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K PMS  
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CURRENT PLANT PRACTICE AT TWIN BUTTES:  
OXIDE COPPER AND BY-PRODUCT URANIUM  
BY WILLIAM P. LORENZ

INTRODUCTION

The Twin Buttes Mine is a copper-molybdenum ore body capped with an oxidized zone up to several hundred feet in thickness. During early pit development the oxide ore was stripped and some 25,000,000 tons of oxide ore with copper contents greater than 0.6 percent was stockpiled. Strip-ping will continue for several years to come.

Since the oxide ore was not amenable to flotation and the ore would not satisfactorily heap or vat leach due to gypsum formation from its high limestone content, there was no economically feasible approach to recovery of the copper values at that time.

In the early 1970's when sulfur dioxide emission re-straints were placed on local smelters, low priced sulfuric acid became available and an acid leach circuit to extract copper from these oxide ores became economically viable.

In 1973 the decision was made to proceed with construc-tion of the copper circuit and in June 1975 the plant was com-missioned.

The presence of uranium in the leach solutions was discovered during the piloting of the copper circuit but the economics at that time did not warrant recovery. In 1975 uranium prices skyrocketed and renewed interest was placed on uranium recovery. In January 1979 construction was begun and in February 1980 the uranium by-product plant was commissioned. The plant is an Eluex process using resin ion exchange followed by solvent extraction and ammonia precipitation. The overall oxide plant process flowsheet is shown in Figure #1.

### CRUSHING AND GRINDING

The oxide plant begins by crushing selected grades of ore through a 48 by 60 inch jaw crusher. Crushed material is conveyed to a vibrating grizzly and the oversize material to a 7 foot standard cone crusher producing a minus 1 inch diameter rock. Single deck vibrating screens separate oversize material which is returned to two 7 foot shorthead crushers in closed circuit with the screens.

The final product at 25 percent plus 0.50 inch diameter is stored in a covered stockpile which feeds the grinding mills via 10 slot feeders under the pile. The pile contains about 15,000 short tons of live ore.

Grinding is accomplished in 2 parallel trains each consisting of a 12 by 18 foot rod mill feeding a 12 by 30 foot ball mill which wet grinds the ore in open circuit to 14 percent plus 65 Tyler mesh and delivers a 55 percent solids

slurry to the leach reactors at 450 dry short tons per hour. Sizing and density of the milled pulp is regulated more by physical characteristics such as solids suspension in the leach reactors rather than by the kinetics of the leach reaction itself.

### LEACHING, THICKENING AND CLARIFICATION

The original leach plant design employed a pH adjustment circuit which was to neutralize leach liquors before solvent extraction. In this circuit, the ground pulp from the wet grinding sections flowed through a series of 5 agitated leach tanks with a retention time of about 1 hour each. Concentrated sulfuric acid was added to the first tank to obtain a pH of 1.5. Additional acid was available to leach tanks 2 and 3 if needed to maintain the pH at 1.5. The leached pulp then advanced to the first of four CCD thickeners for liquid solid separation.

The #1 thickener overflow at pH 1.5 was thought to be too acidic to allow efficient recovery in the solvent extraction section so the overflow was pumped into a neutralization circuit consisting of 3 leach tanks where raw milled pulp was added to adjust the pH to about 2.5. This product was then pumped to a neutralization thickener and clarifier for final liquid solid separation before solvent extraction.

The neutralization concept caused severe gypsum formation

problems and was abandoned in 1976 after discovering that the solvent extraction plant could produce good recoveries at the lower pH produced in the primary leach. This simplified the leach circuit and eliminated the gypsum formation problem.

The neutralization tanks have been converted into additional primary leach tanks to increase leach retention time and the neutralization thickener is now used as an additional clarifier which doubles the retention time of clarification before solvent extraction.

The present leaching section consists of 2 parallel trains of 8 agitated leach tanks, each 30 feet in diameter and 31 feet high with a 9 foot diameter downflow turbine. All tanks are mild steel/rubber lined with pulp overflow assisted by air-lifted chimneys. Retention time in each tank is approximately 1.5 hours. Sulfuric acid is added to the first tank in each train to a pH of 1.5. The pH is allowed to drift upwards until a final pH of about 2.3 is obtained in the leach discharge.

The leach pulp is pumped to the first of four 400 foot diameter CCD thickeners for liquid solid separation. Wash solution consists primarily of solvent extraction raffinate and make-up water to produce a final thickener overflow solution with copper at 3 g/l at a pH of 1.9. The leach/thickening circuit flowsheet is illustrated in Figure #2.

After final clarification of the thickener overflow so-

lution by two 400 foot diameter clarifiers in series, the solution passes through a steam injection reservoir which heats the solution to the minimum temperature requirements for the uranium plant and copper solvent extraction plants. At this point in the circuit, the clarified overflow contains about 3.0 g/l copper, 10 ppm  $U_3O_8$  and 2.5 g/l iron.

#### URANIUM BY-PRODUCT PLANT

This solution is pumped to the resin ion exchange section of the uranium plant for removal of the uranium values. The uranium free solution is then returned to the copper solvent extraction plant followed by filtration and electrowinning. Figure #3 shows a process flowsheet of the uranium plant.

The resin ion exchange section consists of six absorption columns, three elution columns and transfer vessels for moving resin. Each absorption column contains five internal chambers and contains about 200 ft<sup>3</sup> of resin per chamber except for one chamber near the top which is normally empty except during resin transfer. The uranium pregnant solution flows upward through the column and fluidizes the resin in each chamber. The solution entering the bottom of the column contains about 10 ppm  $U_3O_8$  and leaves the top at 1 ppm or less.

Once the resin in the bottom chamber is loaded with

uranium it is transferred to the measuring chamber. The resin is then washed with 10 g/l sulfuric acid which removes loaded iron before it is transferred to the elution column for uranium stripping.

After the resin in the bottom chamber has been moved from the absorption column, the resin in the upper chambers are progressively moved down. A batch of resin from the elution column which has been stripped of its uranium is placed in the top chamber.

After the resin has been washed with 10 g/l sulfuric acid in the measuring chamber to remove iron, it is hydraulically moved to the bottom of the elution column. During normal operation each of the elution columns contains four batches of resin. Elution of the resin is done in a downflow manner using 100 g/l sulfuric acid. The eluted uranium free resin is transferred from the elution column to the rinse chamber where it is rinsed with barrens solution. The primary purpose of the rinse chamber is to reload iron onto the resin. Iron loading increases the density of the resin such that it will quickly settle when transferred to the top of the absorption columns. A diagram of the absorption columns are shown in Figure #4.

Eluate produced from the resin ion exchange section of the plant is used as uranium solvent extraction feed. The uranium solvent extraction plant contains four extraction,

one acid scrub, and three stripping stages.

The extraction units are operated in the organic continuous mode with an organic to aqueous phase ratio of 1.5 to 1.0. The reagent is 3 percent Alamine 336 in kerosene with 2 percent isodecanol added to improve amine solubility and phase disengagement.

The stripping units are operated in the aqueous continuous mode, fed with pH 4 ammonium strip solution. PH is maintained during stripping by injection of anhydrous ammonia into the mixer-boxes.

The pregnant solution from the stripping section is pumped to two precipitation tanks, operating in series which provides 90 minutes total retention time. Anhydrous ammonia diluted with air is piped into the precipitation tanks to achieve a final pH of 7.7.

The precipitated yellowcake is dewatered in a thickener. The thickener overflow is pumped back to the solvent extraction strip circuit for reloading.

The partially dewatered thickener underflow is transferred to a centrifuge to wash the yellowcake free of ammonium sulfate solution and to further densify prior to drying. The discharged cake from the centrifuge is pumped into a four leveled propane fired dryer to remove water to within product specification.

Design production is 500 lb/day of  $U_3O_8$  although production in 1980 has exceeded design capacity by over 50 percent due to a relatively high concentrations of uranium built up in the copper leach circuit.

The plant has been operational since February 1980 and other than mechanical failures associated with a plant start-up, no process chemistry problems or resin fouling have been observed.

#### COPPER SOLVENT EXTRACTION

The copper bearing solution discharged from the uranium plant is split into two streams of 3100 gpm each for counter-current copper extraction in two parallel trains of mixer-settlers. Each train consists of four extraction and two stripping stages.

The settlers shown in the foreground are 45 feet wide by 111 feet long except for E-3 and E-4 which are 139 feet long. Original pilot plant work indicated slower phase disengagement in the third and fourth units and therefore wer made longer. At a normal flow rate of 6200 gpm, the specific flow in the third and fourth units is  $1.14 \text{ gpm/ft}^2$  and  $1.43 \text{ gpm/ft}^2$  in all other units. All settlers have picket fences at both the inlet distributor and at the solvent wiers to promote solvent disengagement.

Mixer-settlers are of standard Davey Powergas gravity

design. A square mixing box contains a draft tube through which the phases are introduced into the eye of the turbine. The dispersion exits the top of the tank through a hole around the turbine shaft which prevents air entrainment from the dispersion air interface. The dispersion is then channeled across the top of the tank to the settler.

The 20 C design temperature for solvent extraction feed is insufficient to allow phase disengagement at design flow rates except when the mixer-settlers are very clean and free of crud. Operating experience has shown that a feed temperature of about 25 C is more realistic to maintain normal flow without entrainment.

The suspended solids in solvent extraction feed as well as the particulate material in the extraction settlers, consists of silica, gypsum, and iron salts. Much of the crud found in the extraction settlers is more dense than the aqueous phase and actually settles to the bottom. The crud formed in the stripper settlers is very light and consists primarily of silica. It is thought that dissolved silica in the aqueous solutions entrained in the loaded organic are precipitated in the stripper units upon contact with high acid concentration solutions. In addition to forming crud, the silica will transfer organic to the electrowinning circuits which deposits on starting blanks causing laminated and lacy deposits.

Crud is removed from the solvent extraction plant

by completely emptying a selected settler and washing down any sediment left in the bottom after draining. This operation involves shutting down one line of solvent extraction for approximately 8 hours during the cleanout. Most of the organic containing crud, is reclaimed by draining the mixer-settler and collecting it in a storage reservoir.

The organic collected is allowed to de-emulsify for about two days before feeding it into a continuous "cream separator" type centrifuge. Organic can be "cleaned" at a rate of about 15 gpm. The time required to clean the organic governs the cleaning schedule of other settlers. Normally each settler is cleaned twice per year or 1 settler approximately every two weeks.

### ELECTROWINNING

Filtered pregnant electrolyte is fed to the tankhouse recirculation system at a rate of 730 gpm. Typical feed solutions contains 50 g/l copper, 100 g/l sulfuric acid and approximately 10 ppm suspended solids.

The tankhouse contains 216 cells. Each cell contains 51 cathodes and 52 anodes on 4 inch centers. The anodes are cast of a calcium/lead alloy. Starter sheets are prepared on titanium blanks.

There are four electrolyte recirculation systems in the

tankhouse arranged in a cascade. The first cascade of 36 cells is a commercial production circuit. The second cascade containing 36 cells is used for preparing starter sheets along with commercial cathodes. The third and fourth cascades contain 72 cells each and are commercial circuits.

The first and second cascades share one rectifier operating at 18 amps/ft<sup>2</sup>. The third and fourth cascades have individual rectifiers and the current varies with production rate but is regulated to maintain the final spent at 25 g/l copper.

Feed to the first two cascades is steam injected to maintain temperature at 35 C. Heat generated from electrolysis requires the third and fourth cascades to be cooled to keep temperatures below 45 C.

About 5 percent of the final spent is bled back to the leach circuit to keep iron below 2.5 g/l. Make-up water to compensate for evaporation is added to the final spent sump before recirculation to the solvent extraction plant. Acid is also added to maintain concentration at 130 g/l.

Cobalt is added to the recirculation system to maintain a concentration of 60 ppm in order to stabilize the lead oxide film on the anode surface. Chloride levels are maintained at 25 ppm by salt additions. No other reagents are added to the electrolyte.

Cathodes are pulled on a 7 day schedule and "wet-slapped" on the second day to eliminate shorting. Current efficiencies are typically 85 percent and power consumption is about 0.90 kilowatt hour DC per pound of cathode. Commercial cathodes produced are fine grained, dense and free of dendrites. A two stage fresh water washing system removes residual electrolyte and maintains cathode brightness.

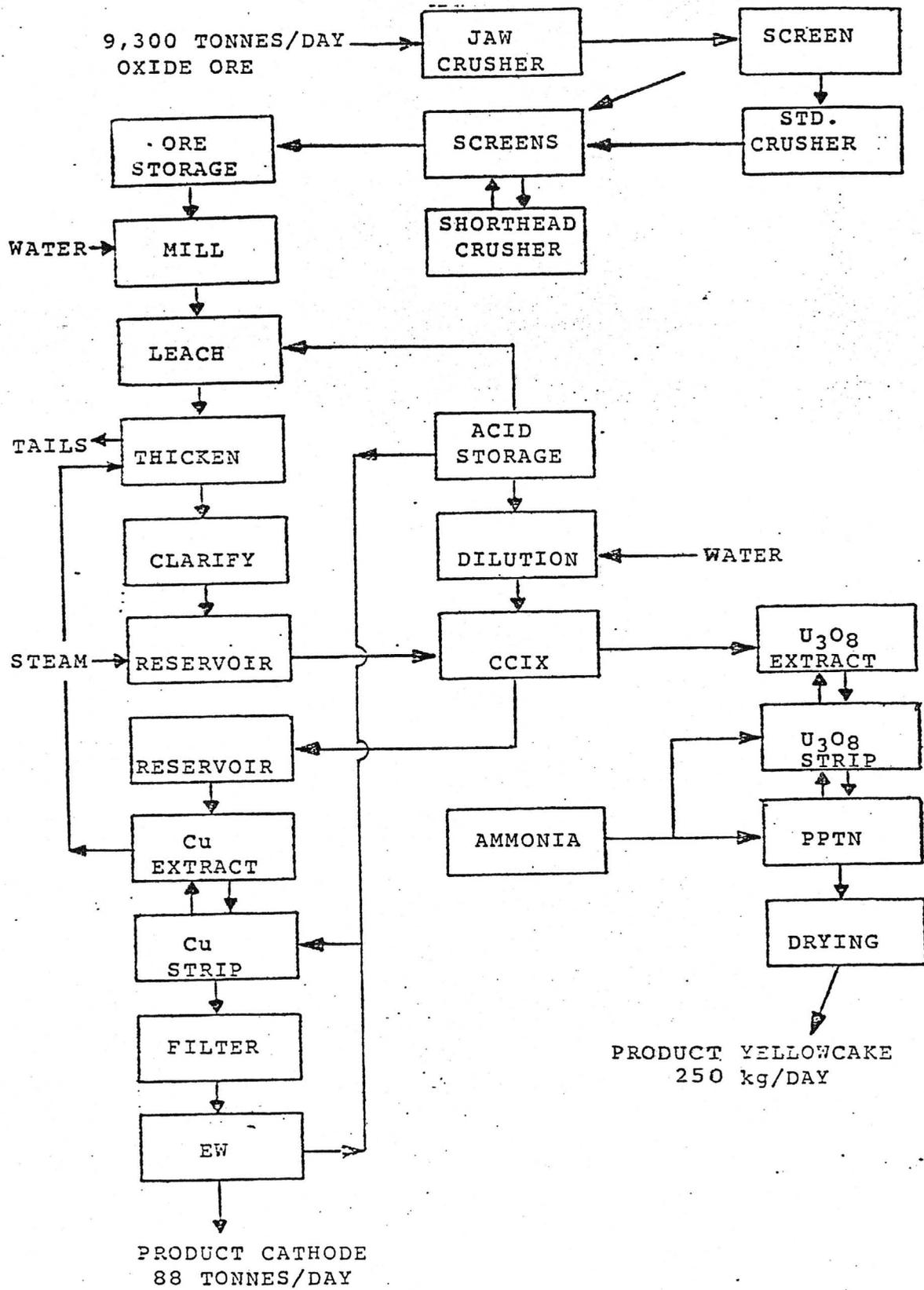


Fig. #1 Overall Oxide Plant Flowsheet

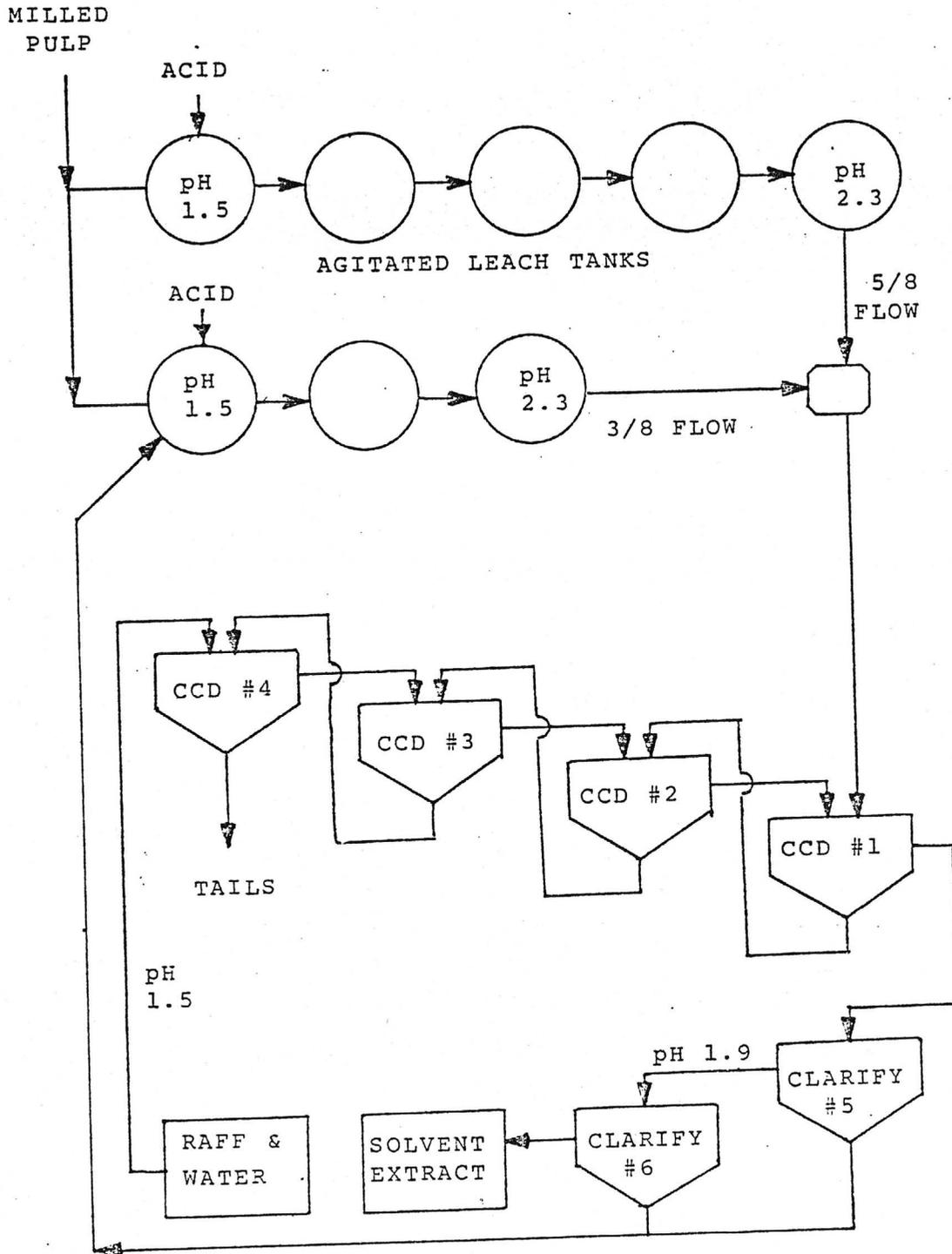


Fig. #2 Leach/Thickening Circuit Flowsheet



TWO ABSORPTION  
COLUMNS PER SET

ONE ELUTION  
COLUMN PER SET

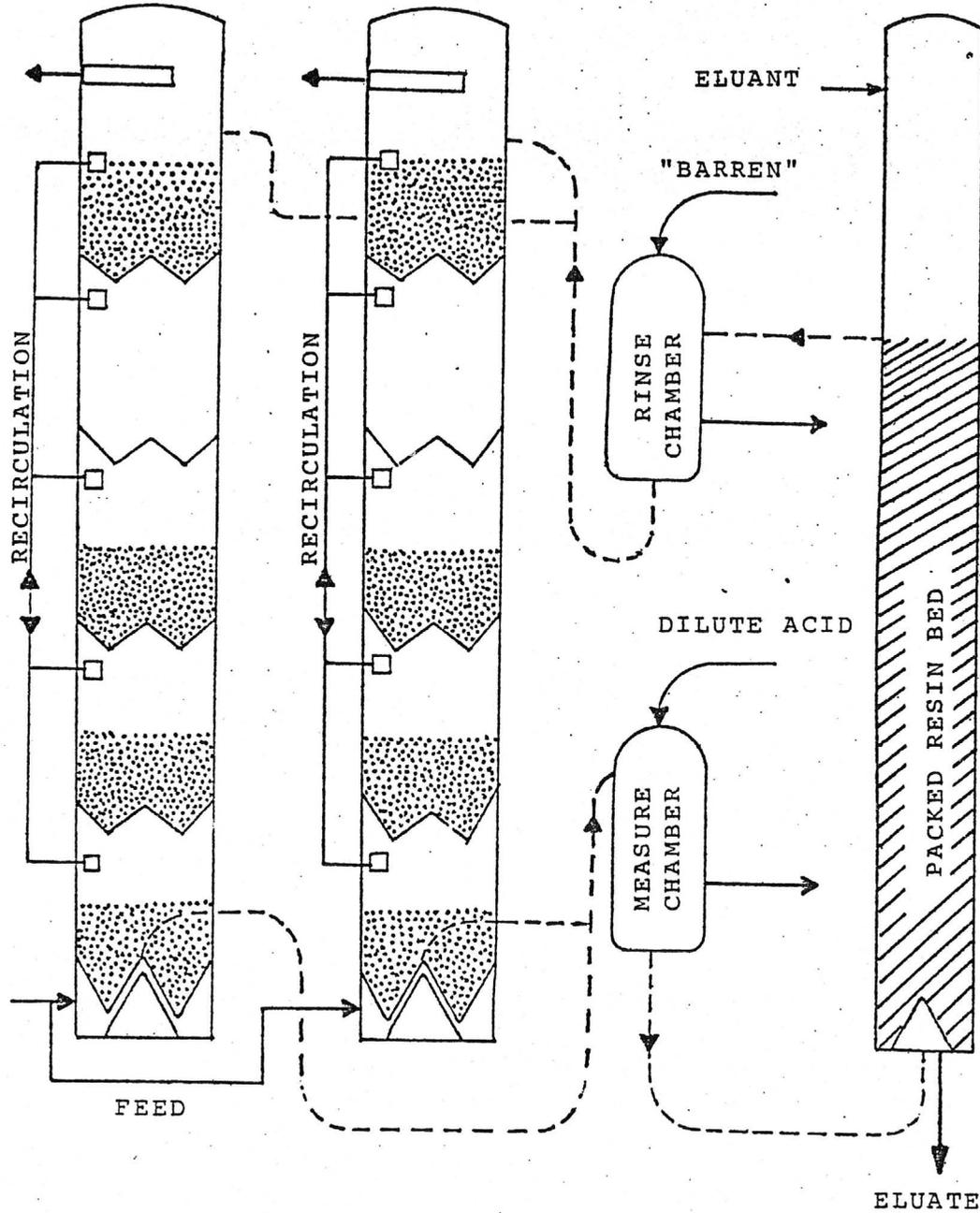


Fig. #4 CCIX Process Flowsheet ( one set of three )



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GEOLOGICAL DEVELOPMENTS IN THE TWIN BUTTES DISTRICT NEAR  
TUCSON, ARIZONA\*

By

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and

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Introduction

A decade ago the geophysical discovery of the Pima orebody by Thurmond and Heinrichs (1) set off a rash of activity in the Twin Buttes mining district that resulted in the discovery of the Esperanza, Mission, and Palo Verde orebodies.

