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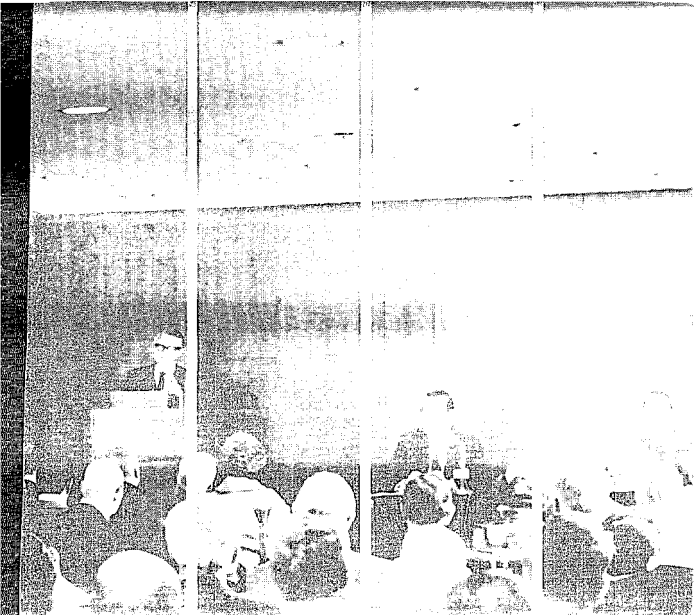


# A REPORT ON THE ANNUAL MEETING OF STOCKHOLDERS

April 25, 1972 at 140 Broadway, New York City

AMERICAN SMELTING AND REFINING COMPANY

To those of you who attended the Annual Meeting, this booklet will serve as a record of what transpired.

To those of you who could not attend, this is what happened.

1. **Chairman's Report**
   Charles F. Barber,
   *Chairman of the Board*

2. **Outlook for Metal Prices and Markets**
   Simon D. Strauss,
   *Executive Vice President*

3. **Summary of Questions and Discussion**

4. **Actions Taken by Stockholders**

Charles F. Barber

*The 73rd Annual Meeting of stockholders of American Smelting and Refining Company convened at 11 A.M. with Chairman Charles F. Barber presiding. Mr. Barber introduced the officers and directors of the Company, and reported as follows.*

## CHAIRMAN'S REPORT

Charles F. Barber, Chairman

This is the first time I have had the privilege of appearing before you as the Company's Chief Executive Officer. I do so after an unusually turbulent year and a trying one for management. We coped with recession, falling metal prices, prolonged strikes, inflation, Phase I and now Phase II. All the while we faced the front line impact of new and sometimes extreme environmental demands in the United States and continuing nationalistic pressures abroad. This is all reviewed in our Annual Report. The result was sharply reduced earnings and large capital requirements for pollution control facilities which, however desirable, produce no return on investment. Like most of the other companies in the non-ferrous metals industry, our Board of Directors found it necessary to reduce the dividend.

I am glad to report that notwithstanding these challenges, morale continues high and we are confident that the worst is behind us. The outlook for production, sales and earnings has improved, the dividend at the new rate is well

First quarter earnings were 47c vs 46c in 1971.

covered by earnings, and there seems to be a somewhat greater disposition on the part of the public authorities to recognize that a clean environment must be achieved within the framework of a healthy on-going economy.

Earnings for the first quarter were 47¢ per share compared to 46¢ in the first quarter of 1971. These earnings reflect sharply higher costs resulting from last year's labor agreements and inflation. Prices of copper, lead, silver and cadmium both in the U.S. and abroad have all improved significantly, but mostly late in the quarter. The price of zinc has been tied up in Phase II price regulations, but we expect this situation to be resolved soon.

Copper production at Mount Isa in Australia and at Southern Peru Copper was greater in the first quarter this year than in 1971; lead production at Mount Isa was reduced as planned. Southern Peru's Cuajone mine development program is on schedule; efforts to arrange financing to assure completion of the project are continuing.

## Outlook—a better year overall in 1972.

With higher metal prices and a firming business outlook, we look forward to a better year overall in 1972.

I would now like to report on four developments since the publication of the Annual Report—environmental lead at the El Paso smelter, a reappraisal of the Silver Belt projects, start of construction at the Manchester ilmenite mine in New Jersey and our go-ahead for two new copper mining projects in Arizona.

Some rather alarming headlines have appeared in the national media concerning "lead poisoning" of children in Smeltertown, a small community of 100 families adjacent to our El Paso smelter. In late February, in connection with a pending suit, we learned that certain young children in this area had elevated levels of lead in their blood. Some were hospitalized for observation and some of these received treatment to reduce blood lead levels. I am

## Alarming headlines in El Paso.

glad to be able to report that there is every indication that the health of the children involved has not been impaired. As a precaution-

ary measure, however, medical surveillance of those concerned is continuing. Since older children and adults in the Smeltertown area had essentially normal blood lead levels, we believe that the youngsters were affected by lead dust in the dirt of the unpaved roads and bare yards where they play, not by lead in the ambient air. Apparently the lead dust had accumulated over the 85 years of smelter operations at the site.

Once we became aware of the problem, we took prompt steps first to take care of the children and then to correct the situation in Smeltertown so that the problem would not recur. There is no evidence of any comparable problem elsewhere in the El Paso area.

The remaining three topics I mentioned are interesting for the manner in which they cast light on the nature of the mining business. Mining starts with exploration. Discovery is a rare event and then it may be many years before

Mining starts with exploration. Discovery is a rare event.

any particular mineral occurrence has its day as a profitable mine.

First—reappraisal in silver.

In each of our annual reports since 1964, we have commented on our exploration program in the Silver Belt of northern Idaho.

The Silver Belt of the Coeur d'Alene Mining District is a zone about five miles long and one-half mile wide characterized by deep-lying silver-copper ores. The Sunshine Mine is at the west end of the Belt and the Galena Mine is at the east end. Precambrian rocks extend through the length of this zone and, when they are associated with faulting, they provide the host rock for silver deposition. In the middle sixties we

Reappraisal in the Silver Belt.

were able to obtain control of the greater part of the favorable zone between the Sunshine and Galena Mines. The properties were consolidated into three working groups known as the Consolidated Silver, Camp and Coeur Projects. For several years, this work constituted one of

our major areas of interest and we spent more than $10,000,000 in this district. The results of these efforts have been disappointing, inasmuch as, to date, we have found only marginal veins with no tonnage approaching that of the Silver Vein at the Galena. Also, costs of mining and mill construction have soared and the price of silver has dropped. When we embarked on this program we were confident we would have $2.50 to $3.00 silver today. Last year the price averaged $1.55 and it reached a low of $1.29 last November. In the long run, the price of silver will work higher inasmuch as annual consumption continues significantly above new mine production. But we are now less confident as to when that may occur.

In the meantime, reappraisal. Last August we terminated the Camp project. More recently work has been suspended on the Consolidated Silver property, but we will maintain our rights under our agreement with the property owners awaiting a more favorable outlook. Work is continuing on the Coeur project, where we continue to develop additional ore. The sharply increased cost of underground mining in the district, however, has made the outlook for this property marginal, unless and until we can look forward to a price of silver substantially above recent levels.

Second—ilmenite. You probably noted in the press two weeks ago that construction of the surface plant had begun at our Manchester mine near Lakehurst, New Jersey. The original discovery was made in 1957. You will recall the

We set out to look for titanium minerals.

excitement about titanium in the early 1950's when it was thought that titanium would be a principal air frame material for the developing age of jet aircraft. As a raw materials company, we set out to look for titanium minerals. Following up on a report by the New Jersey Geological Survey that ilmenite, a titanium-bearing mineral, had been found in Ocean County, New Jersey, one of our exploration geologists went up and down the roads of the area look

Ralph L. Hennebach

ing for favorable signs. Late one afternoon, he found some black sands in a ditch. He had his clue to an ancient river and beach deposit. That was in January 1957. Mapping, acquisition of property, drilling and testing followed. By March 1958 we knew we had an important deposit of ilmenite—perhaps the best undeveloped deposit in the United States. But by then the bottom had dropped out of the ilmenite market. The market for titanium metal did not develop as expected and changing technology for the production of titanium pigments placed a premium on rutile, another titanium mineral, depressing still further the market for ilmenite. The New Jersey property was therefore "put in the bank"; we know that basic raw materials are scarce and don't go out of style. It took time, but now fourteen years later we have a long term contract with Du Pont for the ilmenite and are developing the mine. For twenty years or so beginning

. . . a significant contribution to Asarco earnings.

in mid-1973 we expect the mine to make a significant contribution to Asarco earnings.

Finally—the copper properties. At its meeting last month, your Board of Directors approved development of two new copper mining projects in Arizona—the San Xavier mine near our

Mission mine south of Tucson and the Sacaton mine near Casa Grande about 45 miles southeast of Phoenix, Arizona.

## Two new copper mining projects in Arizona.

In its first phase, the San Xavier mine will produce about 1,000 tons of copper per month beginning next year from oxide ores averaging about 1% copper. A vat leach plant will treat 4,000 tons of ore per day, and consume about 100 tons of sulfuric acid per day from Asarco's new acid plant at the Hayden smelter. The 82% copper precipitates produced from San Xavier ore will in turn be smelted at the Hayden smelter.

In this instance, the original discovery was made in 1956 when one of our field geologists found a small outcrop of a possible porphyry copper deposit on the San Xavier Indian Reservation. This was about 2½ miles north of where we were doing some exploration drilling on the property that has since become the Mission mine. There followed an application to the Bureau of Indian Affairs for a lease, competitive bidding for a prospecting permit with option to lease, exploration drilling, process research, engineering studies—and now 16 years later we are developing the mine. Incidentally, this deposit was not ore when first explored—it could not have been profitably mined at the price of copper then prevailing. An important aspect of this

## A large ore reserve, extending for many years the life of this profitable operation.

development is that the oxide ore now to be mined covers a large reserve of 0.5% copper sulfide ore which in due course will be processed at the nearby Mission mill, extending for many years the life of this profitable operation.

The Sacaton mine we think of as similar to our Silver Bell mine. In Sacaton's first open pit phase, 9,000 tons of sulfide ore averaging 0.76% copper will be mined and milled per day, producing about 21,000 tons of copper per year. The sec-

ond phase, underground operation, is expected to begin about 1979. The original discovery for this mine was made by an Asarco field geologist in February 1961, when he observed a small outcrop of altered porphyry in an uncultivated area of desert. Progress since has been steady, but nonetheless it took eleven years from first clue to mine development. Production is scheduled to commence in mid-1974. Smelting capacity will be available at Hayden for treatment of the copper concentrates to be produced.

A great deal of the time of our executive and operating management this past year has been concerned with environmental matters as we sought to develop means of meeting new environmental standards and as the public authorities searched for an acceptable accommodation among the nation's several social, environmen-

Our confidence in the future of the domestic mining industry.

tal and economic goals. It is especially satisfying, therefore, to comment on the decision of our Board to proceed with these three new mine projects. This attests to our confidence in the future of the domestic mining industry.

larly trying. As many of you have read in the press, a number of U. S. zinc smelters have been closed in the course of the last two years; one additional major smelter will be closed by mid-year of 1972. This has reduced the capacity of the domestic industry to produce zinc metal by about 40%.

Consumption of zinc has been well maintained meanwhile. However, to meet domestic demand, stocks held by domestic producers

The zinc situation is particularly trying.

have been sharply reduced. In addition, imports of zinc metal are steadily increasing.

The price of zinc at this time last year was 15¢ a pound for Prime Western Grade, delivered to domestic consuming destinations. By the time President Nixon imposed his wage-price ceiling on August 15, the price had advanced to 17¢ a pound. The price outside the United States, which is normally well below the domestic price, is currently 18¢ a pound.

Some domestic producers have received approval within the last few weeks for an increase in price to 18¢ a pound. In view of the heavy dependence of this country on imports of zinc and after consultation with the staff of the Price Commission, we filed the appropriate papers with the authorities in Washington to request exemption of zinc from price control. Under date of April 12 this application was denied by the Cost of Living Council and we were allowed ten days to apply for reconsideration of the denial.

Under date of April 21 we applied for reconsideration. The text follows:

"Your letter of April 12 signed by Joseph E. Mullaney, General Counsel, denied our request for an exemption of zinc metal and zinc oxide from price controls. We request reconsideration on the grounds that the Council's determination that removal of price controls would lead to price increases with more than a minimum inflationary impact is erroneous in fact. Inflationary impact has already occurred. Our appeal is based on the fact

that imported zinc metal is being sold at over 21¢ a pound in contrast with our price ceiling of 17¢ a pound for Prime Western and 18¢ a pound for Special High Grade zinc.

"As stated in our original request U. S. mines produce less than 40% of combined requirements for zinc metal and zinc oxide of over 1,300,000 tons annually. Balance must be made up largely from imports. Our application for price relief to the Price Commission has as yet received no action. Some other domestic producers have been granted a 1¢ increase. Your Chairman, Donald Rumsfeld, in recent statement in New York, declared he understood that international commodities such as zinc required a different approach than manufactured products such as automobiles or TV sets.

"The domestic zinc industry is facing an impossible situation. 40% of domestic smelting capacity has been or is being closed down. The present manner of dealing with price controls is aggravating this situation and may lead to still further suspension of domestic production thereby increasing U. S. dependence on imported zinc over which you have no price control. Under these circumstances we urge you reconsider your decision, or at a minimum cause Price Commission to act promptly to establish a uniform ceiling for all domestic zinc producers. Differing company ceilings for zinc will cause an administrative nightmare for producers, consumers and Price Commission staff."

Obviously, one cannot predict what action the authorities will take. Meanwhile, in an effort

It is doubtful that peace-time price controls can be effectively maintained in international commodities.

to protect our position, we have requested the Price Commission alternatively to consider authorizing an increase in Asarco's price to 18¢ a pound to put us on the same footing as our major competitors.

It is doubtful that peace-time price controls can be effectively maintained in international commodities over any protracted period of time if shortages develop. There is undoubtedly a shortage of zinc. At the end of 1970 domestic smelters held unsold stocks of 127,000 tons of zinc. As of March 31, 1972, these stocks had been reduced to 29,000 tons. Production, as stated earlier, has been sharply cut because of smelter closings. It cannot be increased unless new plants are brought into production. So far as we know there are no announced plans for any new domestic capacity. Should any such venture be decided upon, it would take a minimum of two years before the capacity became available. Meanwhile, this country's consumers will have to look to imports and will have to pay whatever price for zinc metal prevails in the world market.

### LEAD

The position in lead has improved considerably since the end of 1971. Demand for lead is good. Our sales in the first quarter of 1972 have been considerably greater than in the comparable period of 1971.

The price of lead has firmed, rising from 14¢ a pound at January 1 to 15½¢ a pound by the end of February. Last week some producers raised their price again to 16¢ a pound. Asarco is still a seller at 15½¢ a pound, as we have a

Demand for lead is good.

substantial tonnage of lead to sell in the current month. It is impossible at this time to forecast whether prices will settle back to the 15½¢ level or rise to 16¢.

So far as price regulations are concerned, the ceiling for most lead sellers would appear to be 16½¢ a pound, the quoted price on May 25, 1970, although at that time some sellers were offering metal at discounts from the published price. Stocks of lead in producers' hands have been considerably reduced from 98,000 tons at the beginning of 1971 to 50,000 tons at the end of February 1972. These are the latest figures available.

### GOVERNMENT STOCKPILE SALES

Domestic supplies of both lead and zinc may be augmented over the balance of the year through sales of surplus metal held in Government stockpile. The Government's General Services Administration has negotiated contracts with the domestic producers covering the sale of such surplus at an average rate of 50,000 tons of each metal per annum. We believe that adequate safeguards have been negotiated into these contracts to prevent undue disturbance to the market at times of metal surplus, while the opportunity exists for drawing down the stocks at a higher rate in times of shortage.

The stockpile contracts have not yet been finally executed. Furthermore, actual release of zinc can only begin after President Nixon has signed enabling legislation recently enacted by

Asarco's share of these stockpile disposals is substantial.

the Congress.* Sales of lead can start promptly once the contracts have been executed as there is a fair quantity of lead already authorized for sale by previous legislation.

Asarco's share of these stockpile disposals is substantial. Much of the metal will have to be shipped to our own refining plants for remelting and recasting—and in some cases even for further refining. Most of the stocks have been held for upwards of fifteen years. Consumers therefore will be somewhat reluctant to accept direct shipments from Government stockpile.

### SILVER

The silver market in 1971 proved a great disappointment to Asarco. When the stockholders met last April the market appeared buoyant; there was reason to hope that the long awaited rise in silver prices might shortly ensue. Instead, the market turned weak. Speculative selling, in fact, drove the price last November back down

*Since April 25, President Nixon has signed the legislation on zinc, and the zinc surplus contracts have been executed. Deliveries of stockpile zinc under the disposal program are expected to occur in May.

to the level of $1.29 an ounce, which had long been the statutory monetary value of silver.

Since then there has been slow but steady recovery. As of the end of 1971 the price was at $1.38 an ounce. Recently the price approached $1.60 an ounce. Yesterday's market was $1.555.

Under existing price regulations, Asarco's ceiling price for silver is $1.615 an ounce. Because of the volatile nature of the market, we believe that price regulation of silver is not feasible. For this reason, application was also made to the authorities for decontrol of silver.

The silver market in 1971 proved a great disappointment.

This, too, was denied as of April 12 by the Cost of Living Council. We have not taken steps to appeal for reconsideration in the case of silver because it appears that there may be opportunities to sell silver at higher prices either on the commodity exchanges or through exports should the world market rise above our ceiling price.

The Cost of Living Council has confirmed that trading in commodity futures is not subject to price regulation. Deliveries can be made of commodities sold in future markets at prices in excess of ceiling. Furthermore, unless new export regulations are invoked, it would appear that there is no barrier to the export of silver if the world price is higher than our ceiling.

## CONCLUSION

Lest there be any misunderstanding, please bear in mind that Asarco as a custom smelter is largely dependent on mines and secondary sources for the materials treated in its processing plants. If Government regulations prevent Asarco from selling refined metals at prices established in world markets, we must absorb heavy losses in buying raw materials at prices in excess of our ceilings or forego the opportunity to obtain such materials.

It is perhaps relevant to point out that in 1970 the present Administration issued a report highly critical of the domestic copper producers

for the so-called two-price system under which copper was then being sold. Domestic producers were selling copper at prices well below the world market.

The domestic production of primary copper satisfies more than 85% of the domestic consumption of primary copper. Yet the copper producers, supplying a much larger share of the market, were then criticized for doing voluntarily what the pricing authorities apparently now insist that domestic silver and zinc producers must do. Domestic production of primary zinc is only about 40% of domestic consumption. Domestic production of primary silver is about 30% of domestic consumption.

We understand and sympathize with the desire of the Administration to control inflation by putting a lid on prices and wages. Where it seems to us the Administration may have erred is in applying to prices of international commodities the same rules that are invoked with respect to manufactured products. In the long run, because of this country's heavy dependence on imports, the silver and zinc markets here cannot be isolated from world market conditions.

**Forrest G. Hamrick**

# SUMMARY OF QUESTIONS AND DISCUSSION

Mr. Barber then opened the meeting for questions. Following is a digest of some of the topics discussed.

## COAL

Several questions were asked concerning the Midland Coal Company Division whose properties were acquired by Asarco in late 1970 from Peabody Coal Company. Stockholders wanted to know the purchase price, profitability, reasons for entering the coal business, and the sulfur content of the coal.

Mr. Barber stated that Asarco paid approximately $27 million for the properties, and that they have not operated at a profit to date. "We look for improvement during the course of the year," he said.

"Coal is an important raw material", Mr. Barber observed in explaining why the acquisition was made. "Energy is one of the great needs of the country as we look ahead. We believe a substantial share of that energy must come from coal. Also, the coal business does not have the cyclical characteristics which the non-ferrous metals business has, and we considered it an appropriate diversification.

"The marketing of coal is something with which we are unfamiliar but which we are learning fast with the assistance of able people with former experience in the coal industry whom we have employed. However, the mining of coal, particularly the open pit mining employed at Midland's four mines, is something with which we are familiar. We think that we can bring something important to that business, and that we can operate it profitably."

Regarding sulfur content, Mr. Barber indicated that Midland's coal contains over two percent sulfur. Relative to the desire for low-sulfur coal to minimize air pollution by coal-burning power plants, Mr. Barber said: "It is not possible to fuel the entire country with low-sulfur coal. That amount of coal simply does not exist. We are confident that Midland's coal will continue to be marketed, and that other

means of dealing with the developing concepts of sulfur-related pollution will be found."

**TITANIUM**

A stockholder suggested that it might be more profitable to convert the ilmenite from Asarco's new mine in Manchester Township, New Jersey, into titanium sheet metal rather than titanium dioxide pigment.

"Asarco will not be in the business to produce either titanium dioxide or titanium metal," explained Mr. Barber. "The product we will produce, a concentrate containing about 63% titanium dioxide, has found an attractive market with Du Pont for the production of titanium pigments, and that is the basis upon which it has been possible to develop the mine.

"The contract with Du Pont, which provides for escalation to protect our margin, will not take our total production, and it is for ten years. If a market for the product we are mining develops in the metal side of the business and it is more attractive, we are, I hope, sufficiently astute businessmen to enter that market with the product that we will have available."

**PERU**

In the light of recent expropriation actions by the government of Chile, stockholder concern was expressed about the security of the Company's investment in Southern Peru Copper Corporation in Peru. Mr. Barber commented as follows:

"The Peruvian government has been trying earnestly to develop a nation according to their concepts of what is best for Peru. To date, these concepts have accommodated the continued growth of mining investments in Peru, and we are doing our best to fulfill our role of producing metals for export.

"They are the host government. I have no reason today to be other than cautiously optimistic that they will make the grade and that we will make the grade. I believe that they, too, learn by the experiences of others, and that they do not wish to impose on Peru the developments which have taken place in Chile.

"No government insurance is available for

investments in Peru of the sort you read about in the paper with respect to Anaconda in Chile. Peru has never entered into the treaty with the United States which is a prerequisite to the granting of so-called expropriation guarantees."

**CUAJONE**

A stockholder requested to be brought up-to-date on the financing of Southern Peru's Cuajone project, and Mr. Barber reported as follows:

"Southern Peru's investment to date in the Cuajone copper orebody is something over $50 million. The Peruvian government has given us every facility in accordance with the bilateral agreement negotiated a few years ago, and, as a result, the project is on schedule and proceeding as planned.

"We will have major commitments to make this summer under the bilateral agreement; we will be required to file a financing plan for the succeeding year. To date the financing for Cuajone has all been provided by Southern Peru from cash flow generated from the neighboring Toquepala mine. Over the last eighteen months, I, personally, and the other officers of the Company have devoted a great deal of time to dealing with the question of the financing to complete the project.

"It's perfectly obvious to us that there is a limit to the amount which private capital can invest in a project of this sort which is subject to the special risks which one encounters not only in Peru but in many overseas countries today. We have been in touch with what we call a consortium of companies interested in copper in Germany, Belgium, the United Kingdom and Japan. We have also been in touch with the Export-Import Bank of the United States and the International Finance Corporation.

"I was encouraged at the end of February when the Peruvian consultative group of the World Bank met in Paris. The press release which was issued at the end of that meeting said, in effect, that the countries of the Western world, to put it in its broadest sense, felt that they had an interest in seeing that the Peruvian government had an opportunity to achieve its

goals. That very general statement must include the Cuajone project, which is in many ways a crossroads project for Peru because of the contribution it will make, if successfully concluded, to export earnings and, therefore, to the economic wherewithal necessary to attain Peru's social and political objectives."

**AUSTRALIA**

A stockholder's question about new developments in Australia prompted Mr. Barber to comment that Mount Isa is just one continuing new development. "The mine is one of the greatest mines in the world," he asserted. "They have very large reserves of both copper ore and lead-zinc ore. The development of the copper orebody from 100,000 metric tons per year to 150,000 metric tons per year by 1974 is proceeding on schedule. The expansion of the Hilton lead-zinc-silver mine, about twelve miles north of Mount Isa, has been stretched out as announced in our Annual Report."

**ASBESTOS**

Recent reports of high incidence of lung cancer among asbestos workers were of deep concern to one stockholder. At Mr. Barber's request, Mr. Michael Messel, president of Lake Asbestos of Quebec, Ltd., an Asarco subsidiary, responded that an epidemiological survey conducted at Lake Asbestos found not one incident of cancer related to asbestos. "We are spending considerable money on medical research to get better acquainted with the subject," he said.

Mr. Barber indicated that there have been reports of some identification of health-related problems in persons working in closed areas installing asbestos products as distinguished from those who mine asbestos. Also, asbestos-related lung cancer seems to be associated with the so-called blue asbestos from South Africa, not the chrysotile asbestos mined in Quebec.

## ACTIONS TAKEN BY STOCKHOLDERS

The holders of 20,659,959 shares, or approximately 77% of the outstanding Common Stock of the Company, were represented in person or by proxy. This number constitutes a majority of the outstanding shares required by the Company's By-Laws for a quorum.

The following 13 directors, as named in the proxy statement, were elected to hold office until the next Annual Meeting:

Frank W. Archibald
Charles F. Barber
William R. Bond
F. L. Byrom
George Champion
Cris Dobbins
F. G. Hamrick
Ralph L. Hennebach
John M. Kingsley
R. E. McNeill, Jr.
Dale E. Sharp
Simon D. Strauss
Howard S. Turner

The proposal to approve the selection of Lybrand, Ross Bros. & Montgomery to serve as independent auditors for the Company for the calendar year 1972 was also approved by a substantial majority.

Registering for Annual Meeting

AMERICAN SMELTING AND REFINING COMPANY

[redacted]

THE MININ

Wed. Dec. 6, 1972
Record
Vol. 83, No. 49
p. 2

Published by
The Mining Record Co.

[redacted]

[redacted]

The Mining Record
U.S.3, Mo. 17, p. 1
Wed., Nov. 22, 1972

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

May 29, 1974

MEMORANDUM FOR THE RECORD:

The San Xavier oxide copper leach operation which went on stream in mid-1973, is designed to produce around 100,000 tons of copper metal during a period of eight years. Open pit mining will continue thereafter on the underlying sulphide ore.

The mine is located in a gravel covered pediment on the Papago Indian Reservation 2 1/2 miles north of the Mission Pit. Events which led up to its development began in December 1955 with the discovery by ASARCO geologists of porphyry copper type alteration-mineralization in a small outcrop surrounded by alluvium. This find was considered significant in that it could be a small exposure of a large body representing the northerly continuation of the Pima-Mission zone of mineralization.

A pospecting permit application was submitted, but the Papagos elected to invite competitive bids on a cash bonus basis. ASARCO's bid of $1,066,000 proved to be the winner, and by mid-1957 diamond drill exploration was underway. This program, carried out on a 600 foot triangular grid, found a modest sized copper deposit under the gravels near the outcrop and also demonstrated a sizeable extension of the Mission deposit into Reservation land.

Drilling was discontinued in 1958, as the average grade in both areas was marginal at then existing copper prices. With a steeply rising price curve in 1965, interspaced drilling was undertaken to more accurately define size and grade, which now amounts to a total of 176,000,000 tons at .54% cu.

J. H. Courtright

JHC:vmh

AMERICAN SMELTING AND REFINING COMPANY
EXPLORATION DEPARTMENT
P. O. BOX 5747, TUCSON, ARIZONA 85703

J. H. COURTRIGHT
CHIEF GEOLOGIST

1150 NORTH 7TH AVENUE
TELEPHONE 602-792-3010

April 17, 1973

Mr. Gordon Kidd
American Smelting and Refining Company
120 Broadway
New York, New York 10005

Dear Mr. Kidd:

Attached is a brief statement regarding the discovery of the

San Xavier copper deposits, Pima County, Arizona

Yours very truly,

J. H. Courtright

J.H. Courtright

JHC:kre

Encl: as noted

cc: J.J. Collins w/encl.
R.B. Meen w/encl.

The San Xavier copper deposits were explored by diamond drilling which began in 1957 after ASARCO, the successful bidder, had been awarded exploration permits on Papago Reservation lands. During the year previous a small mineralized outcrop 2 1/2 miles north of the Mission project had been found by Company geologists. This provided the clue which led to the discovery of the orebodies concealed beneath gravel beds ranging up to 200 feet in thickness.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

November 17, 1972

MEMORANDUM FOR: J.E.A. MacDONALD

GEOLOGIC RESUME
SAN XAVIER SOUTH
AND NORTH DEPOSITS

Both deposits are located on a bedrock pediment covered by gravels averaging 200 feet in thickness.

