraction thereof as provided by Ordinance No. 15, with a minimum camp site area of one acre per mining lease, and one-half of such camp site revenue shall accrue to the District and one-half to the Tribe,

BE IT FURTHER RESOLVED: That all other revenues accruing from mineral leases and from prospecting permits shall accrue to the Papago Tribe,

BE IT FURTHER RESOLVED: (1) that prospecting permits may a) be either exclusive or non-exclusive, b) that they may or may not carry an option to lease, (c) that they may be advertised for competitive bid or be negotiated or be sold for a set fee, and 2) that mining lease may be either advertised for competitive bid or be negotiated the alternative used in each individual case being that which in the opinion of the

Chairman of the Papago Council and the Superintendent of Papago Agency will be of the greatest financial benefit to the Papago Tribe.

PROVIDED: That no mineral lease shall be executed if the campsite included therein is within 100 yards of any wall, charco, spring, or corral, or within 500 yards of any established village, or covers land which has been assigned by the District Council to a member of the Papago Tribe for beneficial use and occupancy, except at the recommendation of the District Council concerned, and

BE IT FINALLY RESOLVED: That any original provisions of Ordinance No. 15 which are in conflict with this resolution shall be set aside in the making of mineral leases.

The foregoing resolution was on Sept. 23, 1955, duly enacted by a vote of 12 for and 0 against by the Papago Council pursuant to authority vested in it by Section 3 (d) of Article V of the Constitution of the Tribe ratified by the Tribe on Dec. 12, 1936 and approved by the Sec. of the Int. on Jan. 6, 1937, pursuant to Section 16 of the Act of June 18, 1934 (48 Stat. 984). Said resolution is effective as of the date of its approval by the Superintendent of the Papago Agency and is subject to the rescission by the Secretary of the Interior, pursuant to Section 6 of Article V of the Constitution and By-Laws of the Papago Tribe.

THE PAPAGO COUNCIL

BY:

(sgd) Mark Manuel, Chairman

ATTEST:

(sgd.) Evelyn Siquieros, Sec. Treas.

APPROVED: Oct. 2, 1955

(sgd.) Albert M. Hawley, Superintendent

March 27, 1956

Mr. Jack A. James
Mgr., Exploration Division
The American Metal Co., Ltd.
61 Broadway
New York 6, N. Y.

Dear Jack:

I am trying to arrange my schedule so that during April and, if necessary, the first two weeks of May I can devote most of my time to the Michigan report. The only interruption, I hope, will be to give a little attention to Union Gypsum Company, one of my old customers. I am also assuming that National Lead will remain quiet until spring weather arrives in the Rockies.

In order to arrange the above, it will be necessary to postpone two Amco possible projects for awhile. One is the Lake Shore mine in the Papago Reservation. I have flown it and the deposit is in a fairly extensive pediment area with relatively shallow cover. There is drilling now going on at Lake Shore and some sort of activity also at the old Slate mine about one mile southeast along the zone. Lake Shore ore carries abundant magnetite, and I have verified this. Thus a magnetic and possible EM investigations are suggested. However, the Papago tribe has not yet adopted regulations to allow prospecting and leasing, but it now looks like only small areas might be covered by future prospecting permits, say one section. Consequently it will require a little work to decide what ground to apply for, depending in part on where the old claims were located prior to May 27, 1955, when the Papagos were given the mineral rights on the reservation. We might consider an aeromagnetic job to select a promising area, but prospecting is not allowed on the reservation without a permit, and might an aerial job prejudice a lease application?

On the flight out to Lake Shore I detoured over another area of possible interest west of Magma Junction and about 6 miles northwest of Florence. This is another pediment area with alteration and copper mineralization displayed in granite making up a group of low hills. It is reported that Magma Copper Company drilled a few holes here many years ago, but the Joint Venture scouts thought that they had not tested the better croppings and believed the area to deserve mapping and study. For some reason this was not followed up.

LAKE SHORE

Mr. Jack A. James - Page 2 - March 27, 1956

With several porphyry copper deposits now known to display various zonal patterns of higher pyrite-lower copper vs. lower pyrite-higher copper, pediment areas with good alteration and indications of disseminated copper are worthy of attention. I think several days reconnaissance field work should be done by me along this zone.

The property set-up in the above-discussed area is complicated. Two sections of probable State land are involved, and the southerly part of the pediment is in the Gila River Indian Reservation. Consequently it would take a little time to determine if and where a possible project might be warranted.