The Twin Buttes mining district, located approximately 20 miles south of Tucson, Arizona, along the eastern pediment slope of the Sierrita Mountains, had at the time of the Pima discovery produced about 20 million dollars in value from lead, zinc, copper, silver, gold and molybdenum. Production was from veins or from relatively small, erratic limestone replacement bodies that cropped out at the surface on remnant hills that stood above a covered pediment surface. Application of improved techniques - geological, geophysical and geochemical - have continued to reveal major discoveries as "blind" orebodies under the pediment cover and beneath leached capping. The area now takes its place among the great mining districts of the Southwest with a developed potential value in excess of a billion dollars. Its development has had a strong impact upon both exploration philosophy and mining legislation.

The area has received careful study by many geologists, with nearly as many interpretations as geologists, and continuing exploration to test the various theories of localizing controls yields encouragement that additional important meta deposits will be found.

General Geology

In spite of the considerable geological and geophysical effort expended in the Twin Buttes district (2, 3), the lack of continuous outcrops and the complexity of faulting, volcanic and intrusive activity have led to varied interpretations of geological relationships and history.

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\*Presented at the 1961 Metal Mining and Industrial Minerals Convention, American Mining Congress, Seattle, Wash., September 10-13, 1961.



STATE OF ARIZONA  
DEPARTMENT OF MINERAL RESOURCES  
MINERAL BUILDING, FAIRGROUNDS  
PHOENIX, ARIZONA 85007

July 20, 1976

Mr. Edwin J. Eisenach  
President, Anamax Mining Company  
Twin Buttes Operation  
P. O. Box 127  
Sahuarita, Arizona 85629

Dear Mr. Eisenach:

Thank you very much for furnishing the Department of Mineral Resources with the 1975 production data for your Arizona mining operations.

Enclosed is a copy of the completed 1974-1975 tabulations for all large Arizona copper producers.

If the Department, or I, can be of assistance to you at any time, please contact us.

Sincerely,

Glenn A. Miller  
Mineral Resources Specialist

Enclosure

GAM:pp

File: Anamix, Pink reading, Yellow Alpha "A"  
Copper Report file, GAM file

C  
O  
P  
Y

1. Twin Buttes Mining Company Property 1942
2. Pima County, Arizona
3. Submitted by several different parties during the last fifteen years but more recently by the late G. M. Colvocoresses and Howard Fields.
4. This property was examined along with others in the Pima Mining District by R. M. Hernon in June, 1942, and the surface was examined by Hernon and Stone in 1947.
5. Several days.
6. Copper
7. In 1942 Hernon stated, "Very little reliable data relative to ore reserves have appeared. One verbal report is that little or no ore was left on the bottom of the various mines along the zone."

The report made by Hernon and Stone in 1947 indicated that, from what information they could gather, the limestone beds impinging on the granite contact (at 650') had probably been explored and have favorable horizons; that ore in the lower lime beds was problematical and the only way to ascertain their value would be by deepening the shaft or diamond drilling from the 600-foot level.

e.

Addendum by G. J. Duff - May 22, 1951: The various shafts on this property have been full of water since the large operation of the mine closed down about 1906. William Foy has had a lease or controlling interest for many years but has never done any prospecting or mining. About January, 1949, Howard Fields secured a lease and option from the owners with a minimum royalty of \$200 per month, which I understand he has been paying but has done no work. As of today I understand a deal is being consummated between the Twin Buttes Mining Company and the Banner Mining Company of Oklahoma City, wherein Fields gets an overriding royalty. Banner has already installed a concrete shaft collar bulkhead at the Copper Queen and they expect to de-water and examine it in the very near future.

1. Pima Mining District
2. Pima County, Arizona
3. Various persons on different occasions
4. Robert M. Hernon
5. Several days in June, 1942. (Additional reports under various years on several individual properties in this district.)
6. Lead-zinc-copper
7. "At present (June, 1942) no operations of size are in the Pima District. Possible operations would center around the Twin Buttes and Mineral Hill areas for copper, and around the San Xavier for lead-zinc. Local operators believe that a custom mill would draw considerable lead-zinc ore. However, the writer knows of no property except possibly the San Xavier which might serve as a backlog for such a mill. . . . It seems that the San Xavier offers the only possibility at this time for tonnage. . . ."
8. San Xavier Mine has since become the only operating unit of any size.

\* \* \* \* \*

War Minerals Report  
United States Department of the Interior - Bureau of Mines

W.M.R. 47 - Copper, Zinc

February 1943

TWIN BUTTES CAMP

Pima County, Ariz.

SUMMARY

The mines of the Twin Buttes Camp are at contacts of intrusive granite with older sediments, largely limestone. The ores are principally the contact metamorphic type and are localized in the hanging-wall sediments at the junction of small fissure veins with the granite contact. No important ore bodies were exposed at the surface, but were discovered by sinking on the fissure veins to the contact zone. Masses of garnetized rock in the contact zone also serve as possible indicators of underlying ore bodies.

Five mines in the area - Minnie, Copper King, Copper Queen, Copper Glance, and Senator Morgan - have yielded 388,000 tons of ore averaging 6.17 percent copper and a small tonnage of high-grade oxidized zinc ore. Developed reserves in two of these mines amount to 30,000 tons of 6-percent copper ore. The Contention mine, on another segment of the granite contact, has 15,000 tons of developed zinc-copper ore averaging 17 percent zinc and 2 percent copper. Ore development is in progress at this mine, financed by a \$20,000 Reconstruction Finance Corporation loan.

All of the copper mines except the Senator Morgan lie along an 8,000-foot east-west segment of the granite-sedimentary contact. Two other shafts, which yielded no production, were sunk on this contact, so that some 6,300 feet of the contact zone is accessible for underground exploration. Geologic conditions favorable to ore deposition are found along some 2,500 linear feet of unexplored portions of this contact zone.

All of these mines are controlled by the owner and operator of the Copper Queen and Contention mines, who holds the other mines under lease. Financing has been arranged for extracting shipping ore now exposed on the lower levels of the Copper Queen and Copper Glance mines and for continued development and mining. Preliminary rehabilitation is under way. Four of the shafts have been made accessible, and the lower levels of the Copper Queen and Copper Glance, now under water, will be unwatered soon.

Mining cost of shipping ore is estimated at \$5 a ton. Ore of lower grade than 5-percent copper will yield little profit when shipped to the smelter.

The Bureau of Mines has begun an exploration program in which it is planning to include (1) mapping and geologic study, both at outcrop and underground; (2) sampling of underground workings and diamond-drill testing at parts of the Twin Buttes contact zone for extensions of known ore bodies and search for new ones; and (3) sampling the Contention mine and diamond drilling to prove extensions of that ore body. About 4,000 feet of diamond drilling and 500 feet of underground drifting will be needed. The total cost of the project is estimated at \$45,000. This program has a dual purpose - first, to disclose additional reserves of shipping ore, and second, to estimate the tonnage of milling-grade ore and, if the available tonnage of the latter is sufficient to justify the erection of a mill, to make metallurgical

test and proposals for a custom mill in this camp.

This program offers an opportunity to disclose ore bodies that should yield copper ore and zinc-copper ore of shipping grade. The expectation is 25,000,000 pounds of copper to be produced from 1943 to 1947, inclusive.

#### INTRODUCTION

The Twin Buttes Camp embraces eight mines that lie along a contact of granite with Paleozoic limestones and quartzite. Five of these have been producers; another is in active development and has some zinc-copper ore blocked out. There is a known reserve of some copper ore in two of the old producers.

In June 1942, when a Bureau of Mines engineer\* investigated these mines, only one of them was accessible. Maps of the others are available, as well as records and smelter settlements covering the greater part of the copper produced from the camp, and a geological report on the Twin Buttes district by Ronald L. Brown in the University of Arizona library. The present operator, who has been connected with these mines since 1916, supplied much information.

The Senator Morgan group, under lease to Charles Taylor of Tucson, Arizona, is owned by the Twin Buttes Mining & Smelting Co. of Milwaukee, Wis., which also owns the Copper Glance, Copper Buttes, Copper Bullion, and Copper King Mines. These are leased to William Foy, of Twin Buttes, until 1948.

The Midland Copper Co., now defunct, owned the Copper Queen mine. William Foy, a former shareholder in that company, has been paying taxes on the mine for several years.

The Arizona Buttes (Minnie) group of claims and the Contention group, all unpatented, are held by William Foy.

The Taurus claim (unpatented) is held by G. Gavin, Box 13, Ruby Star Route, Tucson, Arizona.

Work has been started at the Copper Glance to rehabilitate the shaft and unwater this mine and the Copper Queen, which is connected with the Copper Glance on the seventh level. William Foy has unwatered the Contention mine and is doing development work there.

#### HISTORY

The first locations are said to have been made in 1876. Little mining was done before 1905, when D. S. Rose, of Milwaukee, organized the Twin Buttes Mining & Smelting Co. and acquired the more promising claims in the area, except the Minnie group. This company built 28 miles of standard-gage railroad from Twin Buttes to Tucson and erected a smelter on the Santa Cruz River. It operated from 1906 to 1913, but was not highly successful. It produced 132,500 tons of ore averaging 5.92 percent copper, mainly from the Morgan mine, but some of it from the Copper Glance and Copper King mines.

Ed Bush leased the Morgan mine in 1913 and produced a few carloads of low-grade ore. He relinquished that lease in 1914 and took a lease-and-purchase option on the Minnie mine, which he developed and operated from 1914 to 1917.

\*Burr S. Webber, associate mining engineer.

Ed Bush and associates organized the Midland Copper Co., in 1917 and took the Copper Glance and Copper Queen mines under lease-and-purchase option. The Copper Queen was paid for out of royalties. The lease on the Copper Glance was surrendered in 1918, and the mine has since lain idle. It has produced 118,066 tons of ore averaging 6.72 percent copper. Bush died in 1920. The company reopened the Copper Queen mine in 1922 under the management of William Foy, and shipped ore from 1923 to 1926. The Copper Queen produced 75,186 tons of 7.05 percent copper ore from 1917 to 1926. William Foy produced a little ore from the Minnie mine in 1928.

Total production from the camp has amounted to 388,231 tons averaging 6.17 percent copper, contributed as follows:

<u>Mine</u>	<u>Dry tons</u>	<u>Copper, percent</u>	<u>Copper content, pounds</u>
✓ Senator Morgan <sup>1</sup> . .	132,502	5.92	15,688,237
✓ Copper Glance. . .	118,066	6.72	15,870,493
✓ Copper Queen . . .	75,186	7.05	10,608,048
✓ Minnie . . . . .	<u>62,477</u>	<u>4.71</u>	<u>5,865,333</u>
	388,231	6.17	48,032,111

<sup>1</sup> Production credited to the Senator Morgan mine includes all of the ore produced from the Copper King and the early production from the Copper Glance.

#### PHYSICAL FEATURES

The Twin Buttes Camp, in the Pima Mining District, is 28 miles south of Tucson on the Tucson-Continental County road. It is 6 miles south of Mineral Hill. Almost half of the road is paved and the remainder is well-graded. A graded road 9 miles long connects the camp with Sahuarita, on the Nogales branch of the Southern Pacific Railroad and on paved U. S. Highway 89.

Topographic relief is not great. The altitude is about 3,400 feet, wherefore temperatures are somewhat lower than at Tucson.

Potable water is obtainable from three old prospect shafts in the area, but the nearest supply is rather scant in dry weather. Mine water is used for other than camp purposes.

Although labor is not abundant, a few experienced men are available and some ordinary laborers can be obtained.

#### GEOLOGY

The ore deposits of the camp, as indicated by past development, are mainly the contact metamorphic type and are at or near the contacts of intrusive granite with Paleozoic limestones and quartzites. The ore shoots lie in metamorphosed sediments adjacent to a zone of garnet rock that separates the ore from the footwall granite.

The principal group of copper mines lies along the north side of a sedimentary ridge that may be completely surrounded by granite. The greater part of the contact is masked by alluvium. The claims lie end to end, with their side lines roughly parallel to a nearly east-west segment of the granite-sedimentary contact, which is about 8,000 feet long (fig. 1). From west to east the mines are Minnie (Arizona Buttes), Copper Buttes, Copper King, Copper Queen, Copper Glance, and Copper Bullion.

The contact is approximately defined by outcrops toward the east. Its position underground is determined at intervals for about 6,000 feet. The dip of the contact is south. Some transverse faulting has been noted along this segment of the contact.

The Contention zinc-copper ore body on the North Star claim, about 3,500 feet south of the Minnie mine, is on the granite-sedimentary contact at the northeast side of another block of sediments. The intervening contact line between this mine and the Twin Buttes groups is several miles long, within which interval the granite presents many phases, grading from true granite to diorite. Quartz segregations and lamprophyric dikes also occur.

The old Senator Morgan mine, adjoining the Contention at the southeast, is near a faulted segment of the same granite-limestone contact that trends northwesterly. Several faults are noted in this general area.

#### ORE DEPOSITS

The Copper Bullion, Copper Glance, Copper Queen, Copper King, and Minnie form a geologic unit. Mining on the Glance, Queen, and Minnie has shown that these are contact-metamorphic deposits. Chalcopyrite, together with a little bornite, is the principal copper mineral, although copper carbonates and native copper are found. The gangue consists of garnet, epidotized limestone, and some specular hematite. The three mines have the following characteristics:

1. Initial work was on small-fissure veins containing copper-carbonate ore.
2. The veins led to contact-metamorphic deposits of economic importance.
3. The contact-metamorphic ore bodies did not outcrop.
4. The ore shoot developed, in each instance, has an easterly rake and consists of connected, irregularly shaped ore bodies within the contact zone. The shoots are lenticular in general outline, have an average thickness of 30 to 80 feet, and are about half replaced by copper ore above 5-percent grade.
5. At the surface and in the vicinity of the upward projection of the ore bodies, is a zone of garnetization containing minor amounts of copper carbonates.
6. Progressively from west to east, the contact-metamorphic bodies occur at greater depth below the surface.
7. The depth of these bodies is a function of the horizontal distance between the granite contact and the fissure vein appearing over each body.
8. The importance of the underlying ore body appears to be reflected in the strength of garnetization, where the limestones are of equal amenability of contact metamorphism.

The water table is about 425 feet below the collar of the Copper Glance shaft. That mine makes 50 gallons of water a minute at the 625-foot horizon.

Minnie (Arizona Buttes). - This was the first of the group to be explored. Most of the fissure vein over the ore shoot had been eroded, so that strong mineralization was evident at the surface. The ore shoot lies between limestone and a footwall wedge of quartzite, the thin edge of the wedge being towards the east. This was passed in drifting east on the 325-foot level, where granite was encountered on the footwall of the mineralized zone. The copper content there fell below 3 percent. Mineralization appears to have been localized by transverse fractures that pass from the granite through the quartzite into the limestone hanging wall. The quartzite is partly mineralized adjacent to these fractures and yielded some ore.

The ore shoot, as developed, is about 500 feet along its pitching axis, roughly oval in cross section and about 70 feet wide. Total production has amounted to 62,477 tons with average grade of 4.71 percent copper. The ore diminished in grade on the lowest level; 5,100 tons mined there in 1929 averaged 3.15 percent copper. Ore of similar grade remains in the mine, according to assay maps, but the thickness of the ore shoot is decreasing downward. Future exploration in this mine had best be directed eastward along the granite-limestone contact toward the Copper Buttes shaft about 1,400 feet away. The 325-foot level was driven 375 feet east on this contact without encountering shipping ore. This exploration is not recommended at present.

Copper Buttes. - There is a moderate development of banded garnetization between the Minnie and the Buttes shaft. A small mineralized fissure vein outcrops at the Buttes shaft, which was sunk on this vein at an inclination of about 60° southerly. The shaft entered the footwall granite at 100 feet and was continued in granite to 300 feet on the slope. Crosscuts were driven to the hanging-wall limestone at the 200- and 300-foot levels. Drifting along the contact on these levels aggregates about 225 feet. The contact, where exposed underground, shows a leached zone with some mineralization that averages about 5 feet in width. This zone contains some chalcopyrite in garnet rock, but the material is below commercial grade. Exploration, if undertaken, should be directed westward along the contact toward the Minnie; that is not contemplated as part of the Bureau's present work.

Copper King. - The King shaft was started early in the century on a fissure vein containing copper carbonates. The shaft was last used in 1913 and is reported to be 300 feet deep. The vein is in limestone and dips steeply toward the south. It is exposed for a length of 250 feet at the surface, where it pinches and swells along the strike; underground openings show the same variation in width down the dip. Average width is about 5 feet. Leasers are now mining at the surface, working westward toward the granite contact, which is masked by alluvium.

Mine records show that oxidized zinc ore was found in the footwall limestone a short distance north of the vein. Smelter settlements indicate that 2,183 tons of ore carrying 27 to 34 percent zinc was shipped to Kansas and Colorado smelters.

There is a moderate development of garnet in the hanging-wall limestone over the King fracture. Eastwardly the surface trace of the fracture fades out into a heavy body of garnet rock overlying the Queen stopes. Although the King fissure is well within the hanging wall (perhaps 300 feet), relative to the Queen shaft, it is not unlikely that it connects with the Queen ore body. The intervening block of ground, about 400 feet measured along the rake of the Queen ore shoot, will be explored through stoping in the two mines.

The block of ground below the King workings is considered a promising potential source of copper ore and possibly of zinc ore, also. An ore shoot should be found at the junction of the King fissure with the granite contact, assuming that ore deposition here followed that pattern, exposed by development, at the Minnie mine to the west and at the Queen and Glance mines immediately to the east. The strike and the attitude of the granite footwall are unknown between the Queen mine and the Copper Buttes shaft, so that the distance from the lowest level of the King workings to the granite footwall is unpredictable.

Copper Queen. - The first work at the Queen mine was on a small fracture filling of copper carbonate ore, as at the Minnie, King, and Glance mines. A shaft was sunk on the fracture about 100 feet, almost vertically. In view of geologic conditions already proved at the Minnie and Glance mines, this shaft was abandoned and another was started, inclined  $72^{\circ}$  south. The second shaft intersected the hanging-wall limestone and encountered the metamorphic ore body at 440 feet inclined depth, and has been sunk to 740 feet. Ore was stoped from above the 440-foot level down to the 700-foot level. The ore body is said to diminish in thickness and grade in the backs of the stopes above the 440-foot level. Complete assay records of this last work indicate that the grade of ore is about the same as that of the ore mined above. Selective mining is necessary, as at the Glance and Minnie mines. About half the material in the ore shoot is shipping ore of 6-percent grade.

The shaft cut the granite contact at an inclined depth of 570 feet; on the 700-foot level it is 70 feet in the footwall granite. The calculated dip of the contact between these points is  $45^{\circ}$  south. A wall of granite was encountered 175 feet west of the shaft on the 700-foot level. Ore was mined from the re-entrant angle, and the granite was followed 60 feet toward the hanging wall without finding its contact with the limestone. There is low-grade mineralization along this crosscut. A similar granite projection was found east of the Queen stopes on the 650-foot level about 300 feet east of the shaft. Here it is clearly the result of transverse shearing. The ore continued well back into the footwall granite. Neither of these projections was found on the higher levels. If they continue downward, they may form the western and eastern limits of the Queen ore body. They are 500 feet apart where observed, but it is reported that they incline slightly toward each other downward. The major ore shoot has a width of about 200 feet, although some ore has been mined along the entire strike length of 500 feet.

The Copper Queen could be explored at both upper and lower ends of the developed part of the ore zone. The upper and westerly projection would be difficult and costly to reach by diamond drilling. Continuation to depth could be proved only by sinking on the ore body or crosscutting into the hanging wall and diamond drilling.

The Copper Queen has produced 75,186 tons of ore containing 7.05 percent copper and about 2 ounces silver per ton.

Copper Glance. - The first work at the Copper Glance was an inclined shaft on a small fissure in limestone that strikes N.  $60^{\circ}$  W. and dips steeply south. Two ore shoots were found on opposite sides of the shaft, about 100 feet apart, on the 150-foot level. The first shaft was abandoned, and a vertical shaft was sunk, directed at the western ore shoot. This shaft entered the contact zone between granite and limestone at 330 feet. Two lobes of ore were developed, which join on the 400-foot

level and connect with the eastern ore body found on the 150-foot level in the fissure vein. The ore in the contact zone was developed easterly and downward to a vertical depth of 550 feet.

The shaft intersected the granite contact at 380 feet and was sunk in the footwall granite to 625 feet, where the crosscut to the ore zone is 150 feet long. Two winzes were sunk in ore on the 625-foot level. The ore there is similar in grade to that mined at higher levels. The ore shoot rakes to the east. It has been developed for a length of 400 feet; it is about 200 feet wide and 60 feet thick. About half of the shoot is ore.

A west drift on the 525-foot level connects with workings of the Queen mine. This drift was carried along the granite footwall for 365 feet from the Gance workings, and thence, due to the undulating contact surface, in the limestone hanging wall for the final 1,000 feet.