The copper ore underlying the San Xavier South property occurs within the northerly continuation of the Pima-Mission zone of pyrite-chalcopyrite mineralization in altered shales (argillites), limestones (tactites), and porphyry. Ore-grade concentrations are present as low angle, rudely tabular masses more or less concordant with the bedding of the sediments. Excepting for a thin, overlying blanket of oxidized chalcocite, the copper occurs as primary chalcopyrite with minor bornite. The zone is cut off on the north and at depth (±1300') by faults of post-mineral age.

The San Xavier North orebody lies within a northerly segment of the Pima-Mission zone of mineralization, separated by a large graben fault block containing barren sediments and volcanics. Moderately dipping arkosic sandstones with thin mudstone interbeds make up the host rock. Mineralized porphyry intrusives are present but rarely contain ore grade. Oxidation of a chalcocite blanket, resulting from leaching and enrichment of the mineralized sandstones, formed the Oxide orebody. This is underlain by primary chalcopyrite ore with very irregular assay boundaries.

J.H. Courtright

J.H. Courtright

JHC:kre

ment of all of the plaintiffs' claims, and shall not be credited against rents or minimum or production royalties hereafter payable under the mining leases.

JHC 1-5-72

IV. The production royalty for copper reserved in Paragraph 4(a)(3) of the mining leases shall remain unchanged to the effective date hereof, and thereafter shall be adjusted to the following schedule:

file: San Xavier Papago Res. Pima Co.

A. Production Royalty

1. Sulfide Ore

| Net Smelter Return Per Dry Short Ton of Ore | Royalty as % of Net Smelter Return |
|---|---|
| $3.50 or less | 5% |
| 3.51 - 3.74 | 6% |
| 3.75 - 3.99 | 7% |
| 4.00 - 4.49 | 8% |
| 4.50 - 4.99 | 9% |
| 5.00 - 5.74 | 10% |
| 5.75 - 6.49 | 11% |
| 6.50 - 7.49 | 12% |
| 7.50 - 8.49 | 13% |
| 8.50 and up | 14% |

2. Oxide Ore

| Year of Production (Year Ending September 17) | Royalty as % of Net Smelter Return |
|---|---|
| 1975 and prior years | 10% |
| 1976 | 12% |
| 1977 | 14% |
| All subsequent years | 14% |

V.A(1) Prior to September 17, 1973, ASARCO shall continue to pay the minimum royalties as set forth in the mining leases.

A(2) Commencing September 17, 1973, ASARCO shall pay in quarterly installments to the Superintendent of the Papago Agency of the BIA (herein "Superintendent") for the use and benefit of the lessors under Lease No. 454-2-60 a minimum annual royalty of THREE HUNDRED THOUSAND DOLLARS ($300,000), or the difference between the production royalty paid and such minimum royalty if

San Xavier

.55 leads - sulphide

10 lbs recovered

at 80¢ Cu - net smelter 60¢

$6.00/ton or 11% royalty

ASARCO NEWS

AMERICAN SMELTING AND REFINING COMPANY

120 BROADWAY, NEW YORK, N. Y. 10005



FOR IMMEDIATE RELEASE

April 3, 1972

# ASARCO ANNOUNCES START OF $13 MILLION COPPER PROJECT NEAR TUCSON

TUCSON, ARIZONA.--American Smelting and Refining Company (Asarco) announced today that Asarco had begun construction of a new $13-million copper project about 15 miles south of Tucson, according to Robert B. Meen, manager of Asarco's Southwestern Mining Department, the new facilities will produce about 1,000 tons monthly of 82-percent "cement" copper when the project is completed about mid-1973.

The copper will be recovered by a vat-leach process from oxide ore from an Asarco mine located on the San Xavier Indian Reservation. The leach plant and related facilities will be situated near Asarco's Mission mine and milling unit about 2-1/2 miles from the San Xavier mine.

The San Xavier property consists of two large deposits of low-grade sulfide ore averaging about .50 percent copper, each covered by a zone of oxide ore averaging about 1 percent copper. Following removal of the overburden, it is estimated that the oxide mining operation will extend about eight years at the projected production rate of 4,000 tons of ore per day.

The mineralization was discovered by Asarco geologists in 1957 following the Company's successful competitive bidding for a prospecting permit on the San Xavier

- more -

FOR FURTHER INFORMATION: William K. Murray / Gordon Kidd • (212) 732-9500; after 5 p.m.: 732-9524
Public Relations Department, American Smelting and Refining Company, 120 Broadway, New York, N.Y. 10005

ASARCO

reservation. A lease covering the mineralized ground was entered into with the Papago Indian Tribe in 1959. Copper-bearing silicious ore has been mined at San Xavier for several years for use as a converter flux at Asarco smelters.

In the vat-leach process, sulfuric acid flows over and percolates through the crushed oxide ore, picking up copper from the ore as it trickles downward. This "pregnant" solution is transferred to precipitation tanks, usually filled with de-tinned scrap cans. Iron in the cans precipitates the copper in solution. The resultant cement copper then is washed away from the cans, settled and dried, and shipped to a smelter for further processing.

"The new vat-leach plant at the San Xavier project will consume about 11 percent of the sulfuric acid produced at Asarco's new sulfuric acid plant at the Company's Hayden, Arizona smelter," Mr. Meen said.

This sulfuric acid plant was dedicated in January and is part of Asarco's $50-million program at its copper smelters to reduce sulfur dioxide emissions to the atmosphere by more than 50 percent and to remove practically all particulate matter from smoke streams.

"We are very pleased that we have been able to reach an agreement with the Papago Indian Tribe which provides for the resolution of all issues necessary to bring this project into being," Mr. Meen said.

# # #

PR-72-3-17

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

November 15, 1967

Memorandum to Mr. A. D. Coumides

Re: Estimated Operating Costs - Combined North and South San Xavier Leach Plant

As requested I have revised the North San Xavier operating cost to correspond with the new ore reserve assay (0.73 percent versus 0.71 percent used originally) and prepared an estimated operating cost for South San Xavier. For North San Xavier I am still assuming 80 percent recovery and an acid consumption of 55 pounds per ton; for South San Xavier I am assuming a recovery of 85 percent for an ore reserve estimate of 1.03 percent copper with an acid consumption of 80 pounds per ton. (For reference see my memorandum to Mr. Neen of March 13 concerning this same subject.)

| Item | $/Ton North San Xavier | South San Xavier |
|---|---|---|
| Tailing Haulage | 0.05 | 0.05 |
| Power | 0.04 | 0.04 |
| Labor | 0.12 | 0.12 |
| Operating Supplies | 0.83 | 1.26 |
| Maintenance | 0.06 | 0.06 |
| Supervision | 0.02 | 0.02 |
| Contingency | 0.10 | 0.10 |
| Total Direct | $1.22 | $1.65 |

The large increase in the estimated direct operating cost for South San Xavier when compared to North San Xavier is due to the higher acid consumption (plus $0.15 per ton) and higher iron consumption due to the increased amount of copper precipitated (plus $0.28 per ton). The increased acid consumption is mostly due to the inclusion of argillite-type ore in the ore reserve.

Yours truly,

ORIGINAL SIGNED BY
G. W. BOSSARD

G. W. BOSSARD
Milling Engineer

GWB:cnr

cc: TASheddan
RENeen

NSX-37

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

March 13, 1967

NSX-37

Memorandum to Mr. R. B. Meen

Re: ESTIMATED OPERATING COSTS - NORTH SAN XAVIER LEACH PLANT

The estimated operating costs (direct) for a 4000 tpd leach plant (357 days per year operation) located at the North San Xavier pit to treat 0.71 percent copper oxide ore, assuming 80 percent of the copper recovered is a saleable product, are as follows:

| Item | Salaries and Wages | Supplies | Power | $/ton Leached |
|---|---|---|---|---|
| Crushing Plant | | | | |
| Operations Including Supervision | $0.030 | $0.001 | $0.013 | $0.052 |
| Maintenance | 0.017 | 0.030 | - | 0.047 |
| Total Crushing Plant | $0.055 | $0.031 | $0.013 | $0.099 |
| Leaching Vats | | | | |
| Operations Including Supervision | $0.045 | $0.331 | $0.024 | $0.400 |
| Maintenance | 0.014 | 0.033 | - | 0.047 |
| Total Leaching Vats | $0.059 | $0.364 | $0.024 | $0.447 |
| Precipitation Launders | | | | |
| Operations Including Supervision | $0.022 | $0.484 | $0.001 | $0.507 |
| Maintenance | 0.003 | 0.001 | - | 0.004 |
| Total Precipitation | $0.025 | $0.485 | $0.001 | $0.511 |
| Tailing Pilace | | | | |
| Estimated from information obtained from Mr. J. J. Sense and includes direct labor, repair and supplies but not amortization or overhead (Two 25-ton trucks per day) | | | | $0.0[illegible] |
| | | | | $0.0[illegible] |
| Allowance for Contingencies | | | | $0.100 |
| | | | | $0.100 |
| Total Direct Leaching Cost | | | | $1.206 |

No estimate of indirect costs was made. The above figures were based on an average month of 29.8 working days to treat 119,200 dry tons per month.

In estimating the operating and maintenance costs, the salaries and wages for the first three sections above (crushing plant, leaching vats and precipitation launders were determined from a list of personnel requirements as proposed by this office and checked by Mr. Durrill. Crushing plant supplies and power

estimates for both operations and maintenance were based on Silver Bell crushing plant data as the proposed North San Xavier crushing plant flow sheet is similar to the present Silver Bell flow sheet. Leaching vat supplies (mostly acid) were based on the pilot plant experience. Leaching vat maintenance (total labor and supplies) was calculated to be three percent of the estimated capital cost for this section ($2,231,000) on an annual basis. The precipitation launder operating costs were based on Silver Bell operating information where applicable and an estimated iron consumption of 15 lbs Fe/lb Cu recovered as indicated by Mission Unit test results. The large allowance for contingencies included in this estimate is due to our lack of experience with gantry crane/leaching vats operation and maintenance and also to offset unexpected high acid or iron consumption.

A direct comparison between the operating cost information presented in Mr. Vincent's memorandum of August 8 to Mr. Lewis and my estimate is presented below:

| Item | $/ton J.D.V. | G.W.B. | |
|---|---|---|---|
| Ore & Tailing Haulage | 0.05 | 0.05 | (No ore cost included) |
| Power | 0.06 | 0.04 | |
| Labor | 0.11 | 0.12 | |
| Operating Supplies | 0.70 | 0.82 | |
| Maintenance " | 0.06 | 0.06 | |
| Supervision | 0.02 | 0.02 | |
| Contingency | 0.10 | 0.10 | |
| Total Direct | 1.10 | 1.21 | |

Mr. Vincent's figures have been changed by reducing Ore and Tailing Haulage by $0.10 to present a more valid comparison.

Included in the appendix of this memorandum under Tables 1-A through 1-D, inclusive, is the break-down of estimated operating costs for each section. Given under Tables 2-A through 2-D, inclusive, are the estimated personnel requirements for each section. These latter tables also show an equivalent present classification and wage-salary rate for all personnel listed. The indicated total operating and maintenance man shifts per day is 28.25 and includes two truck drivers. The total number of hourly classifications is 14.

Yours truly,

G. W. DOSSARD
Assistant Milling Engineer

GWB:cmr

cc: TASnedden

SLB
DKH

J.J.S
AUG 8 1967

ASARCO
AUG 08 1967
MISSION UNIT

S.L.B.
AUG 8 1967

740 Las Lomitas Road
Tucson, Arizona 85704
July 27, 1967

Dr. John E. Kinnison
American Smelting and Refining Company
P.O. Box 5795
Tucson, Arizona 85703

Dear John:

The attached letter to you concludes this phase, at least, of the study of the San Xavier North orebody.mineralogy. Identification of minerals is firm, and the mineralogy is basically simple in terms of the number of species present. As is expressed within, however, quantitative data is far less soundly based.

I hope that the report is of use. I will be happy to discuss and further develop any part of it upon my return to Tucson early in September. I have retained all samples and remaining splits of samples in my office for consideration then.

Best regards,

John M. Guilbert

John M. Guilbert

August 1, 1967

Mr. John E. Kinnison, Senior Geologist
American Smelting and Refining Company
P. O. Box 5795
Tucson, Arizona 85703

San Xavier North
Mineralogy

Dear John:

This report amplifies and replaces my handwritten letter to you of July 2, 1967. Examination of the eight speciments from the San Xavier North deposit is completed, and the results of my study of its mineralogy are herewith submitted. The problem proved to present formidable difficulties in the estimation of relative mineral abundances, but the objectives set out in your letter to me of May 18 have generally been met.

The samples studied are described in detail in your memo to J. H. Courtright of May 23, 1967 (SX-10.10) and D. K. Hall's memo to S. L. Tainter of June 21, 1967 (MIS-10.6.0/2). They consisted of 2000 gram diamond drill core composit samples representative of the volumes designated in their numbers and crushed to approximately minus one quarter inch. The word 'Block' should be prefixed to all sample numbers cited below.

A quarter of each sample was split out with a Jones splitter, ultimately for flotation testing. The remaining 1500 g sample of each was dry screened into four fractions, +5 mesh, -5+10 mesh, -10+16 mesh, and -16 mesh, the cutoff for fines being placed at the level of vanishing usefulness for efficient mineral study with the binocular microscope. John W. Anthony Junior was employed at my suggestion for the tedious but necessary task of going carefully through the +16 screen sizes and preparing picked concentrates of the recognizable minerals, a job which he performed, along with several hours of calculation, remarkably well. The preparation of a concentrate was demanded for both optical and chemical appraisal of absolute and quantitative mineralogy. Quantitative appraisal by any technique - optical, x-ray, or chemical - would have been greatly impeded and degenerated by working with the dispersed samples.

Each concentrate, and its picked-over waste, was carefully studied with the binocular microscope. Picking was of course more effective in the coarsest fraction, where nearly total recovery was made. X-ray patterns and chemical-optical tests verified the presence of the following minerals, in amounts of decreasing importance:

Chrysocolla. Nominally $CuSiO_3 \cdot 2H_2O$, several modern texts (eg. Kraus, Hunt, & Ramsdell) cite it as $CuSiO_3 nH_2O$. Chrysocolla is supposed to have an X-ray pattern -- diffuse and weak, but measurable -- but commonly it is either amorphous or so close to it that no pattern is produced. The San Xavier chrysocolla is in the latter category -- no pattern. A. F. Rogers in 1917 called material of this nature 'cornite', a bad mineral name (since amorphous $CuSiO_3 \cdot nH_2O$ is not technically a mineral) but perhaps not a bad in-house term. A paper by Chukrov entitled "On the nature of Chrysocolla" (translated from Russian, copies available from my office) relates it to the montmorillonite structure. Chrysocolla takes many forms generally and at San Xavier. At San Xavier it ranges from deep bright blue, in nearly pure form (no impurities), though myriad shades of bluish green to the very palest of pastel green when it is commonly absorbed into a principally kaolinitic aluminous gel. It ranges in composition from a few tenths copper up to 30%, depending on its dilution by silica -- alumina gel. The profusion of colors and forms in San Xavier North materials suggested that many copper oxide minerals, e.g. aurichalcite, olivenite, etc., might be present, but all suspects proved to be amorphous chrysocolla. Its great variation in composition defeats rigorous point counting -- how do you practically count a pale green grain next to a bright blue one? -- and its amorphous 'structure' defeats X-ray quantification. Optical appraisal plus chemical control is all that remains.

Malachite. Typical emerald green massive to radiating units with less common plate-like, leafy, crystalline joint paint and bright green earthy material.

Azurite. Normal azure blue, massive, crystalline to earthy.

Chalcopyrite. Normal in color and habit.

Secondary chalcocite. As steely-looking ultra-thin films coating pyrite and as more massive (but still fine-grained) deep rims on chalcopyrite. Traces of secondary covellite on chalcopyrite were also noted. All chalcocite and covellite cited is of supergene origin.

Melaconite. Another amorphous phase, resembling manganese oxide stain but distinctively granular and slightly grayer.

Bornite. Locally associated with chalcopyrite.

Cuprite. Adamantive luster, black in color, but with distinctive red streak and flecks.

Native copper. One grain, in a veinlet. Associated minerals of interest: pyrite, abundant in some specimens; molybdenite, noted in only one; goethite, conchoidal fracture, extremely hard, resinous looking; manganese oxide, earthy, black; and jarosite, bright very slightly orangey yellow, earthy, the only sulfate in the specimens.

After careful quantitative appraisal of the picked concentrates in each size range and for each specimen, the concentrates were recombined to constitute one +16 mesh concentrate per sample number. These samples were split in thirds, one third going to Hawley & Hawley (the 'C' series in the assay report*) for Cu oxide (Mission method), Cu sul, and $CO_2$, one third going to George Roseveare for ammonia leach copper oxide (which leaves chrysocolla and chalcopyrite undissolved), and one third retained.

A quarter of the recombined +16 mesh picked waste was submitted to Hawley & Hawley as the 'W' series, and a quarter of the fines was submitted as the 'F' series to check for grain size bias in the samples by comparison with whole sample analyses provided. The 'W', 'C', and 'F' series combined give whole sample reconstructions. Agreement is good to excellent. Assays of the 'W' series are higher than might be expected owing to the fact that they include 'waste' from the -10+16 sizing which was difficult to pick as clean as the +5 and -5+10 sizings were. It is probably unnecessary to explore in any depth the problems of Cu oxide analysis, especially with respect to chrysocolla and dramatically with respect to the obviously great variation in occurrence of San Xavier North chrysocolla. $CO_2$ was asked for to evaluate malachite (20% $CO_2$) and azurite (25% $CO_2$), hopefully in the absence of Ca and Mg carbonates (reported as nil in the whole sample assays). $CO_2$ was determined by adding a known weight of sample to a known weight of 50% HCl and taking weight loss as effervesced $CO_2$. The Hawley & Hawley assays would ideally report everything except chalcocite, chalcopyrite, and bornite as oxide copper, these minerals as sulfide copper. Roseveare's assays report everything but chrysocolla and chalcopyrite as ammonia soluble copper, the remainder being insoluble. Agreement between Roseveare's and Hawley & Hawley's total copper assays is generally poor, although consistently in the same sense. The problem hopefully lies in the splitting, although one is hard pressed to be confident in that explanation. Fortunately, the most significant data are the ratios, presumably internally valid. Selected sample assays are appended to this report, the remainder of the data remaining available if requested. The results reported below, for obvious reasons, are more considered judgements taking all data into account than rigidly derived, computational outputs.

Flotation results, and results from close examination of floated sulfides, are also included in the discussions below. Flotation results as weight per cent total sulfides are appended.

## SAMPLE DESCRIPTIONS

### General

The upper blocks are decidedly richer in total oxide to sulfide mineralogy. Indeed, the 'upper' series was so visibly impoverished in sulfide minerals that it was deemed wasteful to submit them for flotation testing. The most common rock type in all samples is what appears to be an altered arkosic rock or conceivably an aplite, with subordinate amounts of a dark siltstone, with fragments of vein matter and unidentifiable lithic fragments. The arkose is mineralized, containing iron oxide spots in the 'upper' series and very commonly showing pyrite-chalcopyrite specks in the 'lower' blocks. Again, 'chrysocolla' can only be a vague term.

*Repeated in part in Appendix to this letter. Please attach complete form upon receipt.

In the following telegraphic sample descriptions, the figures cited are considered estimates of the amount of total copper represented by the respective minerals followed by volume per cents. The following factors are applicable.

| | | | |
|---|---|---|---|
| Bright blue chrysocolla | taken | as | 30% Cu |
| Pale green | " | " | 5% Cu* |
| Malachite | " | " | 60% Cu |
| Azurite | " | " | 60% Cu |
| Melaconite | " | " | ~~45% Cu~~ 40 |
| Cuprite | " | " | 90% Cu |
| Chalcocite | " | " | 80% Cu |
| Bornite | " | " | 60% Cu |
| Chalcopyrite | " | " | 35% Cu |

Block I Upper

| | | |
|---|---|---|
| Malachite | 48 Cu% | 25% vol |
| Chrysocolla | 43 Cu% | 70% vol |
| Azurite | 9 Cu% | 5% vol |

Native copper in a veinlet with trace cuprite-negligible
Goethite abundant
Mn oxides abundant, but nothing resembling melaconite
Few specks pyrite and chalcopyrite in arkose; most arkose fragments specked with Fe oxide. No chalcocite.

Block I Lower

| | | |
|---|---|---|
| Malachite | 55 Cu% | 30% vol |
| Chrysocolla | 35 Cu% | 60% vol |
| Chalcopyrite | 7 Cu% | 8% vol |
| Chalcocite | 3 Cu% | 2% vol |
| Bornite | neg. | trace |
| Melaconite | neg. | trace |

Chalcopyrite fine grained, much more abundant than trace bornite. Chalcopyrite more common than pyrite (about 5%) Chalcocite gives deep rims on chalcopyrite, thin on pyrite. Some Fe and Cu stained ox arkose. Essentially no goethite, Mn ox. Sulfides lowest of 'Lower' series.

Block 2 Upper

| | | |
|---|---|---|
| Chrysocolla | 65 Cu% | 90% vol |
| Malachite | 35 Cu% | 10% vol |
| Melaconite | neg. | traces |

Minor bright blue chrysocolla, abundant pale green staining. No azurite, no sulfides seen. Goethite, Mn ox present, but not heavy. Arkose stippled with Fe ox.

*With gradations between

Block 2 Lower

| | | |
|---|---|---|
| Malachite | 49 Cu% | 32% vol |
| Chrysocolla | 34 Cu% | 62% vol |
| Chalcocite | 12 Cu% | 4% vol |
| Chalcopyrite | 5 Cu% | 3% vol |
| Melaconite | neg. | 2-3% vol |

Pyrite slightly more abundant than each of other suls. No azurite, other oxides. Jarosite present, minor goethite. Some arkose fragments contain Fe ox spots, some sulfides. Looks like oxide-sulfide interface.

Block 3

| | | |
|---|---|---|
| Chrysocolla | 48 Cu% | 82% vol |
| Malachite | 40 Cu% | 10% vol |
| Chalcocite | 5 Cu% | 1% vol |
| Chalcopyrite | 6 Cu% | 3% vol |
| Melaconite | 1 Cu% | 4% vol |
| Azurite | neg. | trace; one speck |
| Bornite | neg. | trace; one glint in chalcopyrite |

Pyrite present, about 2 vol %; one quartz-molybdenite fragment. Minor goethite, traces Mn ox. Mixed sulfidic and oxidized arkose fragments. Chrysocolla abundant, far more than in other specimens; but mostly low-in-copper light green stains: probable leach problem. Secondary chalcocite on pyrite and chalcopyrite in quartz veinlet fragments. Few pieces show malachite replacing chalcocite after chalcopyrite. Several relatively large pieces chalcocite.

Block 4 Upper

| | | |
|---|---|---|
| Malachite | 50 Cu% | 40% vol |
| Azurite | 40 Cu% | 35% vol |
| Chrysocolla | 5 Cu% | 23% vol |
| Melaconite | neg. | 2% vol |
| Chalcocite | neg. | 2 small specks |
| Chalcopyrite | neg. | 2 small specks |

Chrysocolla relatively copper rich, taken as 20% cu. Sulfides vanishingly rare, essentially none. Arkose fragments predominently oxidized. Jarosite possibly 1% of concentrate. Probably right to Cu ox - Cu sul interface.

Block 4 Lower

| | | |
|---|---|---|
| Azurite | 38 Cu% | 38% vol |
| Malachite | 32 Cu% | 34% vol |
| Chrysocolla | 9 Cu% | 20% vol |
| Cuprite | 4 Cu% | 2% vol |
| Chalcocite | 12 Cu% | 2% vol |
| Chalcopyrite | 5 Cu% | 1% vol |
| Bornite | neg. | 1 rel. large piece |
| Covellite | neg. | 1 patch on chalcopyrite |

Block 4 Lower (cont'd)

No melaconite, sparse Fe and Mn ox. Several pieces show jarosite. Abundant fresh pyrite with sparse chalcocite coatings.

Block 5

| | | |
|---|---|---|
| Malachite | 58 Cu% | 40% vol |
| Chrysocolla | 23 Cu% | 53% vol |
| Chalcocite | 8 Cu% | 4% vol |
| Chalcopyrite | 4 Cu% | 4% vol |
| Cuprite | 7 Cu% | 3% vol |
| Bornite | neg. | neg. |
| Covellite | neg. | trace |
| Melaconite | neg. | trace |

Pyrite abundant, up to 15% of concentrate sample. Most arkose fragments oxidized, many veined with malachite veined by cuprite. Jarosite slightly more abundant but still minor. No azurite. Chalcocite as thin films on pyrite. Arkose fragments abundantly sulfidic, less than half of fragments oxidized.

## CONCLUSIONS AND DISCUSSION

This task has not been one to make a scientist sleep well; indeed it is with some temerity that the foregoing conclusions have been stated. Internal inconsistencies in the assay data, doubtless stemming from basic uncertainties in the chemistry and mineral responses, difficulties of rigorous distinction between, for example, earthy malachite and medium-copper-content chrysocolla*, and difficulties of appraisal of copper in chrysocolla definitely jeopardize the data. The best has been done with the materials and funds available, however, and the 'lines of best fit' with the data at hand have been drawn. I 'feel' that chrysocolla should have come out as a more important phase, with carbonates less so, but the sample-to-sample decisions (and to a reasonable extent the assay data), belie this conclusion. Sulfide copper is generally low, consistent with analysis. I am most distrustful of the $CO_2$ determinations and the ammonium carbonate leach, and suggest that refinement of these data will require a considerable expeniture, principally on quantitative study (and assay responses) of the chrysocolla.

In spite of the above reservations, posting of results on the sketch map is revealing. All quantitative work was done with no knowledge of sample geography. Immediately evident is a great decrease in carbonates to the southwest. Azurite is important in Block 4 (NE), minor in I U (Central, Upper), and unreported generally in the southwest portion, either upper or lower. Malachite accounts for over half of the copper in the NE and N with progressively less of it to the SW, save for an anomalously high value in Block 2 lower. Sulfides are less constant in their variation--both analysis (see appendix) and binocular inspection indicate relatively high chalcocite both in Block 4 Lower at the NE and 2 Lower at the SW.

*Probably the single greatest error, if one exists.

Block 5 contains the most total sulfide, with both 2 Lower and 4 Lower close behind. The only covellite detected is in the NE in Block 5 and Block 4 Lower. The significance of the variations can best be interpreted by those more familiar with the geology of the San Xavier North orebody.

Very truly yours,

/S/ John M. Guilbert

John M. Guilbert

JHG/pjc

cc: TASnedden
RBMeen
PALewis
JHCourtright
JGuilbert
JEKinnison
File

# APPENDIX

| | Original Assays | | C Series, H & H | | | C Series, Roseveare | | | Flotation Test | H & H Data |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ox Cu | Tot Cu | Ox Cu | Sul Cu | $CO_2$ | Tot Cu | Am. Carb. Sol. | Diff. | Wgt % Sulfides | Recalc to Tot Cu |
| 1 U | 0.58 | 0.64 | 2.76 | 0.04 | 1.90 | 1.72 | 0.97 | 0.75 | ND | 0.62 |
| 1 L | 0.45 | 0.63 | 1.85 | 0.52 | 3.70 | 3.35 | 1.75 | 1.60 | 0.86 | 0.69 |
| 2 U | 0.69 | 0.80 | 2.54 | 0.04 | 0.20 | 3.20 | 1.81 | 1.31 | ND | 0.91 |
| 2 L | 0.59 | 1.17 | 3.16 | 0.22 | 1.06 | 2.23 | 0.70 | 1.53 | 1.34 | 1.13 |
| 3 | 0.61 | 0.77 | 1.86 | 0.17 | 1.06 | 1.82 | 0.60 | 1.22 | 1.23 | 0.83 |
| 4 U | 0.44 | 0.47 | 2.16 | 0.02 | 0.19 | 2.36 | 1.45 | 2.13 | ND | 0.49 |
| L | 0.34 | 0.57 | 2.86 | 1.17 | 0.43 | 1.67 | 1.11 | 0.56 | 1.35 | 0.79 |
| | 0.95 | 1.17 | 3.54 | 0.29 | 2.32 | 4.04 | 2.60 | 1.44 | 1.83 | 1.16 |

**Note:** These data are presented without individual comment. They may not compare favorably, item for item, with the preceding sample descriptions, the best judgement based on the most data being given preference. The $CO_2$ values are highly suspect.