Unless I hear from you to the contrary, I shall postpone further attention to the above areas until that report on Michigan is completed.

With kind regards,

Yours sincerely

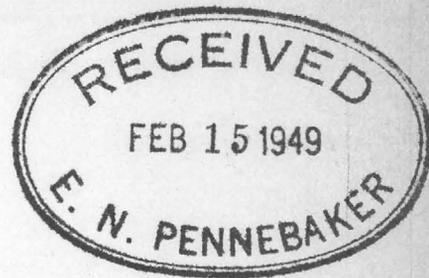
E. N. Pennebaker

ENP:mc

LAW OFFICES
GUYNN & TWITTY
TITLE & TRUST BUILDING
PHOENIX, ARIZONA

C. LEO GUYNN
HOWARD A. TWITTY

February 14, 1949



Mr. E. N. Pennebaker
Box 2996
Globe, Arizona

Dear Penny:

Today we received a letter from Frank M. Leonard, Jr. in reply to our letter of February 2, 1949. He advised, "I do not wish to open negotiations at this time. Be kind enough to so inform your client."

With kind personal regards we remain

Very truly yours,

GUYNN & TWITTY

HAT
ap
Copy Mr. John Hope, Jr.

By *Howard A. Twitty*

Motor turn up.
(major)

Gear wheel bearing
" Universal

Rocke Arms,

1510 N. 3rd Ave