Above the 450-foot level, the Gance stopes are almost entirely west of the shaft, but the ore body lies directly in front of the shaft on the 625-foot level.

Drifts were carried about 275 feet east of the shaft in the contact zone on the 450-foot and 525 foot levels. No profitable ore was found in these drifts nor in short crosscuts driven north and south from them.

Considerable diamond drilling has been done from underground stations in both the Gance and the Queen mines. These holes were all directed into the hanging wall at various angles, but, so far as known, none was directed toward the granite contact.

Copper Bullion. - A vertical shaft on the Copper Bullion claim was sunk 500 feet to explore a strong vein in the cherty Cambrian limestone known as the Abrigo formation. The vein has an average width of 18 feet, dips steeply northeastward, and strikes N. 60°W. in conformity with the bedding of the formation. The cherty country rock suffered little alteration, but there is some garnetization in the fissure filling. The shaft is in the vein to a depth of 50 feet and in the hard, cherty limestone footwall below that depth. Crosscuts were driven to the vein at the 100-, 200-, and 300-foot levels, and raises were carried up in the vein from these crosscuts. A 100-foot winze was sunk in the vein on the 300-foot level. A crosscut was started toward the vein on the 500-foot level but was not finished. A diamond-drill hole 380 feet deep and almost horizontal was directed northeasterly and did not reach the granite contact.

The Copper Bullion vein filling is largely iron oxide, garnet, and partly garnetized limestone, with streaks of copper sulfide and oxide. A little shipping ore was mined from the upper part of the vein.

The Copper Bullion fissure appears to be on the projected strike of the Copper Gance fissure but in a different type of limestone. The horizontal distance between the shafts is about 1,300 feet. No ore exposures were observed except minor occurrences of copper carbonates in garnet near the Gance shaft.

The granite contact north of the Copper Bullion shaft is masked by a heavy mantle of alluvium. The probable line of junction between the vein and the contact is indeterminate but is certainly at considerable depth. There appears to be ample room here for a deep deposit of copper ore.

Contention mine. - An exceptionally strong development of dark garnet rock occurs at the Contention mine. Thin beds of unreplaced limestone remain in the garnet zone, which is nearly 100 feet wide. The zone is separated from the granite here and there by unreplaced limestone and at some places by a thin bed of quartzite. The contact zone is irregular and is interrupted by faulting.

There is one vertical shaft 221 feet deep. A crosscut on the 150-foot level was driven southwesterly and encountered a thin vein at 100 feet from the shaft. This was drifted upon to the south for a distance of 157 feet and was crosscut at two places. Three raises were connected by a sublevel 80 feet above the drift. All of this work is in ore. One raise was continued to 60 feet above the subdrift, where its face is partly in ore. Two winzes were sunk in ore from 150-foot level. It is reported that a crosscut was driven to the ore on the 210-foot level (under water at date of examination) and that the vein was drifted on, in ore, for 150 feet southward.

Development is insufficient to determine the structural relationship. The pinching of the ore to the north is probably related to a fault that outcrops a little north of the shaft. An east-west arroyo probably marks the trace of this fault. Beds on the two sides of the arroyo show almost no horizontal displacement but differ by 35° in strike.

The ore shoot contains masses of irregularly distributed garnet. It has a footwall slip, below which the beds have not been prospected. A zone of radially bladed actinolite may mark the hanging wall, but this has not been crosscut outward from the ore body. Widths across the ore range from 4 to 22 feet, but the average thickness is not less than 12 feet.

A class B development loan of \$20,000 has been granted by the Reconstruction Finance Corporation to be used to develop ore reserves to the south at a depth of 300 feet.

It is worth noting that this ore body did not outcrop and that there were no proved ore bodies in the immediate vicinity. Ed Bush, following his experience at other mines in the district, sank 150 feet on the garnet zone and then crosscut toward the hanging-wall limestone to discover the ore. A similar exploration program on the Gladstone claim, undertaken later, was unsuccessful.

Taurus. - This is an unpatented claim of irregular shape adjoining the North Star (Contention) claim on the southeast. The heavily garnetized contact zone on the North Star claim continues southeasterly across the Taurus claim but pinches out near the southeast end line of that claim. On the Taurus, about 800 feet southeast of the Contention shaft, measured along the contact (500 feet southeast of the nearest proposed diamond-drill hole), is an outcrop containing copper carbonates enclosed in the garnetized and epidotized limestone. This copper streak is about 1 foot wide. There is no development except a few test pits.

#### ORE RESERVES

Minnie mine. - Records and assay maps indicate that the developed ore shoot in the Minnie mine may be nearly exhausted. Both grade and thickness of the ore are diminishing at the edges of the stoped area. The last ore shipped averaged 3.15 percent copper, which is not shipping grade at this time. No reserves are credited to this mine.

Copper King mine. - Ore probably remains in the King fracture. Both zinc and copper ores were being shipped from the mine when the Twin Buttes Mining & Smelting Co. suspended operation in 1913. No assay maps are available. The shaft has been cleaned out and retimbered.

Copper Queen mine.- Assay records indicate that ore of the same grade as that mined above (about 6 percent copper) can be mined from the lowest levels. The thickness of the ore shoot diminishes within the lowest 100 feet of its depth.

Copper Glance mine.-The Copper Glance ore shoot has been proved on the 525- and 625-foot levels but only partly extracted there. Reserve is estimated at 30,000 tons of 6-percent copper ore, based on past production from higher levels.

Contention mine.- Proved reserve is about 15,000 tons of ore that will average about 17 percent zinc and 2 percent copper.

Total reserves are thus 30,000 tons of 6-percent copper ore and 15,000 tons of zinc-copper ore at 17 percent zinc and 2 percent copper.

#### MINING COSTS

Mining costs per ton of shipping ore at the Copper Queen mine from 1923 to 1926 were as follows:

Labdr. . . . .	\$1.668	
Insurance. . . . .	.083	
Power and air. . . . .	.097	
Explosives . . . . .	.197	
Smelter representation . . . . .	.058	
Pumping. . . . .	.076	
Miscellaneous supplies . . . . .	.171	
Timber. . . . .	.022	\$2.372
Prospecting and Development. . . . .		.688
Overhead:		
General office expese. . . . .	0.062	
Repairs and renewals.. . . .	.112	
Taxes, State and County. . . . .	.218	
Taxes, Federal income . . . . .	.477	.869
Total cost per ton of shipping ore . . . . .		3.929
Estimated present cost. . . . .		5.00

Smelter returns at the mine, according to American Smelting & Refining Co. schedule, on copper ore delivered at Hayden, are as follows:

On 4.5-percent copper, 2 oz. per ton silver. . . . .	\$ 5.87
Less royalty (10 percent of net smelter returns) . . . . .	<u>.59</u>
Net per ton at the mine. . . . .	5.28
On 5-percent copper ore, 2 oz. per ton silver . . . . .	7.48
Less royalty (10 percent of net smelter returns) . . . . .	<u>.75</u>
Net per ton at the mine. . . . .	6.73
On 6-percent copper ore, 2 oz. per tons silver. . . . .	11.10
Less royalty (10 percent of net smelter returns) . . . . .	<u>1.11</u>
Net per ton at the mine. . . . .	9.99

The lease terms under which the mines will be operated are not known, but a royalty of 10 percent of net smelter returns is a general standard on this grade of ore. According to the above calculations there will be no profit in shipping 4.5-percent ore, and 5 percent copper will be the probable cut-off for shipping ore.

#### PROPOSED EXPLORATION BY BUREAU OF MINES

The complete program includes the following items, at their estimated costs:

1. Surveying and mapping surface and underground workings and preliminary character sampling. . . . .	\$ 4,000
2. Rehabilitation of mine to give access for drilling, mapping, and cutting of underground drill stations. . . . .	3,000
3. Surface trenching. . . . .	2,000
4. Diamond drilling, including supervision, sampling, and analyses, 4,000 feet at \$6 a foot. . . . .	24,000
5. Driving exploratory headings to favorable areas, 500 feet at \$14 a foot. . . . .	7,000
6. Mine sampling. . . . .	3,000
7. Contingencies. . . . .	<u>2,000</u>
	45,000

For the immediate future, work will be limited to item 3, the results of which will largely determine the advisability of further procedure.

Copper King mine. - Objectives are to extend the known ore reserve and determine its grade. Diamond drilling is proposed to test the Copper King fracture down to the granite contact and also the contact zone. It is proposed to drive a cross-cut 100 feet into the hanging wall on the 300-foot level and to cut a diamond drill station at its end. Drill holes totaling 1,310 feet will be directed at different angles to crosscut the vein at intervals down to its junction with the contact and also to crosscut the contact zone. Some holes will be continued into the footwall of the vein to test the continuity downward of the footwall zinc-ore body, from which it is estimated that 1,100,000 pounds of zinc has been shipped in ore.

Copper Queen and Copper Glance.- It is proposed to test a 1,000-foot gap of unexplored contact zone between Copper Queen and Copper Glance workings by diamond drilling from stations in the long drift on the 525-foot level of the Glance. The drill holes will be spaced at 100-foot intervals and will be directed northeasterly with 45° downward inclination. The total footage to be drilled is estimated at 1,375 feet.

Copper Glance.- The operator proposes to extend the east drift on the 525-foot level 250 feet eastward, and to drive along the limestone hanging wall, thus leaving most of the contact zone unexplored. The contact zone contiguous to the proposed drift seems particularly promising because of its proximity to known ore and because it is under a very heavy mass of garnet rock at the surface. The Bureau of Mines proposes to drill five holes from this drift northerly to the granite footwall. The holes will be inclined about 45° downward and will be about 100 feet deep. The total drilling is estimated at 500 feet. This may disclose an ore shoot similar to the Glance ore body.

Copper Bullion.- The drilling proposed on this claim is to determine the copper content of an 18-foot vein at and below the 500-foot level. The vein has been exposed near the shaft to the 400-foot level. It is leached and oxidized and has spots of copper mineralization to that depth. The drill will be stationed at the bottom of the shaft. If the test holes find profitable ore, divergent holes will be drilled to explore the ore body along the strike as far as is practicable from one station. The proposal calls for 840 feet of initial and 845 feet of supplementary drilling. This work may disclose an ore body extending to considerable depth.

Contention. - The proposed drilling is directed toward proving the continuation of this ore body in depth and along the strike. It will also test the zone between the footwall of the proved ore body and the granite contact. About 1,300 feet of drilling is required. This is expected to increase the present reserve of zinc-copper ore. It will also test the type of mineralization that prevails at greater depth. It is suspected that the copper content of the ore will increase and the zinc content decrease as depth is attained. If a fairly large tonnage of the zinc-copper ore should be developed, a mill will be required to beneficiate this ore.

Taurus.- It is proposed to drill two holes on the Taurus claim unless the results of drilling on the Contention are discouraging. The holes are designed to cut the contact at vertical depths of 150 and 250 feet under the surface showing of copper ore. This drilling may discover an ore shoot similar to those already proved along this contact.

#### CONCLUSIONS

It is believed that the above program should disclose additional ore bodies. The work will decide whether a custom mill should be built in the district. There are two possible sources of mill ore-copper ore at the Twin Buttes group of mines too low in grade to ship directly to a smelter and zinc-copper ore at the Contention mine that will need both concentration and separation. The Bureau's sampling will determine the available tonnage of such ores. If the tonnage is high enough to justify a mill, then ore-dressing tests will be made by the Bureau of Mines metallurgical laboratory followed by proposals for a custom mill. It is probable, however, that enough mill ore will be indicated to recommend a 100-ton milling unit that can begin operation by the end of 1943.

## EXPECTED PRODUCTION

	<u>Copper, pounds</u>	
	<u>From smelting ore</u>	<u>From milling ore</u>
1943 . . . . .	2,192,000	2,386,000
1944 . . . . .	3,288,000	2,386,000
1945 . . . . .	3,288,000	2,386,000
1946 . . . . .	3,288,000	2,386,000
1947 . . . . .	<u>3,288,000</u>	<u>2,386,000</u>
	15,344,000	9,544,000

Production of zinc probably will not be high; its amount cannot be estimated at this time because it is likely that the zinc content of the Contention ore will decline as depth is attained.

## TWIN BUTTES

### LOCATION:

The Twin Buttes Mining District lies in the Sierrita Mountains, about 6 miles west of Sahuarita, a station on the Southern Pacific Railroad, 25 miles south of Tucson, Arizona, toward Nogales. The Tucson-Nogales oiled highway also passes through Sahuarita. A very good graded gravel road connects the camp with Sahuarita, so transportation is most economical. The following are the principal mines of the district:

Morgan, Minnie, Copper Buttes, Copper King, Copper Queen, Copper Glance and Copper Bullion.

### CLIMATE:

The climate is typically that of Tucson and Southern Arizona - hot days, cool nights, with summer showers. The vegetation is sparse and that of the arid desert section. Water for domestic use and for mine operation is available at the Gledstone Shaft, which is under lease.

### LABOR:

Labor is largely Mexican and seems to be abundant in this particular section. The proximity to the border assures a fair supply. The camp has practically all the buildings necessary to begin operation, though the ore bins, etc., will need repairs before commencement of operation.

### HISTORY:

The known history of Twin Buttes mining district dates from the nineties, when four prospectors gophered various surface outcrops of copper carbonates, hauling same to Tucson by wagon. This continued up to the year 1905, when a group of men headed by David S. Ross, then Mayor of Milwaukee, formed the Twin Buttes Mining and Smelting Co., which acquired all the favorable property in the district. They built a standard gauge railroad from Tucson to Twin Buttes, 28 miles in length, and began mining operations in 1906, erecting a smelter near the Santa Cruz River, nine miles from the mines. They operated until the spring of 1913, directing most of their attention on the Morgan Group, as this particular group had the best surface showing.

During these operations the Twin Buttes Mining and Smelting Co. produced a gross of \$3,110,000. Most of this came from the Morgan mine, the balance from the Copper Glance, Copper Queen and Copper King, the latter group being on a different contact with very little surface showing and was not worth considering at that time. However, later operations proved this contact to be the richest zone of the district, higher grade ore and larger ore bodies. The gross production from this contact to date is \$6,115,597.30. This, with the old company's production of \$3,110,000.00, makes a grand total of \$9,225,597.30 for the district.

In 1913, after some of the older officials of the company had died or passed out of the picture, operations ceased. From then on until 1918 the Morgan mine was worked by leasers. In 1914 Ed Bush from Butte, Montana, who had been leasing at the Morgan, took a lease and bond on the old Minnie mine, which lay on the Glance-King contact adjoining the Copper Buttes on the west. Bush and his partners netted over \$400,000.00 in the years 1914-15 and 16. It was while operating the Minnie and seeing the possibilities of this contact that Bush took

a lease and bond on the Copper Glance, which had been previously worked by the old company. This contract was for \$300,000.00 for 3 years on a 10% royalty basis, during 1917-17-18, until the drop of copper after the Armistice. Bush paid \$233,796.16 in royalties to the old company and netted a substantial sum besides.

In 1917, being more convinced than ever of the possibilities of the Copper Queen, Bush took a 3-year lease and bond for \$100,000.00 on this property. He paid this \$100,000 in royalties after the second year and netted besides \$180,643.72 for himself and partners.

W. F. Foy became associated with Bush in 1917, when they took over the Copper Queen, and Foy carried on operations after Bush's death in 1920, by re-opening the Copper Queen and during 1923-26 paid dividends totalling \$412,000 besides sinking a 500 ft. shaft on the Bullion and a 400 ft. shaft on the Gladstone, which expense was absorbed in operating costs.

Foy purchased the properties from his associates in 1928, forming the Buttes Copper Company, embracing all the properties in the district, but the panic halted this project and the properties reverted to their original owners.

In 1938 Mr. Foy arranged a new deal and I became associated with him in 1942. A loan of \$9,000 was granted by the R.F.C. to start unwatering the mines and show sufficient evidence to warrant additional funds to equip and place them in production. Due to difficult operating conditions this was not sufficient, and I, personally, advanced some \$7,500 to complete it. The Glance and Queen Mines were unwatered to the 525 level, where a personal examination showed the ore expected did exist. The shaft was retimbered, the headframe repaired, two 310 cubic ft. Chicago Pneumatic Air Compressors bought and installed, air and water lines installed in the shaft and a Cameron sinking pump obtained. The small amount of water remaining can be easily removed with this equipment and the mine equipped for production.

Mr. Foy eventually relinquished his contract so I could arrange a more favorable one. The mines held under the present lease and option are:

Copper Glance	Pat. No. 2643
Copper Bullion	" " "
Copper King	" " "
Copper Buttes	" " "

The terms of the lease-option from the owners, Twin Buttes Mining and Smelting Co., Room 1112, 229 East Wisconsin Ave., Milwaukee 2, Wisconsin, are:

Date Feb. 1, 1945. Term 6 years. Royalty 10%  
 Price \$60,000.00 Minimum payment \$100.00 monthly.

Foy owns the Minnie and Copper Queen Mines and will include the Queen in any deal which I make for the balance of the group in a separate agreement.

The following gives details of ships from the various mines. These were shipped to the Southern Pacific Railroad at Sahuarita over the Twin Buttes R.R., a company road now abandoned and dismantled.

Mine	Date	Price	RR Cars	Dry T.	%Cu	Gross Cu% Ag.	Net Profits
Minnie	1914-18	22.73¢	1370	62,477	4.71%	\$1,282,202	\$ 493,805
Queen	1917-20	19.145	310	15,234	9.14	556,396	180,648
Queen	1923-26	13.83	1078	59,952	6.55	1,060,872	412,218
Glance	1916-19	18.011	2432	118,066	6.72	2,786,126	629,282
			Total	255,729		5,685,596	1,715,953

## GEOLOGY:

In general, the geology is that common to replacement in a contact zone between bedded limestones and underlying granite. This contact has roughly an East-West strike and dips to the South at about 60 degrees. The contact lies in the form of a shallow arc, whose continuity is broken in several places by rolls, which are usually accompanied by cross fracturing. These rolls probably were occasioned by pressure due to the granite intrusions, which also may have caused the fracturing.

The lime is metamorphosed along the contact to a garnet and these garnet occurrences extend into the limestone for considerable distances at the location of the rolls and fractures. All of the ore found to date occurs in the garnet in the "roll" area.

The lime beds have been tilted by the granite intrusion and faulting but in general the contact crosses the beds, so there is a variation in the garnetization from the surface down, due to variations in the solubilities of the beds traversed. The persistence of the lime is shown by a diamond drill hole, drilled vertically from the 625 level of the Glance Mine, which showed lime to a further depth of 500 feet, with the hole bottom still in lime.

The contact is known for a distance of 9,000 feet and the recognized "rolls" which have been named for the claims on which they occur, are, from East to West--Copper Bullion, Copper Glance, Copper Queen, Copper King, Copper Buttes and Minnie. The Copper Glance, Copper Queen and Minnie have developed into good producing mines. The Copper King has produced an estimated \$150,000 from a small fracture. The Copper Bullion has encountered a strong fracture filled with leached oxidized ore (not commercial). Neither of these developments has reached the contact so their present interesting showings warrant the expectance of ore bodies on the contact similar to those found in the other three mines.

There is an unprospected "roll" between the Glance and Queen, which could be prospected from the drift connecting these two shafts, and which was driven off the contact for permanence. Also, there are several other areas where "rolls" can be expected as between the King--Buttes--and Minnie.

The outcrops of contact, garnet, or ore, are so inconspicuous as to have been practically non-existent. The small mineralized fracture on the surface at the King is the best. In the Queen and Glance the surface showed a very small fracture filled with oxidized copper ore but no commercial ore bodies were encountered until a depth of 300 feet was reached. However, from this point the ore has been practically continuous to their present bottoms, which are in ore.

In general, five "rolls" have been found in the 9,000 feet of known contact, leaving a good chance for a similar number to be found by intelligent prospecting.

The ore found to date is almost entirely a massive pyrite containing bornite and chalcopyrite, there being almost no oxidized ore in any of the mines. These ore minerals are found in the garnet in irregular shaped ore bodies typical of replacement deposits. There has been no sign of diminution in intensity of mineralization or grade to the present depth.

## MINE WORKINGS:

### Copper Bullion:

This shaft is in solid limestone and is open all the way. It contains little seepage water and has no surface improvements at present.

#### Copper Glance:

The shaft has been retimbered to 525 level which was unwatered for inspection. The level is in fair shape permitting access to all the stopes. The drift to connect with the Queen is open. The workings below the 525 level are probably all in good shape since they are relatively new. The headframe has been put in good shape and the shaft is operated by a 15 H.P. gasoline hoist.

On the 400 and 525 levels there exists ore faces which will mine 4% copper, making it possible to begin production at once. When we unwatered these levels, I had an opportunity to take a few check samples to confirm this.

#### Copper Queen:

The shaft has caved around the collar for a depth of 3-4 sets, requiring reopening to restore ventilation in the Glance and Queen mines through the 525 drift, which is the 7th Level of the Queen. Unwatering the Glance takes the Queen to the 7th Level, but supplementary equipment is needed in each case to unwater the bottom of the mine. It is confidently expected the Queen Mine will prove similar to the Glance in that fairly recent timbering, which has been under water, will be in such shape it will not have to be replaced. The Queen has a headframe hoist house and 50 HP hoist.

#### Copper King:

The shaft has been re-laddered and the timbering repaired. It has no surface improvements. The rehabilitation to the 200 level was for the purpose of preparing for diamond drilling to the contact.

#### ORE RESERVES:

The calculation of ore reserves in lime replacement bodies is a different matter, but the following is good practice and details the manner in which the Copper Glance reserves were estimated.

The ore occurs in connected lenses in a large mass of garnet, which occurs along the contact of the granite and overlying limestones. Using the known tonnage mined above the 525 level and below the 300 level from the garnet area there, we find a block 100 ft. by 200 ft. extending from the 300 to 525, an incline distance of 270 ft. This block contains 5,400,000 cu. ft. of garnet or 540,000 tons of garnet zone which actually has produced 118,066 tons of ore averaging 6.72% copper.

From the 525 level to the bottom of the 625 winze, which is still in ore, using the same manner of calculation, we are justified in expecting 400,000 tons of garnet ore zone which could produce 87,000 tons of ore of similar grade. The partial development of these lower levels does not show any diminution in size or grade.

An average of all the mine samples taken during the last 40 days operation shows:

525 level workings assayed	6.80% copper
625 level workings assayed	7.70% copper
Average	7.45% copper

There is no reason to expect the ore bodies to bottom at the present level as diamond drilling shows the limestones, which are essential to ore formation, continues at least 500 feet deeper.