July 19, 1967

FILE MEMO

RE: Core Assays San Xavier North Ore Body

During leach test work on the San Xavier North oxide ore body, two composite samples were made by taking a ½ split of the stored half of the diamond drill core (or a ¼ split of the original core size). The first of the two composites was taken almost entirely from the main zone of oxidation. The second composite was made from the transitional oxide-sulfide zone at the base of the main oxide zone. A further group of composites, for the purpose of mineralogical tests, was made from the final ½ of the stored core from the main zone of oxidation. The total copper assays from the above group of composites when compared with the total copper assays for the same composites calculated from the original drill core assays, indicate that the original drill core assays were "high graded," possibly to the extent that a .95 factor should be used to calculate the assay for the San Xavier North oxide ore reserve.

The composites, their respective actual assays and their calculated assays (from original drill core assays) are:

Composite #1

Lab leach test composite of main oxide zone prepared in May, 1966, leach results reported to J. D. Vincent by A. R. Raihl on 7/22/66

0.83 percent total copper calculated from original drill core assays

0.77 percent total copper - actual assay of composite sample

Composite #2

Lab leach test composite of mixed oxide sulfide zone prepared in March, 1967, leach results reported to S. L. Burrill by A. R. Raihl on 4/14/67

0.76 percent total copper calculated from original drill core assays

0.70 percent total copper - actual assay of composite

Composite #3

Mineralogical composites of main oxide zone prepared by J. E. Kinnison (refer to memo from Kinnison to J. H. Courtright, May 23, 1967, "Composite Core Samples San Xavier North Mineralogy")

| Composites | Footage Represented | Composite Sample Total Cu Assay | Total Cu Assay Orig Drill Core Avg. | Diff |
|---|---|---|---|---|
| SXN Comp Block 1 upper | 169.6 | .64 | .71 | -.07 |
| " " " 1 lower | 54.3 | .63 | .75 | -.12 |
| " " " 2 upper | 119.4 | .80 | .84 | -.04 |
| " " " 2 lower | 142.5 | 1.17 | 1.23 | -.06 |
| " " " 3 | 119.8 | .77 | .94 | -.17 |
| " " " 4 upper | 108.7 | .47 | .56 | -.09 |
| " " " 4 lower | 135.2 | .57 | .74 | -.17 |
| " " " 5 | 183.0 | 1.17 | 1.33 | -.16 |
| Weighted Average | 1032.5 | .81 | .92 | -.11 |

It is significant that the actual assay of each and all of the composites is lower than the calculated assay from the original drill core samples. In each of the composites derived from quartering the core the actual assay of the composite was 0.06 percent lower than the assay calculated from the original drill core assays. The composites of the main oxide zone prepared from the core remaining after quartering, averaged 0.11 percent copper lower than the calculated assays from the original drill core samples.

The apparent "high grading" of the original drill core assays can be explained by the core splitting technique used at the time of the development drilling program, aggravated by the nature of the oxide mineralization. A "single jack" type of hammer was used to split all core on the San Xavier North ore body during the recent development drilling program, creating considerably more fines than would result from using a core splitter. All fines were put into the assay sample. A considerable amount of occasionally soft, often brittle oxide mineralization occurs as fracture fillings in the oxide ore body which apparently tended to concentrate in the fines during the splitting.

The same splitting techniques were used during quartering of the composites 1 and 2 as were used in splitting the original core assay samples. The quartered core was therefore apparently "high graded" in the same manner as were the original drill core samples. This is indicated by the greater difference in the total copper values and the calculated total copper values (from original core assays) of composite group 3 when compared to those of composite group 1.

It is unfortunate that the possibility of or the seriousnous of the systematic error which apparently occurred during the splitting of the core for the San Xavier North ore body was not evident until after the drilling program was completed. I personally became aware of the possibility a systematic error might occur due to the method of core splitting used, when discussing that method with Mr. J. E. Kinnison in April or May of 1967.

Possibly a valid figure for the total copper assay of the oxide ore body could be found by considering the mean deviation of the actual composite assays and the calculated assays (from original core assay samples) for the previously mentioned composites 1 and 3 which were prepared to represent the oxide ore body.

| | | | |
|---|---|---|---|
| m dev | comp 1 | = | 0.030 percent copper |
| m dev | comp 3 | = | 0.055 percent copper |
| m dev | composites 1 & 3 | = | .085 ÷ 2 = .0425 percent copper |

The mean deviation for composites 1 and 3 is approximately 5 percent of the total copper assays for composites 1 and 3. This indicates that the average assay for the San Xavier North oxide ore body calculated from the original drill core assay is 5 percent above the actual value of the material contained within the oxide ore body. The 5 percent figure is not necessarily the actual amount of systematic error induced by the sampling during the development drilling program. This is so because the composites which were prepared to represent the oxide ore body necessarily contain approximately 30 percent of material from the original drilling program.

The zone of chalcocite enrichment as indicated by the actual and calculated assays of composite 2 of this memo (where the copper mineralization is approximately 80 percent chalcocite) appears to be "high graded," apparently to the same degree as the oxides. Chalcocite, a soft somewhat brittle mineral, tends to replace the more easily accessible chalcopyrite on fractures and, like the oxides, it tends to concentrate in the fines during splitting. Because of the disseminated nature of the primary sulfide mineralization, it is possible that less "high grading" occurred in that part of the San Xavier North ore body; however, this has not been verified.

D. K. HALL

DKH:tt

AMERICAN SMELTING AND REFINING COMPANY
Sahuarita Arizona
June 22, 1967

MEMORANDUM TO MR. P. A. LEWIS

Re: San Xavier North Drill Core Composites

Attached please find three (3) copies of the various assays requested by Mr. J. E. Kinnison for the eight (8) drill core composites from the San Xavier North oxide ore body.

D. K. Hall
Resident Geologist

DKH:jl

cc: RBMeen (2)
SLTainter
File

AMERICAN SMELTING AND REFINING COMPANY

**MISSION UNIT**

## NSX COMPOSITES — Work Sheet

Samples

| | LAB No | % Cu | % NIS Cu | % Fe | % $SiO_2$ | % $CaCO_3$ | % $MgCO_3$ | % Ol. | % S |
|---|---|---|---|---|---|---|---|---|---|
| NSX COMP BLOCK [illegible]PER | 3235 | .639 | .578 | 2.3 | 74.2 | NIL | NIL | 6.3 | .06 |
| ✓ ✓ [illegible]-PER | 36 | .627 | .452 | 2.2 | 74.9 | NIL | NIL | 12.4 | .28 |
| ✓ ✓ [illegible]PPER | 37 | .802 | .694 | 2.3 | 68.0 | NIL | NIL | 15.0 | .10 |
| ✓ ✓ [illegible]ER | 38 | 1.171 | .593 | 2.0 | 70.2 | NIL | NIL | 12.3 | .29 |
| ✓ [illegible] | 39 | .771 | .608 | 2.1 | 73.7 | NIL | NIL | 11.3 | .14 |
| ✓ ✓ [illegible]PER | 41 | .473 | .442 | 2.2 | 76.7 | NIL | NIL | 4.8 | .04 |
| ✓ ✓ [illegible]ER | 42 | .565 | .338 | 2.4 | 71.7 | NIL | NIL | 9.6 | .50 |
| ✓ [illegible] | 3-43 | 1.174 | .952 | 2.9 | 72.3 | NIL | NIL | 1.9 | .40 |

S.L.T.

2 10-7

R Burton

2/3/67

3.0
NSX-18

Preliminary Design Factors
4,000 TPD Leach Plant - North San Xavier

## PLANT LOCATION

Plant to be located in the Western half of the Southwest quarter of Section No. 24. Leach ore to be hauled in 85-ton Dart-KW trucks approximately 0.5 miles from Southeast corner of proposed pit perimeter. Tailing disposal area to be West of leach plant in North half of Southeast quarter of Section No. 23. Actual plant location to be 600 ft South of maximum possible pit perimeter based on possible ore reserve. Utilities to be estimated and laid out to plant-site perimeter by Mission Unit. Power will be available as required at 4,160 volts. Available water delivered from 8 in. main will be a maximum of 250 gpm continuous flow discharging into a ground-level reservoir sump or steel tank for process and fire protection purposes. Roads to the site perimeter to be estimated by Mission Unit: roads within the plant-site area to be estimated by General Engineering. Approximate plant site to be 1000 X 3000 ft.

## PIT OPERATION

4,000 tpd of leach ore will be loaded with a rubber-tired front end loader (5-6 $yd^3$ bucket) in a seven-hour shift at an approximate rate of 600 tph. Fragmentation will not be a problem according to Mission mine personnel. Top size of boulders to be 24-30 inches on the average. Haulage to the primary crusher will be in 85-ton Dart-KW trucks carrying 70-75 tons per load.

## PRIMARY CRUSHER

Trucks will dump from one side only as practiced at Silver Bell. A grizzly ahead of the crusher will not be required. The pit front-end loader should be able to load up to 700 tph, and the pan feeder following the crusher should be selected accordingly. The primary crusher will be a 42x65 in. Traylor Type TC gyratory capable of crushing up to 1000 tph at a 5 in discharge opening

(closed side). Drive motor horsepower will be 275 hp. A pan feeder of 700 tph capacity will be required. A 48 in. width pan feeder will handle approximately 700 tph at a speed of 35-40 fpm. A separate dust collection system will be desireable for the primary crusher. Also, a separate lubrication system will be necessary. Overhead crane service will be necessary for rock-hook and crusher maintenance.

## INTERMEDIATE STORAGE

The minimum amount of live ore storage at the intermediate stockpile should be 5,000 tons to carry the secondary crushing plant through a one-day shutdown of the primary crusher. Two or three Syntron-type vibrating feeders discharging in-line with a collecting belt will be required. Assuming an effective 15 percent live-ore factor, the total tonnage in the stockpile will be 35,000 tons. The assumed angle of repose is 37° and the assumed draw-down angle at the draw-point is 55°. The capacity of the vibrating feeders will be a nominal 300 tph each. A separate dust collection system will be required.

## SECONDARY CRUSHER

A double-deck vibrating screen to handle 300 tph of 85 percent minus 5 in. ore from the intermediate stockpile will be required. The top deck will be a 1-1/2 in. oast grizzly; bottom deck will be equipped with a 3/8 in. square opening cloth. A 4 ft × 10 ft unit will be suitable for estimating purposes. The secondary crusher will be a 5-1/2 ft heavy-duty Symons standard head cone crusher operating at a 1 in. discharge setting. Hydraset adjustment of the crusher will be desireable. A separate lubrication system will be required, and a dust collection system for all vibrating screens and both fine crushers will be necessary. A 200 hp drive motor is required.

## TERTIARY CRUSHER

A surge bin (500 Ton) between secondary and tertiary crusher should possibly be studied. (Mission practice.) The preliminary crusher calculations

indicate a good balance between secondary and tertiary crushers, and if hydraset adjustment of both crushers (fine) is furnished, the need for the surge bin may be eliminated (Silver Bell). A 7 ft Symons short head cone crusher (1/4 in. disc charge setting) operating in closed-circuit with a 6x20 ft (or equivalent) single-deck vibrating screen will be required. The screen cloth will be of 3/8 in. square opening design. A separate lubrication system will be required. The drive motor will be 300 hp.

## VAT LOADING

Vat loading will be by a belt tripper mounted on a traveling bridge spanning the 75 ft wide leach vats. The loading conveyor will be loaded either (1) directly from the crushing plant over two seven-hour shifts at the rate of 300 tph, or (2) from a crushed ore stockpile with the front-end loader from the pit at a rate of 600 tph on a single shift of seven hours. The advantage of the latter idea is that the number of vats leaching at one time could possibly be reduced to or kept to six in number (5-2/3 shifts leaching versus 5-1/3 shifts if two-shift loading is considered. The advantage and disadvantages of the two loading rates should be examined more closely.

## LEACHING VATS

The settled weight of the minus 3/8-in. material following solution wetting will be 92 lbs per cubic foot (based on dry material). In 75X75 ft square vats the required height for ore would be 15.5 ft. An additional 1.5 ft of depth will be required for filter bottom construction and 1.5 ft of freeboard for solution over ore is necessary. Therefore, the leach vat walls will be 18.5 ft high. Mastic linings or acid-proof concrete linings will be required to protect the concrete vats from the action of the acid. The Inspiration design of a continuous, looped launder system is preferred to the Yerington arrangement. The former system utilizes individual vertical pumps for solution advance and recirculation; the latter system uses air-lifts for the same duties. Also, the Yerington vats are isolated from each other and do not share a common wall.

## VAT UNLOADING

The present plans are to unload the leach vats, following a 4-8 hour draining period, at the rate of 300 tons per hour (nominal) with a gantry crane equipped with a 4-yd clamshell bucket. The total excavation time would be approximately 14 hours or two seven-hour shifts per day. The tailing would either be loaded into a small hopper (60 ton) and discharged into a 65-ton capacity LeTourneau-Westinghouse truck (Haulpack) or directly into the trucks. On the basis of a 300 tph excavation rate and a 60-ton nominal truck capacity, only five trips per hour will be necessary for tailing haulage. No more than two trucks will be required for this haulage duty. These trucks are available at Mission.

An excavation rate of 600 tph as an alternate should also be considered. This would free the leach vat for inspection and maintenance one shift earlier. Also, the trips per hour of tailing haulage would be increased to 10, a figure which might be handled by three trucks.

## SOLUTION STORAGE TANKS

Pregnant Solution Storage - The volume of pregnant solution produced per day will be approximately 350,000 gals based on a solution assay of 15 ppl of Cu and an average copper production figure of 44,000 lbs per day. Solution will be pumped to the storage tank at a rate of 1000 gpm over a six hour period, and will be withdrawn at an average rate of 250 gals. per minute to a settling thickener for clarification. The assumed size of the clarifying thickener (stainless steel tank and rakes) is 30 ft dia. by 8 ft high. Thickener underflow to be discarded and overflow will go to precipitation. A pregnant solution storage tank or sump of 400,000 gal. capacity is required.

First Wash Solution Storage - The required amount of first wash solution over a 24-hour period will be 350,000 gals to replace pregnant solution sent to precipitation and 335,000 gals required to replace leach solution used to cover

new ore. The solution will be pumped out of storage at the rate of 1000 gpm, first for a total of 335,000 gals and several hours later the remaining 350,000 gals would be removed. Therefore, a 600,000 gal first wash tank will be added to this tank.

Second Wash Solution Storage - The amount of first wash to be advanced to second wash is 585,000 gals minus 175,000 gals of barren solution or 410,000 gals of first wash solution. A first wash storage tank of 500,000 gals is ample. All fresh water added as make will be added to this tank.

Fresh Water Storage - Sufficient fresh water, either in a ground reservoir or cylindrical tank must be available to allow a fresh water flow rate of 1000 gpm for 5 hours approximately in addition to other water requirements. The apparent minimum storage requirement will be 400,000 gallons without considering replacement at the rate of 250 gpm. The whole water system design will require detailed study.

CEMENTATION LAUNDERS

Silver Bell launders are 8' wide, 24' long and 4' deep. In 10 cells there would be 7680 $ft^3$ of active volume. These cells have precipitated 20,000 lbs copper/day or at the rate of 0.38 $ft^3$ of volume per lb Cu precipitated. This figure is for low assay solutions (±1 G/L). Yerington practice on high grade solutions (22 G/L) uses 0.18 $ft^3$/lb Cu precipitated. For our proposed solution assay at 15 G/L Cu, a figure of 0.3 $ft^3$/lb Cu seems reasonable. At 44,000 lbs of copper to be precipitated per day, this would require 13,200 $ft^3$ of active cell volume, or 8 cells @ 10 ft wide, 5ft deep and 33 feet long.

Since the cementation cells are to be served by a mobile crane, rather than an overhead Gantry, no trommel screen will be needed. Rather, the Silver Bell washing procedure and cell design may be used, with modifications for cell size, etc.

Alternate precipitation methods would be cementation using Kennecott cone precipitators and electrodeposition.

Pregnant solution volume is estimated to be 350,000 gals/day or a flow rate of 243 gpm @ 15.0 G/L Cu to produce the daily output of 44,000 lbs of copper. Some of the barren solution from cementation may be recycled for use as wash water to reduce the fresh water demand and to save a portion of its contained acid. The amount of this recycle may reach as high as 50% of the barren solution volume. The remainder of the barren solution, not used as recycle wash, must be sent to waste. This discard will require a pipe line from the leaching plant site to the Mission Mill tailings thickeners.

## IRON HANDLING

If cementation launders are used then de-tinned scrap cans will be received in ±18 ton lots by side-dump trailer trucks. The cans will be stacked by means of magnet mounted on a mobile crane and added to the precipitation launders by the same unit as required. Based on an expected can consumption of 1.5 pounds per pound of copper precipitated, the average daily consumption will be 66,000 lbs. If other precipitation methods are to be considered, this operation must be further studied.

## ACID HANDLING

Acid will be received in 3,500 gal tank trailers and pumped into a 100,000 gal acid storage tank. Based on an estimated 3200 gal actual load per trailer and a consumption of 110 tons per day of acid the consumption will be 14,400 gals or 4.5 loads of acid per day. The acid flow to process will be 10 gpm total.

A study of pumping acid from the Mission railroad yard near the By-Products Plant may be necessary if indicated freight savings justify such a study.

## PRECIPITATE HANDLING

Precipitate copper will be washed from the precipitation launders and collected in several settling tanks. Water will be decanted and returned to the

cell feet to recover solids. Copper precipitate will be baled with a clam-shell bucket mounted on the mobile crane and placed on a concrete drying pad. The approximate area of the pad will be 150x200 ft based on Silver Bell practice. Drying time will be approximately one week in the summer and two weeks in the winter season.

## WATER

Water consumption is indicated at 250 gpm over a 24-hour period. This water will be pumped in an eight-inch line from the Mission plant site and discharged into a surge tank (cylindrical tank or ground reservoir) of 3-400,000 gal capacity. Total daily fresh water consumption will be approximately 360,000 gals, but 270,000 gals or more are required in a four-hour period for a fresh water wash.

2/3/67

J. E. K.
JUN 23 1967

J. H. C.
JUN 22 1967

AMERICAN SMELTING AND REFINING COMPANY
Sahuarita Arizona

June 21, 1967

MR. JEK
READ AND RETURN
PREPARE ANSWERS HANDLE
FILE ✓ INITIALS

MEMORANDUM TO MR. S. L. TAIMER

Re: Composite Core Samples
San Xavier North
Mineralogy

The eight composite core samples of the San Xavier North oxide ore body as outlined by Mr. J. E. Kinnison have been prepared by the Geological and Metallurgical Departments at the Mission Unit.

A 2,000 gram split from each of the eight composite core samples will be sent to Mr. J. E. Courtright to be given to Dr. Guilbert at the University of Arizona for mineralogical determinations.

A 1,000 gram split from each of the eight composite core samples was crushed to minus 10 mesh, 500 grams of which were then pulverized and sent to the assay lab where the following assays are being run for each of the composites: total copper, non-sulphide copper ($H_2SO_4$ method), sulpher, calcium carbonate, magnisium carbonate, alumina, silica and iron. These assays will be transmitted to Mr. J. E. Courtright when available.

The remaining material from each of the eight composites, approximately 3,000 grams per composite, is available for batch leach tests if requested. I feel certain that the results of batch leach tests on the eight composites would be of considerable use to Mr. Kinnison in interpreting the Mineralogical studies to be done on these composites at the University of Arizona.

During collection of the individual core samples it became evident that a larger amount of sample was available then origionally anticipated, because of this it was possible to make certain changes in the amount and size of the eight drill core composite samples which were considered to be advantages to batch leach testings. After consulting with Mr. J. E. Kinnison and Mr. A. Reihl it was decided that the drill core composites would weigh 18 pounds each and be crushed to minus 3/8" as opposed to the requested 9 pounds per composite crushed to minus 1/4". The larger sample made it possible to obtain representative splits for the mineralogical test work, for the assay sample and for enough material to run two batch leach tests per composite at the minus 3/8" size which is more desirable for leach test work.

In addition to the material used in making Mr. Kinnisons eight drill core composites approximately 0.4 to 0.5 pounds per foot of

sample which has been crushed to minus 3/8" remains from the original drill core samples. This material is available for any future compositing and test work required on the San Xavier Oxide Ore Body.

During collection of the drill core samples one to two representative fragments of core were selected per drill core assay run and left in their respective core storage boxes.

D. K. HALL
Resident Geologist

DKH:jl
cc: TASnodden
EBVeen
FALewis
JHCourtright

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

May 31, 1967

Memorandum for Mr. T. A. Sneddon

SAN XAVIER NORTH CORE SAMPLES

Enclosed is Mr. J. E. Kinnison's comments on the San Xavier North deposit with a list of drill hole intercepts for each of eight composite samples.

These eight samples are to be crushed minus 1/4" and a quarter split taken of each sample for mineralogical determinations. The remainder will be retained at the Mission Unit for chemical determinations.

JHC:lml
encl.

J. H. Courtright

cc: R. B. Keen, w/encl.
P. A. Lewis, "
J. E. Kinnison

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

May 25, 1967

Memorandum for: John E. Kinnison

As you know, certain geologists have questioned our conclusions with respect to the basement fault (San Xavier Thrust) in the Pima Mining District. The New York Office has asked for up-to-date information.

Please prepare a brief summary of data on the fault including (1) a list of all drill holes for which we have logs, with depth of penetration through the fault; (2) evidence for a fault contect rather than through an intrusive contact; (3) evidence for the post-mineral age.

JHC:lmi

J. H. Courtright

cc: W. E. Saegart

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

May 23, 1967

MEMORANDUM FOR: J. H. COURTRIGHT

COMPOSITE CORE SAMPLES
SAN XAVIER NORTH
MINERALOGY

The following table (Attachment A) lists the diamond drill core intercepts which I suggest be made into composite samples for mineralogic examination of the subject copper deposit. These intercepts of drill core lie within the principal oxidized area defined by the open pit design and reserve calculation by Mr. Tainter (Tainter to Lewis 2/24/67). The core which remains from this zone has been quarter split previously for a leach test, and when these composites are made no core will be left.

According to the design by Mr. Tainter, production during the "leach period" (present design) will last for a period of eight years and yield 10.1 million tons with a total copper content of 0.71%. This design uses 40 foot benches and a 0.2% copper cutoff. For reference, the areas deliniated for these composite samples is shown on Attachment B.

The San Xavier North is best described as an oxidized chalcocite zone. It was formed first during the middle Tertiary and subsequently tilted slightly to the southwest. The north, central, and eastern areas are oxidized whereas the chalcocite zone on the west lies at a greater depth due to tilting, and has not been oxidized.

The composites tabulated in Attachment A are grouped into five more or less symetrical "blocks". Three of these are further subdivided into a lower and an upper interval. The basic principals which I used to select these composite units is detailed in the Appendix to this memorandum. The samples will weigh about 9 lbs. These should be crushed and 2 lbs. split out for Dr. Guilbert (University of Arizona) to examine. I would like to have the remaining portion assayed at the Mission Unit for total copper and total sulphur. Also, the usual assays for alumina, lime, silica, and other compounds should be made available to me.

In addition to the core composites, I have selected some samples from the open cut near drill hole 1-SX-8, and these also will be furnished to Dr. Guilbert for study.

During my examination, the several major geologic conditions which have formed this deposit became evident, and I will place my interpretation of these on record in report form at a later date if you so desire.

John E. Kinnison
JOHN E. KINNISON

JEK/pjc
Attachments (3)
cc: JHCourtright, 3 X

# APPENDIX

## DRILL CORE COMPOSITES
## SAN XAVIER NORTH

According to Mr. Raihl, Chief Metallurgist at the Mission Unit, approximately 6 lbs. of oxidized rock is needed in order to conduct batch leach tests. In addition, a small quantity from that sample would be needed for assaying. Mr. Guilbert would like to have 2 lbs. for his mineralogical work. Thus a minimum of 8 lbs. plus a 1 lb. safety factor indicates that 9 lbs. of sample for each composite is desirable. With allowance for 20% core loss in drilling and handling, the remaining quarter-core will yield 9 lbs. per 125 feet of penetration. Thus each sample of composite drill core should approximate this length of penetration. Due to overriding geological conditions, some of the composites will not yield this extent of penetration.

In addition to providing for the weight of sample as outlined above, I have used the following guide lines to select those intervals which will be made into composites.

A. The sample should begin about 10 feet below bedrock and about 10 feet below the base of complete leaching.

B. The composite should end at the base of the oxidized zone, as defined by Mr. Hall of Mission, and subsequently used in the various metallurgical leaching tests.

C. I have segregated the oxidized copper deposit into five "blocks" as viewed in horizontal dimension. Wherever possible these have been segregated vertically into an upper and lower half. Geology and mineralogy as well as total copper content largely dictated the division between the vertical units, but where possible the division was made near the base of a pit mining bench.

D. Short intercepts of oxidized copper were correlated to the upper or lower half within their respective blocks on the basis of geology as well as geometry.

Any departure from the above was made because of specific and important geologic/mineralogic variation.

ATTACHMENT A
SAN XAVIER NORTH
DRILL CORE COMPOSITES

Block No. 1 - Central

| Upper Interval | | Lower Interval | |
|---|---|---|---|
| 1 SX 4 | 73.5-118.0 | 1 SX 8 | 114.6-144.7 |
| 1 SX 8 | 64.2-114.6 | 1 SX 13 | 164.4-233.6 |
| 1 SX 13 | 134.0-164.4 | X 124 | 182.2-206.4 |
| X 124 | 137.9-182.2 | | |

Block No. 2 - Southwest

| Upper Interval | | Lower Interval | |
|---|---|---|---|
| 1 SX 3 | 100.3-138.2 | 1 SX 3 | 138.2-169.7 |
| 1 SX 15 | 136.0-182.0 | 1 SX 6 | 178.3-199.8 |
| X 120 | 76.9-112.4 | 1 SX 15 | 182.0-222.6 |
| | | X 120 | 112.4-161.3 |

Block No. 3 - Southeast

| | |
|---|---|
| 1 SX 16 | 141.0-189.9 |
| 2 SX 17 | 150.1-185.3 |
| 2 SX 18 | 152.4-188.1 |

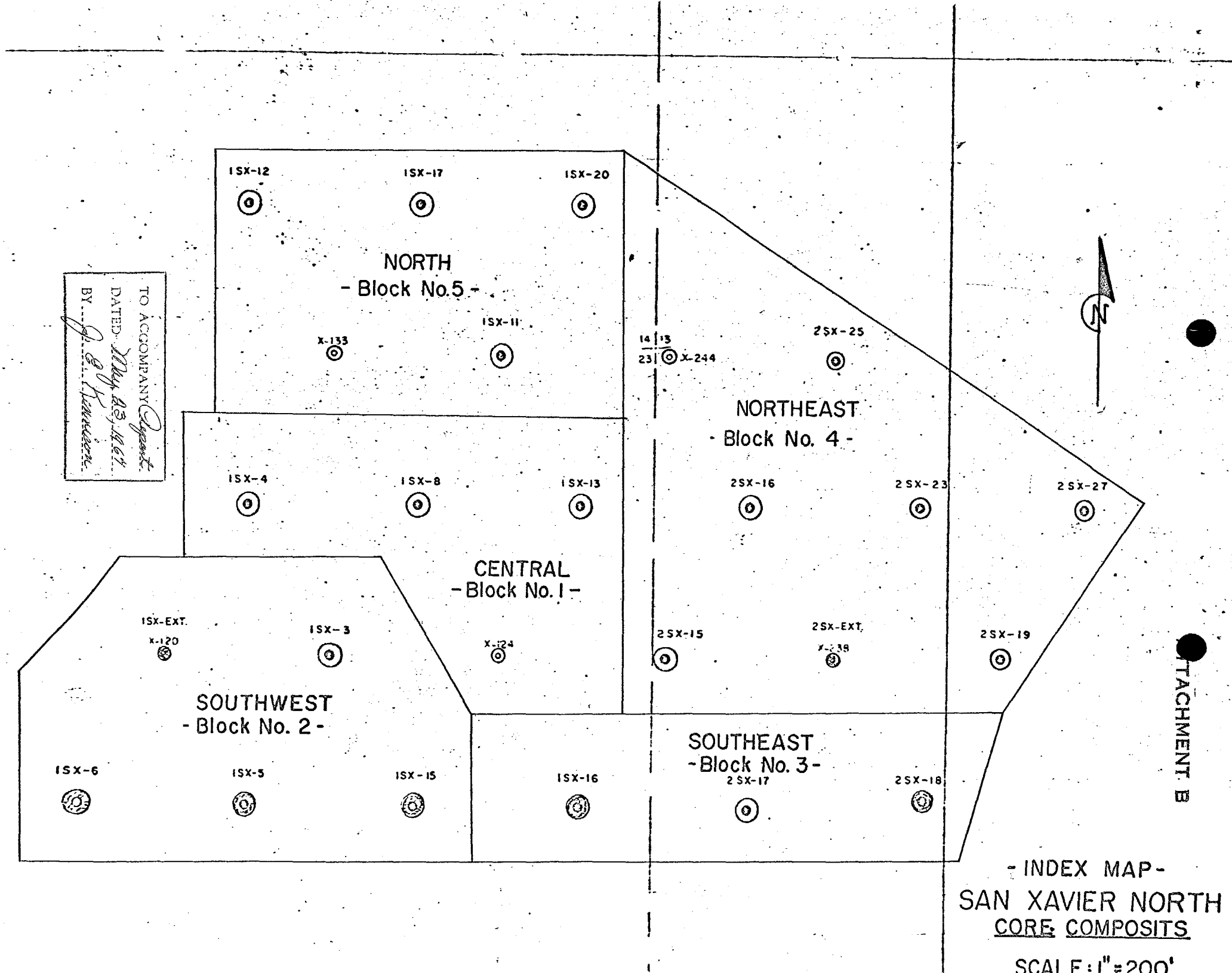
Block No. 4 - Northeast

| Upper Interval | | Lower Interval | |
|---|---|---|---|
| 2 SX 15 | 130.5-170.9 | 2 SX 16 | 163.9-183.5 |
| 2 SX 23 | 149.7-170.2 | 2 SX 23 | 170.2-200.5 |
| 2 SX 25 | 146.9-172.9 | 2 SX 25 | 172.9-201.3 |
| X 244 | 121.4-143.2 | X 244 | 143.2-200.1 |

Block No. 5 - North

| | |
|---|---|
| 1 SX 11 | 84.5-138.7 |
| 1 SX 12 | 187.7-231.0 |
| 1 SX 20 | 118.9-134.8 |
| X 133 | 58.8- 67.9 |
| X 133 | 105.3-165.8 |

Note: X-238 excluded from Block No. 4. Bedrock and oxidized zone were over-drilled; core begins in mixed chalcocite-oxide zone transitional to the main chalcocite blanket.