Kennedy & Farris

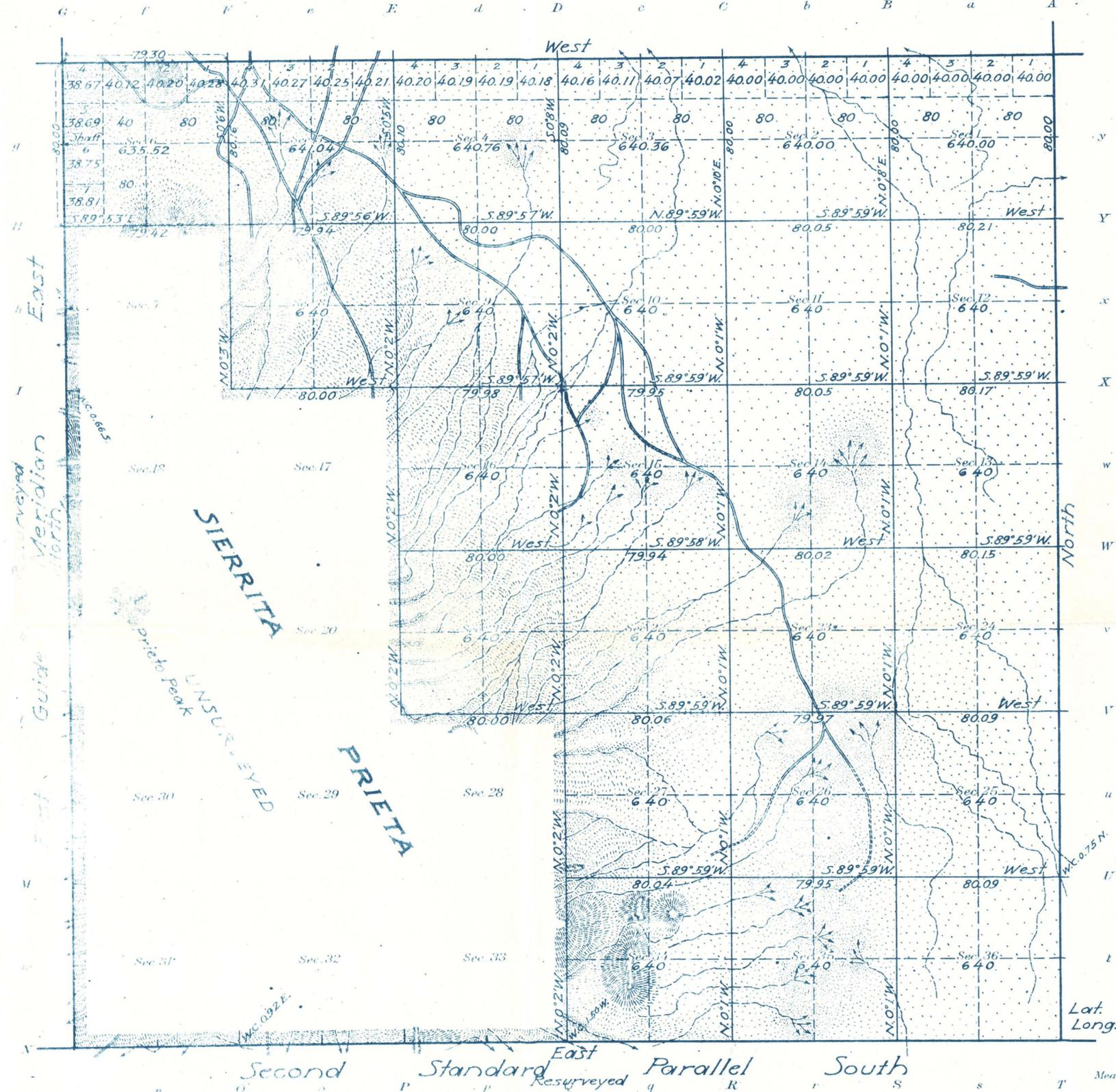
Copper Shore Lines

Jan. 27-1955

Loc Mon. 13

10' N of hole #46

Township No. 10 South Range No. 5 East Gila and Salt River Meridian, Arizona



Areas in Acres	
Public Land	15997.68
Indian Reservation	
Indian Allotments	
Mineral Claims	
Water Surface	
Total Area	15997.68

Lat. 32° 30' 23" N.
Long. 111° 47' 34" W.

Scale 40 Chains to an inch
Mean Magnetic Declination 13° 45' E.

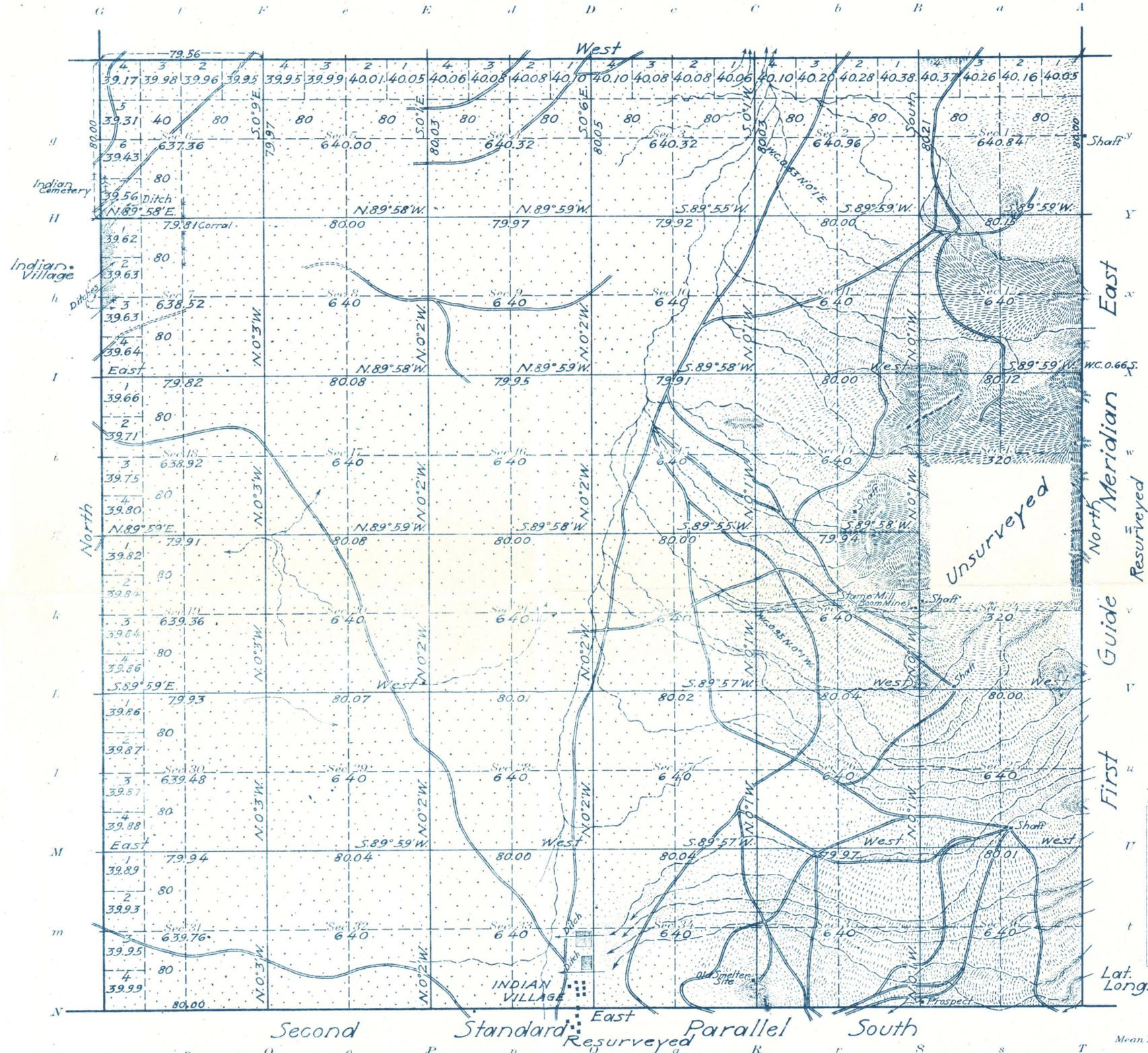
Surveys Described	By Whom Surveyed	Group	Amount of Surveys			When Surveyed		
			No.	Mts.	chs.	fts.	• Begun.	Completed
N. & E. Bdrs.	W.A. Kierulff, U.S.T.	38	July 29, 1915	Complete			Jan. 15, 1915	Jan. 16, 1915
2d Std. Par. S. - Res.	and						.12	.15
1st G. Mer. E. - Res.	W.H. Thorn, U.S.S.						.4	.6
Subdivisions.				As shown			Jan. 18 to 21, 1915.	