This diamond drill hole was drilled from the 625 level so there is 400 ft. of limestone below the 700 level. The 400 feet of limestone from the 300 to the 700 level produced 118,066 tons and is estimated to contain 87,400 tons more, a total of 205,466 tons. It is possible the succeeding 400 feet will contain a similar amount of similar grade.

Copper Queen:

The Queen has been mined to a greater depth than the Gance, but an estimate using similar reasoning shows approximately 40,000 tons reasonably expected, and a possible additional 50,000 tons averaging 6.50% copper.

Copper Bullion:

Copper King:

These two areas have just as good a chance of developing substantial ore bodies as the Gance and Queen had, and of similar grade. It is remarkable that the three mines on this contact that were developed to the contact in the favorable "roll" area, all proved very profitable and add to the possibility that two known areas may also develop similarly. In addition to these, there are other likely "roll" areas between the Gance and the Queen and the King and the Minnie.

In the unprospected "rolls", Copper King and Copper Bullion, it is possible they will each contain a somewhat similar tonnage to the average of the Gance, Queen and the Minnie, which is 232,830 tons, averaging 6.35% copper.

There is a good "roll" between the Gance and Queen Mines, which can be prospected from the 525 level of the Gance. It also could develop a similar tonnage and grade like that estimated in the Copper King and Copper Bullion.

The property has an entirely possible chance of producing four or five times the quantity in the future that it has produced in the past.

COST OF PRODUCTION:

Since the Copper Queen mine was unwatered, rehabilitated and put into production in 1919, under circumstances similar to those existing today, costs and outcome could be similar. Mr. Foy started with a capital of \$21,000, copper price averaged 13.83%, shafts were caved and mine full of water. The net profits 1923-26 were \$412,216.00 on 59,952 tons.

The detailed costs at that time were as follows:

<u>Direct</u>	<u>Per Ton</u>	<u>Indirect</u>	<u>Per Ton</u>
Labor	\$ 1.686	Prospect Outside	
Labor Ins.	.083	Mines	\$ .688
Power	.097	General	.062
Explosives	.179	Repairs-Renewals	.112
Smelter Represent.	.058	Taxes-State & Co.	.218
Pumping	.076	Taxes - Federal	.476
Timber	.022		
Total Direct	2.372	Total Indirect	\$1.556

Future costs of mining will not include "Prospect outside mines", but labor will be higher, so a cost of \$4.00 per ton is estimated.

Cost of Smelting - Transportation and Outcome:

Assuming the first production would come from the Copper Glance Mine, and using an approximation of the average assays of the last 58 railroad cars, 3154.3 tons copper 6.0%, silver 2.0 oz., the following figures will show the outcome.

The price of copper is considered basically at 12¢. I have two premiums, A of 5¢ and B of 7¢, but will only consider A, as the extension of B after July 1st is problematical. If the A premium is not extended, the ceiling price of copper will be raised, so the net should be about the same.

Pay		
Silver	2.0 oz. less 0.5 oz. at 70¢	\$1.05
Copper	6.0% 120# less 12#	
	108# at 12¢ less 2.6¢	<u>10.15</u>
		\$11.20
Deduct		
Hayden Smelting	\$2.50	
RR Frt. plus 6% H <sub>2</sub> O	<u>1.50</u>	\$ 4.00
		\$ 7.20
Royalty 10%	.72	
Trucking	.80	
Mining	<u>4.00</u>	\$ 5.52
		\$ 1.68
Premium A 97% of 120# at 5¢		<u>5.82</u>
Net profit per ton		\$ 7.50

The R.F.C. loan must be paid as it is an obligation of the lease, but the local officers assure me that 5% royalty per ton is about what may be expected as a basis for reimbursement.

FUTURE OPERATIONS:

To reopen this group of mines, several plans may be followed.

- I. A diamond drilling campaign from the surface and shallow open workings to prospect the possible new ore areas.

Copper King.....3, 200-ft. holes  
 Copper Bullion.....3, 200-ft. holes

Deeper drilling to prove vertical extensions of known ore bodies.

Copper Glance.....2, 1,000-ft. holes  
 Copper Queen.....2, 1,000-ft. holes

If this program proved successful, then the reopening of the mine would follow and be guided by the information gained from such drilling.

- II. Commence reopening the Glance Mine, followed by the Queen reopening, with subsequent or simultaneous diamond drilling. With the equipment installed, the shaft practically repaired, headframe repaired, and the small amount of water remaining in the mine, the reopening of the Glance seems logical.

Shipments could begin 90 days after work commences and should furnish the funds for reopening the Queen and the Minnie, and do the drilling necessary to develop the new possible shoots.

The estimated cost of getting into production and amount of operating capital needed is:

Hoist.....	Move 50 HP diesel hoist Queen Mine to Glance. Extend building foundations, small repairs.	\$ 750.00
Shaft.....	Repair, tighten guides and sets, ladders to 625	500.00
Levels.....	Clean up 525, 625. Repair, install track	1,000.00
Ore Bin.....	Repair	250.00
Unwater.....	500, 625 levels, 625 winze with Cameron pump	1,000.00
Air Receiver..	Install	75.00

Equipment:

3 Jackhammer type drills, hoses, tanks, 1 cradle, 1 stoper, hose tank, line oilers	1,200.00
4000# drill steel (Use contention sharpener)	750.00
2500' 12# rail and spikes (5 tons)	300.00
10 Mine cars (used)	1,000.00
8500' - 2" pipe - 21¢	525.00
2500' - 1-1/2" pipe - 15¢	375.00
1000' - 1" pipe - 12¢	120.00
Fittings, valves, etc.	250.00
Air hoist - 625 winze	500.00
Air pump	250.00
Shovels, picks, wrenches, miscellaneous tools	250.00

\$ 9,095.00

Reopening Queen shaft for ventilation	1,350.00
Carload miscellaneous timber (repairs and operation)	1,450.00
30 day payroll - 1,000 tons	4,000.00
Pickup truck	1,000.00

Total \$16,895.00

In order to meet any unforeseen contingencies a fund of \$25,000.00 should be available.

All the maps and records were furnished by Mr. W. F. Foy, who was the manager under the last operations. When I was ore purchasing agent for the A.S. & R. Co., I bought the Copper Queen production from Mr. Foy during 1923-26. I saw his operations and was so very favorably impressed that I have confidence in all this data. The evidence disclosed in unwatering to date has confirmed his statements.

Considering the history of production and profits from these mines, and reviewing the maps and considering Mr. Foy's statements concerning the ore in the Glance Mine available for immediate production, it is entirely probable that more than enough ore can be easily and quickly produced to repay the capital investment, a drilling and development campaign, and furnish profits soon after production begins.

With intelligent management, the purchase price of the mines can be accomplished through royalty payments, ore can be developed for the future, and a long time mining operation of fair size can be developed.

Howard H. Fields  
March 13, 1946



1870

THE  
TWIN BUTTES  
STORY



1970

Copper mining in this area had its beginnings in the 1870's when prospectors found rich outcrops of copper ore. It wasn't long until these rich, easy to mine pockets of ore were mined out.

In the early 1900's the copper mines near Twin Buttes enjoyed a brief return to productivity. Copper prices were good, optimism was high to the degree that a railroad line was built from Tucson to service this area. This rebirth of mining activity was short lived, however, and it wasn't until the 1950's that new interest was shown in this mining district. Modern day prospectors, geologists and engineers armed with the most up-to-date tools for divining the secrets of the earth began an intensive exploration of the district, hoping to find areas of mineralization suitable for mining.

In 1963 The Anaconda Company and the Banner Mining Company entered a long-term lease agreement for the exploration and development of Banner properties.

Shortly thereafter, an extensive program of diamond drilling was undertaken to develop the limits of what was possibly a large, low-grade ore body and to provide information as to the expected grade of the mineralization.

Engineers undertook the task of designing the mine and conducted economic studies to determine the best mining method...a task of unbelievable complexity!

Following this, an underground shaft was sunk for the purpose of acquiring additional geologic data. This also provided large, bulk samples of mineralized material for processing through a pilot plant to determine the most efficient method of removing the metal from the rock.

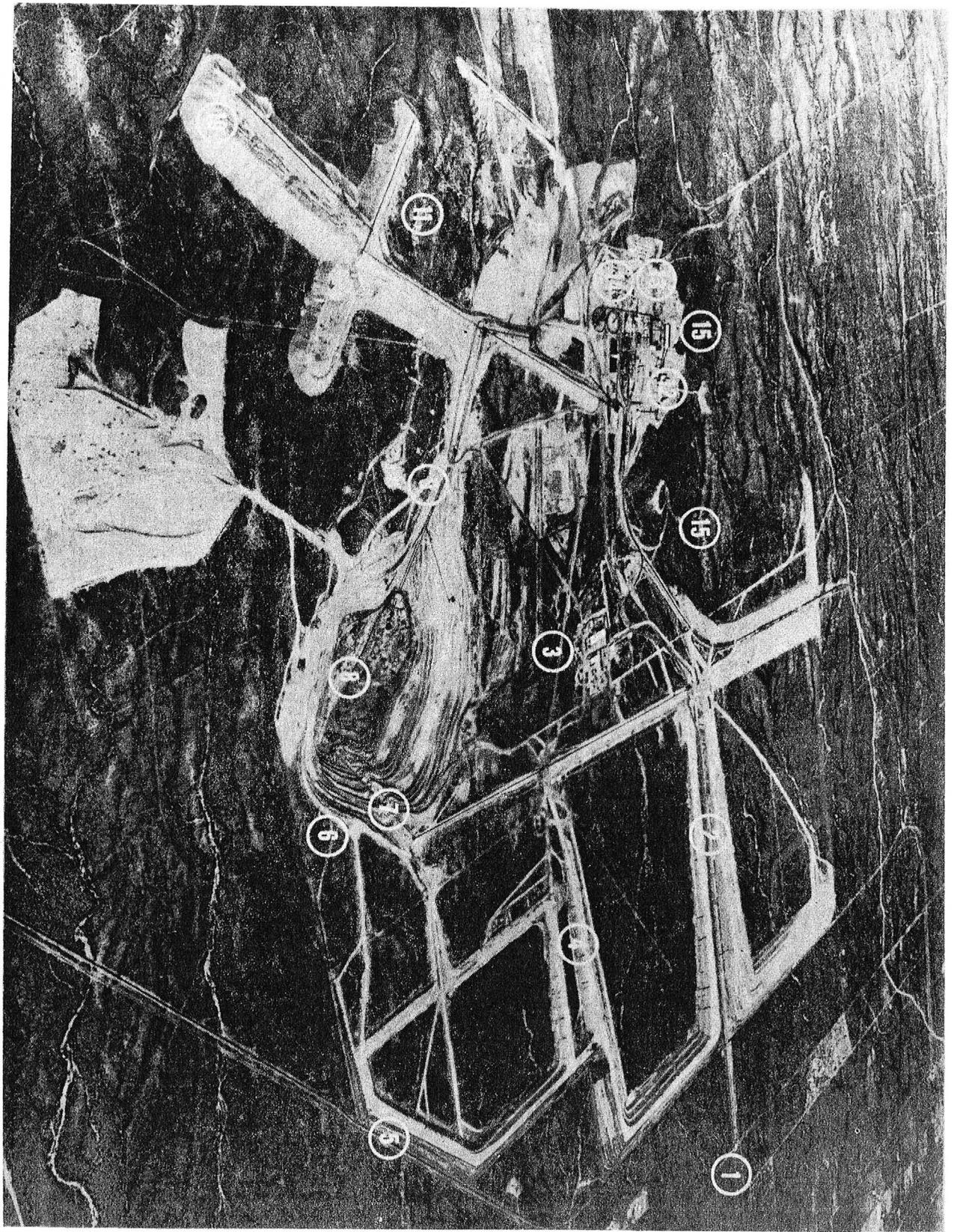
In making the decision to mine the ore by open pit methods, many factors had to be considered. One of the most significant was the fact that the ore body is overlain by 460 feet of sand and gravel. Anaconda was faced with the biggest pre-production stripping job in copper mining history anywhere in the world--a job that involved the removal of more than 200,000,000 tons of material before getting into the ore body in the underlying hard rock. It was decided to strip this overburden by means of scrapers, belt conveyors and bottom dump trucks.

Ore and rock are mined by 15 cubic yard electric shovels, loaded into 100-ton capacity end dump trucks and hauled to the primary crushers deep in the pit.

Belts carry ore to the surface for treatment in a multimillion dollar concentrator. Other belts convey waste rock to disposal areas.

All of this complex operation is designed to mine ore that averages less than six tenths of 1% copper, or less than 12 pounds of copper per ton. In the development and mining of this ore body the lowest possible costs must be achieved for a successful operation. A tremendous expenditure of money was made before a single pound of copper concentrate was produced, and it will take many years to recover this investment.

The application of the most advanced technology plus the interest, enthusiasm and cooperation of the men and women working for Anaconda are our best guarantees for success.



## A TOUR OF ANACONDA TWIN BUTTES MINE

1. **THE MINE ENTRANCE** affords an excellent frontal view of the Alluvium (sand and gravel) dikes, terraced and planted with shrubs and grasses.
2. **INSIDE THE MINE PROPERTY** the dikes are 200 feet high and the steep slope makes them susceptible to erosion. The dikes here are not terraced.
3. **THE MINE SHOP AREA** is the nerve center of the entire Twin Buttes operation and its 1000 employees. The offices are located here along with the maintenance area for all the major equipment.
4. **DIKES** constructed with the Alluvium overburden removed from the pit area form tailing ponds where mill waste is impounded and from which water is recovered for re-use.
5. **LANDSCAPING** together with irrigation and fertilizing is required to transform the dikes from mountains of barren waste to verdant hillsides, blending into the natural desert beauty of the surrounding Santa Cruz Valley.
6. **OBSERVATION AREA** provides a breathtaking view of the pit area, 4000 feet from left to right and 6000 feet long. The 100 ton bottom dump trucks appear as toys from this vantage point.
7. **THE ALLUVIUM CONVEYOR** is located on the east wall. As the pit is expanded the conveyor removes the overburden at the rate of 8000 tons per hour. This expansion will continue for the life of the mine, which is estimated to extend possibly into the next century.
8. **PIT FLOOR** is currently at a depth of 750 feet. Ultimate depth is 1800 feet! Down here the trucks no longer appear as toys.
9. **ORE and ROCK CONVEYOR** runs up the west wall at a speed of 950 feet per minute. Primary ore crusher is located near the bottom of this conveyor system and grinds the ore to medium size.
10. **WASTE ROCK DISPOSAL AREA** is fed by one branch of the conveyor system. After every blast in the pit, the Ore Control Engineer analyzes samples and determines whether the rocks will go to the waste area or the concentrator.
11. **THE ORIGINAL TWIN BUTTES VILLAGE** came into being 100 years ago when prospectors found rich outcrops of copper ore in the area. It wasn't long until these rich, easy-to-mine pockets of ore were mined out and the village was abandoned.
12. **THE FINE ORE CRUSHER** is located next to the concentrator and grinds the ore into a heavy gravel suitable for introduction into the concentrator.
13. **IN THE CONCENTRATOR** the grinding section reduces the rocks to a very small size. The brassy colored copper minerals are then separated from the waste in flotation cells.
14. **THICKENERS**, circular in shape, receive the brassy-yellow colored mixture and remove the excess water. The concentrate is then dried and is ready for shipment to a smelter. 100 pounds of ore produces about 2 pounds of concentrate and this in turn will produce a little over one-half pound of copper.
15. **TWIN BUTTES**, from which the original village and the current mine draw their names, stand watch over the entire area.



ROSE MOFFORD, GOVERNOR  
RANDOLPH WOOD, DIRECTOR

TWIN BUTTES IMA  
11/5/90  
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

JOINT NOTICE OF PROPOSED ACTION

by the

U. S. Environmental Protection Agency  
Region 9 (W-5-1)  
75 Hawthorne Street  
San Francisco, CA 94105

State of Arizona  
Department of Environmental Quality  
2005 North Central Avenue-Room 202  
Phoenix, AZ 85004

Telephone: (415) 774-1887

Telephone: (602) 257-2270

On Application for National Pollutant  
Discharge Elimination System (NPDES)  
Permit to Discharge Pollutants to  
Waters of the United States

On Application for Certification  
for Compliance with Applicable  
Effluent Limitations and  
Appropriate Requirements of the  
State of Arizona

The Environmental Protection Agency (EPA), Region 9, San Francisco, California, and the Arizona Department of Environmental Quality (ADEQ) are jointly issuing the following notice of proposed action under the Clean Water Act (CWA).

The Environmental Protection Agency, Region 9, San Francisco, California, has received a complete application for a National Pollutant Discharge Elimination System (NPDES) permit and has prepared tentative determinations regarding the permit.

On the basis of preliminary review of the requirements of the Clean Water Act, as amended, the implementing regulations, the Regional Administrator, Region 9 Environmental Protection Agency, proposes to issue an NPDES permit to discharge to the following applicant, subject to certain effluent limitations and special conditions:

Public Notice No. 24-90-AZ

November 5, 1990

Cyprus Twin Buttes Corporation  
P. O. Box 527  
Green Valley, AZ 85622  
NPDES Permit No. AZ0023388

*The Department of Environmental Quality is an Equal Opportunity Affirmative Action Employer.*

The applicant is dewatering an open pit copper mine located near Sahuarita in Pima County. The dewatering is done by pumping four groundwater wells to the Santa Cruz River through two discharge points. Discharge point No. 001 is located at latitude 31° 53' 57" N, longitude 111° 58' 28" W and discharge point No. 002 is located at latitude 31° 54' 57" N, longitude 111° 57' 28" W. This segment of the Santa Cruz River (Josephine Canyon to Roger Road WWTP discharge) has protected uses of Aquatic and Wildlife, Domestic Water Source, Incidental Human Contact, Agriculture Irrigation and Agriculture Livestock Watering. The proposed permit contains effluent limits for Suspended Solids, Arsenic, Barium, Boron, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Selenium, Silver, Zinc, Cyanide, Sulfides, pH, Sulfate, Nitrate, Fluoride and Gross Alpha Radiation. The proposed permit will expire approximately five years after it becomes effective.

The State of Arizona is considering a request to certify the discharge described above, pursuant to Section 401 of the Clean Water Act. The certification will set forth any limitations and monitoring requirements necessary to assure compliance with water quality standards under Section 303, areawide waste treatment management plans under Section 208(e), effluent limitations under Sections 301 and 302, standards of performance under Section 306, or prohibitions, effluent standards or pretreatment standards under Section 307 of the CWA, and any other appropriate requirement of State law.

The State may certify a draft permit and specify conditions which are more stringent than those in the original draft permit, where the State finds such conditions necessary to meet the requirements of the CWA. For each more stringent condition, the certifying State agency shall cite the CWA or State law references upon which that condition is based. Review of appeals of limitations and conditions attributable to State certification shall be made through the applicable procedures of the State.

The Administrative Record, which includes the application, draft permit conditions and other relevant documents, is available for public review Monday through Friday from 9:00 a.m. to 4:00 p.m. at the EPA address below. A copy of the draft permit and other pertinent documents may be obtained by calling or writing to the addresses below.

Persons wishing to comment upon or object to the proposed determinations or request a public hearing pursuant to 40 CFR 124.12 should submit their comments or request in writing within 30 days from the date of this notice, either in person or by mail to:

U. S. Environmental Protection Agency  
Region 9 (W-5-1)  
Attn: L. Silva  
75 Hawthorne Street  
San Francisco, CA 94105

State of Arizona  
Department of Environmental Quality  
Attn: Wayne H. Palsma - Room 202  
2005 North Central Avenue  
Phoenix, AZ 85004

Telephone: (415) 774-1887

Telephone: (602) 257-2270

All comments or objections submitted within 30 days from the date of this notice will be considered in the formulation of the final determinations

regarding the application. If the response to this notice indicates a significant degree of public desire for a public hearing, the Regional Administrator shall hold one in accordance with 40 CFR 124.12. A public notice of such hearing will be issued at least 30 days prior to the hearing. A request for a public hearing shall be in writing and shall state the nature of the issues proposed to be raised in the hearing.

The permit will become effective 33 days following the date of mailing by the EPA of the final permit. If no comments request a change in the draft permit, the permit will become effective three (3) days from the date of mailing.

A request for an evidentiary hearing may be submitted to the Permits Record Coordinator, (W-5-1), within 33 days following the mailing of the final determination, in accordance with 40 CFR 124.74. If granted, applicable provisions of the permit will be stayed pending the hearing.

Please bring the foregoing notice to the attention of all persons you know would be interested in this matter.

DM

# Arizona Department of Mines and Mineral Resources

## Verbal Information Summary

Date: October 20, 1995

Engineer: Nyal Niemuth

### Notes from talk by Jeff Clevenger President, Cyprus Climax Metals Co. to Maricopa Section SME on 10/19/1995.

The talk reviewed Cyprus' copper and molybdenum operations worldwide during the last couple of years, with a focus on cost cutting activities and modernization projects. Below are some comments on the Arizona operations.

**General Comments:** Cyprus company goal: to significantly increase productivity, reduce the number of employees. How? eliminate unproductive tasks, institute a bonus system for every employee, share cost/price information. At Sierrita the first year of this system resulted in a 20% bonus.

Other goals: 1) invest and modernize the mines. Replace the truck/shovel fleet with 240 ton trucks and 50 cubic yard shovels, 2) increase reserves, 3) produce copper at a cost of 60 cents per pound (at \$3 LB molybdenum credit.) Through the end of 1994 73% of the company's truck fleet has been replaced. 11 more trucks replaced since then. The company has achieved a 50% increase in tons milled per man shift and a 50% increase in copper produced per employee. Reserves were increased by raising the copper price used in 1992 from \$.65 to \$.90 per pound. and the purchase of El Abra in 1994. When the grade turned out to be lower at El Abra Chile, they got the Chilean government to triple the area of the concession (future exploration potential) and grant a huge water allotment to the mine. In moly they were able to cut out \$30 MM, mainly through the AMAX merger.

#### Comments on individual Arizona mines:

**Bagdad (f) Yavapai Co.** A 1 billion ton resource of 0.38 Cu and 0.028 Mo exists. A new technology, a water flush crusher was installed that takes 20% of oversize for autogenous mill, water flushes fines to floatation circuit. This increased capacity from 75,000 to 80,000 ton per day.