1SX-12
1SX-17
1SX-20
NORTH
- Block No.5 -
1SX-11
X-133
14
23
13
X-244
2SX-25
NORTHEAST
- Block No. 4 -
1SX-4
1SX-8
1SX-13
2SX-16
2SX-23
2SX-27
CENTRAL
- Block No. 1 -
1SX-EXT.
X-120
1SX-3
X-124
2SX-15
2SX-EXT.
X-138
2SX-19
SOUTHWEST
- Block No. 2 -
SOUTHEAST
- Block No. 3 -
1SX-6
1SX-5
1SX-15
1SX-16
2SX-17
2SX-18
N
TO ACCOMPANY Report
DATED May 23, 1961
BY G. O. Kinnison
ATTACHMENT B
- INDEX MAP -
SAN XAVIER NORTH
CORE COMPOSITS
SCALE: 1" = 200'

SX-10.10

J.H.C.

MAY 24 1967

May 18, 1967

Professor John Gilbert
Department of Geology
College of Mines
University of Arizona
Tucson, Arizona 85721

MINERALOGY DETERMINATIONS
SAN XAVIER NORTH
MISSION UNIT, ASARCO

Dear Professor Gilbert:

This letter will authorize you, as a consultant, to study the mineralogy of the subject copper deposit, from examination of samples which will be furnished to you by me. From our previous discussion, I understand you will have the time to do this study after the middle of June approximately. The samples will be furnished to your office prior to that time.

Feel free to call on your colleagues, if necessary, for supplemental help. Routine work which can be handled by students - such as sample polishing, grain counting etc. - should preferably be done by student help. We did not discuss your consulting fee, but I assume it will be on a base similar to that used by you and R. L. DuBois last year on the Lampa, Peru samples.

The samples will be from oxidized portions of the "San Xavier North" porphyry copper deposit which is now being tested by our metallurgists for a vat-leach. The deposit may be best described as a partly oxidized chalcocite blanket of supergene origin, which was formed and subsequently leached during Tertiary time by several geologic conditions. The oxidized copper minerals are poorly known at present. I recognize the chrysocolla-type minerals, malachite, azurite, copper "pitch" of the usual brown lustrous type, a black Mn-Cu-Silicate(?), and native copper. Brochantite has not been recognized to date, nor is the quantitative aspect of green Cu minerals and/or silicate gels known. Your study will be to: 1) determine the Cu minerals present - including any residual chalcocite or other sulfides, and 2) also determine their relative abundance. The quantitative apsect will probably require the study of polished briquettes. Total copper and sulphur assays will be furnished with the samples, but these data must be kept confidential.

I will be in contact with you during this work. Results will be desired as soon as practicable.

Yours very truly,

JOHN E. KINNISON

JEK/pjc
cc: JHCourtright

FORM FORM HB-132110

# AVOID ORAL ORDERS

**Oral Orders are often forgotten or misunderstood. Use this blank for all important instructions or requests.**

**To** J. H. C.

This letter will be held pending your O.K. I do not believe I have said anything that could be detrimental, nor do I expect any leaks of this info to other sources — Gilbert respects the confidential nature of Company work. Nevertheless, please check it and I can then make changes prior to sending.

J. H. C.
MAY 18 1967

J. H. C.
MAY 18 1967

Mailed May 22
JER

J. E. K.
MAY 16 1967

**Date**

**Signed** J. E. K

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. H. C.

May 15, 1967

MAY 19 1967

TO: K. E. RICHARD

FROM: W. G. FARLEY

I. P. AND RESISTIVITY
SAN XAVIER INDIAN RES.
PIMA COUNTY, ARIZONA

On May 1, 1967, a tract of the San Xavier Indian Reservation lying west and northwest of the ASARCO San Xavier Ore Body was auctioned for exclusive mineral prospecting rights. The winning bid, as you know, was obtained by the Tidewater Oil Co. in partnership with the P. D. Corporation. In April of 1967, I made an airplane flight over this area and several ground visits to check on geophysical activities by other companies in this area. At that time an unknown I. P. crew was surveying on Exclusive Mineral Prospecting Tract No. 1 with most of the activity concentrated northwest of the ASARCO San Xavier Ore Body. There was evidence that other I. P. crews had also recently surveyed this area.

I would like to bring to your attention I. P. surveys that have been run in this area by ASARCO in the past. On the attached overlay I have shown the location of Exclusive Mineral Prospecting Tract No. 1 and the locations of the ASARCO I. P. lines using a Wenner 600 foot "a" that were run in 1961 under the supervision of W. E. Saegart. The results of that survey were reported in Geophysical Surveys - Amole District, Nov. 1961. Mr. Saegart concluded that within the area surveyed on the Indian Reservation no disseminated sulfide target existed to a depth of 500-600 feet.

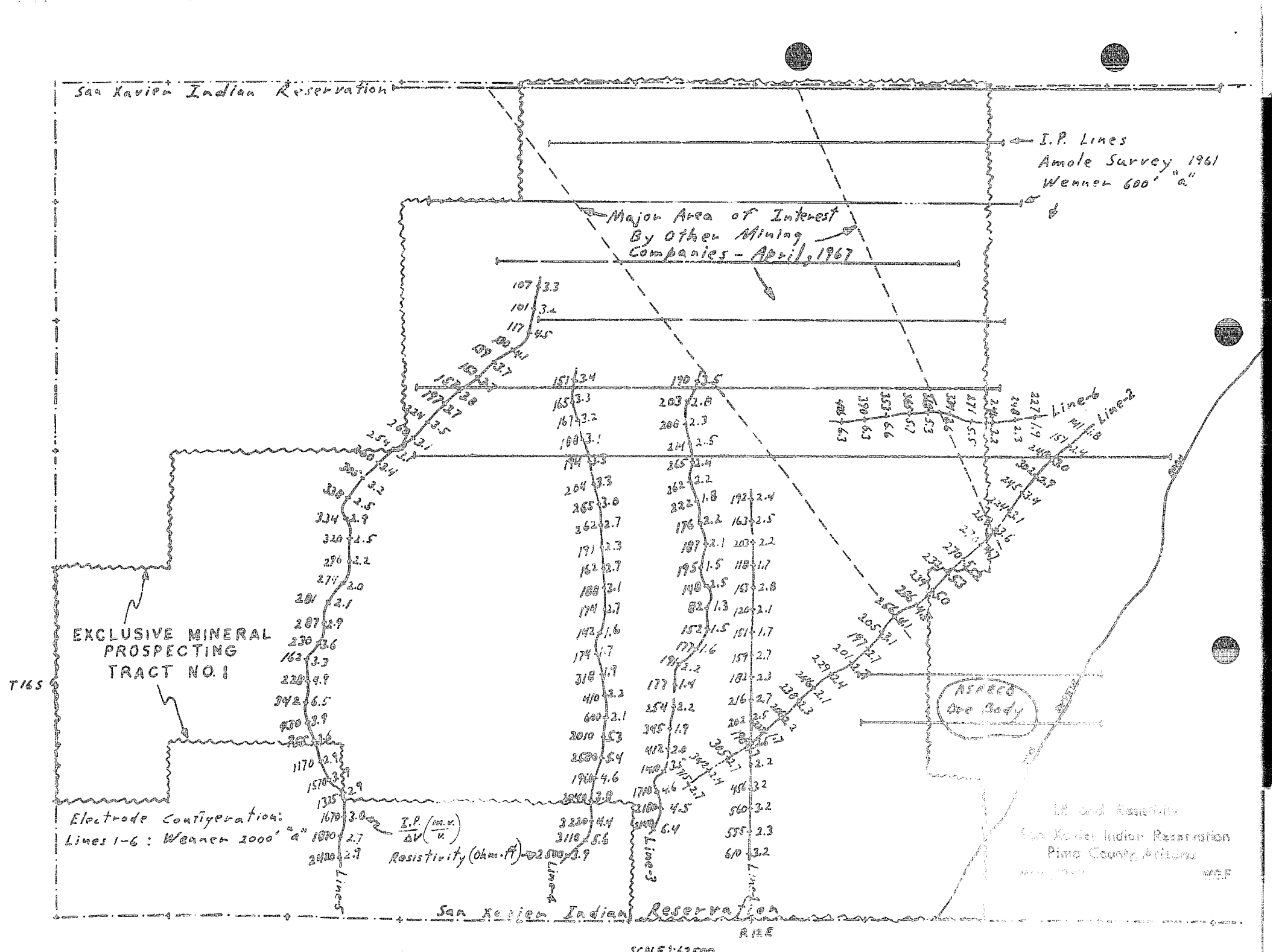
With the development of more powerful I. P. equipment in recent years we did run several additional traverses using a combination Wenner 2000 foot "a" and a 3 electrode 1000 foot "a" looking for deeper targets. With this electrode arragnement, we feel we can detect large disseminated sulfide targets to a depth of 1500 feet. The attached overlay shows six lines that were run and the I. P. and resistivity values that were obtained from the Wenner 2000 foot "a". The only significant response on the six lines was on lines 2 and 6 where weak anomalous I. P. response did occur when crossing the northwest projection of the San Xavier - Mission mineral trend extending northwest from the ASARCO San Xavier Ore Body. This weak anomalous I. P. response agrees with the weak mineralization found in ASARCO drill holes in sections 10 and 11.

On line - 6 a comparison of the response between the Wenner 2000 foot "a" and the Wenner 600 foot "a", over a weak anomalous I. P. zone detected on the earlier Amole Survey, showed no substantial increase in I. P. response with the larger electrode spread thus indicating no better mineralization at depth. The Amole Survey northwest of Line - 6 to the north boundary of the reservation indicated a shallow bedrock area with no suggestions of mineralization. Therefore, no further interest was deemed necessary. At this date it still does not appear likely that ASARCO missed any important mineralization on Tract No. 1 on the San Xavier Indian Reservation.

Wayne G. Farley

WAYNE G. FARLEY

WGF/pjc
Attachment
cc: JHCourtright)
RJLacy ) all w/ attachment
WESaegart )


San Xavier Indian Reservation
I.P. Lines
Amole Survey 1961
Wenner 600' "a"
Major Area of Interest
By Other Mining
Companies - April, 1967
EXCLUSIVE MINERAL
PROSPECTING
TRACT NO. 1
T16S
R12E
ASARCO
Ore Body
Line 1
Line 2
Line 3
Line 4
Line 5
Line 6
Electrode Configuration:
Lines 1-6 : Wenner 2000' "a"
I.P. (ms. v.) / ΔV / V
Resistivity (Ohm-Ft)
I.P. and Resistivity
San Xavier Indian Reservation
Pima County, Arizona
SCALE 1:63500

San Xavier Indian Reservation
IP and Resistivity
Pima County, Arizona
Survey Line
Azimuth
Dipole Spacing
Transmitter
Receiver
Array
Profile
Scale 1:25,000
Exclusive Mineral Rights
Prospecting Permit
Tract No. 1
Tract 2
Arizona
Mexico
Papago Indian Reservation
San Xavier Indian Reservation

CONFIDENTIAL

New York, April 25, 1967

J.H.C.

APR 26 1967

Memorandum for: Mr. C. P. Pollock

San Xavier Indian Reservation-Tract I

This refers to the recent tender of bids for a prospecting permit on Tract I by the Bureau of Indian Affairs. (It should be noted that this new Tract I covers the old Tract I which we acquired several years ago, and, in part, dropped, and it also includes a number of additional sections to the north and west.)

Since there are no outcrops in the area involved, we must rely on geophysical information and geological projection to determine whether or not the Company should place a bid for this new Tract I. Several years ago, we obtained a weak I.P. anomaly trending north-northwesterly from the North San Xavier ore body. At that time, we drilled a couple of holes on this anomaly and obtained only weak pyritic mineralization in bedrock. Recent gravity work by the U.S. Geological Survey has shown that the depth to premineral bedrock increases rapidly going farther in this northwesterly direction. We have no new geological information which would improve exploration possibilities of this new Tract I.

After considering all available data including results of geophysical surveys, we have concluded there are no worthwhile exploration targets in this Tract. Accordingly, we recommend that no bid be submitted for prospecting the ground.

Kenyon Richard

CC:EMcLTittmann
CENelson

Blcc:JHCourtright
RJLacy

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 12, 1967

Mr. K. E. Richard, Chief Geologist
American Smelting and Refining Company
120 Broadway
New York, N. Y. 10005

SAN XAVIER INDIAN RESERVATION
ARIZONA

Dear Sir:

Enclosed is a copy of a USGS gravity map on which we have superimposed the area of Tract I recently submitted for bidding.

Yours very truly,

J. H. COURTRIGHT

JHC/kw
Enclosure

## EXPLANATION

Gravity stations

-100 / -102

Gravity contours

Contour interval 1 milligal; gravity values are complete Bouguer anomaly, all values on this map are negative. Gravity observations relative to 979.227.7 milligals at boarding gate of Tucson Municipal Airport (Behrendt, J.C. and Woollard, G.P., 1961, An evaluation of the gravity control network in North America: Geophysics, v.26, p.73). Elevation and terrain are corrected, assuming a density of 2.67 grams per cubic centimeter to sea level. The terrain effect is corrected to a distance of 61.5 miles.

NOTE

The elevations for most of the gravity stations were determined by altimetric methods. The probable error of elevation for stations symbolized by a solid circle is less than 10 feet. The elevation error for stations symbolized by a starred circle may be greater than 10 feet. An elevation error of 10 feet corresponds to an error of 0.60 milligal in the gravity anomaly.

INDEX MAP OF ARIZONA SHOWING LOCATION OF GRAVITY SURVEY

SCALE 1:125,000

1 0 1 2 3 4 5 MILES

Exclusive Mineral Prospecting Tract No. 1

111° 30' 111° 15' 111° 00' 110° 45' 32° 30' 32° 15' 32° 00' 31° 45'

TUCSON

CORONADO N.F.

SAHUARITA BOMBING AND GUNNERY RANGE

DAVIS MONTHAN AIR FORCE BASE

SAFFORD PEAK

SAMANIEGO PEAK

TWIN BUTTES

COCORAQUE BUTTE

PESCADERO MOUNTAIN

RECORTADO MOUNTAIN

TORTUGA BUTTE

ALTAR VALLEY

SILVER BELL MOUNTAINS

SANTA RITA MOUNTAINS

PENITAS HILLS

CERRO COLORADOS

# BOUGUER GRAVITY ANOMALY MAP OF THE TWIN BUTTES AREA, PIMA AND SANTA CRUZ COUNTIES, ARIZONA

BY

DONALD PLOUFF—1962

U. S. GEOLOGICAL SURVEY

Released to open files

August 8, 1962

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 6, 1967

Mr. K. E. Richard, Chief Geologist
American Smelting and Refining Company
120 Broadway
New York, N. Y. 10005

SAN XAVIER RESERVATION - PROPOSED TRACT I
(Now Open to Bids)

Dear Sir:

Reference is made to my file memorandum of April 5, 1967 reporting that Mark Secayouma, Phoenix Office, Bureau of Indian Affairs, had refused permission for ASARCO to enter proposed Tract I for the purpose of carrying out Induced Polarization surveys. Subsequently, you instructed that a further attempt to gain permission to enter Tract I should be made.

Mr. Snedden has advised me that the Bureau of Indian Affairs had been given to understand that ASARCO would probably not bid on either Tracts I or II, and the fact that we have informed the Bureau of geophysical activity within the past week on Tract I may lead to a delay in the bidding, and consequently a delay in the lease in Tract II, which ASARCO has applied for. That is, since the Bureau had canceled all permits to enter Tract I (presumably over 2 weeks ago), on being informed that entry had been made contrary to this ruling, they might decide, to avoid possible litigation, to cancel the present offering and start over at a later date.

A copy of my memorandum of April 5 is attached.

Yours very truly,

J. H. Courtright

J. H. COURTRIGHT

JHC/kw
Attachment
cc: TASnedden
RBMeen
ACHall
WESaegart

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 5, 1967

FILE MEMORANDUM: SAN XAVIER RESERVATION, PROPOSED TRACT I
(Now Open to Bids)

Yesterday I put in a call for Mr. Artichoker at Sells and was referred to Bill Battese in the former's absence. Subsequently, Mark Secayouma, in charge of real estate, called from Phoenix and advised that all permits to enter the San Xavier Reservation were canceled two weeks ago, and that no additional permits were to be issued.

I pointed out that geophysical survey crews were observed this past week operating on proposed Tract I west of the North San Xavier deposit. He replied that such crews were apparently getting away with trespass due to inadequate agency policing.

J. H. Courtright

J. H. COURTRIGHT

JHC/kw
cc: KERichard
SIBowditch

~~SLB, JEK, WES~~ SX-10.5

SX-4.19

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 6, 1967

S. L. B.
APR 7 1967

W.E.S.
APR 19 1967

J. E. K.
APR 07 1967

J. H. C.
APR 7 1967

File Memorandum

Re: San Xavier Exploration Cost Tax Write-Off

Mr. Roland Parks and Joe Bierman, representing Internal Revenue Service, arrived at the Tucson Office Tuesday morning, April 4th, to review the drilling program in relation to the write-off of expenses on those portions abandoned on the Indian Reservation on Tracts 1, 2 and 3.

A review was made of map number 1391 showing location of holes drilled before 1958 indicating mineralized and barren zones of North and South San Xavier. Map number EP-2-ID was also given to Mr. Parks showing location of roads, mines, etc. in the Pima Mining District. A paper published by Mr. John Kinneson entitled "The Mission Copper Deposit - Arizona" was also given to them. Both Parks and Bierman realized for the first time that only four of the eight sections of each tract could be retained after prospecting and that the Banner 1200 foot strip existed between Mission and South San Xavier ore bodies.

The Mission pit, concentrator and equipment were viewed with photographs taken of all. We then went to the North Dump where Tracts 2 and 3 could be viewed. After locating ourselves in the South San Xavier we proceeded on up to the hill in Tract I in the vicinity of the proposed pit area of the North San Xavier. Photographs were taken along the way by Parks.

We followed the Twin Buttes road to the Duval Road and on to the Nogales Highway and to Green Valley for lunch. We returned on the Nogales Highway to the Pima Mine Road and crossing the Twin Buttes Road to a point one mile west. From there we tried to visit holes north and east of the proposed North San Xavier pit area and passed several old hole locations but were cut off from going further by washes, so returned to Tucson.

While on the hill in Tract I, I was asked if we had cross sections of both mineralized areas. I told them I could not find the cross sections they referred to in their letter and wondered where they found them. They replied they had no such cross sections but thought we had. They also asked if it was not customary to plot holes on cross sections to plan the next holes, to which I replied possibly so and work sheets were probably made but I found none in our Southwestern files. I told them cross sections were made up for the new drilling.

We did not visit the pit that was dug to get a bulk sample for leach testing so the only bedrock exposure or sample of the bedrocks they saw was on the hill in Tract I.

I did not object to their taking photographs because they could take the same pictures from our viewpoint of the pit and from the county roads. Both men showed a great deal of interest in the Santa Rita variety of the Prickley Pear Cactus (purple) which supposedly flourishes in areas where copper is found.

During the day questions were answered such as, concentrate grades for low grade copper deposits in the neighborhood of 30%, and the grade of moly was low, and that our daily production at Mission was 25,000 tons of ore and a total tonnage of 100,000 tons.

Other items discussed were blast hole spacing, depth of hole, type of explosive, size of hole and direction of pit advancement (west). I told them the wall of the east end of the pit was fixed, Anaconda had the land to the north and we could not see a possibality to break through the east end of Anaconda's property into the Indian land. The pit was viewed from a point on the northeast side of the perimeter only.

Thursday, April 5th, I was again visited by Parks and Bierman for about one-half hour. During that time I was questioned as to why deep holes were drilled in Tracts I and 2, to which I replied, to see if there was any deep copper. I was also asked why some holes were drilled only a few feet into bedrock to which I replied there was probably no mineralization. The question "did the drill holes encounter any structures?" was answered "probably so".

Mr. Parks was born in Lake Linden, Michigan, went to Michigan Tech at Houghton and taught there, writing a well known book on mine evaluation, then went to work for the government.

Mr. Bierman was raised in upper New York State, went to school and worked in Pennsylvania, then went to work for the government in Denver, and later in Washington, D.C. Both men grasp a situation quickly, with Parks being quicker and leader. I believe their minds were made up that we were wrong and they were trying to find material to prove it.

Upon leaving, they asked my position and what I was doing during the early drilling period. I gave them my present position, and told them I had held it over two years and told them I was Mine Superintendent at Silver Bell during the drilling period.

R. B. Meen

RBM:mg

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 18, 1968

Mr. C. P. Pollock, Vice President
ASARCO - New York Office

Drilling - San Xavier Area

Dear Sir:

The enclosed map shows the locations of holes drilled by Phelps Dodge and Pima in the north San Xavier area.

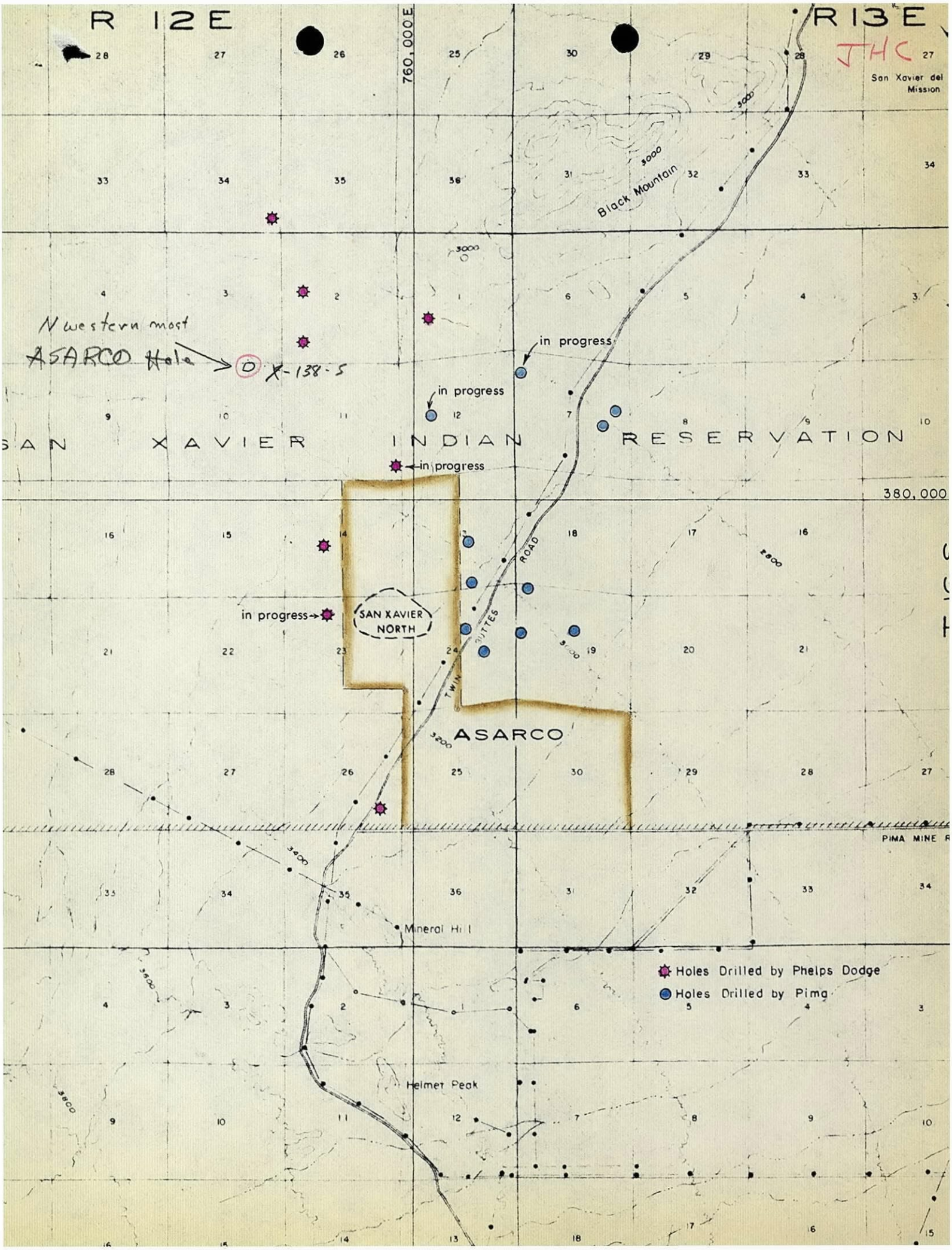
Both companies are operating two rigs, two shifts per day each. Including holes in progress, Phelps Dodge has drilled 8 holes and Pima 11 holes. The drilling started around the middle of November, 1967, and assuming 30' per drill shift, Phelps Dodge holes would average around 900' and Pima's holes around 600'.

Also shown is the location of Asarco's northwesternmost hole which cut 700' of post-mineral volcanics and 200' of weakly pyritized arkose.

Yours very truly,

J. H. Courtright

JHC:lmi
encl.


R 12 E
R 13 E
760,000 E
380,000
JHC
San Xavier del Mission
Black Mountain
3000
Nwestern most
ASARCO Hole
X-138-5
in progress
in progress
in progress
in progress
SAN XAVIER INDIAN RESERVATION
SAN XAVIER NORTH
ROAD
TWIN BUTTES
ASARCO
3200
3400
3600
3800
PIMA MINE R
Mineral Hill
Helmet Peak
Holes Drilled by Phelps Dodge
Holes Drilled by Pima

J. H. C.

NOV 1 0 1966

San Xavier

Mr. W. Wade Head, Area Director
United States Department of the Interior
Bureau of Indian Affiars
P. O. Box 7007,
Phoenix, Arizona 85011

Dear Sir:

Your letter of November 2nd regarding the drilling map we submitted for the drilling completed for the period April 1 to July 1, 1966, and where you noted that hole #2SX was extended during the period April 7 through 13, 1966, and designated extension X210S. This hole, as you noted, is located in the eastern half of Section 24, T16S, R12E, and was drilled outside of our leased premises.

The only explanation we can give is that when our engineering department was laying out the land required for dumps, our Chief Geologist noticed that the east half of Section 24 would be required for leach and waste disposal. This, in turn, required extra drilling and deepening of holes to prove no minerals were being covered in the process. This hole had been deepened 388 feet before it came to the attention of our supervisors and could be stopped.

We realize that we were in error and are very sorry that this has happened.

Yours very truly,

R. B. Meen,
Manager

RBM:mg

Three copies mailed to Juan's office.

J. E. K.

OCT 10 1966

S. I. B.

OCT 10 1966

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

September 9, 1966

J. H. C. OCT 12 1966

OCT 10 1966

W.L.S. S.I.B., W.E.S., J.E.K.

READ AND RETURN

PREPARE ANSWERS ..... HANDLE .....

FILE ..... INITIALS .....

