REPORT

of the

PRELIMINARY EXAMINATION OF THE GILA COPPER SULPHIDE COMPANY CHRISTMAS ARIZONA

BY W. BURNS

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No. 1,	Composite Level Map,			
2,	100	"	"	
3,	200	"	"	
4,	300	"	"	
5,	350	"	"	
6,	400	"	"	
7,	500	"	"	
8,	800	"	"	with sections,
9,	Section through No. 3 shaft.			

Letter regarding 800 development appended to report.

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REPORT OF PRELIMINARY EXAMINATION OF THE

GILA COPPER SULPHIDE COMPANY,

Christmas, Arizona,

By W. Burns.

PREAMBLE:

The writer arrived at the property on February 24th, and devoted six days to an investigation of the mine workings and ore occurrence, the surface indications, the maps and mine records, and accounts in the mine office showing the commercial status of past operations. No sampling or estimating of certain known reserve tonnage were undertaken, for reasons hereinafter set forth.

Having no knowledge of his employer's identity, of the exact terms upon which the property can be purchased, or of whether they wish to be assured of existing known reserves assuring return at a basic copper market of capital invested, or are willing to take intelligent chances on future ore developments and market price of copper, the writer has been at somewhat of a disadvantage. According to the best accepted and most conservative conventions the property does not show an absolutely proven reserve tonnage of importance. Furthermore, its cost of production per pound of copper has been in the vicinity of 15 and 16 cents. These conditions would undoubtedly make the property uninteresting if the purchasers insist upon absolute guarantees for the return of their capital invested. However, there are good reasons to believe that intelligent prospecting will be rewarded by further ore disclosures of importance, and that the market price of copper, after readjustment from war disturbances has taken place

and reconstruction is properly under way, will be favorable for at least several years. If the employers of the writer are inclined to take intelligent risks on these matters, and in the matter of smelter contract litigation hereinafter outlined, the writer is of the opinion that the property is of considerable value, and well worthy of a more careful and detailed final examination.

It should be borne in mind at all times that this report is of a preliminary nature, and that the writer has accepted and used therein many statements and figures furnished by agents of the Gila Copper Sulphide Company, without attempting personally to check the accuracy of the same. The time and expense necessary to accomplish this is not warranted in preliminary work. Nearly all of these statements and figures were furnished by Mr. S. H. Sherman, Superintendent of the property, and Mr. George D. Morris, Co-receiver for the stockholders thereof, and the writer has great personal faith in their accuracy, and believes that they would be fully upheld by a complete sampling of the mine and audit of accounts. However, the writer cannot, from the nature of things, take definite personal responsibility for their accuracy.

LOCATION:

The property is located a little over one mile to the west of, and, roughly, one thousand feet above, the Gila River in Gila County, southeastern Arizona. A branch of the Arizona Eastern railroad system extends from Phoenix through Ray Junction, Magma, and Hayden, all points important to the mining industry, along the banks of the Gila to Christmas, its most eastern terminal station. The town proper of Christmas is at the mine, above and to the west of this station. The London-Arizona, and other moderately well

known properties are adjacent, comprising what is known as the Banner Mining District.

TOPOGRAPHY AND CLIMATE:

The property lies on the eastern slope of the Mescal Mountains, a typically rugged, somewhat serrated Arizona range. The altitude is moderate, being about 2800 feet. An excellent opportunity exists for a drainage and ore haulage tunnel from the railroad. Such a tunnel with a length of, roughly, 7,000 feet would tap the present main workings at a depth approximately 900 feet below the shaft collar. It would cost in the neighborhood of $140,000.00, and while it would undoubtedly result in cheaper and simplified ore extraction, ore reserves considerably greater than those known at present would have to be proven to justify the capital expenditure.

The very arid warm climate permits but the sparsest of vegetation, the Sahuaro, or Giant Cactus, being much in evidence. The climate is most excellent for general operating purposes, snow troubles being unknown, the lightest of dwellings and roof structures being satisfactory, and general fuel requirements being kept at a minimum. The Gila Company purchases electric power, and treats none of its own ores, and as a result the mine workings furnish water sufficient for all purposes. The nearby river, however, offers a reserve in excess of any possible future requirements, a circumstance unusual in such a climate.