**Sierrita (f) Pima Co.** CRU International rates Sierrita as the most efficient copper mine in the world and it operates at the lowest grade for a milling operation, 0.28%. A current experiment at Sierrita is a 50-50 joint venture between Cyprus and the vendor. It involves one set of high pressure rolls used for crushing. With it a higher percentage of fines go directly to float cells without grinding. It appears 40% of product may bypass the ball mills. The cost of maintenance on the rolls is still unknown and will be a deciding factor in their success.

Cyprus received \$9 per pound for moly in the 2nd quarter of 95, resulting in a cash cost of producing copper of \$.07 per pound. Sierrita has both an moly roaster as well as a leach circuit to remove copper from off specification concentrates.

**Twin Buttes (f) Pima Co.** Cyprus is studying Twin Buttes as underground mine but its iffy as it is high cost even with the high 1.75% Cu grades. Part of the problem is that the ore isn't compatible with the ore at Sierrita so it requires a separate circuit or its own mill.

**Lakeshore (f) Pinal Co.** Cyprus bought the property to get the roaster due to a worldwide shortage of smelting capacity at the time, now the roaster is shutdown. The property has a 600 MM ton leach resource at 0.5% Cu, but it has a high acid consumption. As an open pit heap leach it can produce 40 to 50 MM lb. per year but at a high cost. A feasibility study is underway to see if it remains a permanent producer.

**Inspiration [aka Miami (f)] Gila Co.** Cyprus bought the property to acquire the smelter and refinery. When first operated SRP was able to provide cheap electric rates for the electric furnace. When the electric went up Cyprus installed a ISA melt furnace that initially had problems with the off gases hood. A redesign of the hood making it vertical (less heat build up) and increasing the temperature and pressure of the cooling tubes was completed in February of 95 and there have been no further problems. A \$280 MM was invested in ISA technology for the electrolytic refinery (annual capacity of 150 MM lb). It uses stainless steel starter sheets. The new technology results in a savings \$.02 per pound at the refinery and overall the refinery is now about \$.05 per pound cheaper than a custom facility.

**Mineral Park (f) Mohave Co.** Installed a portable SX-EW plant. In situ leach research project is underway.

TWIN BUTTES (A)

Triple Nichol, Inc.

111800 a  
9721652 Kelly

Rural Route 1, Box 123N  
1750 North Broad Street

Globe, Arizona 85501  
Monty Nichols, Contractor

Telephone 425-7006  
425-8116 / 425-8117

JUN 12 1989

June 9, 1989

MSHA  
300 West Congress  
Box FB53  
Room 4J  
Tucson, AZ 85701

RE: Cyprus/Twin Buttes

Dear Sir:

This letter will serve as our official notification that Triple Nichol, Inc., will be working with Cyprus Twin Buttes, on their project. We will be starting our Mobilization on June 12, 1989. Upon completion we will have approximately six men working two shifts at this site. We will be crushing approximately 3000 to 5000 tons of material per day. The Supervisor at this site will be Shannon Archey.

If you need any other information, or have any questions, please feel free to contact me.

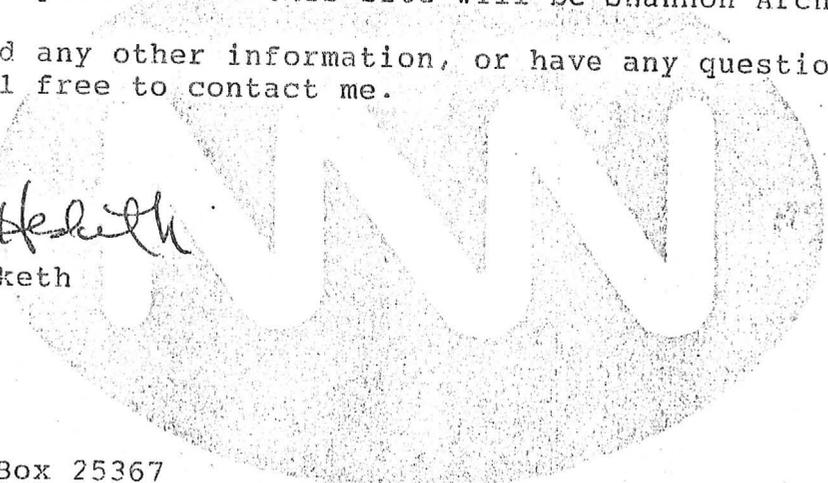
Sincerely,

Jackie Hesketh  
Secretary

JH/jh

CC: MSHA  
P. O. Box 25367  
Denver, Co 80225

CC: State Mine Inspector  
1616 West Adams  
Suite 411  
Phoenix, AZ 85007-2627



Next - reading  
yellow - H  
file - Anamax

July 26, 1977

Mr. Paul A. Hodges, President  
Anamax Mining Company  
Twin Buttes Operation  
P. O. Box 127  
Sahuarita, Arizona 85629

Dear Mr. Hodges:

The Department of Mineral Resources is compiling data for its annual report on the copper industry, A PROFILE OF ARIZONA'S PRIMARY COPPER INDUSTRY FOR 1976, VOLUME I. We would appreciate having your 1976 production figures for: (1) tons of ore mined (2) pounds of recoverable copper and (3) pounds of recoverable molybdenum. Please insert the Data in the space provided on the attached tabulation sheet.

Similar requests are being sent to all Arizona copper producers and a copy of the completed 1976 tabulations will be returned to you.

Thank you very much.

Sincerely,

Glenn A. Miller  
Mineral Resources Specialist

Enclosures

GAM/bh

Pink - Reading  
Alpha - "E"  
Subject - Anamax Mining  
Co., Copper  
Copy - GM Rpt.

April 26, 1977

Mr. Edwin J. Eisenach, President  
Anamax Mining Company  
Twin Buttes Operation  
P.O. Box 127  
Sahuarita, Arizona 85629

Dear Mr. Eisenach:

The Department of Mineral Resources is compiling data for its annual report on the copper industry, A PROFILE OF ARIZONA'S PRIMARY COPPER INDUSTRY FOR 1976, VOLUME I. We would appreciate having your 1976 production figures for: (1) tons of ore mined (2) pounds of recoverable copper and (3) pounds of recoverable molybdenum. Please insert the Data in the space provided on the attached tabulation sheet.

Similar requests are being sent to all Arizona copper producers and a copy of the completed 1976 tabulations will be returned to you.

Thank you very much.

Sincerely,

Glenn A. Miller  
Mineral Resources Specialist

Enclosures

GAM/ap

STATE OF ARIZONA  
DEPARTMENT OF MINERAL RESOURCES  
MINERAL BUILDING, FAIRGROUNDS  
PHOENIX, ARIZONA 85007

April 21, 1976

C  
O  
P  
Y  
  
Edwin J. Eisenach, President  
Anamax Mining Company  
Twin Buttes Operation  
P.O. Box 127  
Sahuarita, Arizona 85629

Dear Mr. Eisenach:

The Department of Mineral Resources is compiling data for its annual report on the copper industry, "The Copper Industry Statistics For 1975 Compared With Other Years - Arizona, The United States and The World". We would appreciate having your 1975 production figures for: (1) tons of ore mined, (2) pounds of recoverable copper, and (3) pounds of recoverable molybdenum. Please insert the data in the space provided on the attached tabulation sheet.

Similar requests are being sent to all large Arizona copper producers and a copy of the completed 1974-1975 tabulations will be returned to you.

Thank you very much.

Sincerely,

Glenn A. Miller  
Mineral Resources Specialist

Enclosures

jm

cc: Anamax file  
Pink reading, Yellow Alpha "A"  
Copper Report file, GAM file

TWIN BUTTES MINES, Wm. F. Foy and Howard Fields, operators,  
Tucson, Arizona.

Five separate workings, but on adjoining properties, are included in this group. One of the mines has been granted a Preliminary Development Loan and another a Development Loan. A third property is open and the remaining two are under water. The five properties cover a lateral mineralized length of approximately  $1\frac{1}{2}$  miles, and all of them have unusually good prospects for a continuous and appreciable production.

As no applicant can, by established precedence, receive more than one R.F.C. loan, further government help is not available in reopening these properties. If that condition did not exist, and the mines simultaneously opened, four of the properties could produce 100 tons per day, combined, of 6% copper ore and the fifth 100 tons of 3% copper ore; A total of 520,000 pounds of copper per month.

Existing R.F.C. precedent would have to be altered and priorities definitely assured before this group's potential productive possibility could become a fact.

CONSOLIDATED COPPERMINES CORPORATION

~~KIMBERLY NEVADA~~

P. O. Box 127  
Safford, Arizona

C. I. COOK  
GENERAL MANAGER  
A. J. O'CONNOR  
GENERAL SUPERINTENDENT  
JOHN EABY  
CHIEF CLERK

May 16, 1950

Mr. Roger I. C. Manning  
Department of Mineral Resources  
Mineral Building  
Fairgrounds  
Phoenix, Arizona

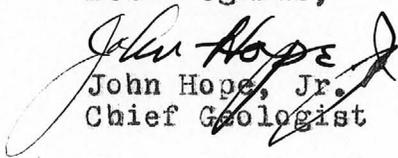
Dear Mr. Manning:

Please find enclosed the report on the  
Twin Buttes district that you left with us some  
time ago.

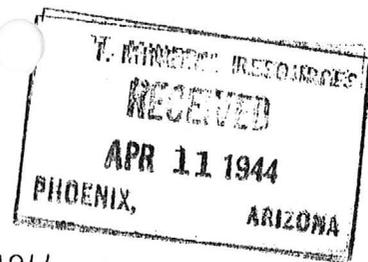
We have decided we would not be interested  
in the property. However, we appreciate your  
bringing it to our attention.

If you are around these parts, drop in and  
see us. Thanks again.

Best regards,

  
John Hope, Jr.  
Chief Geologist

JH/me  
Encl.



MEMORANDUM

April 4, 1944

To: Bill Broadgate  
From: J. S. Coupal  
Subject: Howard Field's Copper Glance, 5¢ A premium

I have tried to get some information regarding Howard Fields' plans, but was unable to contact him last time George was in the district. He did contact Foy who is Howard's partner and reports as follows:

"Foy, by the way, is still unwatering the Copper Glance. The contractor has had a lot of trouble with corrosion and has had to install special equipment. The water is now at 460 ft. and they propose to take it down to the bottom at 625 ft. It is connected with the King Workings at 525 ft. so there is a lot of water to lift. They expect to make it accessible for the RFC. I cannot answer Bill's question yet."

When I can contact Howard Fields, I will find out if he can operate the Glance on the 5¢ premium and will advise you.

*J. S. Coupal*  
J. S. Coupal  
Director

JSC:JES

Dear Sam,

I wrote Fields and finally heard from him. I advised him to get the water out before pressing his case for a special premium as he really has no precise knowledge of the ore until he does.

Bill

# DEPARTMENT OF MINERAL RESOURCES

## REPORT TO OPA ON ACTIVE MINING PROJECT

Date 12-9-44  
 Name of Mine Contestation  
 Owner or Operator (W.F. Fey) Paul Garcia, Mines  
 Address Box 28, Ruby Star Rd, Tucson  
 Mine Location Twin Buttes

**Filing Information**

File System.....  
 File No.....  
 This chart to be used for gallons of gasoline required per month.

**PRESENT OPERATIONS:** (check X)

Production ; Development.....; Financing.....; Sale of mine.....;  
 Experimental (sampling).....; Owner's occasional trip.....;  
 Other (specify).....

**PRODUCTION: Past and Future.**

Tons

Approx. tons last 3 months .....  
 Approx. present rate per 3 months .....  
 Anticipated rate next 3 months 1500 per mo 4500 tons  
 If in distant future check (X) here .....

**EQUIPMENT OPERATED:**

Type	Quantity or Horse Power	Miles or Hours Per Month	Gallons Required Per Month
Personal Cars	.....	<u>1.55</u>	.....
Light or Service Trucks	.....	.....	.....
Ore Hauling Trucks	.....	.....	.....
Compressors	.....	.....	.....
Other Mine or Mill Eqpt.	.....	.....	.....

**PRODUCT PRODUCED OR CONTEMPLATED:** Name metals or minerals.

Copper Zinc

**REMARKS:**

Mr Garcia is a miner working for Day mine which is shipping copper zinc ore to Eagle Truck mill at Malheur. Excess mileage indicated is for 2 trips per week to Tucson

ARIZONA DEPARTMENT OF MINERAL RESOURCES

By [Signature]

116 Morley St.,  
Nogales, Arizona,  
January 19, 1945.

*Full Hayden*

Mr. H. F. Hayes,  
Director of Copper Division,  
War Production Board,  
Washington, D. C.

Dear Hayes:

I hope that you will recall that some time ago you were most helpful to me in getting a loan of \$5,000.00, and a subsequent additional \$4,000.00 to unwater and rehabilitate the Copper Glance Mine at Twin Buttes, Arizona.

In my request for the additional loan, I stated that if this was not enough money to finish the job I would personally finance it. As you can surmise, this was not enough money, but I did finish the job.

In December, 1943, I made application for 8¢ additional premium over the basic premium of 5 ¢ per pound copper. This was rejected, stating that there was nothing at that time to warrant it.

In 1944 we got the water out and found available a considerable tonnage of low grade ore in the margins of the stopes. In finishing the unwatering job, I spent approximately \$7,500 of my own money and we are now ready to complete and equip all of the mine and can go into production in 30 days if we can get some additional premium. I have made application on Form WPB 2465, requesting an additional premium of 7 ¢ per pound and we can commence actual shipping within thirty days if this is granted.

The application outlines that we have the ore, that labor is available, trucks are available, and the smelter at Hayden is willing to take the ore. The net smelter returns on this ore, which will average 1.17 silver, 3.17 copper, without any premium is 23 ¢. To this is added the basic premium of 5 ¢, ~~33~~.07--and the special premium of 7 ¢, \$4.30--a total of \$7.60. From this is deducted royalty 33 ¢, trucking 76 ¢, mining and development \$4.50, a total of \$5.59, leaving an estimated profit of \$2.01.

With my associates, we stand ready to put in \$25,000 and put this property into operation, but we should have the requested premiums. It seems fair that these be granted because in the district of Pima and Santa Cruz Counties in that area, practically every shipper has these two premiums. I can personally

assure you that if you will grant these we will get into production at once.

If there is any further details or information that I can give you to assist you in a favorable reply, please wire me at 116 Morley St., Nogales, Arizona.

Thanking you in advance, I remain

Very truly yours,

Howard H. Fields.

# DEPARTMENT OF MINERAL RESOURCES

## REPORT TO OPA ON ACTIVE MINING PROJECT

### Filing Information

Date: 5/31/45  
 Name of Mine: Copper Silver & others  
 Owner or Operator: Howard H. Fields  
 Address: 1833 E 4th Tucson  
 Mine Location: Iron Butte

File System: \_\_\_\_\_  
 File No.: \_\_\_\_\_  
 This chart to be used for gallons of gasoline required per month.

**PRESENT OPERATIONS:** (check X)

Production: ; Development: \_\_\_\_\_; Financing: \_\_\_\_\_; Sale of mine: \_\_\_\_\_;  
 Experimental (sampling): \_\_\_\_\_; Owner's occasional trip: \_\_\_\_\_;  
 Other (specify): \_\_\_\_\_

**PRODUCTION: Past and Future.**

Tons

Approx. tons last 3 months: \_\_\_\_\_  
 Approx. present rate per 3 months: \_\_\_\_\_  
 Anticipated rate next 3 months: \_\_\_\_\_  
 If in distant future check (X) here: \_\_\_\_\_

**EQUIPMENT OPERATED:**

Type	Quantity or Horse Power	Miles or Hours Per Month	Gallons Required Per Month
Personal Cars	_____	_____	_____
<input checked="" type="checkbox"/> Light or Service Trucks	<input checked="" type="checkbox"/> _____	<u>1000</u>	<u>70</u>
Ore Hauling Trucks	_____	_____	_____
Compressors	_____	_____	_____
Other Mine or Mill Eqpt.	_____	_____	_____

**PRODUCT PRODUCED OR CONTEMPLATED:** Name metals or minerals.

Copper

**REMARKS:**

Mr. Fields has a residence in Tucson and makes periodic trips to the Iron Butte property for engineering purposes. This is a new operation and gasoline requested is recommended.

ARIZONA DEPARTMENT OF MINERAL RESOURCES

By: Roy O. Dillan

DEPT. MINERAL RESOURCES  
RECEIVED  
MAR 21 1944

March 18, 1944

Dear Sam,

Do you know if Howard Fields is going to be able to operate at the Copper Glance on the 5¢ A-zero?

Bill Broadgate

DEPT. MINERAL RESOURCES  
RECEIVED  
MAR 30 1944  
PHOENIX, ARIZONA

Feb. 23, 1944

Mr. Howard Fields,  
1833 East Fourth St., Tucson, Ariz.

W  
C  
Hotel Harrington,  
Washington, D.C.

Dear Howard,

I have been having plenty of trouble over your Copper  
Glance application for premium.

The Copper Division is taking what they think to be a benevolent attitude and intend to turn it down on the basis that they would not be warranted in inducing you to invest more money when the tenure of premiums is precarious.

Perhaps they are right in a way, but I had a big fight this morning over the operation of these secret policies... if they were going to take this attitude they either should publicly announce that no applications will be considered which require substantial investment, or allot the premium and in the letter of transmissal state that the applicant goes ahead at his own risk.

I am having lunch tomorrow with, as guests, ~~KKK~~ WFB Vice-chairman Bunker and the Director of the Copper Division, Schwarz, and am going to make an example of this case if possible. I talked to Howard Young about it this afternoon and think he agrees with me.

I am pretty sick of what Scrugham calls secret policies. Either the plan should be carried out as announced or public statements should be made as to additional policy.

Hope things are well with you,

Sincerely,

W. C. Broadgate

STANDARD TIME INDICATED  
 RECEIVED AT  
 1418 NEW YORK AVE.  
 EVANS BUILDING  
 WASHINGTON, D. C.  
 NATIONAL 6600  
 TELEPHONE YOUR TELEGRAMS  
 TO POSTAL TELEGRAPH

# Postal Telegraph

Mackay Radio  
Commercial Cables



All America Cables  
Canadian Pacific Telegraphs

THIS IS A FULL RATE TELEGRAM, CABLEGRAM OR RADIOGRAM UNLESS OTHERWISE INDICATED BY SYMBOL IN THE PREAMBLE OR IN THE ADDRESS OF THE MESSAGE. SYMBOLS DESIGNATING SERVICE SELECTED ARE OUTLINED IN THE COMPANY'S TARIFFS ON HAND AT EACH OFFICE AND ON FILE WITH REGULATORY AUTHORITIES.

Form 16

BY WESTERN UNION.... COLLECT

DEPT. MINERAL RESOURCES  
 RECEIVED  
 SEP 29 1913  
 104

*Turn Butler*

Howard H. Fields,  
 Prescott, Arizona

Noted it is unlikely small copper mines now operating will be closed especially if ores have fluxing values. UFB is with increasing hesitancy approving additional operations and this appears to be stiffening UFB requirements. However, if labor can be assured, ore is reasonably highgrade and especially if has fluxing qualities there should be no trouble as things now stand.

Bill Broadgate

CLASS OF SERVICE

This is a full-rate Telegram or Cablegram unless its deferred character is indicated by a suitable symbol above or preceding the address.

# WESTERN UNION (37)

1201

SYMBOLS

DL=Day Letter

NL=Night Letter

LC=Deferred Cable

NLT=Cable Night Letter

Ship Radiogram

A. N. WILLIAMS  
PRESIDENT

NEWCOMB CARLTON  
CHAIRMAN OF THE BOARD

J. C. WILLEVER  
FIRST VICE-PRESIDENT

The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

WP65 40 DL=PHOENIX ARIZ 25 1208P

WILLIAM C BROADGATE=

CARE HARRINGTON HOTEL=

1943 SEP 29 11 40 AM  
DEPT. MINERAL  
RECEIVED  
SEP 29 1943  
PHOENIX

FINALLY PUMPING TWIN BUTTES EXPECT REACH FOUR HUNDRED  
WITHIN TEN DAYS. PLEASE WIRE ME COLLECT PRESCOTT  
WESTERNUNION WHETHER AGITATION REGARDING CLOSING SMALL  
COPPER MINES WILL HINDER FAVORABLE CONSIDERATION OUR  
REQUEST FOR BALANCE MONEY EQUIPMENT OPERATING CAPITAL  
PROVIDED EXAMINATION SATISFACTORY REGARDS=

HOWARD H FIELDS.

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

Feb. 25, 1943

W  
C  
H

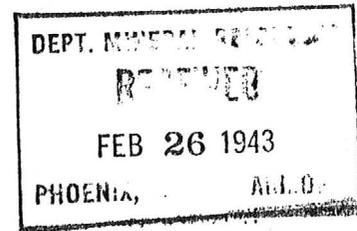
MEMORANDUM

Upper Glance  
(Twin Buttes)

To: Director, Dept. Mineral Resources  
From: George A. Ballam

Wm. Foy and Howard Fields have been granted additional funds to unwater the Glance mine, some \$9,000 in all. However, work has been held up on account of labor difficulties. Foy informed me yesterday that his men struck for \$8 per day. He tried to compromise on \$7 without success. He has ceased work temporarily, and is maintaining a skeleton crew on the Contention only.

*George A. Ballam*



C

January 26, 1943

H.

Mr. Howard Fields  
P. O. Box 676  
Ajo, Arizona

Dear Howard:

I have just received a memorandum from Bill Broadgate saying the additional loan was granted to the Copper Glance.

It was a tough job to get the plan through. Following is a quotation from Bill's memorandum:

"What a struggle it is to set precedents, but it is worth it when you can make policy out of them."

Good luck and best wishes.

Very truly yours,

J. S. Coupal  
Director

JSC:kk

Washington, D.C.  
Jan. 21, 1943



SUBJECT: Mine Loans,  
Class C extended,  
Copper Glance,  
Howard H. Fields,

I talked to Macartney again today, and I am glad to say I have finally gotten this loan through.

Macartney has sent it to the Board with his OK and it should be passed on favorably tomorrow.

You will note that the new RFC circular expressly allows additional amounts now.

What a struggle it is to set precedents, but it is worth it when you can make policy out of them.

Bill Broadgate

W  
January 12, 1943

LH:LH

Mr. D. M. Rait  
Chief, Mining Section  
Reconstruction Finance Corporation  
Washington, D. C.

Dear Don:

Mr. Howard H. Fields has sent the attached information regarding the Glance Mine to this office for us to review before forwarding to your department.