FILE MEMORANDUM

SAN XAVIER LANDS - APPLICATION FOR BUSINESS LEASE

A series of disjointed news releases began on Wednesday, September 7, in the two local Tucson papers. As a result, we have been in contact with various newspaper representatives, as well as representatives of the Bureau of Indian Affairs and the Papago Tribe.

Yesterday I attempted to reach Mr. Homer Jenkins, Superintendent of the Sells Agency. He did not return my call until this morning.

I spoke to Mr. Jenkins of our concern and bewilderment with relation to the above noted publicity concerning Papago affairs. He commented, "People certainly don't have much to write about." In response to my inquiry as to whether he had any comments at this time regarding the status of ASARCO's Application for Business Lease on the equivalent of three sections, he acknowledged that he did.

The gist of his remarks are as follows:

"At last they had finally gotten a policy."

The B.I.A. has decided to offer PP's on competitive bid basis on the following lands in the San Xavier District. Two Parcels are involved.

One Parcel -- 7-10 sections--, including the area sought by ASARCO under Business Lease. Mr. Jenkins said this permit is to be for one year only.

A second Parcel consisting of approximately 20,000 acres is to be subject of bid for a two-year PP.

On the main Reservation four Parcels involving approximately 28,000 acres in five districts are to be bid separately for two-year PP's.

Presumably all of the PP's will include options for Mining Lease.

I remarked that such an action on the part of B.I.A. seemed ill advised in view of the land ownership as related to Parcels now under Mining Lease to ASARCO and lands corresponding to lands sought now by ASARCO under Business Lease. Mr. Jenkins replied, "The Secretary has decided that all this land must be put up for competitive bidding." He commented further that he visualized no great problem as far as ASARCO is concerned. He assumed

that ASARCO would be the successful bidder, and then could perform the drilling required by the U.S.G.S. Once the mineral potential of the area sought is disproved, the Business Lease could then be negotiated on the area of interest. Although such seems entirely unnecessary, I pointed out to Mr. Jenkins that ASARCO might well not prove to be the successful bidder, and in that event the corresponding Indian landowners' interests would be adversely affected, as he and others had been previously advised.

I inquired as to what procedure would now be followed. Mr. Jenkins stated that B.I.A. would request approval of the program at the next Tribal Council meeting scheduled October 7. If the members of the Council acquiese, Mr. Jenkins indicated that invitations to bid would be sent out to all concerned on or about October 10. He said there would be a 30-day period from the date of invitation in which to present sealed bids.

I asked Mr. Jenkins if he felt that the Tribal Council would approve the program. He answered that he had no assurance but that hopefully the plan would be approved. In response to my inquiries, he indicated by his first response that he had not given consideration to any reaction on the part of the Tribal Council except over-all approval or disapproval. If the result is one of disapproval (with respect to the area of ASARCO interest), the matter of ASARCO's Business Lease would again be referred to the Commissioner. Mr. Jenkins obviously has no concern regarding passage of time.

I asked Mr. Jenkins if it were the intent of the B.I.A. to respond formally to the long-standing Application for Business Lease. He advised that he would consult Mr. Diddock, Real Estate Manager for Papago Affairs in the Phoenix Area. In a further discussion, he suggested that we contact the last mentioned representative directly. I expressed the hope that the wording of any response relative to ASARCO's application would be such as to not provide further barriers, explaining to Mr. Jenkins my concern over an entirely negative response.

On September 7 and 8, I had discussions with John Riddick, who is a feature writer for the Tucson Citizen. Over a period of years he has proved to be very intelligent and helpful in problems related to the Mining Industry. While I was unsuccessful on the morning of the 8th in reaching Mr. Mackett, Chairman of the Papago Tribe, the latter was contacted by Mr. Riddick, who reported to me immediately relative to their lengthy telephone conversation. In answer to Mr. Riddick's questions, Mr. Mackett pretty well covered the situation which has now been confirmed by Mr. Jenkins.

Mr. Mackett stated that he had not been invited to attend the Tucson meeting on September 7, which gave origin to the publicity. He thought it unlikely that invitations for bids could be gotten out within a period of 3-4 weeks because approval would be required by the landowners, the San Xavier District Council, and the Tribal Council, in addition to that required by B.I.A. Mr. Mackett volunteered that there would be a meeting at San Xavier on Sunday, September 11, with the interested landowners.

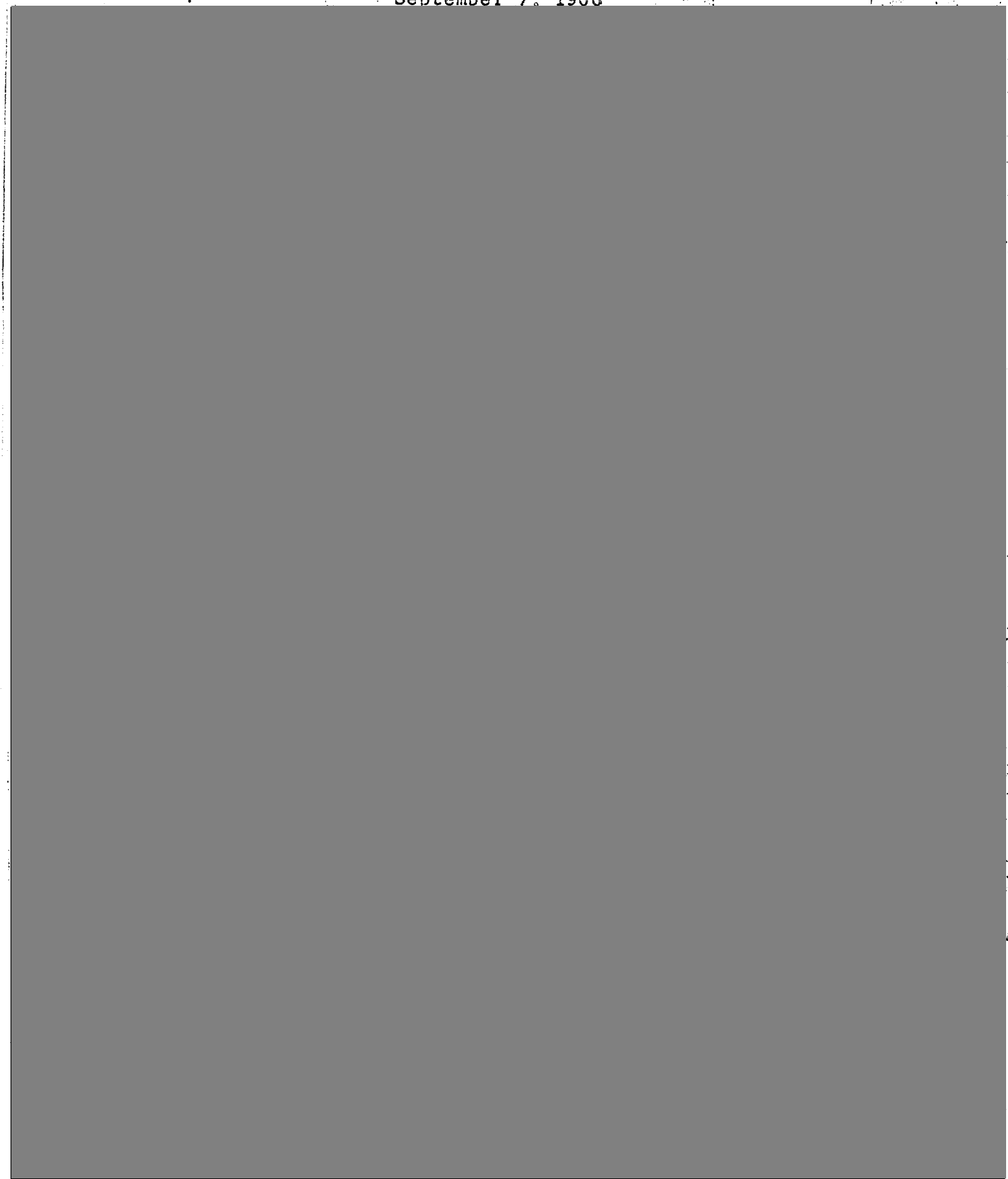
On the basis of Mr. Mackett's statement as reported to me by Mr. Riddick, I think that the former feels that he is in control of the situation. I have no reason to believe that the interested landowners, the District Council, or the Tribal Council will approve the plan in its entirety.

A. C. Hall
cmr

A. C. HALL

ACH:cmr

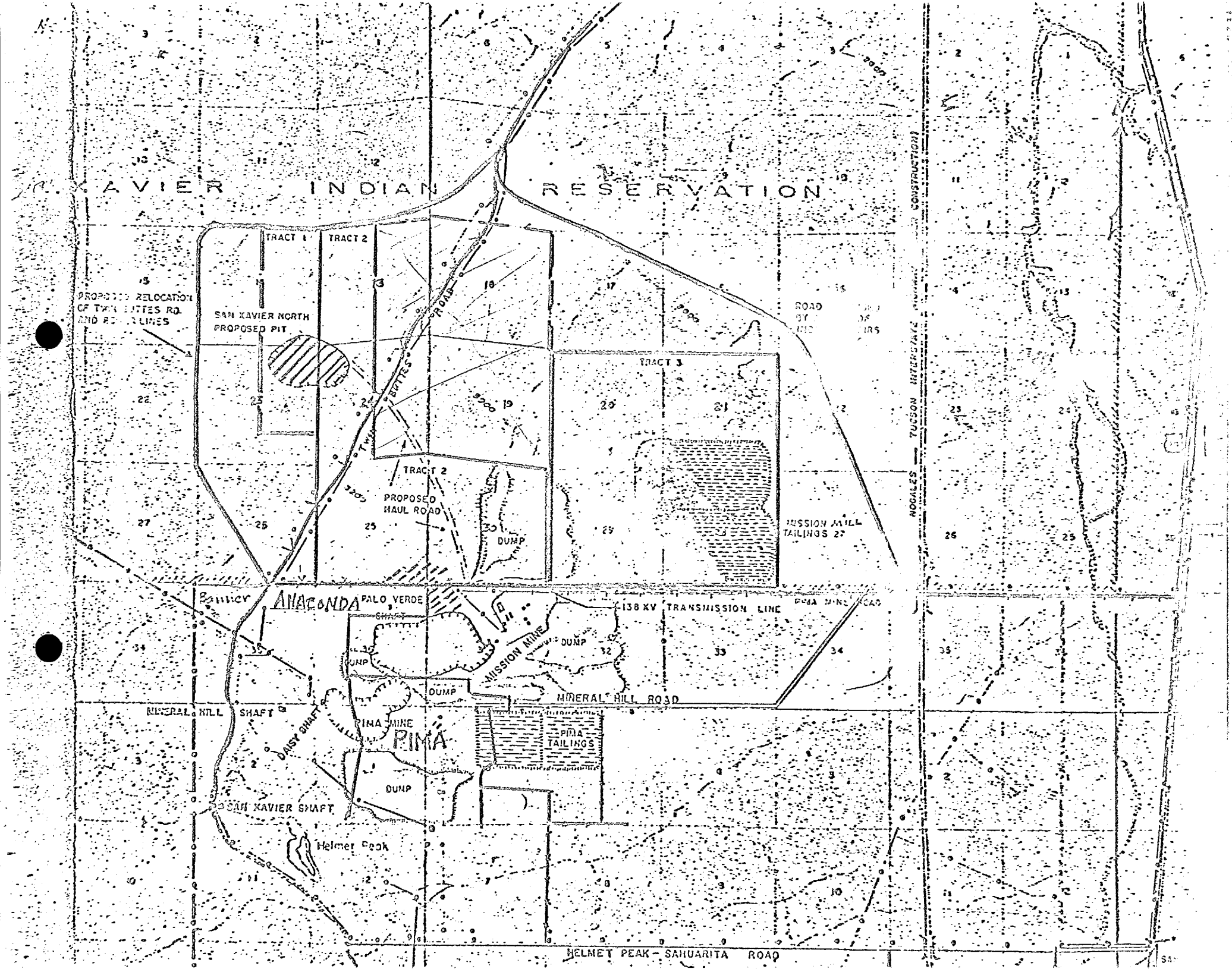
TUCSON DAILY CITIZEN
September 7, 1966



ARIZONA DAILY STAR
September 8, 1966



[redacted]


SAN XAVIER INDIAN RESERVATION
TRACT 1
TRACT 2
TRACT 3
PROPOSED RELOCATION OF TWIN BUTTES RD. AND POWER LINES
SAN XAVIER NORTH PROPOSED PIT
TWIN BUTTES ROAD
PROPOSED HAUL ROAD
DUMP
MISSION MILL TAILINGS
TUCSON INTERSTATE 19
CONSTRUCTION
Barrier
ANACONDA
PALO VERDE SHAFT
138 KV TRANSMISSION LINE
PIMA MINE ROAD
MISSION MINE
DUMP
MINERAL HILL ROAD
MINERAL HILL SHAFT
DAISY SHAFT
PIMA MINE
PIMA
PIMA TAILINGS
SAN XAVIER SHAFT
Helmet Peak
HELMET PEAK - SAHUARITA ROAD

S. I. B.

SX-10-5

OCT 10 1966

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

SEP 12 '66

MINING DEPT.

| PLS NOTE | NOTED |
|---|---|
| CEN | |
| HNTG | |
| JCP | |
| EHS | |
| TAS | |
| TAW | |
| CPP | |
| KR | |

JEK

MR. S.H.B. HALL

September 9, 1966

READ AND RETURN

PREPARE ANSWERS HANDLE

FILE INITIALS

J. G. P.
SEP 12 1966

E. H. S.
SEP 15 1966

Mr. T. A. Snedden, General Manager
United States Mining Department,
American Smelting and Refining Company
P. O. Box 5795,
Tucson, Arizona 85703

SAN XAVIER LANDS
Application for Business Lease

Dear Sir:

Attached is a file memorandum from Mr. Hall regarding his conversation with Mr. Homer Jenkins, Superintendent of the Sells Agency.

As a result of this conversation with Mr. Jenkins, Mr. Hall proceeded to the Bureau of Indian Affairs Phoenix Office where he discussed this matter with Mr. Donald Maynard and Mr. Diddock, Real Estate Manager of Papago Affairs. Mr. Hall will write a detailed report of his conversation upon his return from Salt Lake.

In the meantime, I will give a gist of the conversation he had at that time.

Mr. Hall was very disappointed with the conversation he had with these men as he felt he was getting the "run around". They did state that the Secretary had stated this land would be put up for competitive bidding at the request of others. Others had also claimed that our drilling was not to sufficient depth or in adequate numbers to prove the ground. Although Anacondas' name was not mentioned in particular in regard to these points, only their name was mentioned several times throughout the conversation.

They stated that only seven sections were to be put up for competitive bidding. Mr. Hall requested that if this land had to be put up for competitive bidding, that it be split into two parcels - our three sections and the remaining four.

The Bureau of Indian Affairs officials thought the Indians would approve the request for competitive bidding - in fact, it had not occurred to them that it might be turned down.

(Continued)

In regard to our request for a business lease, they thought that we deserved an answer. In fact, Mr. Jenkins had phoned and asked how to reply.

As stated earlier, Mr. Hall will give added comments on his visit upon his return from Salt Lake.

Yours very truly,

R. B. Moon,
Manager

RBM:mg
Enclosures
cc: CENelson
CFBarber

MR. W.E.S., J.E.K.

READ AND RETURN

PREPARE ANSWERS ____ HANDLE ____

FILE ✓ INITIALS

W.E.S. SEP 1966

J.E.K. SEP 07 1966

New York, N. Y., September 2, 1966

Mr. C. E. Nelson

At the meeting of the Advisory Committee held on August 31, 1966, there was approved the Review application for property appropriation - New York No. 1417 - Plant T, AX-3-66, in the amount of $78,000 for the excavation of 153,300 tons of waste and 2,100 tons of ore and preparation of bulk ore sample; and construction and operation of acid-leach pilot plant.

Harold Roe

JPHarrison
CWPollock
HLCoppedge
TAHamilton
RDBlount
EHixon
SFJohnson
PALewis
JHCourtright

New York, N. Y., August 18, 1966

J. H. C.

AUG 24 1966

Mr. C. E. Nelson

At the meeting of the Advisory Committee held on August 17, 1966, there was approved Gas Service application for property appropriation - New York Bu. 1405, Plant No. SK-1-66 - in the amount of $162,000 for an additional 4,300 ft. of rotary drilling and 19,350 ft. of core drilling.

Harold Howe

JHarrison
CPollock
HWoodenough
TSnedden
EJDiBento
EMason
PALewis
STJohnson
JHCourtright

SX-4.1.1

J. E. K.
AUG 17 1966

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. H. C.
AUG 01 1966

August 9, 1966

MR. W E S J E K
READ AND RETURN
PREPARE ANSWERS HANDLE
FILE INITIALS

W.E.S.
AUG 17 1966

Mr. T. A. Snedden
Building

SAN XAVIER INDIAN RESERVATION MINING LEASES
APPROPRIATION REQUEST NO. SX-2-66

New York Appropriations Nos. 1171, 1230, and 1329 have authorized a total expenditure of $373,000 for development drilling on the San Xavier Indian Reservation Leases. The work contemplated under these authorizations will be completed shortly, but our geologists and engineers now recommend approximately 24,000 feet of additional drilling at a cost of $162,000 to permit proper evaluation of the ore zone in the south part of Tract II. The drilling previously accomplished in this area has been found insufficient for ore reserve calculations and pit design purposes.

Attached are original and 7 copies of San Xavier Appropriation Request No. SX-2-66 to cover this additional work. Copies of Mr. Kinnison's memorandum of August 3, 1966, to Mr. Courtright, and of Mr. Lewis's letter of August 5, 1966, to me, recommending the work are attached to Mr. Nelson's and your copy of the request. I am in agreement with them. If you concur, please transmit the original and four copies to Mr. Nelson for his approval and processing, the designated copy to him for his file, and the designated copy to Mr. DiSanto.

ORIGINAL SIGNED BY
R. B. MEEN

R. B. MEEN
Manager

KvdS/cj
Encls.
cc: CENelson, w/attachs.
BJDiSanto," "
PALewis, " "

CPPollock, no attachs.
JHCourtright, " "

AMERICAN SMELTING AND REFINING COMPANY

EXPLORATION DEPARTMENT

120 BROADWAY, NEW YORK, N.Y. 10005

ASARCO

J.E.K. AUG 18 1966

W.E.S. AUG 19 1966

C. P. POLLOCK
VICE PRESIDENT

MR. WES, JEK

READ AND RETURN

August 4, 1966

PREPARE ANSWERS ____ HANDLE ____

FILE ✓ INITIALS ____

J. H. C.

AUG 9 1966

AIR MAIL - CONFIDENTIAL

Mr. J. H. Courtright, Chief Geologist
American Smelting and Refining Company
P. O. Box 5795
Tucson, Arizona 85703

San Xavier Indian Reservation

Dear Mr. Courtright:

I am enclosing for your file and as of possible interest copy of Mr. Lacy's confidential memorandum to Mr. Richter dated August 1st describing the geophysical methods and summarizing results of the various surveys in connection with the San Xavier Indian Reservation investigation. One copy of Mr. Lacy's memorandum is being retained here for the Mining Department files.

Very truly yours,

C. P. Pollock

Enc.
CC-RRichter
RJLacy

Cpy for R. B. Meen - 8/4

J. H. C.
AUG 3 1966

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

MR. .....
READ AND RETURN .....
PREPARE ANSWERS ..... HANDLE .....
FILE ..... INITIALS .....

August 3, 1966

TO: J. H. COURTRIGHT

FROM: J. E. KINNISON

SAN XAVIER
SOUTHERN TRACT II
DEVELOPMENT DRILLING

Following Mr. Saegart's request, I have reviewed the recent drilling in the subject area. Mr. Dennis Hall of Mission has provided me with the most recent drill data. I recommend the following drilling program:

1. Sixteen drill holes, which aggregate 12,350 feet--3200 feet rock bit and 9150 feet core.

2. Provision for interspaced drilling in the northwestern part of the chalcocite-oxide blanket, which may aggregate 1500 feet in four holes. Breakdown as follows: 800 feet rock bit, and 700 feet core.

The 16 holes are shown on the attached sketch map, and an estimated depth listed beside each hole. The actual depth will, of course, be determined at the drill site by the resident staff.

Drill holes A and B are designed to delimit the northern edge of tactite ore which may be reached by an open pit.

Deep drill holes C and D are spaced symmetrically with reference to other deep drill holes, and will test chalcopyrite values in an area which appears to be waste. These holes will also penetrate a deep tactite layer.

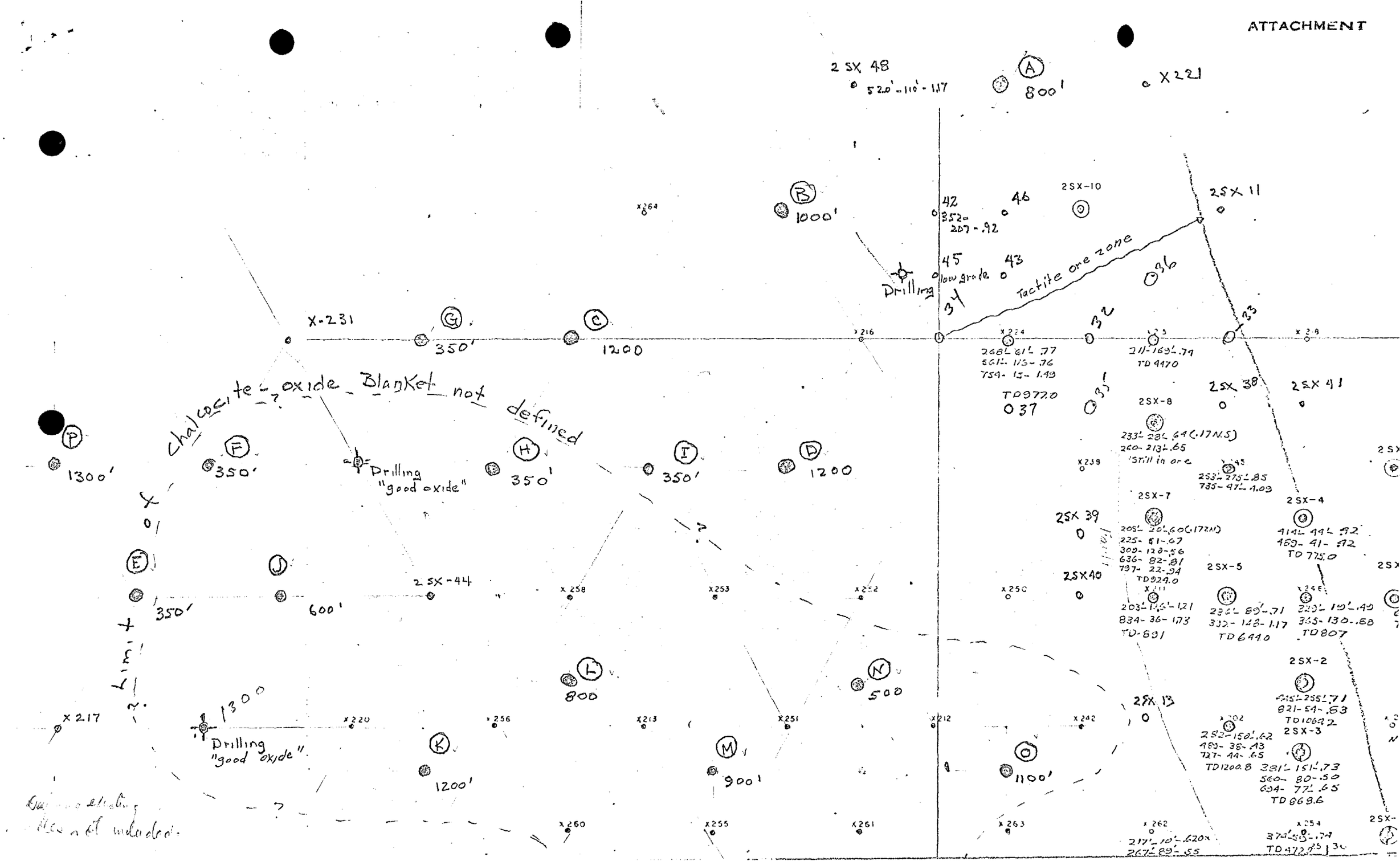
The remaining holes are designed to provide adequate data for an ore reserve calculation in that area known to contain mixed chalcocite and oxide values. The depth of these holes is partly determined by the slope of a large pit, designed to strip across the Eisenhower group and into the southern part of Tract II.

Drill hole 2SX-44 appears to be an interior waste hole which has a rather large influence on tonnage available. To provide for interspaced drilling near this drill hole (44), and elsewhere in the northwest portion of the blanket, I recommend 1500 feet in four holes. These four interspaced drill holes are not shown on the attachment, and will be determined after the other holes are completed.

John E. Kinnison
JOHN E. KINNISON

JEK/pjc
Attachment
cc: PALewis, w/ attachment
WESaegart, w/ attachment

ATTACHMENT


2 SX 48
520'-110'-1.17
A
800'
X 221
2SX-10
2SX 11
42
352=
207-.92
46
B
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45
low grade
43
Drilling
tactite ore zone
34
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036
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1200
X 216
X 224
X 223
X 218
268L 61L .77
561L 115-.76
754- 15- 1.49
TD9720
211-169L.79
TD 9470
2SX 38
2SX 41
2SX-8
233L 28L .64 (.17N.S)
260- 213L.65
still in ore
X 239
X 243
253L 275L.85
735- 47L 1.09
2SX-7
2SX-4
2SX 39
205L 20L.60(.172N)
225- 61-.67
309- 120-.56
636- 82-.81
737- 22-.94
TD924.0
414L 44L .92
469- 41- .92
TD 775.0
2SX40
2SX-5
X 250
X 211
X 246
203L 14L-.121
834- 36- 1.73
TD-891
235L 89L.71
332- 148- 1.17
TD 6440
220L 19L.49
335- 130-.88
TD807
2SX-2
2SX 13
435L 255L.71
821-54-.63
TD10692
2SX-3
X 202
252-150L.62
489- 36-.43
727- 44-.65
TD1200.8
381L 151L.73
560- 80-.50
694- 77L.65
TD 868.6
X 262
217L 10L.620x
267L 89-.55
X 254
374L 58L.74
TD 472.85
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X 255
X 261
X 263

GEOPHYSICAL DIVISION
3422 South 700 West
Salt Lake City, Utah



August 1, 1966

Mr. Robert Richter, Assistant Comptroller
New York Office

GEOPHYSICS
SAN XAVIER INDIAN RESERVATION

Dear Sir:

My memorandum of this date, concerning the subject matter relative to the tax write-off, is enclosed. Time and cost accounting was handled by the Tucson office and their figures should be more accurate than any judgment that can be obtained through the percentage figures of survey coverage on property retained. Survey coverage and anomalous features interpreted from the geophysical data are described relative to the federal survey control. The descriptions could have been shortened considerably if they could be illustrated on maps.

I hope that the enclosed will be of some assistance in your study of the problem.

Very truly yours,

R. J. Lacy

R. J. LACY

RJL:ao
Enc.

2 cpies of this letter together with the Memorandum dtd. 8-1-66 forwarded to same under N.Y. Office ltr. dtd. 8-4-66.

GEOPHYSICAL DIVISION
3422 South 700 West
Salt Lake City, Utah

August 1, 1966

CONFIDENTIAL

GEOPHYSICS
SAN XAVIER INDIAN RESERVATION

INTRODUCTION:

The Mineral Hill Mine, about one mile south of the San Xavier Indian Reservation and several old mines in the Twin Buttes area six miles to the south, in low outlying foothills of the Sierritta mountains had been operated sporadically for many years. United Geophysical Company discovered the Pima deposit east of the Mineral Hill Mine under 200± feet of gravel and sand valley fill (alluvium) by the application of geophysical methods. ASARCO later discovered a more or less northward extension of the Pima deposit. This ore deposit, called the Mission Mine, is immediately adjacent to the San Xavier Indian Reservation entirely under 200± feet of alluvium. The eastern edge of the deposit was known to extend into the Indian Reservation. The only outcrops on the reservation north of the Mineral Hill, Pima and Mission complex of ore deposits are some small hills of post-mineral volcanic and conglomerate rocks in the southwest corner of Tract 1 and two small, low knobs of altered pre-mineral arkose and monzonite with iron oxides derived from sulphides in the northeast corner of Section 23 in Tract 1. The alluvial cover ranges from .0 to 100 feet or so in the southwest part of Tract 1 and thickens north and east to 200 feet or more.