The above map of Township No. 10 South Range No. 5 East of the Gila and Salt River Meridian Arizona is strictly conformable to the field notes of the survey thereof on file in this office, which have been examined and approved
U. S. Surveyor General's Office.
Phoenix, Ariz., March 19, 1917.

Frank P. Frost
Surveyor General.

Township No. 10 South Range No. 4 East Gila and Salt River Meridian, Arizona

Survey Accepted July 30, 1917
G.L.O.



Indications of copper in Secs. 23, 24 & 25.

Areas in Acres	
Public Land	22395.84
Indian Reservation	
Indian Allotments	
Mineral Claims	
Water Surface	
Total Area	22395.84

Lat. 32° 30' 23" N.
Long. 111° 53' 44" W.

Scale 40 Chains to an inch
Mean Magnetic Declination 13° 45' E.

Surveys Designated	By Whom Surveyed	Group		Amount of Surveys Mls. chs. Secs.	When Surveyed	
		No.	Date of instructions		Began	Completed
N. and W. Balrs.	W.K. Kierulff, U.S.T.	38	July 29, 1914.	Complete	Dec. 27, 1914.	Jan. 7, 1915.
1st G. Mex E. - Res.	and				Jan. 4, 1915.	6.
2d Std. Par. S. - Res.	W.H. Thorn, U.S.S.				Dec. 27, 1914.	4.
Subdivisions				As shown	Jan. 5 to 13, 1915.	

The above map of Township No. 10 South Range No. 4 East of the Gila and Salt River Meridian, Arizona is strictly conformable to the field notes of the survey thereof on file in this office, which have been examined and approved.