The two vertical sections of the Glance Mine, together with the record of grab samples furnished by Mr. William F. Foy, former Assistant Manager, justify in our opinion the extension of further financial aid in opening up this property.

Yours very truly,

F. H. Hayes  
Assistant Chief of Production  
Copper Division

LH:MN

cc: Mr. Howard H. Fields  
Mr. William Broadgate

CLASS OF SERVICE

This is a full-rate Telegram or Cablegram unless its deferred character is indicated by a suitable symbol above or preceding the address.

# WESTERN UNION

1201

1943 JAN 8  
40!

SYMBOLS

DL = Day Letter
NT = Overnight Telegram
LC = Deferred Cable
NLT = Cable Night Letter
Ship Radiogram

A. N. WILLIAMS  
PRESIDENT

NEWCOMB CARLTON  
CHAIRMAN OF THE BOARD

J. C. WILLEVER  
FIRST VICE-PRESIDENT

The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

W46 16=AJO ARIZ 8 930A

WM C BROADGATE=

HARRINGTON HOTEL WASHDC=

*Coupal*

RAIT WROTE ASKING DETAILS WATER CAVES ASSAYS TELEGRAPHED HIM VIA WU WITH COUPAL ASSISTANCE DETAILED ANSWERS=  
HOWARD H FIELDS.

DEPT. MINERAL RESOURCES  
**RECEIVED**  
 JAN 11 1942  
 PHOENIX, ARIZONA

C

RAIT COUPAL ANSWERS.

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

January 8, 1943

Mr. Howard Fields  
P. O. Box 676  
Ajo, Arizona

Dear Mr. Fields:

I have a memorandum from Bill Broadgate of January 6 in which he states he has just received the additional data on your Copper Glanqe Mine and was taking the matter up first with the War Production Board, Copper Branch, and then with the Reconstruction Finance Corporation.

Very truly yours,

Earl F. Hastings  
Assistant Director  
and Projects Engineer

EFH:kk

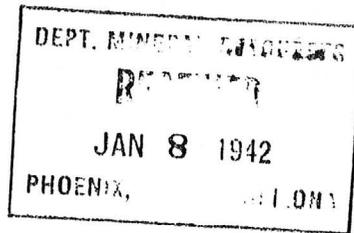
# United States Senate

## MEMORANDUM

Jan. 6, 1942

Please tell Howard Fields that I received tonight the additional data on the Copper Glance and that tomorrow I am taking the matter up with the Copper Branch and then the RFC.

Bill Broadgate



December 30, 1942

Mr. Howard Field  
Box 676  
Ajo, Arizona

Dear Howard:

I am enclosing a copy of a memorandum received from Bill Broadgate. In this you will note that Bill Broadgate recommends that you send more evidence.

I do not know how much additional evidence will be required but there also is another problem that is probably sticking in their craw, and that is the fact that the Copper Glance is connected underground with other workings and that the unwatering of one will unwater the other. From your viewpoint and from mine, this work should make no difference whatsoever.

I do believe it will be necessary to get some additional evidence to them. Probably a review and your views combined with such information as Mr. Foy can give of the old operations might readily convince the Copper Branch that there remains in the old workings a sufficient tonnage to warrant the added money needed.

You will note in Bill's memorandum the fact that there is some question as to being reimbursed for expenditures over the \$5,000 granted on the "C" loan even after a "B" loan is authorized.

With best wishes and kindest regards, I am

Very truly yours,

J. S. Coupal  
Director

JSC:kk  
Enclosure

Washington, D.C.  
Dec. 26, 1942

DEPT. MINERAL RESOURCES  
RECEIVED  
DEC 30 1942  
PHOENIX, ARIZONA

SUBJECT: Mine Loan,  
Copper Glance,  
Howard Fields

I have certainly been struggling with this as the enclosed correspondence will show, and have saved it by the skin of my teeth a couple of times.

In the ordinary course, Fields would have had a turndown a few days after he filed the deal. It is better to keep it alive with a chance of turning the tide than getting a flat"no!"

However, unless the Copper Branch has enough dope of the property or feel like unqualifiedly endorsing it, to support my requests, I am afraid of the deal not being approved, unless Fields produces more evidence.

Of course, the application has served one purpose, it has crystallized policy on 5-d-2 extensions of C loans, which is important to the small mining people.

As for Fields being reimbursed out of a B loan, if he goes ahead on his own, I think this is very unlikely due to the general policy of the RFC not to "bail anyone out" and to insist that as much of a loan as possible be used to mine with.

However, one could always try.... some strange things happen at times and I might talk them into such a deal but I should hate to have to do so with the outcome so improbably satisfactory.

I suppose the idea came from the fact that the RFC absorbs one loan into the other, but that is because they increasingly improve their security.

In the meantime, next time I am over in legal, I will try to find a reason to broach the subject and get a reaction.

Bill Broadgate

December 29, 1942

H.

Mr. Howard H. Fields  
P. O. Box 676  
Ajo, Arizona

Dear Howard:

I have received a copy of Bill Broadgate's letter to you of December 23 in which he states that Hayes received your wire.

I have also received the following memorandum from Broadgate on your problem:

"SUBJECT: CLASS C supplementary loan under 5-d-2  
Copper Glance....Howard H. Fields

The Coupal wire received this morning.

I talked to Hayes today and he has received no wire.

100100

However, I explained the situation to him in case he should get one.

The whole thing now rests on the fact that Rait does not seem to think that the evidence submitted by Fields shows sufficient probability of any ore being left in the mine to warrant the additional money.

Anything the Department or Fields can do to supplement the application with reports or evidence or merely further opinion would have a considerable bearing on the disposition of the application.

As I have explained, we have the policy situation well in hand, but this case sticks in Rait's craw. You would think he is spending pennies from his baby's bank. Thank the Lord we made arrangements to clear Class C loans through the Department or the % turndowns would

Dec. 22, 1942

SUBJECT: CLASS C supplementary loan under 5-d-2  
Copper Glance.... Howard H. Fields



The Coupal wire received this morning.

I talked to Hayes today and he has received no wire.

However, I explained the situation to him in case he should get one.

The whole thing now rests on the fact that Rait does not seem to think that the evidence submitted by ~~RAIX~~ Fields shows sufficient probability of any ore being left in the mine to warrant the additional money.

Anything the Department or Fields can do to supplement the application with reports or evidence or merely further opinion would have a considerable bearing on the disposition of the application.

As I have explained, we have the policy situation well in hand, but this case sticks in Raits' craw. You would think he is spending pennies from his baby's bank. Thank the Lord we made arrangements to clear Class C loans through the Department or the % turndowns would be terrific. The States which have made no such arrangement show a very poor record of loans on a volume basis.

Bill Broadgate

United States Senate

DEPT. MINERAL INDUSTRIES  
RECEIVED  
DEC 30 1942  
PHOENIX

MEMORANDUM

C  
Dec. 26, 1942

Dear Sam,

I suppose few if any C loans have had as much attention as this one. The engineers sent it to the Board with recommendation to turn it down.

The Executive Assistant to the Chairman withdrew it for me before action, and referred it to Rait's boss, Macartney, and told him not to let it get through without checking with me further.

I have used every argument I could to get this approved. If it proves a lemon to the RFC I shall have lost a lot of "face" in case they just get sick of my insistence and approve it against the recommendation of their Mining Section.

Actually, I know they would like to approve it for me, as they are a little afraid of my intimacy with Henderson and how it might influence my conversations with him, but Rait and Nelson are genuinely afraid of the deal, for some reason or other.

I am having Macartney check with the Copper Branch WPB and whether or not he upsets Rait's decision will in the end depend on what recommendation Hayes and Hersey make to Macartney.

Bill Broadgate

Dec. 26, 1942

Hotel Harrington  
OR  
% Senator Carl Hayden

Mr. Morton Macartney, Chief,  
Self-Liquidating Division,  
Reconstruction Finance Corporation,  
Washington, D.C.

Dear Mr. Macartney,

Relative to our conversation about the Fields loan, I had not heard before that the workings are interconnected with another mine and that the unwatering may attain proportions beyond the scope of the additional funds asked for. If this was in the data submitted, I overlooked it. If not, it seems that Mr. Fields should be queried on this point as he is known to be a careful and experienced operator, before rejection is decided on because of this feature.

The objection that the prior production was marketed at a much higher figure than at present obtains for copper and that, consequently the operation might not be economically possible seems quite serious. There are two possible reasons for chancing this if the additional funds required are not substantially greater than applied for. First, it may be possible to expose reserves for future use in case the situation demands copper at any price. Second, I am told that there is now a substantial increase in copper premiums under consideration at WPB and OPA.

The fact that Fields has done a workmanlike job so far and that operators of his type should be encouraged is of some importance, it seems to me, and that he already has an operating force and can immediately continue with the work should be noted.

I appreciate the validity of Don Rait's and Mr. Nelson's general feeling that there is no evidence whatever that a body of commercial ore remains in the mine. It boils down to whether in the opinion of the Corporation past production points to the probability of the existence of an ore body which, the copper stringency being what it is and will be, warrants the expenditure of the small sum requested to prove this one way or the other and provided the sum asked for will do the work.

Certainly this application has had detailed and careful consideration by the Mining Section and whatever decision is reached will not have been a hasty one.

With kindest personal regards,

Very truly yours,

W. C. Broadgate

*Copper Branch  
Phoenix*

Dec. 23, 1942

DEPT. OF INTERIOR  
RECEIVED  
DEC 26 1942  
PHOENIX, ARIZONA

*e  
H*

Hotel Harrington  
Washington, D.C.

Mr. Howard H. Fields,  
P. O. Box 676,  
Ajo, Ariz.

Dear Howard,

I have talked with three people at the WFB Copper Branch and have explained your problem.

Although it is not usual for the WFB to be interested in mine loan applications where the amount involved is less than \$40,000, I have been promised that a good word will be put in for you at RFC.

Hayes received your wire.

With best personal regards,

Very truly yours,

W. C. Broadgate  
Asst. Director.

H

December 22, 1942

MEMORANDUM

Supplemental "C" Loan  
Howard Fields  
Glance Mine

TO: Bill Broadgate

FROM: J. S. Coupal

I had a long talk last night with Howard Fields and with William Foy regarding their operations. Howard felt the need of trying to expedite action and stated that he was going to wire Frank Hayes. In view of his desire to do this, I sent you a wire which you undoubtedly received this morning.

I tried to emphasize the fact that if any steps were taken by Frank Hayes which would interfere with the progress you have made on this issue, it would be wise for Hayes to consult you and remain out of the picture if advisable.

In connection with this loan Fields brought up a question which it might be advisable to consider at this time rather than wait. If, on the Glance Mine, the supplemental loan is not granted, Fields is prepared to go ahead, spend his own money in excess of the \$5,000 and unwater the mine and prepare it for a "B" loan examination. If this is done and if the "B" loan was approved, I told Fields that I would try and urge you to get permission for Fields to be reimbursed out of the "B" loan for the amount he would spend in excess of the \$5,000 unwatering loan.

There may be no need of crossing bridges until we come to them, but if I could get your views on this, either officially or unofficially, it might help to allow Fields anticipate his next move.

CLASS OF SERVICE DESIRED	
DOMESTIC	CABLE
TELEGRAM	ORDINARY
DAY LETTER	URGENT RATE
SERIAL	DEFERRED
OVERNIGHT TELEGRAM	NIGHT LETTER
SPECIAL SERVICE	SHIP RADIOGRAM

Patrons should check class of service desired; otherwise the message will be transmitted as a telegram or ordinary cablegram.

# WESTERN UNION

1213-D

CHECK
ACCOUNTING INFORMATION
TIME FILED

R. B. WHITE  
PRESIDENT

NEWCOMB CARLTON  
CHAIRMAN OF THE BOARD

J. C. WILLEVER  
FIRST VICE-PRESIDENT

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

To W.C. BROADGATE *Continuation* Dec. 21/42 19

Street and No. HOTEL HARRINGTON

Place WASHINGTON - D C

HOWARD FIELDS HAS WIRED FRANK HAYES ASKING HIM  
ASSIT EXPEDITE SUPPLEMENTAL LOAN UNDER

FIVE D TWO AMENDMENT SUGGEST YOU

CONTACT HAYES AND JOINTLY DECIDE ON STEPS

NECESSARY TO TAKE OR IF ADVISABLE NOT TO

DISTURB PRESENT PLANS.

J.S. COOPER

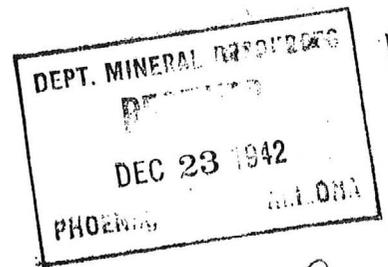
(Charge Acct. Co) →

DEPARTMENT OF MINERAL RESOURCES

Sender's address  
for reference

TELEGRAPH BIRTHDAY GREETINGS—25c TO ANY WESTERN UNION POINT IN U. S. 20c LOCALLY

Sender's telephone  
number



Dec. 21, 1942

Hotel Harrington,  
Washington, D.C.

Mr. Howard H. Fields,  
P. O. Box 676,  
Ajo, Ariz.

Dear Howard,

I spent considerable time with Don Rait today on your application for additional funds for the Copper Glance.

I have the matter of procedure and precedent worked out OK; it is fully agreed that such cases shall be considered under 5-d-2, rather than new C loans. So the method of filing I recommended to the Office and they in turn recommended to you is the one which should have been followed. Your application, then, is in proper order.

Which is just fine, but they can't make up their minds that the mine warrants the additional loan. As I don't know any more about the property than the file shows and, as Rait stated, the production may just show the ore is all gone (a favorite attitude, and what can you say unless you have a current examination?) I wish you could dig up some more information and airmail it to Rait promptly, which would indicate the probability of new ore being encountered.

All of which sounds like "the operation was successful, but the patient died". But the patient is not dead yet.

I told Rait, among other things, that you were generally a good picker, a good operator, and that we want him to give you all possible benefit of the doubt to encourage you to operate further in Arizona.

For some reason Rait is not agreeably inclined toward this application and, in fact stated that he wished my test case had been a better one.

I hope you have more data to submit. Let me know when you send it, or write to Rait, and I will follow further.

Sincerely yours,

W. C. Broadgate  
Asst. Director

December 10, 1942

Mr. William Foy  
Ruby Star Route  
Box 8  
Tucson, Arizona

Dear Mr. Foy:

I have just had a memorandum from our man in Washington stating that the proper procedure to handle the work we contemplated on the Contention, that is the taking over of spending the balance of the "B" loan by another party such as we discussed for the Octave Company, would be for you to contract with them to do the work and have the loan still remain in your name.

I realize that this is not being considered right now, but just wish to advise you of the procedure that would be approved by Washington.

I have talked with Mr. Clark about the Gance, the Queen, and the King Mines and if and when you have a chance to discuss this with Howard Fields and care to outline some plan whereby the Octave Company could take this over, I would be very glad to discuss it with you and make arrangements so that we could get down to a definite agreement.

With best wishes and kindest regards, I am

Very truly yours,

J. S. Coupal  
Director

JSC:kk

December 5, 1942.

Mr. Wm. Foy:-  
Ruby Star Route  
Box # 8  
Tucson, Arizona.

Dear Mr. Foy:-

I am sorry you were unable to make it to Phoenix on Thursday or Friday but am aware that you have your hands full.

Today I received a copy of the notice in the paper regarding the Eagle Pitcher Co., and the proposed mill at Staquarita.

I have talked this over with the Octave company and it has been suggested that if you are not in position to come to Phoenix it would be wise for me to again call on you at the mine.

Accordingly I am making my plans to leave here early on Tuesday or Possibly late Monday and be at Twin Buttes some-time before noon on Tuesday.

Time is the important element right now for the war effort and I believe all mining work should be pushed to the utmost. The mill question can be left for a little later date but the mine work should be pushed and pushed right NOW.

I know that with the Octave organization this can be done and it will get you into profits at an early date from the actual production.

I would like to discuss this with you with an idea of getting in shape for quick production and that will be the object of my seeing you.

If you are not going to be at the mine or if you have plans which would take you to Phoenix or Tucson on Tuesday please wire me collect and I will act accordingly.

Unless I hear from you by wire before 5 PM on Monday I will see you at the mine on Tuesday.

With best wishes and kindest personal regards,

Very truly yours,

J. S. Coupal.

December 4, 1942

H

Mr. Howard Fields  
P. O. Box 676  
Ajo, Arizona

Dear Howard:

I have just had a memorandum from Bill Broadgate stating that the instructions given you for submitting on a general mining loan form, the application for additional funds to complete the work started on the Copper Glance Mine, is the correct method of handling this. When it gets in Bill Broadgate's hands, he will give it his personal attention.

With best wishes and kindest regards, I am

Very truly yours,

J. S. Coupal  
Director

JSC:kk

W

DEPT. MINERAL RESOURCES  
RECEIVED  
DEC 7 1942  
PHOENIX, ARIZONA

Dec. 3, 1942

Hotel Harrington,  
Washington, D.C.

C

H

Mr. Howard H. Fields,  
P. O. Box 676,  
Ajo,  
Ariz.

Dear Howard,

I received your application for additional funds for the Copper  
Glance this evening.

As far as I can see it is in order and follows the information I  
sent to Sam Coupal. Although these General Mining Loans forms state  
that only a corporation may apply under 5-d, it is because they ~~have~~  
have not been revised to suit the present law which extends the  
privilege to individuals and partnerships.

The RFC has already told me some time ago that it will deal with  
cases where the unwatering, retimbering, etc., may run to more than  
\$5,000, under 5-d-2, but this is the first actual case which has  
come to my attention, although I understand they have had some original  
applications for greater sums. I do not see why this should be treated  
differently excepting that the loan would not have come directly under  
Class C had the whole sum been asked for at the first instance.

I shall file this with the RFC tomorrow.

Very truly yours,

W. C. Broadgate  
Asst. Director

December 3, 1942

Mr. William F. Foy  
Star Route  
Tucson, Arizona

Dear Mr. Foy:

Many thanks for your telegram.

As time is limited and production should be gotten under way as early as possible, I hope you can make the trip to Phoenix at an early date.

Very truly yours,

J. S. Coupal  
Director

JSC:kk

**CLASS OF SERVICE**  
 This is a full-rate Telegram or Cablegram unless its deferred character is indicated by a suitable symbol above or preceding the address.

# WESTERN UNION

(27)

SYMBOLS
DL=Day Letter
NT=Overnight Telegram
LC=Deferred Cable
NLT=Cable Night Letter
Ship Radiogram

A. N. WILLIAMS  
 PRESIDENT

NEWCOMB CARLTON  
 CHAIRMAN OF THE BOARD

J. C. WILLEVER  
 FIRST VICE-PRESIDENT

The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

USA89-10TUCSON ARIZ 3 1150A

1942 DEC 3 PM 12 28

J S COUPAL

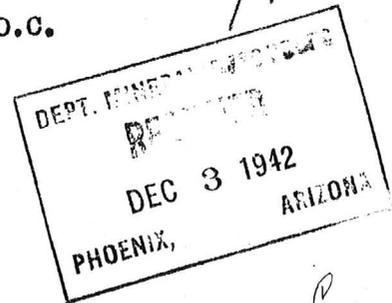
413 HOME BUILDERS BLDG 128 NORTH 1 AVE PHOENIX ARIZ

IMPOSSIBLE TO GET TO PHOENIX TODAY WILL ADVISE YOU LATER

WILLIAM F FOY.

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

Washington, D.C.  
Dec. 2, 1942



SUBJECT: Mine Loans, class C  
\$5,000 will not complete the work.  
Copper Glance Mine  
Howard Fields  
Memo Coupal Nov. 28

No such case has yet come before the RFC legal division.

Their opinion coincides with mine, however, that an application on the general mining loan form and the statement that the C loan was not adequate, giving the usual details and stating, as you mention in your memo that the application is made under the authority of sub-paragraph 2 of the 4th paragraph of section 5-d, of the RFC Act as amended.

In other words, much as we are advised to do where an initial amount greater than \$5,000 is required for the same purpose as the C loans.

Bill Broadgate

November 28, 1942

MEMORANDUM

"B" LOAN  
CONTRACTING FOR WORK  
UNDER THE LOAN.



TO: W. C. Broadgate

FROM: J. S. Coupal

There is a point in question that I believe is clear enough but on which I would like your opinion and if necessary the opinion of the legal department of the RFC. Here is the question.

The Contention Mine, owned by William Foy at Twin Buttes, Arizona, has a \$20,000 loan on which approximately \$7000 has been spent to date. A deal is now contemplated whereby the old Octave Co. would take a lease and option on the Contention property with an object of applying for a Government loan to install the mill equipment owned by the Octave Co., which is now available due to the gold closing order, when and if sufficient ore is developed to warrant asking for a loan.

The deal contemplates some working arrangement by the Octave Co. and Foy whereby the Octave Co. would move some of its equipment and men to the property and carry out the development work provided by the unspent balance of \$13,000 of the "B" loan. Would it be more advisable to have the Octave Co. furnish the development work under a contract with Foy or have some recognition by the RFC, such as a transfer of the loan to the Octave Co., due to the fact that they would hold the lease and option on the property. It may be that after the present \$20,000 loan is spent it might be necessary to apply for an additional \$20,000 loan in order to fully justify the erection of the mill.

I would like your opinion on this, keeping in mind the fact that the future plans will be governed by the development progress. The terms of the deal have not as yet been worked out and possibly they may not be able to get together on terms, but I would like an opinion on which plan might be preferable under the conditions.

November 28, 1942

MEMORANDUM

CLASS "C" LOAN GRANTED  
BUT THE \$5,000 WILL NOT  
COMPLETE WORK.  
: COPPER GLANCE PROPERTY  
( HOWARD FIELDS

TO: W. C. Broadgate

FROM: J. S. Coupal

I was in Tucson last week and went to the Copper Glance property at Twin Buttes and looked over the work on the mine being done by Howard Fields.

In making the application for this loan it was thought that the water level was at the 425 foot point and on this basis the estimate of cost was made. I do not know the exact amount spent to date but believe there is ten or twelve hundred left to be spent under the \$5,000 loan. They have cleaned up the shaft and have it fully retimbered down to the present water level which is 320 feet.

To complete the work to the 425 foot level so as to leave a sump and make the 400 foot level accessible will require the installation of pumping equipment and unwatering of a sizable amount of water, due to the old stopes and some cleaning up of the 400 foot level to make the old showings accessible will take probably \$2000 or \$3000 more than the balance of the \$5000 loan. On the 300 foot level there are some caved areas through which it would be necessary to drive spilling in order to show the ore in the stopes above this level.