Prospecting is a matter of elimination of areas that are geologically unfavorable or uneconomic due to physical factors as much as it is evaluating known mineral deposits. When a potential geologically favorable area is covered with alluvium or post-mineral rock, the process of elimination requires extensive drilling or geophysical surveys and less extensive drilling. In the latter case the geophysics indicates targets for drilling to check depths to various horizons and geological information to verify one or the other alternate interpretations of the geophysical results. These cross geological-geophysical correlations build up until the geophysical interpretations are firm and can be extrapolated over large areas with only occasional drilling checks. The point here is that geophysics is not a complete substitute for geological information obtained by drilling and that every hole drilled serves a real purpose in the elimination process involved in exploration in alluvium and post-mineral rock covered areas.

Geophysics can indicate base metal sulphide mineral deposits indirectly through magnetic surveys (sulphides associated with magnetite and pyrrhotite),

gravity surveys (sulphides associated with heavy lime silicates and massive sulphides), electromagnetic surveys (massive sulphides and metallic sulphide veins and veinlet complexes) and induced polarization surveys (metallic sulphides in disseminated, vein or massive replacement forms). They seldom, however, give any indication of grade or detailed geometry unless the former is directly proportional to the density contrast or percent sulphide concentrations by volume (induced polarization). In any case, the development drilling is necessary for purposes of economic evaluation and engineering aspects of the mineral deposit.

The following geophysical methods applied on the San Xavier Indian Reservation are listed below along with survey periods and percent of total coverage that was done on property retained.

| Method | Survey Period | % of Survey on Property Retained |
|---|---|---|
| Magnetic (Aeromagnetic | July 17-22, 1956 | -- |
| (Ground Mag- | September 1957 | 64% |
| (netics | | |
| Gravity | Oct.-Dec. 1957 | 23-2/3% |
| Electromagnetic | July 1957-Jan. 1958 | 40% |
| Induced Polarization | Feb.-March 1958 | -- |

The aeromagnetic survey was very useful in eliminating areas with excessive thickness of alluvium and post-mineral volcanic rock cover wherein deposits could not be mined by open pit methods. The survey was conducted well before the permit date, however, and the area of the three tracts is an infinitely small percentage of total survey coverage which cost about $14,000.00.

Gravity, with a little more drilling necessary to indicate the correlation, served the same purpose of eliminating areas with excessive alluvium and post-mineral volcanic rock cover. It did indicate an additional non-magnetic post-mineral rock (conglomerate) and thus extended the unfavorable areas.

The gravity method also serves to indicate the thickness of the post-mineral rocks better than the magnetic method.

The electromagnetic method served no purpose in eliminating areas and, in the positive sense, did not indicate any metallic sulphide conductors as the sulphide occurrence was geometrically unfavorable to the application of this method.

The induced polarization survey was a test on the Mission property and on the San Xavier Indian Reservation entirely within the boundaries of property retained. This test, even though the results were good, was conducted after drilling had outlined the Mission deposit and its extension into the south edge of the Indian Reservation.

The percentage of survey coverage on property retained is quite accurate, but may not reflect variations in line footage of production per day due to physical problems. Personnel and wage and salary variations are obviously unobtainable from the percentage figures given. The time and cost accounting was handled by the Tucson office and their figures should be more accurate.

## MAGNETIC SURVEYS

### DESCRIPTION OF METHOD:

The Earth's magnetic field can be described by assuming a bar magnet at a small angle to the axis line between the north and south poles. The magnetic flux lines therefore are horizontal near the equator and have increasing inclinations in the north and south latitudes to 90° at the magnetic north and south poles. The horizontal declination of the earth's magnetic field in the Tucson area is 13° to 14° east of true north; its inclination from the horizontal is 59° north and the total magnetic intensity is approximately 50,800 gammas. The magnetometers used on the San Xavier Indian Reservation surveys can measure to an accuracy of 1 gamma so that on the order of 1 part in 50,000 parts of the earth's field can be measured.

Local deviations in the magnetic field are caused by magnetic susceptibility variations in the earth's crust due to variations of magnetic mineral content. The magnetic mineral of interest in the alluvium and rocks on the San Xavier Indian Reservation is magnetite. Igneous rocks that intruded sedimentary rocks and were extruded on the surface in the form of hot molten magmas and flows, usually contain accessory magnetite on the order of a few percent. The detection of igneous rocks in contrast to most sedimentary rocks with little or no magnetite content is therefore possible through magnetic measurements with sensitive magnetometers. Some types of base metal sulphide deposits are associated with appreciable quantities of magnetite gangue mineral and are thus detectable as well. Thin layers of magnetite in alluvial fans and stream beds can be deposited in sand and gravel valley fill material by erosion of igneous rocks and magnetite deposits from mountains and foothills. As the magnetic field decreases inversely, and exponentially with distance, the effect of these thin layers of magnetite can be minimized by increasing the altitude of the plane of measurement. The effect of massive magnetite deposits and large bodies of igneous rock underlying the alluvium will not decrease as much with distance and may then be more clearly detectable.

SURVEY COVERAGE AND RESULTS:

A request for authorization to conduct airborne geophysical surveys over the San Xavier Indian Reservation, among other areas in the Avra and Santa Cruz valleys, was made on May 31, 1956. Both the airborne magnetic and electromagnetic methods were recommended on the basis of successful ground tests of these methods in the Pima and Silver Bell areas. The request was approved on June 6, 1956. Preliminary tests of the airborne electromagnetic system were negative and this method was eliminated from the contract. The aeromagnetic survey of all areas, including the San Xavier Indian Reservation, was flown during the period July 17-22, 1956. Specifications were 1/4 mile spacing between north-south flight lines at 500 feet mean terrain clearance. Therefore 96 line miles were flown over the three tracts on the San Xavier Indian Reservation.

A preliminary report, dated October 6, 1956, was submitted in which it was stated that interpretation of the aeromagnetic results indicated that most of Tract 3 (excluding Section 28 and the south 1/2 of Section 29) was underlain by post-mineral volcanics at depths exceeding 200 feet and having a thickness exceeding 200 feet. A similar interpretation was made for the south 1/2 of Section 19, the south 1/8 of Section 24, the north 1/2 of Section 30 and a southwest strip diagonally across Section 25 including all but a little less than the NW 1/4 and a strip along the south border. It was concluded that no ore deposit at depths ammenable to open pit mining could exist within these volcanic flow areas.

During the latter half of June 1957, 167,100 line-feet of ground magnetic surveys were run on Tracts 2 and 3, primarily in Section 30, T16S, R13E; Sections 25 and 26, T16S, R12E; and the south 1/4 of Section 24, and southeast 1/4 of the southeast 1/4 of Section 23, T16S, R12E. The part of this survey within the boundaries of ground retained constitutes 64% of the total. Since thin layers of magnetite in the alluvium caused extreme "hash" in the data, the ground surveys were terminated and more reliance was placed on the aeromagnetic survey.

In a report dated August 23, 1957, entitled "Magnetics-Airborne and Ground", it was suggested that the magnetic high trending southeast from the center of Section 25, T16S, R12E through the southwest corner of Section 30 could represent copper mineralization associated with magnetite along the projection of the Mission orebody. A hole was recommended at this location. Holes were recommended at the center of Section 25 in Tract 2 and near the southeast corner of Section 26 in Tract 1 to check the interpretation of and depth to volcanics.

In a similarly titled letter dated September 11, 1957, a magnetic high trending southwest into Sections 13 and 18 in Tract 2 is noted and interpreted as another peninsula of post-mineral volcanic flow underlying the alluvium. A hole was recommended off the southwest nose of this anomaly near the two small outcrops of altered arkose and monzonite in the northeast

part of Section 23. Another hole was recommended about 1,200 feet east of the center of Section 15 in Tract 1 to check a magnetic high that could be interpreted as volcanics or possibly magnetite associated with copper mineralization. The former was drilled as a matter of evaluating mineralization near the two outcrops and the latter was drilled and volcanics verified.

In a memorandum dated December 13, 1957, the following was stated: New theoretical calculations in light of the drill hole data (shallow drilling that verified interpretation of post-mineral volcanics and indicated depth of alluvial cover in the center and southwest corner of Section 25 in Tract 2) suggest a thickness of volcanics of 150 feet near the center of Section 25, of 50-75 feet near the southwest corner of Section 25 and 300 to 400 feet northeast of the center of the section. A hole was suggested in a magnetic low at the northeast corner of the southwest 1/4 of the southwest 1/4 of Section 20 in Tract 3 to test for the possibility of pre-mineral rock windows in the volcanics. Another hole near the center of Section 29 in Tract 3 was recommended to check a southeast trending magnetic high for possible copper mineralization associated with magnetite similar to the condition at the south part of the common Sections 25 and 30 line in Tract 2.

CONCLUSIONS:

The magnetic surveys served to indicate areas underlying the alluvium and the order of magnitude of thickness of these rocks. Some shallow drilling was required to check the interpretation of post-mineral volcanics and the depth of alluvial cover to refine the calculation of thickness of these rocks. Some drilling was necessary to check the alternate interpretations of isolated magnetic highs as volcanics or copper mineralization associated with magnetite and all but one of these were indicated as caused by volcanics. The point is that all of these holes were necessary and served a purpose in a negative sense concerning mineralization, but an impractically large number of holes would have been necessary for this purpose without the magnetic surveys.

## GRAVITY SURVEYS

DESCRIPTION OF METHODS:

Gravity meters are used to detect variations in the density of subsurface materials in the earth's crust. They are capable of measuring one part in ten million parts of the earth's gravitational field. Relative gravity contour maps are reduced to a base elevation and this requires elevation survey control within a foot or less at all stations. It is often possible to indicate bedrock topography underlying alluvial cover and distinguish between rock types that have density contrasts. Massive sulphide and magnetite deposits may result in local gravity highs. Heavy lime silicate gangue minerals associated with disseminated and lensy iron and copper sulphide mineralization in the Mission deposit resulted in gravity highs over that deposit.

COVERAGE AND RESULTS:

Gravity surveys were conducted on the San Xavier Indian Reservation during the period October 1957 to January 3, 1958. North-south lines 21,120 feet long, approximately 580 feet apart, were surveyed on approximately 290 foot station intervals on all of Tracts 1 and 2 and the west edge of Tract 3. The thirty-six lines on Tracts 1 and 2 and two lines on Tract 3 constitute a total of 802,560 feet. Five east-west lines 8,300 feet long (totaling 41,500 feet) and 4,000 feet apart were surveyed on approximately 580 foot station intervals on Tract 3. Total footage, then, is 844,060. The line-feet of survey within the property retained is 199,740, constituting 23 2/3% of the total survey.

The following was stated in a preliminary report dated October 17, 1957. A gravity high in the southeast corner of Section 25, Tract 2 is west of the East Boundary Fault (indicated by drilling and gravity results on the Mission Mine property to the south) and could indicate heavy lime silicate gangue minerals associated with copper mineralization. Note that there was also a magnetic high here suggesting copper mineralization associated with magnetite gangue (report dated August 23, 1957, titled "Magnetics-Airborne and Ground"). It was noted that a hole currently being drilled would test this interpretation. The hole later intersected ore grade copper mineralization with heavy lime silicate and magnetite gangue. A gravity high in the southeast 1/4 of the southwest 1/4 of Section 30 in Tract 2 was interpreted as a bedrock hill as it was east of the Boundary fault (there was no magnetic high at this position). A hole drilled to test this interpretation against the alternate interpretation of heavy lime silicate, encountered unmineralized bedrock at 134 feet, rather than the usual $\pm$ 200 feet of alluvium. The negative gravity feature in Tract 2 trending southwest and bounded by a fault on the south from the center of Section 30 through a point 2,000 feet west of the common line between Sections 25 and 30 and 1,000 feet north of the south line of Section 25; and by a fault on the northwest side striking southwest from a point 2,100 feet east of the northwest corner of Section 19 through a point 1,200 feet east of the northwest corner of Section 25 corresponds to the magnetic anomaly interpreted as thick post-mineral volcanic flow. The boundaries are steeply dipping, suggesting a volcanic-filled down-faulted block. The area north of this block is interpreted, both from gravity and magnetic surveys, as pre-mineral bedrock with a few bedrock hills and the only two outcrops of pre-mineral rock (the altered and mineralized arkose and monzonite in the northeast corner of Section 23) on the three tracts. Gravity irregularities in the southwest part of Tract 1 were interpreted as due to variations of gravel thickness in a near outcrop environment.

In a letter dated December 19, 1957, titled "Geophysics (Magnetic & Gravity)", a progress report of magnetic interpretations in the light of new evidence, dated December 13 and a progress report concerning the results of the gravity survey, dated December 10, were summarized. Another fault had been interpreted from the gravity results as this survey progressed north. This fault strikes west-southwest from a point about 2,100 feet

north of the south common corner of Sections 18 and 13 to a point about 600 feet north of the south common corner of Sections 14 and 15. The eastern part of this fault corresponds to the south boundary of the northernmost peninsula interpreted from the aeromagnetic survey as post-mineral volcanic flow rocks. Interpretation of the gravity and aeromagnetic surveys, supplemented by a few shallow drill holes, indicated a thickness of at least 600 feet of post-mineral volcanic flow and caliche conglomerate underlying approximately 150 to 200 feet of alluvium north of this fault. A similar thickness was interpreted for the southernmost peninsula of post-mineral volcanics between the fault striking southwest from the northwest corner of Section 19 to the southwest corner of Section 24 and the fault extending from the center of Section 30 through the south central part of Section 25. Besides these, the entire area east of a line about 2,200 feet east of the center of Tract 2 was interpreted as post-mineral volcanics exceeding a thickness of 600 feet under 200± feet of alluvium. This left a 6,000 foot wide strip of pre-mineral bedrock, covered by 0 to 200± feet of alluvium, trending southwest from about the north-central third of Tract 2 through the southwest part of Tract 1. A few possible windows of pre-mineral rock to the east were to be checked by drilling. Small remnants of volcanic flow could be anticipated in the southwest part of Tract 1. Except for a few shallow holes and one or two deep holes to check this interpretation, the drilling could be confined to the north extension of the Mission deposit along the south edge of Section 25 and southwest corner of Section 30 in Tract 2 and to the relatively shallow pre-mineral rock area described above. A great deal of shallow-hole and some deep-hole drilling would have been necessary to eliminate the area of thick post-mineral rock without the magnetic and gravity surveys. Except for the indication of the heavy lime silicates and magnetite associated with copper mineralization in the south part of Section 25 in Tract 2, the gravity and magnetic surveys did not result in any interpretation related to sulphide mineralization. The mineralization in the east central part of Tract 1 and west central part of Tract 2 is largely disseminated sulphides in arkose and monzonite and therefore there is no density or magnetic contrast between the mineralized and unmineralized pre-mineral rocks.

## ELECTROMAGNETIC SURVEYS

### DESCRIPTION OF METHOD:

The electromagnetic surveys conducted on the San Xavier Indian Reservation were done with the dip-angle technique. A vertical transmitter coil, with its plane oriented toward the receiving coil produced the primary electromagnetic field. The receiving coil measured the dip-angle of the primary field (horizontal at the receiver station) plus the dip-angle of any secondary field from electrically conductive sub-surface media. Maximum coupling for this system is obtained with steeply dipping planar conductive media and coupling with flat dipping media is minimum. Electrical continuity of the conductive media is necessary over at least one half the transmitter-receiver separation and preferably equal to the separation for adequate correlation of curves between adjacent profile lines. The trans-

mitter-receiver separation should be approximately twice the depth to the top of conductive media. An alluvial cover of 200+ plus leached caprock requires a loop separation of at least 500 feet. Conductive media would include massive sulphides, metallic sulphide veins or veinlet complexes; moist fault gouge, graphite and permeable rock contacts.

SURVEY COVERAGE AND RESULTS:

Tracts 1 and 2 were surveyed along north-south lines 1,160 feet apart extending 12,000 feet north from the south edge of the San Xavier Indian Reservation, during the period July 1957 through January 1, 1958. One of these lines was surveyed on the west edge of Tract 3. A few intermediate lines and some east-west lines were surveyed. Power line interference eliminated a 3,000 to 5,000 foot strip trending southwest through the central part of this survey area. Total line footage surveyed at 100 foot stations was 298,000 and 118,000 feet, or approximately 40% was within the property retained. All electromagnetic anomalies indicated could be attributed either to fault zones or to permeable pre-mineral rock contact zones. Although a few holes were recommended on electromagnetic anomalies, the electromagnetic surveys did not contribute positive or negative information to the exploration program on the San Xavier Indian Reservation.

## INDUCED POLARIZATION SURVEY

DESCRIPTION OF METHOD:

The induced polarization method used on the San Xavier Indian Reservation involved the introduction of a current pulse (4-8 seconds) between two metal electrodes in the ground and measuring the electrical resistance potential between two porous pot electrodes between the current electrodes. Conductive minerals, such as metallic sulphides, block the electrolytic current paths (carried by ionized ground waters) and a charge is built up on their surfaces. The current is then turned off and the potential of the discharge (decay of the induced polarization) is measured. This measurement is proportional to the aggregate surface volume of the metallic sulphides. The potential electrodes were 400 feet apart and the current electrodes were 400 feet on either side of the potential electrodes, making a total lineal spread of 1,200 feet. This electrode array was traversed along survey lines and measurements were made at 200 foot station intervals.

SURVEY COVERAGE AND RESULTS:

An induced polarization test survey was conducted on the Mission deposit south of the San Xavier Indian Reservation and on its extension into the reservation. A block of ground approximately 7,300 feet long (east-west) and 1,800 feet wide (north-south) was surveyed in Tract 2 along the south edge of the Indian reservation centered at the common line between Sections 25 and 30. This constitutes approximately 50% of the Mission-San Xavier induced polarization test survey. The survey outlined the sulphide concentrations very well, except for an induced polarization lobe extending

east (axis along south boundary of reservation) of the gravity and drilling indicated East Boundary Fault. Sulphide mineralization associated with heavy lime silicates could not exist above a depth of about 700 feet here, so this was interpreted as possibly a pyritic zone in siliceous clastics such as arkose.

Since the drilling on the northern extension of the Mission deposit along the south edge of the reservation had already outlined the deposit, the induced polarization survey did not contribute to the program. A few test lines were run in the mineralized area in Sections 23 and 24, but unusually strong fluctuating natural earth currents interferred with the signal here. Instrumentation and techniques to minimize this problem was developed at a later date.

R. J. Lacy

RJL:ao

R. J. LACY
Chief Geophysicist

MR. ~~J.E.K.~~

READ AND RETURN JHC Desk

PREPARE ANSWERS____ HANDLE____

FILE____ INITIALS____

W.E.S.
JUL 22 1966

July 21, 1966

AIR MAIL

J. H. C.
AUG 15 1966

J. E. K.
JUL 26 1966

Mr. T. A. Sneddon, Gen. Mgr.
Asarco U. S. Mining Dept.
Tucson

South Ore Body
San Xavier
Indian Reservation

Dear Mr. Sneddon:

With reference to the south ore body on the San Xavier Reservation and the north extension of the Mission ore body, it is my understanding that all of the geological sections (not ore reserve sections) were sent to the Mission Unit. In view of the additional diamond drilling in these two areas, these sections should be returned to Mr. Courtright and all of the new drilling information should be made available so that Mr. Knowlton can bring them up to date. When this work is completed, please have the sections copied and one set forwarded to New York.

Very truly yours,

Original Signed
C. E. NELSON

Talked to KER today - Instructions as per this letter are O.K. 7/28/66 W.E.S.

cc: ~~MacTittmann~~
~~KRichard~~
~~EMagen-A/M~~
~~JCourtright-A/M~~

disregard → K.E.R. requested this, but it was my impression he wanted these sections on San Xavier North Ore Deposit as well as South. 7/22/66 W.E.S.

K.E.R. may want geol. Sections on SX North - however I sent nothing to mission re S.X.N. Would have to start from their logs + our old logs. J.E.K

MR. J. H. COURTRIGHT

AMERICAN SMELTING AND REFINING COMPANY

COMPTROLLER'S DEPARTMENT - TAX SECTION

J. H. C.
JUN 14 1966

A-6-99

New York, N.Y.
June 13, 1966

MEMORANDUM FOR MR. H. L. GOODENOUGH

San Xavier Pro.

On June 6, 1966 the following persons met in the Board of Directors Room to discuss the presentation to be made in Court with regard to the disallowance of $843,000 written off in respect to the San Xavier Property:

Representing ASARCo.:

C. F. Barber
R. W. Vaughan
D. J. Pope
H. L. Goodenough
T. A. Sadden
K. E. Richard
J. H. Courtright
Robert Richter
Paul A. Barrese

Representing Miller & Chevalier

Fred W. Peel
Clarence T. Kipps, Jr.

The meeting was opened at 10:00 A.M. by Mr. Richter who gave a brief summary of the problems we had encountered with the Engineering Branch of Internal Revenue Service on the disallowance of the aforementioned deduction. Mr. Richter then turned the meeting over to our legal counsel handling this case, Mr. Fred Peel.

Mr. Peel advised that we would endeavor to get as much information and evidence through questioning the persons present on the following points:

(a) the mechanical details of signing leases to prove multiple leases rather than one lease for each tract.

(b) establish on the basis of engineering that exploration work on areas subsequently abandoned did not aid us in finding the eventual areas of interest.

Mr. Peel then questioned Mr. Richard and Mr. Courtright regarding the nature of the geophysical survey at the San Xavier tracts. He also questioned them regarding drilling which was done, and whether or not the drill holes drilled in areas subsequently abandoned helped us in locating our area of interest.

Mr. Richard advised that he felt that each hole drilled contributed some information to the sum-total of our knowledge of the entire area.

On the basis of these remarks Mr. Peel felt that we do not have much of a case on the geophysical expenditures and some of the drilling, however, he requested to be furnished with maps in this regard. He also requested that Mr. Richard have someone in his department furnish him with the procedures followed in the geophysical examination of this property, such procedure should be written so that it will be understood by the layman. Mr. Richard advised that he would have Mr. Lacy of the Exploration Department furnish a narrative presentation of this procedure.

A discussion ensued regarding the allocation of the expenditures to the three separate tracts, i.e. geophysical examination, surveying and mapping, drilling, etc. We did have a detail of the amounts allocated to different tracts; however, Mr. Peel wants these submitted in greater detail. Mr. Sneddon advised that he would have the accountant who prepared the original statements, Mr. K. von den Steinen, furnish the required information.

Regarding the mechanical details of signing leases by the Indians, it was decided that it would be advisable to present as evidence the original copies of the prospecting permits signed by each individual Indian on the three tracts involved. Copies of these permits will be made and sent to Mr. Peel. We are also making copies of a folder on definitive acreage and locations of the San Xavier Indian allotments which Mr. Peel also requested. The attorneys were also furnished with files from the Mining Department which they felt they should study to determine whether any of the information therein would help them in this case. They will return these files on June 13 when Mr. Peel has to come to New York again.

The meeting terminated at 4:00 P.M. During the day many other thoughts were exchanged by all present, which are not reported in this memorandum; however, the entire discussion centered on furnishing bits of information that might be helpful to our attorneys.

At the end of the meeting Mr. Peel and Mr. Kipps felt that they had a great deal of studying to do before they could make a decision as to what their final course of action would be. Their present feeling after the meeting was to rely more on stipulations and documents rather than expert witnesses in direct testimony. Mr. Peel advised that the Commissioner who is to sit in on our case in the United States Court of Claims had set a June 22 deadline for the submission of lists of documents and witnesses, a statement of noncontroverted facts, and a memorandum of the facts and law at issue. Mr. Peel will ask for a 60 day extension in regard to this order.

All maps and other data to be sent to Mr. Peel will be sent first to the Comptroller's Department - Tax Section which will act as the "clearing house" in forwarding the material to Mr. Peel.

PAB:JV

P. A. BARKER

cc: CFBarber
RWVaughan RJPope EERichard Fred W. Peel
TASneddon JHCourtright CKKipps,Jr.

P.A.B.

Mr. C. P. Pollock

Copy to Courtright 5/27/66

AMERICAN SMELTING AND REFINING COMPANY

Comptroller's Department - Tax Section

J. H. C.

MAY 31 1966

A-6-59

New York, N. Y.
May 19, 1966

Federal Income Tax Year 1959 -
San Xavier Suit for Refund in
U. S. Court of Claims

MEMORANDUM FOR MR. H. L. GOODRICH

In connection with A &RCo.'s suit for refund in the U. S. Court of Claims for recovery of income tax paid for the year 1959, Mr. Fred W. Peel, our Washington attorney who is handling this matter, has suggested the desirability of having a meeting in A&RCo.'s corporate office in New York to discuss the presentation to be made in Court with regard to the disallowance of some $880,000 written off in respect to the San Xavier property.

Mr. Peel has asked that we arrange to have present at this meeting the personnel who were most closely involved in negotiations with the Indians and the Bureau of Indian Affairs. He has also requested that there be present at the meeting our Engineering and Geological personnel who are most knowledgable about the geology of the San Xavier property.

The meeting has been set for 10:00 A. M., June 6, 1966 in the Board Room. I am sending copies of this memorandum to Messrs. C. F. Barber, R. W. Vaughan, C. H. Nelson and C. P. Pollock. I think it would be desirable for Mr. Nelson to select one or more people in the Mining Department to attend this meeting. Perhaps he may wish to have Mr. A. C. Hall or Mr. T. A. Snow come up to New York from Tucson for the meeting. Mr. Pollock may wish to have Mr. Kenyon Richard attend because of his knowledge of the ore body.

Because we are dealing here with an approximate amount of $460,000 of Federal income tax liability, the matter is of enough importance to have those people who have first-hand knowledge about the property and the Indian negotiations present even though it may entail travel to New York. If any of the recipients of this memorandum think of any others who should be present at the meeting, I will appreciate being informed so that the others may be invited to attend.

S/ R R
ROBERT RICHTER

RR:ED
cc - CFBarber
RWVaughan
CHNelson
CPPollock
FWPeel

San Xavier

mineral Prospecting Permit and Lease Option - May 17, 1957

3 tracts 8 sections each

Permit gives excl. right to prospect for 2 yrs.

Lease may cover upto 2,560 acres - term 10 yrs

| | | $ |
|---|---|---|
| tract | 1 | 283,000 |
| | 2 | 757,002 |
| | 3 | 26,005 |
| | | $1,066,000 |

Drilling started Aug '57 - compl Aug '58.

Drilling compl in '58 -

| | |
|---|---|
| core drilling - | 29,307.6 |
| Rotary | 24,619.2 |
| | 53,926.8 |

total cost ft 10.32

" cost $556,070

Reserve 29,000,000 @ .66

DOMESTIC SERVICE

Check the class of service desired; otherwise this message will be sent as a fast telegram

| | |
|---|---|
| TELEGRAM | |
| DAY LETTER | |
| NIGHT LETTER | |

$
S
E

# WESTERN UNION TELEGRAM

1206 (4-55)

W. P. MARSHALL, PRESIDENT

INTERNATIONAL SERVICE

Check the class of service desired; otherwise the message will be sent at the full rate

| | |
|---|---|
| FULL RATE | X |
| LETTER TELEGRAM | |
| SHORE-SHIP | |

| WDS.-CL. OF SVC. | PD. OR COLL. | CASH NO. | CHARGE TO THE ACCOUNT OF | TIME FILED |
|---|---|---|---|---|
| | | | EXPLORATION | |

*Send the following message, subject to the terms on back hereof, which are hereby agreed to*

J. H. C.

April 26, 1966

APR 23 1966

STRAIGHT WIRE

Mr. A. C. Hall
American Smelting & Refining Company
1150 North 7th Avenue
Tucson, Arizona

SJM

THIS WILL AUTHORIZE YOU TO SIGN THE PROSPECTING PERMIT AND ARRANGE FOR AND SIGN THE $2000 BOND IN CONNECTION WITH THE GEOLOGICAL WORK JUST BROUGHT TO YOUR ATTENTION BY COURTRIGHT

CC-TASnedden
JHCourtright
SIBowditch

RICHARD
American Smelting &
Refining Company
120 Broadway
New York, New York

# ALL MESSAGES TAKEN BY THIS COMPANY ARE SUBJECT TO THE FOLLOWING TERMS:

To guard against mistakes or delays, the sender of a message should order it repeated, that is, telegraphed back to the originating office for comparison. For this, one-half the unrepeated message rate is charged in addition. Unless otherwise indicated on its face, this is an unrepeated message and paid for as such, in consideration whereof it is agreed between the sender of the message and the Telegraph Company as follows:

1. The Telegraph Company shall not be liable for mistakes or delays in the transmission or delivery, or for non-delivery, of any message received for transmission at the unrepeated-message rate beyond the sum of five hundred dollars; nor for mistakes or delays in the transmission or delivery, or for non-delivery, of any message received for transmission at the repeated-message rate beyond the sum of five thousand dollars, unless specially valued; nor in any case for delays arising from unavoidable interruption in the working of its lines.