TITLE AND HOLDINGS:

The main property of the company consists of thirty-five patented mining claims, aggregating 552.64 acres. In addition there are three unpatented claims at the railroad tracks at Christmas station, as a site for ore bins, etc.

The Gila Company also owns a gold-silver property of fifteen patented claims, aggregating 265 acres, and 640 acres of coal lands, which are

off the railroad, both in Pinal County, and respectively five and ten miles east of Christmas. They were not visited by the writer, but were reported to be in a state of such slight development that their value is still entirely problematical.

Title to all of these holdings is vested in Gila Copper Sulphide Company, according to best local unofficial information available.

HISTORY:

The following is copied verbatim from a typewritten memorandum placed at the disposal of the writer by Mr. Morris:

" The property was originally located by a party named O'Brien about 1883, whose interests were purchased by the Phelps-Dodge interests, The mines are located on what was then a part of the San Carlos Indian Reservation, and therefore, Phelps-Dodge had to withdraw. A portion of the reservation, including that in which the mines are located, was restored to public domain by executive order of the President (Roosevelt) in 1902. Thereupon George B. Chittenden, who, at that time or prior thereto, was connected with the U. S. Geological Survey, relocated the property on Christmas Eve and named the locality Christmas. Later, the Saddle Mountain Mining Company was incorporated to hold and work the ground.

"Phelps-Dodge sued to recover the property. Just how the suit made out is questionable--one report states it was settled by the payment to the Phelps-Dodge people of approximately $160,000; the other, that the Saddle Mountain Company won out in the court. The Saddle Mountain Company at any rate operated the property for some time under adverse conditions, in that all supplies had to be hauled by wagon from Winkelman. A small smelter was erected, and ore was mined and smelted to the extent of some 113,000

tons of ore. The matte running in the neighborhood of 56% copper, was shipped to the plant of the Consolidated Arizona Smelting Company for conversion. The failure of the Saddle Mountain Company to make the property a paying one was evidently due to the lack of efficient management, coupled with tremendously high cost of supplies, including coke used in smelting. Mining and smelting operations were suspended some time in 1907 and 1908. In 1909, a contract between the Saddle Mountain Mining Company, Development Company of America, and the Gila Copper Sulphide Company was entered into, under the terms of which the Development Company was to advance funds to pay pressing debts of the Saddle Mountain Mining Company, prosecute development work, and resume operations, receiving therefor Saddle Mountain bonds, as well as a large block of stock in the Gila Company to which latter company the Saddle Mountain Company deeded the property. The Gila Company was incorporated with a capital of $2,500,000, and a bond issue of $1,000,000 was authorized. It was stipulated in the contract referred to that the bonds of the Saddle Mountain Company, aggregating $1,000,000, were to be scaled down to $840,000, and to be exchanged for a like amount of Gila Company bonds, which latter bonds carried the privilege of conversion into Gila Company stock at par. When the contract was completed, there were in the treasury of the Gila Company, $1,499,900 of its stock, $1,000,000 of which was for conversion of its bonds (when issued) as well as $160,000 of Saddle Mountain bonds. The funds provided by the contract proved insufficient to put the property on a producing basis, and matters dragged along for some years after the completion of the contract. Early in 1913, certain negotiations, contemplating securing the necessary funds, were entered into, which seemed likely to be consummated, and in anticipation a mortgage was drawn in the name of the Gila Copper Sulphide Company, and bonds, amounting to $1,000,000 prepared and signed, dated April 1st, 1913.

The negotiations fell through, and the Gila bonds remained in possession of the Union & New Haven Trust Company, Trustee. Thereafter, and in April, 1915, negotiations were entered into with the American Smelting & Refining Company, owners of a large smelting plant at Hayden, Arizona, and a contract was entered into with it by which the money necessary to place the property on a producing basis was advanced, under conditions that the Smelting Company was to have the management of the property until the amount advanced was repaid, and the right to smelt the Gila Company ore for ten years at a fixed rate. The holders of the Saddle Mountain bonds then agreed to exchange them for Gila bonds, and this exhcnage took place some time in June, 1915, but the date of the bonds (April 1, 1913) remained unchanged.