Most of the mining is contemplated on or below the 300 foot level and work on the 300 foot level would only expose the remnants of worked out stopes. It seems as though the only workable plan should be to examine the ore on the 400 foot level.

In what shape should an application for additional funds to carry out this work be presented? I have suggested to Howard Fields that he might make application under a General Mine Loan Form stating that the application was made under the authority of Sub-paragraph 2 of the 4 Paragraph of Section D of the RFC Act as amended. This may or may not be the proper procedure. Can you advise me on this point?

I might say that Mr. Lane from the Office of William B. Gohring, examining engineer for the RFC, has examined the property and has discussed this same feature with Howard Fields and that no decision was reached.

TWIN BUTTES MINES, Wm. F. Foy and Howard Fields, operators. Tucson, Arizona.

Five separate workings, but on adjoining properties, are included in this group. One of the mines has been granted a Preliminary Development Loan and another a Development Loan. A third property is open and the remaining two are under water. The five properties cover a lateral mineralized length of approximately  $1\frac{1}{2}$  miles, and all of them have unusually good prospects for a continuous and appreciable production.

As no applicant can, by established precedence, receive more than one R.F.C. loan, further government help is not available in reopening these properties. If that condition did not exist, and the mines simultaneously opened, four of the properties could produce 100 tons per day, combined, of 6% copper ore and the fifth 100 tons of 3% copper ore. A total of 520,000 pounds of copper per month.

Existing R.F.C. precedent would have to be altered and priorities definitely assured before this group's potential productive possibility could become a fact.

Report by Earl F. Hastings, October 9, 1942, to Copper Branch, War Production Board.

*ESH*

*10000 10000*

October 6, 1942

Mr. William Foy  
Ruby Star Route  
Tucson, Arizona

Dear Mr. Foy:

I plan to be in the southern part of the state on the week commencing October 12 and hope to have time while enroute to Aravaca on Monday, October 12, to call in and see you. I may have some reply from Washington at that time.

I have in mind discussing with you and Howard Fields a plan whereby you might consider a lease or sale or option on your low grade property so that you might consider moving the Octave mill on to the ground. If Howard Fields is on the property at this time I do hope he can remain over until the 12th as I will make it a point to call in and see you and would like to discuss this proposal with you and Howard.

With best wishes and kindest regards, I am

Yours very truly,

J. S. Coupal, Director

JSC:LP

October 2, 1942

Mr. William Foy  
Ruby Star Route  
Tucson, Arizona

Dear Mr. Foy:

I have just had word from George Ballam and I am sorry to hear that you have an injured shoulder and Howard Fields an injured leg.

The revised Circular No. 14 on preliminary development loans states very definitely that "loans not to exceed \$5,000 to any one borrower will be made...". It was in view of this clause in the provisions for preliminary development loans that I took the question up with you of having a lease granted to outside parties and having them make application for the loans. As this does not seem to meet with your approval I will write Bill Broadgate in Washington and see if he can take the matter up directly with headquarters and get a decision.

With best wishes and kindest regards, I am

Yours very truly,

J. S. Coupal, Director

JSC:LP

October 2, 1942

MEMORANDUM

CLASS "C" LOANS  
MORE THAN ONE LOAN TO AN INDIVIDUAL

TO: W. C. Broadgate

FROM: J. S. Coupal

We are faced with a problem on the Twin Buttes area south of Tucson where there are 4 or 5 distinct individual operations owned by a partnership, William Foy and Howard Fields, on which they asked our advice as to how one individual or partnership can obtain more than one preliminary development loan.

With this restriction in mind I approached Foy and Fields with the suggestion that they let me locate one or two other good operators who would willingly take over a lease on part of their holdings, apply for a preliminary loan and later, if necessary, a "B" loan for operating purposes. I have just heard from Foy and Fields through George Ballam and will quote his statement: "They will welcome aid of the department in providing ways and means of procuring additional loans to open up two or three more properties in the Twin Buttes if it can be negotiated on status quo of their partnership basis."

Fields already has a preliminary development loan on one property, the Gance, and Foy has a \$20,000 loan on another property along the same contact. There remain 3 or 4 properties along this contact, all of which have excellent records and all of which are separate operations and require individual unwatering.

Can you take this up with the R.F.C. and see if they have any suggestion as to a solution?

Sept. 29, 1942

MEMORANDUM

TWIN BUTTES  
(Wm. Foy-Howard Fields)

To: Director, Dept. Mineral Resources  
From: George A. Ballam

Saw Bill Foy on trip to Castile mine this AM. Bill is laid up with injured leg, and Howard with injured shoulder. Both are opposed to idea of taking on any help and wish to keep on as is, despite injuries. However, they will welcome aid of department in providing ways and means of procuring additional loans to open up two or three more properties in Twin Buttes, if it can be negotiated status quo - partnership basis.

Work is proceeding on unwatering and retimbering Glance. Major difficulty seems to be getting more men. Can use timbermen. Foy and Conlin had been trying to steal men from each other. Introduced them this AM and they decided to cooperate.



Copper District

Aug. 22, 1942

Hotel Harrington  
Washington, D.C.

Mr. Howard H. Fields,  
P. O. Box 676,  
Ajo, Ariz.

Dear Howard,

I have been assured that your export order will go forward with all possible speed.

There seems to have been some question about there only being one reference number, and I gather that it is usual for each commodity to be on a different application.

Very truly yours,

W. C. Broadgate  
Asst. Director

Although I previously (note last Fields correspondence) told you that everything must clear through Phoenix, he sent in an application and export order, and I handled it direct through the required agency.

Bill



*Copied from original*

AUGUST 12, 1942

Hotel Harrington,  
Washington, D.C.

Mr. Howard Fields,  
P. O. Box 676,  
Ajo, Ariz.

Dear Howard,

In discussing the matter of sending Class C forms to Washington with the RFC today, they agreed that it is a waste of time. Gohring or his office will be notified not to make this recommendation to the applicant in the future.

Applications will be filed at the Field office, assigned a number there and not go to Washington till the final report is ready.

Action on these applications should thus be pretty rapid, although I have not yet had a case from which I can determine the time which will elapse between the receipt of the report in Washington and the disbursement of the loan. I am very anxious to get dates on such cases.

I do not know if it will save you any time to refile in the Phoenix office... your application has not yet reached the Loan Section, or had not this afternoon.

Keep me informed. Coupal can advise you whether to refile or not.

Very truly yours,

W. C. Broadgate  
Asst. Director

Aug. 11, 1942

Hotel Harrington,  
Washington, D.C.

Mr. Howard Fields,  
Box 676,  
Ajo, Arizona.

Dear Howard,

Your telegram is at hand stating that you have mailed your application for a Class C or Preliminary Development Loan to the RFC at Washington.

I have no suggestions for handling this further than those already mentioned to you.

I had understood in a conversation with Bill Gohring that it had been contemplated at one time that these applications be filed directly with the Field Offices of the RFC. However the present procedure contemplates mailing them to Washington, where they take a docket number and then are sent to the Field Offices to be dealt with.

It appears to me that this will take a week or ten days, and that no real purpose is served, and I am suggesting to Mr. Charles B. Henderson that this step be eliminated.

I may say that the Senators and Congressmen who sponsored the legislation which was cancelled in exchange for this R.F.C. rule, are watching the operation of these new loans carefully to see whether or not there is much delay in the administration by the R.F.C. Please let me know the exact schedule on your application.

Did you consult with J. S. Coupal as I suggested?

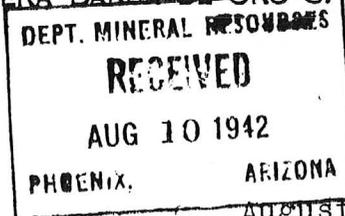
Let me hear from you as to progress.

Very truly yours,

W. C. Broadgate,  
Asst. Director

CIA. MINERA BARCA DE ORO S. A.

MINES: CERRO PRIETO, SONORA, MEXICO  
MILL: COSTA RICA, SONORA, MEXICO



ADDRESS: BOX 676: AJO: ARIZONA  
WESTERN UNION: AJO, ARIZONA

August 6, 1942.

Mr. W. C. Broadgate,  
Washington, D. C.

Dear Bill:

It is rather peculiar that I should be writing to you in Washington, asking your assistance. I recall very well the work Joe Walton and I did on the original idea of development loans and it is rather ironical now that I am requesting such from the government.

A short time ago I wrote the R. F. C., requesting a \$5,000 loan to get the Copper Glance Mine, in the Twin Buttes District of Pima County, in shape to sample, with the idea that this would show sufficient ore to warrant the advisability of a further loan of \$17,500, to unwater and equip the mine and put it into production.

Of course I do not know how much help you will be able to give me in this, but I certainly would appreciate whatever you can do to rush a favorable and prompt decision. I hope that you will be able to help me in this matter and feel that you are in a position to.

We are still operating in Mexico and outside of a water shortage, which has cut down our tonnage, everything is going smoothly.

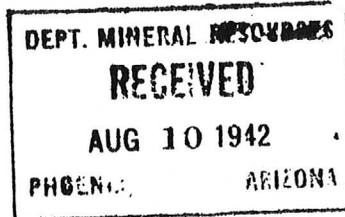
I was very pleased to hear of you being in Washington as I sincerely feel that you can, and will, do the mining industry a great deal of good. Personally, I cannot think of anyone better for the job.

With kind personal regards, and thanking you in advance for whatever you can do for me, I remain

Sincerely yours,

*Howard H. Fields*  
Howard H. Fields.

HHF/e



Aug. 7, 1942

Hotel Harrington  
Washington, D.C.

Mr. Howard H. Fields,  
P. O. Box 676,  
Ajo, Arizona.

Dear Howard,

It was a pleasure to have a line from you, if only in the course of business. Yes, I well remember that you were a member of my Class C loans committee and did yeoman service on it... you never can tell, you see... several of the fellows on the committee, I am sure thought I was a bit cracked or over optimistic and that they were, perhaps, wasting their time. But whatever else they can say, I cannot be accused of ~~lacking~~ persistence... Grace used to say I would have the Class C loans if I only lived long enough. And now, here you are, ready to apply for one!

Well, to come down to business, I have had the forms sent you from here. They went out today. Business to me must clear through Phoenix.

You are choosing a wise route, I should say, for if the Class C loan shows up OK, the B loan you need we should be able to get through in a minimum of time.

You will remember that in the original draft of the C bill I insisted on a provision for utilizing State agencies? It will interest you to know that the Department of Mineral Resources is agent for the RFC for these small loans.

I should advise you, therefore, to be sure and run up and see Sam Coupal as soon as you get this letter and the forms... or Sam can give you some.

I thank you for your good wishes and compliments. Please give Evelyn my regards when you next see her.

With best personal wishes,

Very sincerely yours,

W. C. Broadgate  
Asst. Director

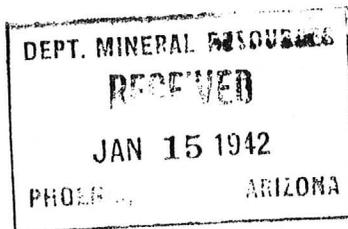
# United States Senate

## MEMORANDUM

Jan. 13

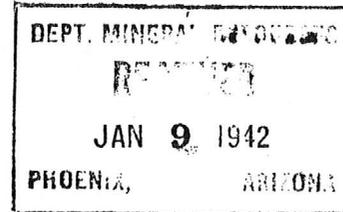
I think this was the smart thing to do in the Fiedls case. I took the stuff over to WPB and told them to study it and transmit the whole thing to the RFC with a recommendation, not mentioning the fact that I took it over personally.

I think that, with WPB approval, the application should have no further trouble, but will check in a few days.



Bill

*C*  
*Wayne*



Jan. 7, 1942

Hotel Harrington  
Washington, D.C.

H.  
/

Mr. Howard H. Fields,  
P. O. Box 676,  
Ajo, Ariz.

Dear Howard,

I took the data on the Copper Glance over to WFB Copper Branch this morning.

I left the whole thing there for study, as I am of the opinion than under these circumstances it will be better if the file is transmitted to RFC by the Copper Branch with a favorable memo, than if I file it myself.

I will then go to bat again as soon as I am informed the data has gone over.

I feel more optimistic about the outcome with the additional material to ~~argue~~ argue about, and will let you know developments.

Best regards,

Sincerely,

W. C. Broadgate  
Asst. Director

@

United States Senate

*W*

DEPT. MINERAL INDUSTRIES  
 MEMORANDUM RECEIVED  
 JAN 4 1942  
 Dec. 30 PHOENIX, ARIZONA

I finally got the Copper Branch to call RFC on the Fields case, yesterday.

RFC is asking Fields for further information.

*H.*  
*C*

*Copper Branch*

Bill Broadgate

*Copper Blaine*

Washington, D.C.  
~~DEPT.~~ Jan. 2, 1942

DEPT. MINERAL RESOURCES  
RECEIVED  
JAN 4 1942  
PHOENIX, ARIZONA

SUBJECT: Export licenses  
Howard Fields

I am pleased to say that I have had Fields' licenses extended for 60 days, by the Board of Economic Warfare.

*H*  
*C*

Bill Broadgate

June 23, 1941

Mr. J. J. Williams  
Box 2161  
Tucson, Arizona

Dear Mr. Williams:

I have the questionnaire relative to the Minnie and Copper Butte mines. You state that the property has about 60,000 tons of ore blocked out which could be worked if the price were 15¢ per pound, but we would have to know the possible annual production of copper; that is, how fast the copper could be taken out and how much copper is in the ore. We would also have to know some rough estimate of the capital investment required. I hope that you can send us this information right away, as it is almost time for us to close up our report and submit it to Washington.

It would appear that you can produce copper and, therefore, it should be included within our survey. Included within this report we anticipate putting a brief description of the properties which will be listed as potential producers. In order to have these brief reports uniform in their contents we have gotten up another questionnaire showing the points we want to cover, and it will be greatly appreciated if you will fill in one of these questionnaires for the Minnie and Copper Butte mines and return it to us.

Thanking you, and with kindest personal regards, I am

Yours very truly,

Chairman, Board of Governors  
Arizona Department of Mineral Resources

CFW:LP  
Enc.

July 1, 1941

Mr. J. J. Williams  
Box 2161  
Tucson, Arizona

Dear Mr. Williams:

I want to thank you for answering the second questionnaire I sent you giving us some of the data regarding Twin Buttes Mine. I believe that we can pick up additional data for a more complete description from the Mines Handbook and our records.

Thanking you, I am

Yours very truly,

Chairman, Board of Governors  
Arizona Department of Mineral Resources

CFW:LP

June 18, 1941

Mr. William F. Foy  
Ruby Star Route, Box 8  
Tucson, Arizona

Dear Mr. Foy:

I have your letter of June 15. I fully agree with all that you say regarding the ridiculous economic situation in Washington, and you cannot get any arguments out of me on that subject. However, I feel that we must recognize their economic policy and conform ourselves to it just as nearly as we can and make our presentation based upon the economic policies of those in Washington who are controlling factors.

It is not made too clear in your letter as to just what you think Twin Buttes could do. You state that from present ore reserves the Glance Mine can produce 200,000 pounds of copper per month and that it would take about 120 days to get into operation. You also state that a similar amount can be produced from the King Mine. You do not state clearly, however, at what price copper would have to be in order to get this production, nor do you give us any idea as to the capital investment required to get under way. The price should be sufficient to amortize the capital investment in a period of not less than three or more than five years. We are going to have to have that information for our report on potential copper production, as it is essential that both the price and the capital investment be given. The capital investment, should, of course, include enough for operating expense until such time as smelter returns are obtained.

I personally believe that the Twin Buttes section has a lot of possibilities on copper production, and I am anxious to include that in our report with a comprehensive description. From what you have already given us it is apparent that copper production can be made and, therefore, it will be included provided we have these additional figures.

Included within this report we anticipate putting a brief description of the properties which will be listed as potential producers. In order to have these brief reports uniform in their contents we have gotten up another questionnaire showing the points we want to cover, and it will be greatly appreciated if you will fill in one of these questionnaires for Twin Buttes and return it to us.

Yours very truly,

Chairman, Board of Governors  
Arizona Department of Mineral Resources

CFW:LP  
Enc.

WILLIAM F. FOY

~~XXXXXXXXXX~~

TUCSON, ARIZONA

Ruby Star Route Box 8. June 15th, 1941.

Chas F. Willis, Chairman  
Board of Governors Arizona Department  
of Mineral Resources.  
Capital Building, Phoenix, Arizona.

My dear Sir:

In accordance with your request I am submitting a report of the production from the mines at Twin Buttes. These properties have been idle for the past ten years because of the low price of copper, which made it impossible to finance even the small amount necessary to open the mines and start production. Since small mines require a greater amount of expenditure in development to insure a steady production, I am sure I voice the sentiment of all small producers that we should have a few cents increase per pound over the present low price of 12 cents.

The Glance mine here can be made a producer as soon as shaft is repaired and unwatered, this mine can start producing around 200,000 lbs per month from reserves already developed, this production could commence 120 days after starting operations. The King mine can be made a producer on the same scale, in the same time, in other words these two properties could make a production of 400,000 lbs of copper monthly. Two other properties can also be made producers again, but will require further development to make satisfactory tonnage.

Enclosed on separate sheet you will find a schedule of the entire production at Twin Buttes from the several mines by various companies from the beginning of operations in 1906 to 1929 inclusive, which time includes various periods of inactivity owing to low price of copper. I have been closely associated with all operations here since 1916 as part owner and have managed operations.

During this period there was produced by five of the producing mines the following; 419,433 wet tons, 402,193 dry tons, averaging 6.1722 % copper and 2.0314 ozs silver, amounting to 49,648,435 lbs copper and 817,024 ozs silver, with a gross value of \$8,244,039.92, \$7,668,851.57 for copper and \$575,188.35 for silver. The average price received for copper was 15.446 cents per lb, and for silver .70338 cts per oz. The average cost for copper after silver credits was 12.413 cents per pound.

These figures will show that we need a higher price for our copper, not only for a little profit but to enable us to do the proper amount of development to insure and maintain a steady production of from 1500 to 2000 tons monthly which has been our past schedule. And too, we need a higher price today owing to the increases in costs of everything, labor, labor taxes, supplies of every description and federal taxes etc, etc. Also the severe deductions at smelters, and the ever present  $2\frac{1}{2}$  cent per lb deduction for freight and refining of bullion, an item the copper critics seem to be ignorant of, in other words we producers must pay the freight to the east coast refiners and fabricators then when we need a little wire or sheet, we pay the freight back here.

The Big Three copper producers (Anaconda, Kennicott, and Phelps Dodge) have their own smelters, refining plants, and fabricating plants, they can easily make up any deficiency in copper price on their fabrications, not to mention their big low cost foreign properties where labor is only a fraction of what it is here. At present we get  $9\frac{1}{2}$  cents per lb at the smelter, after freight and treatment, on the balance we must pay the increased labor, taxes etc, we have no way of adding these additional costs on our product, but the Fabricators, Aircraft industry, automobile industry, brass companies are protected by a ridiculous low price PEGGED, to enable them to pyramid their profits at our expense. We have no low pegged price on what WE need such as labor, supplies, freight treatment, etc, etc,.

Chas F. Willis.

--- 2 ---

June 15th, 1941.

Just why was the low figure of 12 cents selected as the PEGGED price ?. If the powers that be in Washington were gaging the price on the earnings of the Big producers, they used the wrong angle, because the earnings of the Big producers would not be large if they had to depend on production alone, and were not able to lean on their fabrication and low cost FOREIGN properties.

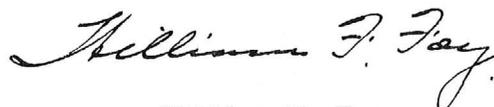
It would seem that a raise in price for producers and a drastic cut in price of finished copper and brass products would be more in line with fairness, Why should finished copper products sell in excess of .50 cents per lb, ?. I wonder if this is'ent something Henderson's office has overlooked.

Another thing, The 50 year average price of copper is around  $14\frac{1}{2}$  cents, Why not use such a basis for a PEGGED price ?, I am sure no one could take exception to such a proceedure.

We small producers have had a very bad ten year period and unless we get relief we are sunk. We are not asking for subsidies, bonuses, parity or plow under payments,. No, just common ordinary fair treatment in line with other industries, that the unfair discrimination against our industry be lifted, that capital once again can take heart to give us the assistance to produce, Under present conditions, where is there a dollar for mining copper ?.

I hope with the schedule enclosed I have given you the information desired, however if anything more, advise me.

Very truly yours,



William F. Foy  
Ruby Star Route Box 8.  
Tucson, Arizona.

June 12, 1941

Mr. William F. Foy  
Ruby Star Route  
Box 8  
Tucson, Arizona

Dear Mr. Foy:

I have received a letter from C. M. Taylor of Tucson, and he advises me that you are going to send us the data on the Twin Buttes Mines relative to potential copper production.

I surely hope that you will be able to get this information to us soon, as we have to get our report completed and in to Washington by the end of this month.

I have personally felt that the Twin Buttes District offers considerable possibility of copper production. We have a national emergency in that the large mines of both North and South America together cannot produce sufficient copper to fulfill the defense needs and the government is going to be urgently seeking possible supplies. We are going to present to them the Arizona picture as to the price at which additional copper can be obtained, the capital investment required, the tonnage of copper available, and the time that it will take to get the properties into production.

Of course, this survey is not intended to cover copper prospects, but is limited to those who have reasonable ore reserves and can produce merely by the erection of proper plants and installation of equipment.

I am sending you the complete set of forms and I hope that you will get the data to us regarding Twin Buttes at an early date.

I appreciate that much of the information will be estimates, but I am sure that your knowledge of this district is sufficient that they will be intelligent estimates.

Thanking you for an early reply, and with kindest personal regards,  
I am

Yours very truly,

Chairman, Board of Governors  
Arizona Department of Mineral Resources

CFW:LP  
Enc.

## TWIN BUTTES

### LOCATION:

The Twin Buttes Mining District lies in the Sierrita Mountains, about 6 miles west of Sahuarita, a station on the Southern Pacific Railroad, 25 miles south of Tucson, Arizona, toward Nogales. The Tucson-Nogales oiled highway also passes through Sahuarita. A very good graded gravel road connects the camp with Sahuarita, so transportation is most economical. The following are the principal mines of the district:

Morgan, Minnie, Copper Buttes, Copper King, Copper Queen, Copper Glance and Copper Bullion.