2. In any event the Telegraph Company shall not be liable for damages for mistakes or delays in the transmission or delivery, or for the non-delivery, of any message, whether caused by the negligence of its servants or otherwise, beyond the actual loss, not exceeding in any event the sum of five thousand dollars, at which amount the sender of each message represents that the message is valued, unless a greater value is stated in writing by the sender thereof at the time the message is tendered for transmission, and unless the repeated-message rate is paid or agreed to be paid and an additional charge equal to one-tenth of one per cent of the amount by which such valuation shall exceed five thousand dollars.

3. The Telegraph Company is hereby made the agent of the sender, without liability, to forward this message over the lines of any other company when necessary to reach its destination.

4. The applicable tariff charges on a message destined to any point in the continental United States listed in the Telegraph Company's Directory of Stations cover its delivery within the established city or community limits of the destination point. Beyond such limits and to points not listed in the Telegraph Company's Directory of Stations, the Telegraph Company does not undertake to make delivery but will endeavor to arrange for delivery by any available means as the agent of the sender, with the understanding that the sender authorizes the collection of any additional charge from the addressee and agrees to pay such additional charge if it is not collected from the addressee.

5. No responsibility attaches to the Telegraph Company concerning messages until the same are accepted at one of its transmitting offices; and if a message is sent to such office by one of the Telegraph Company's messengers, he acts for that purpose as the agent of the sender; except that when the Telegraph Company sends a messenger to pick up a message, the messenger in that instance acts as the agent of the Telegraph Company in accepting the message, the Telegraph Company assuming responsibility from the time of such acceptance.

6. The Telegraph Company will not be liable for damages or statutory penalties when the claim is not presented in writing to the Telegraph Company, (a) within ninety days after the message is filed with the Telegraph Company for transmission in the case of a message between points within the United States (except in the case of an intrastate message in Texas) or between a point in the United States on the one hand and a point in Alaska, Canada, Mexico, or St. Pierre-Miquelon Islands on the other hand, or between a point in the United States and a ship at sea or in the air, (b) within 95 days after the cause of action, if any, shall have accrued in the case of an intrastate message in Texas, and (c) within 180 days after the message is filed with the Telegraph Company for transmission in the case of a message between a point in the United States and a foreign or overseas point other than the points specified above in this paragraph; provided, however, that this condition shall not apply to claims for damages or overcharges within the purview of Section 415 of the Communications Act of 1934, as amended.

7. It is agreed that in any action by the Telegraph Company to recover the tolls for any message or messages the prompt and correct transmission and delivery thereof shall be presumed, subject to rebuttal by competent evidence.

8. Special terms governing the transmission of messages according to their classes, as enumerated below, shall apply to messages in each of such respective classes in addition to all the foregoing terms.

9. No employee of the Telegraph Company is authorized to vary the foregoing.

4-54

# CLASSES OF SERVICE

## DOMESTIC SERVICES

### TELEGRAM

The fastest domestic service.

### DAY LETTER (DL)

A deferred same-day service, at low rates.

### NIGHT LETTER (NL)

Economical overnight service. Accepted up to 2 A. M. for delivery the following morning; at rates lower than the Telegram or Day Letter rates.

## INTERNATIONAL SERVICES

### FULL RATE (FR)

The fastest overseas service. May be written in code, cipher, or in any language expressed in Roman letters.

### LETTER TELEGRAM (LT)

For overnight plain language messages, at half rate. Minimum charge for 22 words applies.

### SHIP RADIOGRAM

For messages to and from ships at sea.

New York, N. Y., April 15, 1966

J. H. C.
APR 19 1966

Mr. C. E. Nelson

At the meeting of the Advisory Committee held April 14, 1966, there was approved Sun Xavier application for property appropriation - New York No. 1329, Plant No. SX-1-66 - in the amount of $91,000 for 3,000 feet of rotary drilling and 11,000 feet of core drilling.

Harold Howe

JWHarrison
CPPollock
HLGoodenough
TASneddon
DJMBaute
HMHaen
STJohnson
PALewis
JHCourtright

SX-4.1.1

J. H. C.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

APR 5 1966

April 5, 1966

MR. W E S
READ AND RETURN
PREPARE ANSWERS ..... HANDLE .....
FILE ✓ INITIALS W.E.S.
APR 14 1966

Mr. T. A. Snedden
Building

SAN XAVIER INDIAN RESERVATION MINING LEASES
APPROPRIATION REQUEST NO. SX-1-66

New York Appropriations No. 1171, approved June 23, 1965, and No. 1230, approved November 4, 1965, authorized a total expenditure of $282,000 for development drilling on the San Xavier Indian Reservation Mining Leases. The work contemplated under these authorizations will be completed in the near future. Our engineers now recommend a further 3,000 feet of rotary drilling and 11,000 feet of core drilling at an estimated cost of $91,000 for the following purposes: (1) location of dump and plant sites for the north San Xavier ore body; (2) additional study of the area immediately adjacent to the north boundary of the Mission Unit property; (3) development of probable extensions of Anaconda's Eisenhower ore body into the San Xavier ground.

Attached are original and 7 copies of San Xavier Appropriation Request No. SX-1-66 to cover this new work. Please transmit the original and 4 copies to Mr. Nelson for his approval and processing, the designated copy to him for his file, and the designated copy to Mr. DiSanto.

ORIGINAL SIGNED BY
R. B. MEEN
R. B. MEEN
Manager

107,000
175,000 > 282,000
91,000
373,000

KvdS/cj
Encls.
cc: CENelson, w/attachs.
BJDiSanto, " "
PALewis, " "

CPPollock, no "
JHCourtright, " "

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

W.E.S.
OCT 26 1965

October 25, 1965

Mr. T. A. Snedden
Building

SAN XAVIER INDIAN RESERVATION MINING LEASES
APPROPRIATION REQUEST NO. SX-2-65

New York Appropriation No. 1171 approved June 23, 1965, authorized the expenditure of $107,000 for diamond drilling on the San Xavier Indian Reservation Mining Leases. The work originally authorized has now been substantially completed, but an additional 5000 feet of rotary drilling and 21,000 feet of core drilling are required to delineate and develop the potential ore bodies. Mission Unit estimates the cost of this additional work, including sampling, assaying, and engineering, at $175,000.

We are attaching original and 7 copies of San Xavier Appropriation Request No. SX-2-65 to cover this work. Please transmit the original and 4 copies to Mr. Nelson for his approval and processing, the designated copy to him for his file, and the designated copy to Mr. DiSanto.

ORIGINAL SIGNED BY
R. B. MEEN

R. B. MEEN
Manager

KvdS/ma
Encls.
cc: TASnedden, w/attachs.
BJDiSanto, " "
PALewis, " "

CPPollock, no "
JHCourtright," "

8/21/65 JEK

MR. NELSON

READ AND RETURN

PREPARE ANSWERS ___ HANDLE ___

FILE ___ INITIALS ___

J. H. C.

AUG 19 1965

August 19, 1965

W.E.S.

AUG 23 1965

Mr. C. E. Nelson, Vice President
ASARCO - New York Office

MISSION UNIT
Drilling - San Xavier North

Dear Sir:

Attached is a Bench Composite plan map of the San Xavier North area, N-S Section 758,800 E, N-S Section 759,490 E, and E-W Section 375,000 N. These maps show that there is a possibility of ore being produced from an open pit that would overlap Tracts 1 and 2, with 80 to 90 percent of the potential ore being in Tract 1.

The drilling done to date has been on centers of over 500 feet so the polygons are too large to permit the calculation of ore reserves. It is indicated that the area might produce about 24,000,000 tons of 0.65 percent copper with a stripping ratio of 4:1. In addition to the 24,000,000 tons of sulfide ore there are some 3,000,000 tons of about one percent oxidized copper that might be heap leached.

In order to evaluate the area, with drill holes on about 300 ft. centers, another 40 holes with an average depth of 600 feet must be drilled. About 25 of these holes will be in the potential pit area and 15 will be on the perimeter. The cost of the 40 holes will be about $110,000. The current drill program on the reservation will be completed in about five weeks with an estimated $50,000 remaining, so another $80,000 will be needed. It will be best to make a supplemental request at a later date when estimates can be more accurate. The above-mentioned 40 holes can be completed in about 6 months. One additional drill will be put into operation within the next few days and the two rigs now working on the reservation will be moved to the San Xavier-North after another 6 or 7 holes are completed.

Yours very truly,

ORIGINAL SIGNED BY
T. A. SNEDDEN

T. A. Snedden
General Manager

TAS:lc
Encl. (4)
cc: RBHeen, no encl.
PALewis, " "
JNCourtright, No encl.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

June 28, 1965

J. H. C.
JUN 28 1965

AIR MAIL
Mr. W. T. Reed, Assistant Secretary
American Smelting and Refining Company
120 Broadway
New York, N. Y., 10005

Re: Mining Authorization No. 1028

Dear Sir:

We note your memorandum of June 23, 1965, to Mr. C. E. Nelson captioned:

> "Mining Authorization No. 1028, San Xavier Indian Reservation Silver Bell Unit, Arizona"

wherein you refer to the Company's lease on the San Xavier Indian Reservation "north of the Silver Bell Unit."

The leased area is north of the Mission Unit, not the Silver Bell Unit. The minutes of the meeting of the Advisory Committee should be corrected accordingly.

Very truly yours,

ORIGINAL SIGNED BY
R. B. MEEN

R. B. MEEN
Manager

KvdS/ma
cc: FGHamrick
CENelson
HLGoodenough-2
TASnedden
PALewis
JHCourtright

Note to Mr. Goodenough:
Are we correct that expenditures under this Mining Authorization will be recorded by Mission Unit and carried by them in A/C 2600 - Mine Examination and Development Expense? The alternative would be to record them at Tucson Office and clear them monthly to New York as with other mining authorization expenditures.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

June 23, 1965

Mr. K. E. Richard, Chief Geologist
American Smelting and Refining Company
120 Broadway
New York, N. Y. 10005

Dear Sir:

Enclosed are two copies each of your letters of August 17 and August 21, 1959 to D. J. Pope.

One of these letters is entitled "San Xavier Tracts I and II, Ore Reserves", and the other, "San Xavier Reservation Zones of Mineralization on Proposed Mining Leases".

We have not been able to locate in the files here, or at Mission, anything resembling a San Xavier ore reserve estimate by Walter Schubel.

Mr. Tainter advised that they were compiling a map and cross section for the purpose of estimating the open pit ore reserves on the central zone which is in tracts I and II.

Yours very truly,

J. H. COURTRIGHT

JHC/pjc
Enclosures: 4
cc: TASneddon, w/enclosures
RDMoon, w/enclosures
PALewis, w/enclosures

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

June 17, 1965

Mr. C. P. Pollock, Vice President
American Smelting and Refining Company
120 Broadway
New York, N. Y. 10005

SAN XAVIER
DRILLING, TRACT II

Dear Sir:

Reference is made to my letter of January 18 to Mr. Meen (copy enclosed) recommending a resumption of diamond drilling on the San Xavier Reservation.

This drilling is now underway; however, Mr. von den Steinen has pointed out that the cost cannot be charged to Mission Unit operating expense since the San Xavier ground is still in the exploration stage, and therefore the Exploration Department should obtain a Mining Authorization to cover the cost.

The recommended drilling (described in John Kinnison's report to me dated January 4, 1965) amounts to 24 holes, totaling 4800' of rotary and 12,400' of core drilling. The estimated cost is:

| | |
|---|---|
| 4800' rotary drilling at $3.50/ft. | $ 16,800 |
| 12,400' core drilling at $7.30/ft. | 90,520 |
| Total | $107,320 |

These costs include the contractor's charges, sampling, assaying, etc.

If this program meets with your approval, please request a Mining Authorization in the amount of $107,000.

Yours very truly,

Original signed by
J. H. Courtright

J. H. COURTRIGHT

JHC/jak
Encl.
cc: TASnedden, w/encl.
RBMeen, " "
KvdSteinen," "
PALewis(2)," "
JEKinnison, w/o encl.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

June 10, 1965

J. H. C.
JUN 11 1965

TO: P. A. LEWIS
Mission Unit

FROM: JOHN E. KINNISON

SAN XAVIER TRACT II
COMPOSITE ASSAYS

I believe you already have my file memorandum of January 11, 1965, on the subject heading. Find enclosed two other copies which may be useful either to Mr. Anzalone and certainly to Mr. Burton in connection with the difference in assays between those done by Hawley & Hawley and those done by the Mission Unit.

I have talked to Mr. Burton in a preliminary way on this several months ago, at the suggestion of Mr. Weiss, but have not had a chance to follow it up in a further manner. I may inadvertently not have included a copy of the tabulated assays for Mr. Burton's perusal, and apologize for such. Would you please forward one of these copies to him.

ORIGINAL SIGNED BY
JOHN E. KINNISON

JOHN E. KINNISON

JEK/jak
Encls.
cc: JHCourtright
SAnzalone

MR. J. H. COURTRIGHT

AMERICAN SMELTING AND REFINING COMPANY

COMPTROLLER'S DEPARTMENT - TAX SECTION

S. I. B.

JUN 16 1966

MR. SIB

READ AND RETURN

PREPARE ANSWERS ..... HANDLE .....

FILE C ..... INITIALS .....

A-6-39

New York, N.Y.
June 3, 1966

MEMORANDUM FOR MR. C. F. BARBER

North San Xavier

In connection with the meeting to be held on Monday, June 6, 1966 in regard to our suit for refund in the United States Court of Claims on the San Xavier issue, attached please find the portion of the petition filed December 27, 1965 dealing with this issue.

This will enable you to refresh your memory regarding this matter.

ROBERT RICHTER

RAR:JV

cc: BKVaughan )
KERichard )
IASnedden ) With attach.
JHCourtright)

HLGoodenough - without attach.

IN THE

# United States Court of Claims

No. 449-65

AMERICAN SMELTING AND REFINING COMPANY—CONSOLIDATED, *Plaintiff*

*v.*

THE UNITED STATES OF AMERICA, *Defendant*

## PETITION

(Filed December 27, 1965)

*To the Honorable, the Judges of the United States Court of Claims:*

1. The plaintiff is a corporation organized and existing under the laws of the State of New Jersey, and has its principal office at 120 Broadway, New York, New York.

2. This is an action arising under the Internal Revenue laws of the United States and is brought pursuant to Sections 6402 and 7422 of the Internal Revenue Code of 1954 and Section 1491 of the Judicial Code. The plaintiff seeks to recover the sum of $680,513.67,

together with interest thereon as provided by law, which sum represents an overpayment of Federal income taxes and interest for the calendar year 1959.

3. The plaintiff's principal business is exploring for and mining, smelting, refining, and selling copper, silver, lead, zinc, and other minerals.

4. The plaintiff and its affiliated companies filed a consolidated Federal income tax return on the accrual basis for the calendar year 1959 and timely paid the income tax liability shown thereon (less two credits) in the amount of $7,626,396.45. Thereafter, the Commissioner of Internal Revenue assessed a deficiency against the plaintiff in the amount of $1,137,835.44 for 1959.

5. On December 2, 1964, the plaintiff paid the $1,137,835.44 deficiency assessed for 1959, plus $321,773.63 interest thereon.

6. The plaintiff timely filed a claim for refund in the amount of $680,513.67 for 1959 and asserted therein that the Commissioner of Internal Revenue erroneously disallowed (1) a loss deduction in the amount of $843,459.72, (2) a percentage depletion deduction in the amount of $194,363.69, and (3) a legal expense deduction in the amount of $6,543.29. The Commissioner of Internal Revenue disallowed the plaintiff's claim for refund for 1959 by statutory notice dated October 26, 1965.

7. The plaintiff's claim for the loss deduction presents the question whether the amount deducted, or any part thereof, was an investment in property relinquished and abandoned in 1959 or an investment in property retained. The claim arises under the following circumstances.

(a) In 1957, the plaintiff purchased from indi-

vidual Indian landowners exclusive prospecting permits on parcels of land located in three contiguous tracts in San Xavier Papago Indian Reservation in Pima County, Arizona, coupled with options to acquire mineral leases on portions of the acreage. The plaintiff paid bonuses totaling $283,000 ($55.27 per acre) for prospecting and option rights in parcels located in tract 1, which contained approximately 5,120 acres. The plaintiff paid bonuses totaling $757,002.04 ($146.05 per acre) for prospecting and option rights in parcels located in tract 2, which contained approximately 5,183 acres. The plaintiff paid bonuses totaling $26,005 ($5.08 per acre) for prospecting and option rights in parcels located in tract 3, which contained approximately 5,120 acres.

(b) The parcels of land located in tracts 1, 2, and 3 had been allotted by the United States to individual Indians. In 1957, 165 Indians owned parcels, or undivided interests in parcels, of land in tract 1, 175 owned parcels, or undivided interests in parcels, of land in tract 2, and 137 owned parcels, or undivided interests in parcels, of land in tract 3.

(c) The United States Department of Interior Papago Indian Agency acted as agent for the individual landowners in arranging for the sale of the prospecting and option rights, in the collection and distribution of the bonuses, rents, and royalties, and in certain administrative matters.

(d) The plaintiff acquired the prospecting and associated option rights from each of the individual landowners under three contracts dated May 17, 1957 and identical in form. In each of the three contracts the landowners authorized the Commis-

sioner of Indian Affairs or his authorized representative to sign, execute, and deliver on their behalf Modified Form 5-154 mining leases to the extent the plaintiff exercised its options.

(e) In order to obtain the prospecting and option rights, the plaintiff was required to locate and have each landowner sign the contract covering his land. No prospecting or option rights could be obtained on the landowner's land unless he signed the contract granting such rights, except that the Papago Indian Agency signed for minors, incompetents, and undetermined or unlocated heirs of deceased landowners, and the Tribal Chairman of the San Xavier group of Papago Indians signed for one allotment that had been canceled and reclassified as tribal lands.

(f) In return for granting the plaintiff the prospecting and associated option rights with respect to his land, each landowner in tract 1 received a bonus of $55.27 for each acre owned by him in tract 1. Similarly, each landowner in tract 2 received a bonus of $146.05 for each acre owned by him in tract 2. Each landowner in tract 3 received a bonus of $5.08 for each acre owned by him in tract 3.

(g) Under the terms of each of the contracts, the plaintiff could prospect on all the acreage owned by the landowners who signed the contract. The plaintiff could exercise options under each such contract to take mineral leases on all of any individual landowner's acreage and to take mineral leases on up to 2,560 acres in the aggregate in each of the tracts. The plaintiff could exercise its options without payment of additional bonus for the acreage leased.

(h) After certain mineral exploration on the parcels in tract 1, the plaintiff exercised its options under its contract with the landowners to lease 560 acres. The mining lease, dated August 31, 1959, covered parcels of land owned by 37 Indians. Those landowners whose land was not leased were entitled to receive no payments beyond the $55.27 per acre already paid as a bonus.

(i) After certain mineral exploration on tract 2, the plaintiff exercised its options under its contract with the landowners to lease 1,994.37 acres. This lease, dated August 31, 1959, covered parcels of land owned by 144 Indians and was identical in terms, except for the names of the landowners whose land was leased and the description of the leased acreage, with the lease taken on tract 1.

(j) After certain mineral exploration on tract 3, the plaintiff chose not to take any mineral lease on the land in tract 3.

(k) In 1959, the plaintiff relinquished and abandoned all its mineral rights in all the parcels of land contained in tracts 1, 2, and 3 except for 560 acres in tract 1 and 1,994.37 acres in tract 2.

(l) The plaintiff expended $1,658,532.01 with respect to the parcels of land in the three tracts prior to the taking of the two mining leases on 2,554.37 acres and the relinquishment and abandonment of its rights in the remaining land. Of this amount, $888,583.60 were the plaintiff's costs attributable to parcels of land in which the plaintiff relinquished and abandoned all of its rights in 1959. The following table sets forth a breakdown of such costs:

| | |
|---|---|
| Bonuses | $743,766.60 |
| Other costs of acquiring prospecting permits and option rights | 24,021.83 |
| Surveying and mapping | 29,927.64 |
| Geophysical examination | 31,652.85 |
| Miscellaneous costs of acquiring permits | 190.20 |
| Direct drilling expense | 42,726.70 |
| Indirect expense of drilling | 16,297.78 |
| | $888,583.60 |

(m) In accordance with Section 165 of the Internal Revenue Code of 1954 and the plaintiff's prior practice, the plaintiff deducted the $888,583.60 as a loss in 1959.

(n) The Commissioner of Internal Revenue allowed the amount deducted with respect to the parcels of land in tract 3, except for $11,146.72 of geophysical expenses. The Commissioner of Internal Revenue disallowed $832,313.00 that the plaintiff had deducted with respect to the parcels of land in tracts 1 and 2 as to which the plaintiff had relinquished and abandoned all its rights in 1959. The total loss deduction disallowed by the Commissioner of Internal Revenue was $843,459.72.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 18, 1965

TO: R. S. MEEM

FROM: J. H. COURTRIGHT

SAN XAVIER
DRILLING, TRACT II

This will transmit Mr. Kinnison's proposals for drilling on the San Xavier Reservation, Tract II, accompanied by plans and sections.

The primary objective of this proposed drilling is to gain additional information in certain previously drilled areas which might provide sufficient copper ore for a small mining operation--production from Tract II being necessary in order to fulfill terms of the lease with the Papago Indians.

A secondary objective of the drilling would be to more adequately test the deep-lying ore-bearing horizon which extends from the Eisenhower ground into the Reservation ground on the north.

I believe the drilling should logically start with the area on the east where some high-grade copper mineralization is known to exist. Should the work be successful here, the shallow holes designed to test the thin mixed oxide-sulfide zone to the west would not be necessary. However, in any event, a few deep holes should be drilled in this general area to further test the deep-lying horizon extending northerly from the Eisenhower ground. This information is needed to more firmly evaluate the possibility of expanding the Mission pit into the Reservation ground.

Original signed by
J. H. Courtright

J. H. COURTRIGHT

JHC/jak
Encl.
cc: RSMeem, 1 extra, w/encl.
PALewis, 2, w/encl.
KERichers, w/encl.
JKinnison, w/encl.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 4, 1965

TO: J. H. COURTRIGHT

FROM: J. E. KINNISON

SAN XAVIER
DRILLING, TRACT II

As you requested, I have reviewed the geology and ore distribution in the southern portion of San Xavier Tract II, which adjoins the Eisenhower group and part of the Mission ore zone. Attached (A and B) are two plan maps (1" = 300') showing recommended drill holes and their estimated depths, and for reference to illustrate the general copper distribution please find two cross-sections (Attachments C, D; 1" = 100').

These proposed drill holes, 24 in number and which aggregate 4800 feet rotary and 12,400 feet core, will fulfill three principal objectives:

(1) To aid in selecting a location for underground workings from which high-grade lenses of Cu, if present, could be prospected and developed.

(2) To gain additional assay and geologic data pertinent to future pit plans.

(3) To explore, in a limited way, a deep-level tactite horizon from which some high-grade intercepts have been cut.

These objectives are discussed in more detail in the following.

General Statement

The ore-grade Cu zones may be viewed, geologically, in three principal ways:

(1) A thin chalcocite zone bounds the Eisenhower group on the north. The northern and northwestern edge of this enriched blanket is not now closely defined, so that only a crude estimate of "ore" can be made with the presently available data. Dependent upon the location of the northern edge of enrichment, I figure the tonnage will be between 4 and 8 million tons, with a thickness of about 50 feet and grading about 1.60% copper. This ore zone contains a lesser amount of pure chalcocite, and a greater amount of oxidized material made of chalcocite, malachite, chrysacolla, and minor quantities of native copper. The top of this zone lies at about a depth of 205-225 feet; nearly all of the cover is gravel.

Since the enriched zone is contained in argillite and porphyry, there would not appear to be any difficulty in classifying it as "leach" material. The unoxidized chalcocite could no doubt be milled.

This zone is underlain by protore of which a substantial tonnage grades between .25 and .40 per cent copper.

(2) The eastern portion of ore values consists of a segment of tactite about 150 feet wide, over 400 feet long, and of variable thickness. Copper occurs as chalcopyrite, and lies at various depths. I expect the copper there to be distributed in a manner similar to that found in the present pit; that is--erratic.

The drill holes which penetrate this zone are too widely spaced to permit a valid reserve estimate.

As interpreted from drill results, this zone is bounded on its east side by argillite with very low copper values. In the absence of direct drill penetration along this east contact, I can make no absolute statement on its nature, but certainly there is a possibility that high-grade lenses occur at the contact, just as are found in the east vein zone of the present Mission pit.

The drill holes in this tactite zone did not penetrate any high-grade zones of significant thickness, with one exception (X-245 @ 735') this does not entirely preclude the existence of small erratic pods of strong chalcopyrite, for these could easily be missed by the exploratory drill holes, and, of course, it is unlikely that a narrow vertical band of high-grade, such as might exist along the east contact, would be penetrated by surface drilling.

(3) An ore-grade zone at considerable depth, as shown on the cross-sections, has been penetrated by a few deep drill holes. The copper values appear to be spotty, and the copper zone is only about 100 feet thick, more or less. The rock is tactite and is underlain by barren marble. This zone is most probably the northern extension of the tactite horizon in the Eisenhower group, where it is much more strongly mineralized.

Mining Considerations

I am informed that, in order to fulfill the requirements of our mining lease on the reservation ground, mining must be in progress within 10 years from the beginning of the lease; and it has been proposed that an underground mine be used to fulfill this requirement. Prior to sinking a shaft and commencing underground exploration in search of high-grade lenses in the eastern (tactite) area, some additional drilling should be done to locate more closely the east contact of tactite against argillite. At present, it is rather poorly bracketed by drill holes.

A second factor connected to the proposed drilling is that future pit plans on the reservation, which probably will be associated with mining agreements on the Eisenhower group, will require these proposed drill holes as a basis for a firm ore reserve estimate. Some holes proposed fall in the "interspace" catagory, and others in the "delimiting" catagory, but all are required for this purpose. Furthermore, should the attempt to find high-grade lenses in tactite fail, attention might then be turned to a consideration of mining the oxide-chalcocite blanket by underground methods; and in that case the proposed holes there will then be necessary.

Finally, I have proposed that some of the holes be drilled deeper than would be required for any of the foregoing reasons, in order that we may obtain a little more knowledge of the deep layer of tactite with somewhat erratic copper values. Drill penetrations at the present time are insufficient to determine whether this zone may possibly be an asset for the future.