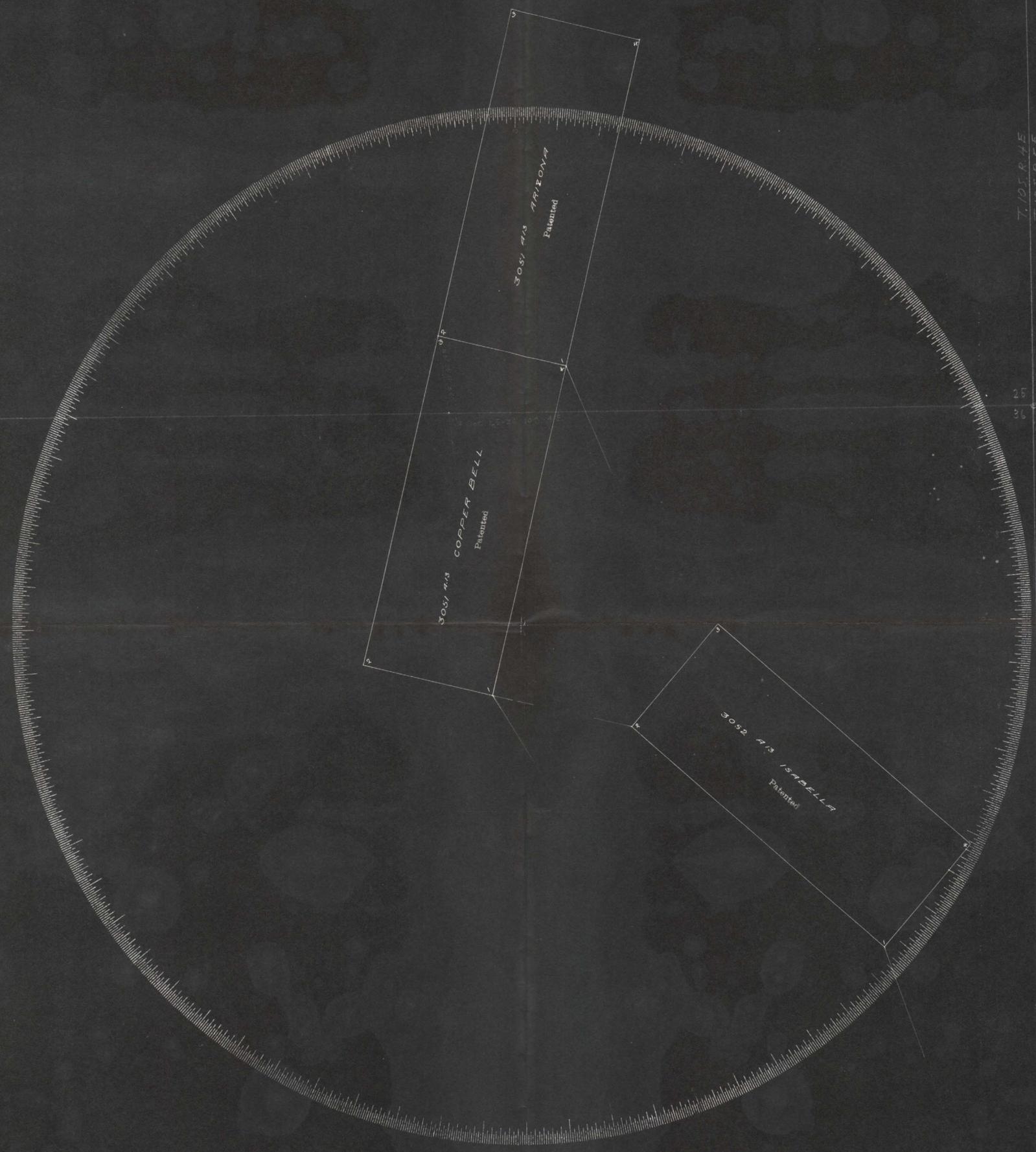
U. S. Surveyor General's Office.
Phoenix, Ariz., March 19, 1917.

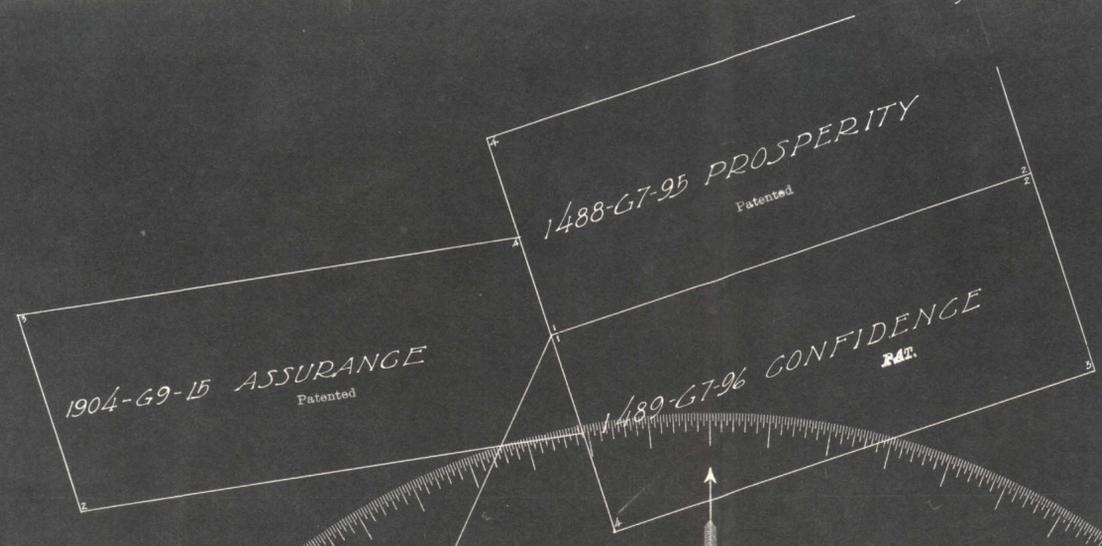
Frank O. Frost
Surveyor General.