### CLIMATE:

The climate is typically that of Tucson and Southern Arizona - hot days, cool nights, with summer showers. The vegetation is sparse and that of the arid desert section. Water for domestic use and for mine operation is available at the Gladstone Shaft, which is under lease.

### LABOR:

Labor is largely Mexican and seems to be abundant in this particular section. The proximity to the border assures a fair supply. The camp has practically all the buildings necessary to begin operation, through the ore bins, etc., will need repairs before commencement of operation.

### HISTORY:

The known history of Twin Buttes mining district dates from the nineties, when four prospectors gophered various surface outcrops of copper carbonates, hauling same to Tucson by wagon. This continued up to the year 1905, when a group of men headed by David S. Rose, then Mayor of Milwaukee, formed the Twin Buttes Mining and Smelting Co., which acquired all the favorable property in the district. They built a standard gauge railroad from Tucson to Twin Buttes, 28 miles in length, and began mining operations in 1906, erecting a smelter near the Santa Cruz River, nine miles from the mines. They operated until the spring of 1913, directing most of their attention on the Morgan Group, as this particular group had the best surface showing.

During these operations the Twin Buttes Mining and Smelting Co. produced a gross of \$3,110,000. Most of this came from the Morgan mine, the balance from the Copper Glance, Copper Queen and Copper King, the latter group being on a different contact with very little surface showing and was not worth considering at that time. However, later operations proved this contact to be the richest zone of the district, higher grade ore and larger ore bodies. The gross production from this contact to date is \$6,115,597.30. This, with the old company's production of \$3,110,000.00, makes a grand total of \$9,225,597.30 for the district.

In 1913, after some of the older officials of the company had died or passed out of the picture, operations ceased. From then on until 1918 the Morgan mine was worked by lessors. In 1914 Ed Bush from Butte, Montana, who had been leasing at the Morgan, took a lease and bond on the old Minnie mine, which lay on the Glance-King contact adjoining the Copper Buttes on the west. Bush and his partners netted over \$400,000.00 in the years 1914-15 and 16. It was while operating the Minnie and seeing the possibilities of this contact that Bush took

a lease and bond on the Copper Glance, which had been previously worked by the old company. This contract was for \$300,000.00 for 3 years on a 10% royalty basis, during 1917-17-18, until the drop of copper after the Armistice. Bush paid \$233,796.16 in royalties to the old company and netted a substantial sum besides.

In 1917, being more convinced than ever of the possibilities of the Copper Queen, Bush took a 3-year lease and bond for \$100,000.00 on this property. He paid this \$100,000 in royalties after the second year and netted besides \$180,643.72 for himself and partners.

W. F. Foy became associated with Bush in 1917, when they took over the Copper Queen, and Foy carried on operations after Bush's death in 1920, by re-opening the Copper Queen and during 1923-26 paid dividends totalling \$112,000 besides sinking a 500 ft. shaft on the Bullion and a 400 ft. shaft on the Gladstone, which expense was absorbed in operating costs.

Foy purchased the properties from his associates in 1928, forming the Buttes Copper Company, embracing all the properties in the district, but the panic halted this project and the properties reverted to their original owners.

In 1938 Mr. Foy arranged a new deal and I became associated with him in 1942. A loan of \$9,000 was granted by the R.F.C. to start unwatering the mines and show sufficient evidence to warrant additional funds to equip and place them in production. Due to difficult operating conditions this was not sufficient, and I, personally, advanced some \$7,500 to complete it. The Glance and Queen Mines were unwatered to the 525 level, where a personal examination showed the ore expected did exist. The shaft was retimbered, the headframe repaired, two 310 cubic ft. Chicago Pneumatic Air Compressors bought and installed, air and water lines installed in the shaft and a Cameron sinking pump obtained. The small amount of water remaining can be easily removed with this equipment and the mine equipped for production.

Mr. Foy eventually relinquished his contract so I could arrange a more favorable one. The mines held under the present lease and option are:

Copper Glance	Pat. No. 2643
Copper Bullion	" " "
Copper King	" " "
Copper Buttes	" " "

The terms of the lease-option from the owners, Twin Buttes Mining and Smelting Co., Room 1112, 229 East Wisconsin Ave., Milwaukee 2, Wisconsin, are:

Date Feb. 1, 1945. Term 6 years. Royalty 10%  
Price \$60,000.00 Minimum payment \$100.00 monthly.

Foy owns the Minnie and Copper Queen Mines and will include the Queen in any deal which I make for the balance of the group in a separate agreement.

The following gives details of ships from the various mines. These were shipped to the Southern Pacific Railroad at Sahuarita over the Twin Buttes R.R., a company road now abandoned and dismantled.

Mine	Date	Cu Price	RR Cars	Dry T.	%Cu	Gross Cu% Ag.	Net Profits
Minnie	1914-18	22.73¢	1370	62,477	4.71%	\$1,282,202	\$ 493,805
Queen	1917-20	19.145	310	15,234	9.14	556,396	180,648
Queen	1923-26	13.83	1078	59,952	6.55	1,060,872	412,218
Glance	1916-19	18.011	2432	118,066	6.72	2,786,126	629,282
			Total	255,729		5,685,596	1,715,953

## GEOLOGY:

In general, the geology is that common to replacement in a contact zone between bedded limestones and underlying granite. This contact has roughly an East-West strike and dips to the South at about 60 degrees. The contact lies in the form of a shallow arc, whose continuity is broken in several places by rolls, which are usually accompanied by cross fracturing. These rolls probably were occasioned by pressure due to the granite intrusions, which also may have caused the fracturing.

The lime is metamorphosed along the contact to a garnet and these garnet occurrences extend into the limestone for considerable distances at the location of the rolls and fractures. All of the ore found to date occurs in the garnet in the "roll" area.

The lime beds have been tilted by the granite intrusion and faulting but in general the contact crosses the beds, so there is a variation in the garnetization from the surface down, due to variations in the solubilities of the beds traversed. The persistence of the lime is shown by a diamond drill hole, drilled vertically from the 625 level of the Glance Mine, which showed lime to a further depth of 500 feet, with the hole bottom still in lime.

The contact is known for a distance of 9,000 feet and the recognized "rolls" which have been named for the claims on which they occur, are, from East to West--Copper Bullion, Copper Glance, Copper Queen, Copper King, Copper Buttes and Minnie. The Copper Glance, Copper Queen and Minnie have developed into good producing mines. The Copper King has produced an estimated \$150,000 from a small fracture. The Copper Bullion has encountered a strong fracture filled with leached oxidized ore (not commercial). Neither of these developments has reached the contact so their present interesting showings warrant the expectance of ore bodies on the contact similar to those found in the other three mines.

There is an unprospected "roll" between the Glance and Queen, which could be prospected from the drift connecting these two shafts, and which was driven off the contact for permanence. Also, there are several other areas where "rolls" can be expected as between the King--Buttes--and Minnie.

The outcrops of contact, garnet, or ore, are so inconspicuous as to have been practically non-existent. The small mineralized fracture on the surface at the King is the best. In the Queen and Glance the surface showed a very small fracture filled with oxidized copper ore but no commercial ore bodies were encountered until a depth of 300 feet was reached. However, from this point the ore has been practically continuous to their present bottoms, which are in ore.

In general, five "rolls" have been found in the 9,000 feet of known contact, leaving a good chance for a similar number to be found by intelligent prospecting.

The ore found to date is almost entirely a massive pyrite containing bornite and chalcopyrite, there being almost no oxidized ore in any of the mines. These ore minerals are found in the garnet in irregular shaped ore bodies typical of replacement deposits. There has been no sign of diminution in intensity of mineralization or grade to the present depth.

## MINE WORKINGS:

### Copper Bullion:

This shaft is in solid limestone and is open all the way. It contains little seepage water and has no surface improvements at present.

#### Copper Glance:

The shaft has been retimbered to 525 level which was unwatered for inspection. The level is in fair shape permitting access to all the stopes. The drift to connect with the Queen is open. The workings below the 525 level are probably all in good shape since they are relatively new. The headframe has been put in good shape and the shaft is operated by a 15 H.P. gasoline hoist.

On the 400 and 525 levels there exists ore faces which will mine 4% copper, making it possible to begin production at once. When we unwatered these levels, I had an opportunity to take a few check samples to confirm this.

#### Copper Queen:

The shaft has caved around the collar for a depth of 3-4 sets, requiring reopening to restore ventilation in the Glance and Queen mines through the 525 drift, which is the 7th Level of the Queen. Unwatering the Glance takes the Queen to the 7th Level, but supplementary equipment is needed in each case to unwater the bottom of the mine. It is confidently expected the Queen Mine will prove similar to the Glance in that fairly recent timbering, which has been under water, will be in such shape it will not have to be replaced. The Queen has a headframe hoist house and 50 HP hoist.

#### Copper King:

The shaft has been re-laddered and the timbering repaired. It has no surface improvements. The rehabilitation to the 200 level was for the purpose of preparing for diamond drilling to the contact.

#### ORE RESERVES:

The calculation of ore reserves in lime replacement bodies is a different matter, but the following is good practice and details the manner in which the Copper Glance reserves are estimated.

The ore occurs in connected lenses in a large mass of garnet, which occurs along the contact of the granite and overlying limestones. Using the known tonnage mined above the 525 level and below the 300 level from the garnet area there, we find a block 100 ft. by 200 ft. extending from the 300 to 525, an incline distance of 270 ft. This block contains 5,400,000 cu. ft. of garnet or 540,000 tons of garnet zone which actually has produced 118,066 tons of ore averaging 6.72% copper.

From the 525 level to the bottom of the 625 winze, which is still in ore, using the same manner of calculation, we are justified in expecting 400,000 tons of garnet ore zone which could produce 87,000 tons of ore of similar grade. The partial development of these lower levels does not show any diminution in size or grade.

An average of all the mine samples taken during the last 40 days operation shows:

525 level workings assayed	6.80% copper
625 level workings assayed	7.70% copper
Average	7.45% copper

There is no reason to expect the ore bodies to bottom at the present level as diamond drilling shows the limestones, which are essential to ore formation, continues at least 500 feet deeper.

This diamond drill hole was drilled from the 625 level so there is 400 ft. of limestone below the 700 level. The 400 feet of limestone from the 300 to the 700 level produced 118,066 tons and is estimated to contain 87,400 tons more, a total of 205,466 tons. It is possible the succeeding 400 feet will contain a similar amount of similar grade.

Copper Queen:

The Queen has been mined to a greater depth than the G glance, but an estimate using similar reasoning shows approximately 40,000 tons reasonably expected, and a possible additional 50,000 tons averaging 6.50% copper.

Copper Bullion:  
Copper King:

These two areas have just as good a chance of developing substantial ore bodies as the G glance and Queen had, and of similar grade. It is remarkable that the three mines on this contact that were developed to the contact in the favorable "roll" area, all proved very profitable and add to the possibility that two known areas may also develop similarly. In addition to these, there are other likely "roll" areas between the G glance and the Queen and the King and the Minnie.

In the unprospected "rolls", Copper King and Copper Bullion, it is possible they will each contain a somewhat similar tonnage to the average of the G glance, Queen and the Minnie, which is 232,830 tons, averaging 6.35% copper.

There is a good "roll" between the G glance and Queen Mines, which can be prospected from the 525 level of the G glance. It also could develop a similar tonnage and grade like that estimated in the Copper King and Copper Bullion.

The property has an entirely possible chance of producing four or five times the quantity in the future that it has produced in the past.

COST OF PRODUCTION:

Since the Copper Queen mine was unwatered, rehabilitated and put into production in 1919, under circumstances similar to those existing today, costs and outcome could be similar. Mr. Foy started with a capital of \$21,000, copper price averaged 13.83¢, shafts were caved and mine full of water. The net profits 1923-26 were \$412,216.00 on 59,952 tons.

The detailed costs at that time were as follows:

<u>Direct</u>	<u>Per Ton</u>	<u>Indirect</u>	<u>Per Ton</u>
Labor	\$ 1.686	Prospect Outside	
Labor Ins.	.083	Mines	\$ .688
Power	.097	General	.062
Explosives	.179	Repairs-Renewals	.112
Smelter Represent.	.058	Taxes-State & Co.	.218
Pumping	.076	Taxes - Federal	.476
Timber	.022		
Total Direct	2.372	Total Indirect	\$1.556

Future costs of mining will not include "Prospect outside mines", but labor will be higher, so a cost of \$4.00 per ton is estimated.

Cost of Smelting - Transportation and Outcome:

Assuming the first production would come from the Copper Glance Mine, and using an approximation of the average assays of the last 58 railroad cars, 3154.3 tons copper 6.0%, silver 2.0 oz., the following figures will show the outcome.

The price of copper is considered basically at 12¢. I have two premiums, A of 5¢ and B of 7¢, but will only consider A, as the extension of B after July 1st is problematical. If the A premium is not extended, the ceiling price of copper will be raised, so the net should be about the same.

Pay		
Silver	2.0 oz. less 0.5 oz. at 70¢	\$1.05
Copper	6.0% 120# less 12#	
	108# at 12¢ less 2.6¢	<u>10.15</u>
		\$11.20
Deduct		
Hayden Smelting	\$2.50	
RR Frt. plus 6% H <sub>2</sub> O	<u>1.50</u>	\$ 4.00
		\$ 7.20
Royalty 10%	.72	
Trucking	.80	
Mining	<u>4.00</u>	\$ 5.52
		\$ 1.68
Premium A 97% of 120# at 5¢		<u>5.82</u>
		\$ 7.50
	Net profit per ton	

The R.F.C. loan must be paid as it is an obligation of the lease, but the local officers assure me that 5% royalty per ton is about what may be expected as a basis for reimbursement.

FUTURE OPERATIONS:

To reopen this group of mines, several plans may be followed.

- I. A diamond drilling campaign from the surface and shallow open workings to prospect the possible new ore areas.

Copper King.....3, 200-ft. holes  
Copper Bullion.....3, 200-ft. holes

Deeper drilling to prove vertical extensions of known ore bodies.

Copper Glance.....2, 1,000-ft. holes  
Copper Queen.....2, 1,000-ft. holes

If this program proved successful, then the reopening of the mine would follow and be guided by the information gained from such drilling.

- II. Commence reopening the Glance Mine, followed by the Queen reopening, with subsequent or simultaneous diamond drilling. With the equipment installed, the shaft practically repaired, headframe repaired, and the small amount of water remaining in the mine, the reopening of the Glance seems logical.

Shipments could begin 90 days after work commences and should furnish the funds for reopening the Queen and the Minnie, and do the drilling necessary to develop the new possible shoots.

The estimated cost of getting into production and amount of operating capital needed is:

Hoist.....	Move 50 HP diesel hoist Queen Mine to Glance.	
	Extend building foundations, small repairs.	\$ 750.00
Shaft.....	Repair, tighten guides and sets, ladders to 625	500.00
Levels.....	Clean up 525, 625. Repair, install track	1,000.00
Ore Bin.....	Repair	250.00
Unwater.....	500, 625 levels, 625 winze with Cameron pump	1,000.00
Air Receiver..	Install	75.00
Equipment:		
	3 Jackhammer type drills, hoses, tanks,	
	1 cradle, 1 stoper, hose tank, line oilers	1,200.00
	4000# drill steel (Use contention sharpener)	750.00
	2500' 12# rail and spikes (5 tons)	300.00
	10 Mine cars (used)	1,000.00
	2500' - 2" pipe - 21¢	525.00
	2500' - 1-1/2" pipe - 15¢	375.00
	1000' - 1" pipe - 12¢	120.00
	Fittings, valves, etc.	250.00
	Air hoist - 625 winze	500.00
	Air pump	250.00
	Shovels, picks, wrenches, miscellaneous tools	250.00
		<u>\$ 9,095.00</u>
Reopening Queen shaft for ventilation		1,350.00
Carload miscellaneous timber (repairs and operation)		1,450.00
30 day payroll - 1,000 tons		4,000.00
Pickup truck		<u>1,000.00</u>
	Total	\$16,895.00

In order to meet any unforeseen contingencies a fund of \$25,000.00 should be available.

All the maps and records were furnished by Mr. W. F. Foy, who was the manager under the last operations. When I was ore purchasing agent for the A.S. & R. Co., I bought the Copper Queen production from Mr. Foy during 1923-26. I saw his operations and was so very favorably impressed that I have confidence in all this data. The evidence disclosed in unwatering to date has confirmed his statements.

Considering the history of production and profits from these mines, and reviewing the maps and considering Mr. Foy's statements concerning the ore in the Glance Mine available for immediate production, it is entirely probable that more than enough ore can be easily and quickly produced to repay the capital investment, a drilling and development campaign, and furnish profits soon after production begins.

With intelligent management, the purchase price of the mines can be accomplished through royalty payments, ore can be developed for the future, and a long time mining operation of fair size can be developed.

Howard H. Fields  
March 13, 1946

QUESTIONNAIRE

Relating to survey of potential copper production from Arizona small and marginal mines for national defense purposes;

Name of mining property... Minnie and Copper Buttes .....

Location..... 8 miles west of Sahaurita R. R. .....

Ownership..... ..

Name of Manager..... J. J. Williams .....

Post Office address... Box 2161, Tucson, Arizona .....

Copper production (pounds) during each of the past five years:

1936..... None..... 1937..... None..... 1938..... None.....

1939..... None..... 1940..... None.....

1941 rate of copper production based upon first four months... None.....

How much copper could this property produce annually

on a 14 cent price? .....

*There is now about 60,000 tons blocked*

on a 16 cent price? ..... *at 15¢ or better*

on an 18 cent price?.....

on a 20 cent price?.....

What price copper is necessary for this property? At least 15..... cents per pound?

What plant facilities would be required and how much is the estimated cost in the event a 14 cent price could be assured? ... Due to long idleness underground repairs .....

*125,000? mill*

a 16 cent price could be assured? .....

18 cent price? .....

20 cent price? .....

For what length of time would assurance of price and sale of full production be necessary? ..... Two years .....

How long would it take, after financing has been provided for, before production on the above basis could be reached? ...Thirty days.....

Does your organization have the facilities for raising the necessary capital to increase production to the amount stated? ...No.....

If not, do you believe that your company would be amenable and agreeable to government financing? .....Yes.....

Do you believe that you could finance the capital investment yourself on some such basis as a guarantee of sale of output at a fixed price and for a definite period, with damages to cover unamortized portion of capital investment in the event the government failed to take the output for the agreed upon time - or some similar arrangement? ....Yes.....

Please let us have your comments on the probability or possibility of your organization participating in such a program for national defense purposes .....

.....This would be possible, of course, depending upon the restrictions placed upon the management......

What would be your ideas on financing and carrying out such a plan as is indicated by these questions? ...In my opinion some such plan as indicated in the above questions is the only solution to the coming copper problem - regardless of the large imports from S.A......

Kindly list names and addresses of other potential copper producers in Arizona whose operations should be included within this survey.....

.....For a more detailed report upon these properties see W. F. Ray's report......

.....Glance and Copper Queen of which this property is a part......

Date ..... June 19, 1941 ..... Signed..... J. J. Williams .....

ARIZONA DEPARTMENT OF MINERAL RESOURCES  
Capitol Building, Phoenix, Arizona

*Part of actual records  
- Globe mine*

Name of property. MINNIE and COPPER BUTES - also known as Bush-Baxter property.

Location and accessibility of property. Twin Buttes District - good roads and 8 miles from railroad.

*Pima Pima County*

History of ownership. Started by Bush and Baxter who produced some \$200,000 then sold to the A.S.&R. for \$300,000, \$100,000 of which was cash - the balance to be paid in one year. At the end of one year an extension was refused. The property then was worked again by Bush and Baxter, thence by W. F. Foy, 1929.

*Handwritten notes and scribbles*

Production history. I do not have the pounds of copper produced at hand. Other than about \$2,000,000 in 1929 the last operation was by Mr. Foy, 5000 tons mines shows a net smelter return of \$57,000.

General geology (brief) Contact limestone and quartzite and granite.

C O P Y

Ore occurrence. Large bodies along contact, however, not continuous.

Ore reserve (quantities and values). Report by Mr. Dennedy, Denver, Colorado, 1929 shows 60,000 tons average value 4 to 5 per cent.

Accessory metals of value. Just recently some sheelite in very small quantities about 1 per cent in spots.

Development work done.

500' shaft about 2000 feet drifts and raises.

Plants (with capacity) already on property.

25 H.P. Hoist and 300-foot compressor now operating.

Date 6/28/41

Signed J. J. Williams

Florida Mining & Materials Corp. will invest \$68 million this year to double cement production capacity to 1.2 million tons per year at its Brooksville plant, 30 miles north of Tampa.

## COBALT

Sozacom, the Zairian marketing agency of GECAMINES, reportedly lowered its world list price of cobalt for electrolytic broken cathodes from \$17.26 per pound to \$12.50 per pound effective February 1. The price reduction brings the producer price in line with current spot market prices, which were consistently well below the producer price throughout 1981.

## COPPER

It is estimated that domestic copper mine production was curtailed from 12% to 15% in early 1982 by shortened work schedules and closed-down mines. The average producer's price for delivered wirebar copper was 78.8 cents per pound in February, compared with 78.6 cents in January and 80.3 cents in December.

In Pima County, Arizona, the copper industry experienced the following:

- o As of February 1, Cyprus Pima Mining Co. announced a 43% reduction in copper and molybdenum production for a minimum of 3 months. The company put over 700 employees on a 4-day work week and has plans to lay off 175 workers.
- o Magma Copper Co. scheduled a cutback at its San Manuel smelter from 40 hours to 35 hours per week because of the reduction in the amount of copper concentrate being received from other mining companies. About 360 smelter workers will lose an average of \$50 per week.
- o Anamax Mining Co. reportedly has requested a freeze on cost-of-living pay increases until the price of copper rises significantly. The company employs 1,300 people at its Twin Buttes mine.

Michigan White Pine Copper, a division of Copper Range co., announced on February 8, that mine production would be cut back affecting 125 hourly employees. Construction of the firm's new refinery complex is continuing.

## GOLD

Standard Metals Corp., which operates the Sunnyside mine near Silverton, Colorado, announced a reduction in its workforce from 300 to 125 effective March 1. The mine is Colorado's largest producer of gold, producing about 1,000 tons of ore per day, and the sixth largest primary producer of gold in the United States. Silver, lead, zinc, and copper are also produced at the mine.

## IRON ORE

The first price increase for Lake Superior pellets in 13 months was announced by Hanna Mining Co., effective February 15, raising the price 9% to 88 cents per long ton unit of iron contained, delivered rail-of-vessel at lower lake