Proposed Drill Holes

For the purpose of over-all pit planning and ore reserve estimation, little needs to be said about the proposed holes, for their object is self-evident. The proposed depths are, of course, approximate only, and the actual depth will be determined at the drill site by the resident geologic staff. I should note that the holes designed to drill out the chalcocite blanket along its northern side have estimated depths just sufficient for that purpose (Att. B) whereas, those farther south are shown to go a little deeper. This is because a large pit designed to encompass the Eisenhower group, will extend the stripping into the southern part of the chalcocite area where there is chalcopyrite grading between .25 and .40 per cent Cu. These holes should be drilled deep enough to present an opportunity to calculate this minus .4% Cu rock, because a pit, if stripped north to this area,

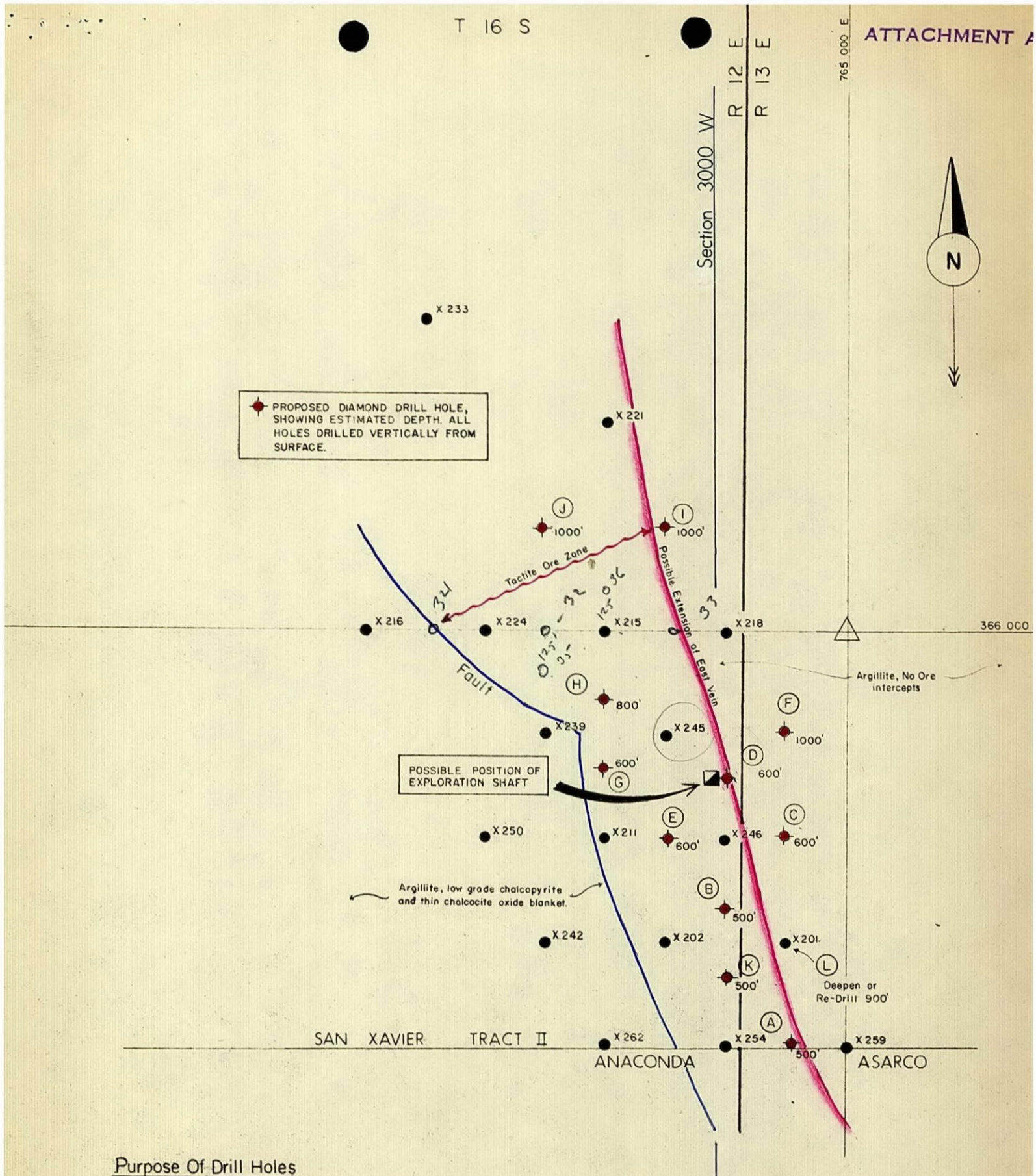
might produce a substantial tonnage of this low-grade copper rock at a time when the mill could profitably accomodate this nominally "not-ore-grade" rock.

In the tactite zone, several holes will help directly to bracket the east contact. If hole "D" (Att. A) penetrates argillite rather than tactite, then "F" hole would not be necessary at all, and hole "D" should be extended deeper to penetrate the deep-level tactite zone. These drill holes will not by themselves actually give the necessary data pertaining to the details of geometry of this east contact, or the existence of copper along it. They will, however, allow a better judgment to be made on the location of a shaft for underground exploration.

John E. Kinnison

JOHN E. KINNISON

JEK/jak




## Purpose Of Drill Holes

To determine shaft location
A, B, C, D, E, F

To evaluate tactite ore zone at moderate depths
A through K

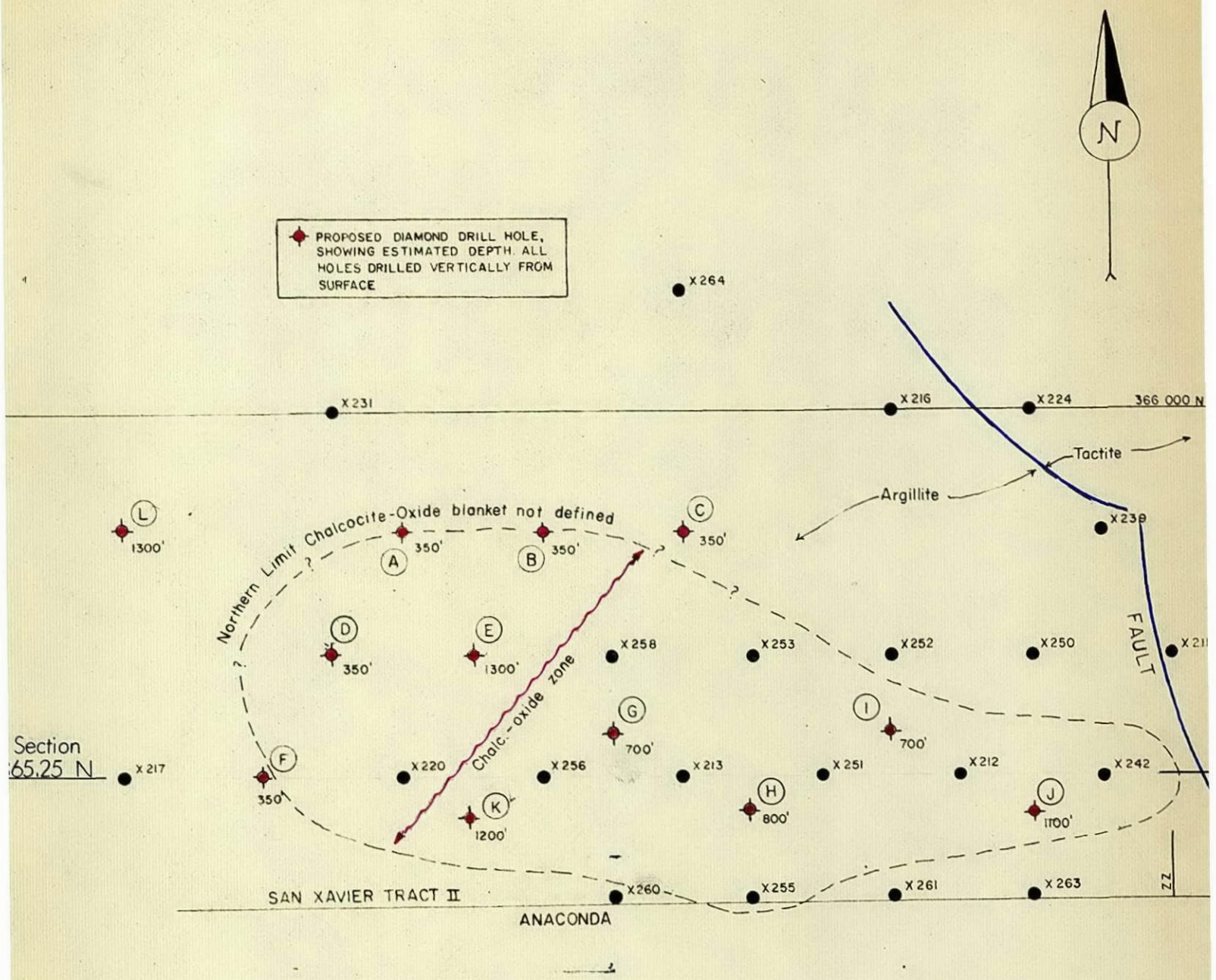
To explore deep-level tactite
F, I, J, L

# SAN XAVIER TRACT II
## PROPOSED DRILLING
## TACTITE ZONE

SCALE: 1" = 300'

J.E.K. NOV. 1964

ATTACHMENT E




## Purpose Of Drill Holes

Evaluation of chalcocite-oxide blanket.

A through K

Evaluation of minus 0.4 % Cu, chalcopyrite.

G, H, I, J, K

Exploration of deep-level tactite.

E, J, K, L

# SAN XAVIER TRACT II

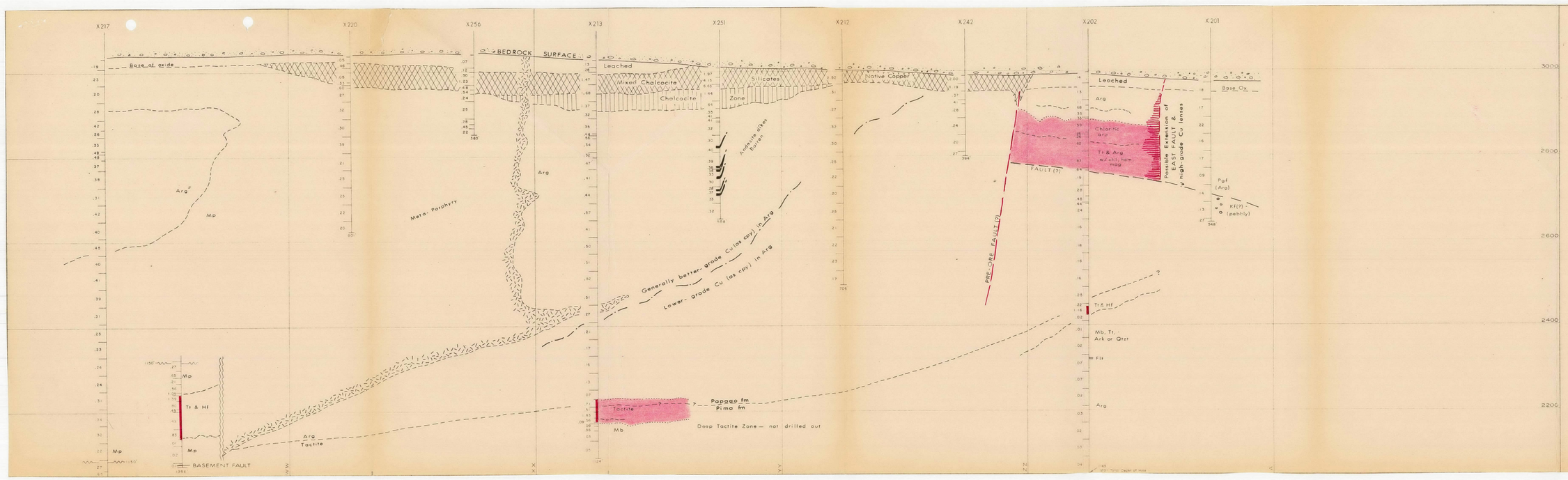
## PROPOSED DIAMOND DRILL HOLES

CHALCOCITE-OXIDE ZONE

SCALE: 1" = 300'

J.E.K. NOV. 1964

ATTACHMENT C




AMERICAN SMELTING AND REFINING COMPANY

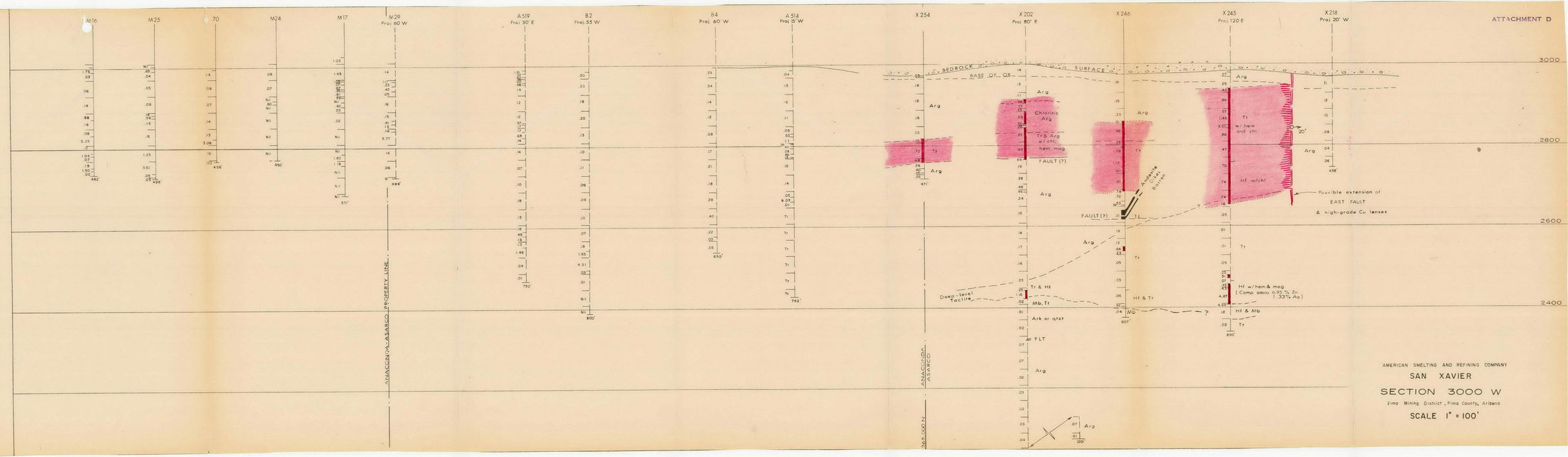
# SAN XAVIER

## SECTION 365.25 N

Pima Mining District, Pima County Arizona

SCALE 1" = 100'

ATTACHMENT D




AMERICAN SMELTING AND REFINING COMPANY

SAN XAVIER

SECTION 3000 W

Pima Mining District, Pima County, Arizona

SCALE 1" = 100'

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

August 17, 1959

Mr. D. J. Pope, Assistant to Vice President
American Smelting and Refining Company
120 Broadway
New York 5, New York

SAN XAVIER
Tracts I and II
Ore Reserves

Dear Sir:

During the discussion of the above subject in my office August 11, I told you that I did not recall having written a letter giving ore reserve tonnages on the Reservation. Since then I have found my notes on ore tonnage data compiled in June 1958 when we were nearly completed with the main phase of drilling, with the further notation that I had quoted the tonnages and grades to you on February 9, 1959. These quoted figures are the ones you doubtless had in mind, and for the record they are repeated, as follows:

Southern Tract II

Shallow Ore (classed as "Indicated Ore")

| | | |
|---|---|---|
| Mixed Oxide-Sulphide | 4.0 mil. @ | 1.70% Cu |
| Sulphide | 6.0 mil. @ | .80% Cu |
| Total | 10.0 mil. @ | 1.16% Cu |

Waste/Ore Ratio ± 5:1

Deep Ore (classed as "Inferred Ore")

50 to 75 mil. @ .75% Cu

Central Tracts I-II

Shallow Ore (classed as "Indicated Ore")

15 to 20 mil. @ .65% Cu

Waste/Ore Ratio ± 5:1

Due to property line limitations in the case of the Southern shallow ore body, and to incomplete drilling in the case of the Central ore body, the above figures are not firm. The Southern "ore" body would actually become ore only if the Mission open pit were to be extended through Banner ground. By itself -- that is, with a pit limited by the south edge of the Reservation -- this material would not be an ore body.

Due to its low average grade and high waste/ore ratio, the Central "ore" body of course is not a commercial proposition today. In fact, it would become a true ore body only under an exceptionally favorable copper market.

At the present time there is no occasion to do closer-spaced drilling or to make more precise ore reserve calculations for either of these potential

open pit ore bodies.

The Southern deep ore body eventually may be the most substantial resource on the Reservation; but it can only be considered as an underground mine at some time far in the future. The ore tonnage listed above is classed as "inferred" because it is penetrated by only five, wide-spaced holes, X213, X217, X224, X231, and X250.

Due to the depth it will be expensive to drill out this ore body. Certainly, there is no need for further drilling there at the present time.

Yours very truly,

Original Signed By
K. Richard

KENYON RICHARD

KR/ds
cc: CFFolbek
ACHall
WOSchubel
JHCourtright

SX-10.5
I

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

August 21, 1959

FILE MEMORANDUM

SAN XAVIER RESERVATION
Zones of Mineralization on Proposed Mining Leases

Our Mineral Prospecting Permits on the Reservation state that applications for mining leases shall include ". . .such acreage as is reasonably proven productive, supported by factual information, . . .". The amount and type of "factual information" required would seem to be uncertain.

All exploration work was conducted by diamond drilling. As this work progressed, maps showing locations of drillholes together with detailed geologic and assay logs of the holes were sent periodically to Mr. R. S. Fulton, Regional Mining Supervisor, U. S. Geological Survey, who has the responsibility of checking on all exploration and mining done on the Reservation. Copies of all these data were sent also to Messrs. Gilmore and Haverland of the Bureau of Indian Affairs. These drillhole logs and maps themselves may satisfy the requirement for factual information. But if such proves not to be the case, the following interpretive information relative to potential ore reserves should suffice. It is presumed that, in any event, duplicates of the drillhole logs need not be included with lease applications.

Two mineralized areas about two miles apart have been found by the drilling. One is situated in the southern part of Tract II; the other is partly in Tract I and partly in Tract II, and involves the common corners of Sections 13, 14, 23 and 24 (T 16 S, R 12 E).

The southern zone consists of two potential ore bodies, both of which are extensions of the same ore zone that this Company is now developing into an open pit mine in the ground just south of the Reservation. One of these occurrences is shallow and amenable to open pit mining; the other is deep and probably accessible only to underground mining.

The shallow mineralization of the southern zone is estimated to consist of about 10 million tons of ore of the "indicated" classification with a copper content in excess of 0.4%. It is penetrated by vertical drillholes which are distributed over a triangular-shaped area 1100 feet north-south by 2000 feet east-west. Following are the ore intercepts in these drillholes:

| Hole No. | Depth to Top of Ore | Vertical Thickness of Ore | Average % Cu |
|---|---|---|---|
| X-202 | 282' | 150' | .62 |
| X-211 | 203 | 126 | 1.21 |
| X-212 | 206 | 31 | 2.53 |
| X-213 | 224 | 86 | 1.55 |
| X-215 | 211 | 169 | .74 |
| X-220 | 204 | 58 | .85 |
| X-224 | 268 | 61 | .77 |
| X-242 | 205 | 37 | 1.60 |
| X-245 | 253 | 275 | .85 |
| X-246 | 365 | 130 | .88 |
| X-251 | 206 | 51 | 3.08 |
| X-253 | 219 | 46 | 1.41 |
| X-254 | 374 | 59 | .74 |
| X-255 | 217 | 69 | .88 |
| X-256 | 216 | 54 | .88 |
| X-258 | 224 | 73 | 1.11 |
| X-260 | 233 | 33 | .89 |
| X-262 | 267 | 89 | .55 |
| X-263 | 204 | 32 | 1.38 |

The deeper mineralization described above partly underlies the shallow ore body. It is estimated to consist of 50 to 75 million tons of ore, but this is classed only as "inferred" ore because it is penetrated by only five, wide-spaced drillholes, as follows:

| Hole No. | Depth to Top of Ore | Vertical Thickness of Ore | Average % Cu |
|---|---|---|---|
| X-213 | 365' | 398' | .47 |
| | 990 | 74 | .83 |
| X-217 | 1172 | 159 | .66 |
| X-224 | 561 | 116 | .76 |
| X-231 | 772 | 277 | .47 |
| | 1093 | 144 | .80 |
| | 1258 | 79 | 1.48 |
| X-250 | 865 | 95 | 1.02 |

The northern mineralized zone is estimated to contain 15 to 20 million tons of possibly eventual ore which could be reached by open pit mining. It is penetrated by drillholes which are rather wide-spaced; therefore, this ore is classed as "indicated". This mineralization lies both in Tract I and Tract II:

TRACT I

| Hole No. | Depth to Top of Ore | Vertical Thickness of Ore | Average % Cu |
|---|---|---|---|
| X-104 | 334' | 44' | .66 |
| X-113 | 354 | 39 | .40 |
| X-114 | 151 | 43 | 1.03 |

TRACT I (Continued)

| Hole No. | Depth to Top of Ore | Vertical Thickness of Ore | Average % Cu |
|---|---|---|---|
| X-120 | 77' | 84' | 1.12 |
| | 184 | 178 | .87 |
| | 390 | 59 | .58 |
| X-124 | 138 | 79 | .58 |
| | 263 | 22 | .82 |
| | 324 | 44 | .54 |
| X-126 | 168 | 45 | .75 |
| X-129 | 312 | 88 | .58 |
| | 423 | 48 | .55 |
| | 491 | 50 | .59 |
| X-131 | 209 | 49 | .49 |
| X-133 | 105 | 48 | 2.68 |
| | 166 | 35 | 1.45 |
| TRACT II | | | |
| X-238 | 171 | 69 | 1.55 |
| | 293 | 77 | .48 |
| X-244 | 200 | 69 | .56 |
| X-247 | 187 | 35 | .52 |
| | 270 | 20 | .84 |

Original Signed By
K. Richard

KENYON RICHARD

KR:S
cc: ACHall

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

February 20, 1958

J. M. C.

FEB 24 1958

Mr. W. E. Saegart
American Smelting and Refining Company
600 Crandall Building
Salt Lake City 1, Utah

Dear Bill:

I discussed the apparent discrepancy between the gravity anomaly X-7 and the lithology observed in the hole X-205 and surrounding holes with Mr. Richard. The difference in hydrothermal alteration has been noted elsewhere in the district and can occur over short distances. Thus the difference in degree of alteration does not necessarily indicate a difference in age.

There have been only two holes drilled between the gravity anomaly X-7 and the inferred rhyolite-basalt contact. Either or both X-205 and X-225 could have been drilled in outliers of rhyolite, and a contact could be drawn in approximately where you show one. The rhyolite-basalt contact shown on the drilling map was drawn on the basis of Mr. Erwin's magnetic anomaly. However, we now note that there is an upper magnetic basalt and a lower, less magnetic basalt. It is quite possible that Mr. Erwin's map shows the outline of the upper one and that the lower basalt extends up to the gravity anomaly X-7. In the absence of more extensive drilling in the questioned zone, this would fit both the known geology and geophysical conditions. Mr. Richard is in agreement with the above stated possibility.

I will send you a sample of the rhyolite from X-225 in the near future.

Very truly yours,

BERT C. MONRISON

BCM/ds
cc: LHHart
RJLacy
KERichard
JHCourtright

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

September 24, 1957

Mr. L. E. Hart, Chief Geologist
New York Office

DRILLING - SAN XAVIER PROJECT

Dear Sir:

Enclosed is a print of the 1000-scale drilling map on the Reservation. This map shows the results to date of the geophysical work and progress of drilling. This map will be brought up to date and released periodically as drilling and geophysical information of interest are developed.

Hole X2Q5 encountered bedrock with chrysocolla in strongly altered arkosic quartzite at a depth of 132 feet. Sulphides, including a fair amount of chalcocite, were penetrated at about 170 feet. Core recovery in bedrock has been poor, and we are now moving the pull-down rig off this location with the intention of eventually deepening the hole with a hydraulic rig.

Hole X2Q6 encountered strongly altered arkose, containing chalcocite-limonite, at a depth of 86 feet. NX casing is being set, and this hole will be drilled to depth with our regular coring procedure. The results of these two holes offer encouragement for the general area around the two outcrops in Tract 1. We expect to be clear on Tract 1 with the Bureau of Indian Affairs by September 25 and will move rigs into the area around the two outcrops promptly thereafter.

Holes X2Q1 and X2Q2 on the northwest extension of the East Flat are area have been making slow progress due to broken, leached ground, but they both now are in arkose containing moderate disseminated chalcopyrite.

Upon closer inspection, the cores in holes X2Q3, X2Q4, and X2Q5 represent a variety of volcanic rock types rather than the single unit basalt porphyry. This suggests a series of flows.

Those receiving copies of this map please note the alphabetical designation for north-south coordinate lines, which appear on the south edge of the map. In referring to proposed drill holes this alphabetical designation will be used in conjunction with the east-west survey coordinate lines, the numbers for which appear along the east edge of the map. Thus, the location of the proposed shallow hole east of X2Q5 would be

W-374, and for the proposed location west of X202 would be W.25-365.25. When a location is drilled, the hole will be given a number in sequence with holes drilled on that tract, as explained in the note on the map.

Our information is that the union voted on September 15 to discontinue the strike. There has been no picket activity since then. Therefore, Joy will operate four deep-hole rigs on a two-shift basis beginning about September 30. Shortly thereafter they will bring in an additional rig. The two rigs drilling shallow holes will continue on a one-shift basis for the time being. Out of the total of seven rigs, one will remain in the East Pima area to drill several fringe and claim-validation locations.

Yours very truly,

Original Signed By
K. Richard

KENTON RICHARD

KR/ds
Attachment - Map No. 1385
cc: EMoyo - w/Attachment
RMacy - w/Attachment
WGeogart - w/Attachment

bc: JLClark - w/Attachment
JKinnison - w/Attachment

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 23, 1957

PERSONAL/CONFIDENTIAL

Mr. L. E. Hart, Chief Geologist
New York Office

SAN XAVIER RESERVATION

Dear Sir:

In accordance with our discussions in the past, this is intended to give you my up-to-date opinion on the bidding situation. I presume that a final decision on this matter will have to be made within about 10 days or so in order that papers can be prepared to meet the May 13 deadline.

It seems unlikely that in the interim we will pick up any information on competitor activity which would be of sufficient importance to alter opinions. Everyone in the local exploration business is being suspiciously quiet. No significant new angles have developed; so your present information is more-or-less complete. There is no reason for me to go into detail herein, but I would like to emphasize some points which seem important to me, even though most of them will probably not be new to you.

Three factors are involved: (1) the exploration value to us, (2) the operating value to our present ore body, and (3) the possible value, operating as well as exploration, to competitors.

The exploration value of tracts 1 and 2 is high, for reasons which all of us have been aware of for some time and which have not changed in recent weeks.

The exploration value of tract 3 is low, because it is outside of the projected margin of the mineralized zone, but it is not entirely worthless because this projection has less validity to the north.

Tract 1 of course has no operating value to our present ore body. Tract 2 has a high value in this respect because the ore body indicated by holes 90 and 105 could be mined only by extending a pit into the Reservation, and because it offers convenient dumping area. Tract 3 has a modest value as dumping area. (Although not specified in the terms, I suppose the lessee would have a preferred position in obtaining dumping privileges.)

Tract 1 may have generally less exploration value to competitors than to us because, in my opinion, the competitive field men involved would not attach all of the significance we do to the two mineralized outcrops in tract 1 and the conglomerate of mineralized boulders at the base of Black Mountain to the north. (Bennett and Phelps Dodge field men may be exceptions, to a certain extent.) This means that tract 1 represents the best opportunity for us more nearly to insure the acquisition of attractive exploration ground by making a substantial bid.

Tract 2 of course has the greatest exploration value to all competitors simply because it offsets the area of intensive drilling by us and by Banner. Periodic photographs obtained from a plane during the past two years would permit anyone to make a pretty good guess as to the size and position of our ore body by analysing the sequence, spacing and depth of drill holes. Low-flying, sight-seeing planes have circled almost daily over our drilling area. My thought in this regard is that anyone using this system would be apt to over-estimate rather than under-estimate the tonnage of our ore body.

Tract 2 has especial value to the Pima Mining Company and Banner Mining Company, as compared to other competitors. With control of this tract, Pima could hem us in more effectively and strengthen their whole position in the district. Under present circumstances, Banner almost has to deal on our terms, eventually, in the matter of mining the ore in their ground adjacent to our ore body. This situation would become much less favorable to us if Banner were to gain a hold on tract 2.

The people at the Sells Agency have told us that over 20 mining companies have shown active interest in the area up for bids, and they have distributed notices to over 300. Following are comments on the principle competition.

Kennecott: Exploration office in Tucson; several competent men actively searching for, and drilling, alteration zones; rumored to be strongly interested in the Reservation.

Anaconda: Office in Tucson; field men have thorough knowledge of Pima mine geology.

Pima Mining Company: In better position than anyone else to guess the tonnage and grade of our ore body.

Phelps Dodge: Competent field men known to have checked our drilling operations from the air several times in the past two years.

Banner Mining Company: Probably unable to be serious financial competition without reorganization. However, their drill logs would be a valuable asset in a partnership with a company, say, like Phelps Dodge whose field men probably have little direct knowledge of the character of structure and mineralization in the district.

Kern County Land Company: Reputedly a wealthy California company with extensive experience in oil exploration; holds some large claim groups in the southern part of the Pima district; last year opened a mining exploration office in Tucson headed by a competent man who has a good knowledge of the Pima mine mineralization due to former connection with United Geophysical.

Cerro de Pasco: Opened Tucson exploration office last year; interest in Pima District unknown.

American Metals: Opened Tucson exploration office last year after their

chief geologist made a visit to the Pima District, but we know of no specific activities by them in the district.

Each of the above companies (Banner provisionally, as noted above) is capable technically, financially, and psychologically of placing serious bids. The 10% royalty on the leases may be a deterrent, as we all know, in which case they will make only nominal bids. Otherwise, they will look at our position and bid high.

The following are suggested as a minimum for us:

| | |
|---|---|
| Tract 1 | $83 |
| 2 | 550 |
| 3 | 41 |
| | $674 |

In view of the fact that Mr. Courtright made the field discoveries which first directed our interest to the Reservation ground, and has been closely connected with all developments since, it should be noted that this letter is a reflection of his ideas as well as mine.

Yours very truly,

Original Signed By
K. Richard

KENYON RICHARD

KR/ds
cc: WMacmillen - P/C
JKCourtright - P/C