26 25
35 36

T. 105, R. 4 E.
T. 103, R. 5 E.

25 30
36 31

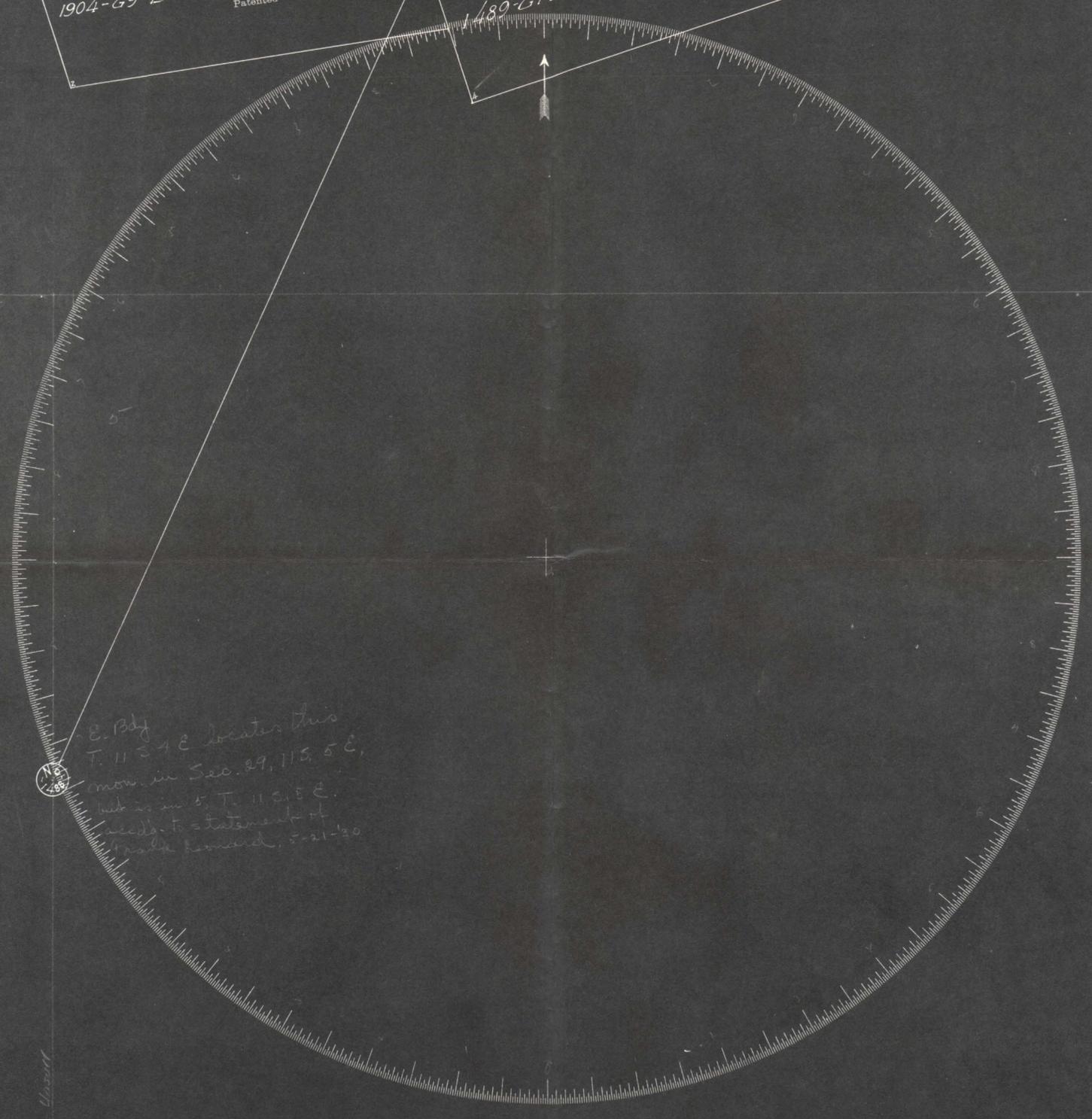




T. 105. R. 4 E. T. 105. R. 5 E.

36 31

6 115.5 E



E. Bdy
 T. 115.4 E locates this
 mon. in Sec. 29, 115.5 E,
 which is in 5 T. 115.5 E.
 needs to state ment of
 made demand, 5-21-30

KEUFFEL & ESSER CO.

CASA GRANDE DIST.
SEC. 24, T. 11 S., R. 4 E.

4-E