"The Gila bonds, however, were stamped, subrogating them to the right of the American Smelting & Refining Company to receive back its advances. Past due interest on the Saddle Mountain bonds, and Gila bonds was paid to April 1st, 1915, by means of the $160,000 of bonds, and $149,900 of free stock in the treasury of the Gila Company. Thereafter, the interest due as of October 1st, 1915, April 1st and October 1st, 1916, was paid by cash advanced by the American Smelting & Refining Company. Shipments from the mine began about the middle of February, 1916, and by November of that year the net earnings were sufficient to reimburse the American Smelting & Refining Company for the advances under the contract, and the advances to pay bond interest. This left but 16 months' earnings available to apply on the $1,000,000 of bonds which matured April 1st, 1918. While it was known that the Gila Company could not expect its net earnings to equal $1,000,000, plus interest, in that short time, it was believed a considerable portion of the amount needed to pay off the bonds would be earned by the date of maturity and that the balance could be borrowed, or the unpaid bonds extended. The

refusal of the smelter to take more than the minimum amount of ore under the contract (7500 tons per month); the increased cost of production; the fixing of the price of copper by the Government, and the ban placed by the Government on new issues of securities upset the Company's plans, and it was unable to arrange to take up the bonds outstanding April 1st, 1918, amounting to $690,800. Practically 49% of the outstanding bondholders agreed to extend, or exchange, their bonds, but 51% refused to do so, and have instituted suit for foreclosure. When the attitude of 51% of the bondholders became known, receivers were applied for in order to protect the stockholders, and they are now in possession of the property. The trustee for the bondholders endeavored to take possession of the property, and advised the American Smelting & Refining Company of its intention days before notifying the Gila Company. The American Smelting & Refining Company immediately seized on the opportunity to present a demand for aan increase of $1.50 per ton over the treatment rate set forth in the contract to cover alleged loss. The amount demanded was so unreasonable that the receivers asked for data on which the claim of the Smelting Company was based. The representative of the Trustee in the meantime agreed to this increase, but the receivers refused until they were furnished the data requested. The receivers' representative met the American Smelting & Refining Company's officials on two or more occasions, but the data furnished him was not only incomplete relative to smelting costs, but contained obvious errors of commission and omission. Thereafter, and without waiting to hear of the receivers' decision after receiving the report of their representative, the American Smelting & Refining Company refused to receive shipments of ore, and it was necessary for the receivers to obtain an injunction compelling them to do so. Prior to obtaining this injunction, shipments were suspended for approximately two weeks, with a

resulting loss to the company of probably $50,000, consisting of profit that could have been made had shipments not been suspended, and tremendously increased cost of production, since the mine was kept operating, during the time of suspension. The matter of making the injunction permanent is now awaiting decision.

" As of January 1st, 1917, a supplemental agreement was entered into (principally to satisfy the 51% of the bondholders who are seeking to foreclose the mortgage) whereby the American Smelting & Refining Company continued in the management of the property receiving as a management fee 10% of the net profits. This contract is terminable on 30 days' notice."

The writer would add that the management of the property by the American Smelting and Refining Company was terminated on January 20th, 1919, Operations now seem to be donducted by the Receivers for the stockholders.

LIVING CONDITIONS:

The camp has an ample number of dwelling houses, mostly of frame construction, but suitable for all practical purposes, and a small club-house, evidently intended for gatherings of American employees. The cost of living seems to be about as usual in the southwest, a company store and company meat market. selling at average prices. The store is said to earn about $1000 net per month for the company. Nearby ranches along the Gila River, and the important agricultural region around Phoenix, are a great aid to comfortable living. For instance, fresh milk of excellent quality is available,--an unusual thing in Arizona. The climate is such that a large part of leisure time can be spent in the open air. The camp has no moving picture theater, and besides the club-house the only center

of recreation is a pool and billiard hall.

POWER:

Electric power is purchased from the American Smelting and Refining Company's smelter at Hayden, and delivered to the property by an ordinary transmission line with steel towers. It is delivered at 6600 volts, and stepped down by transformers to suitable working voltages. The writer was advised that this power is purchased at two cents per Kilowatt hour. This is probably as cheap as the moderate amount of power used could be generated locally, and the arrangement simplifies operations considerably. Before the war the most efficient large power plants in the Southwest of Diesel or steam types, showed cost of about 0.7 cents per Kilowatt hour. With greatly increased fuel and labor costs, it is doubtful if any small plant could show a two-cent cost at present.

OPERATING EQUIPMENT:

The property is equipped with a Bleichart Aerial Tramway, erected in 1916, and in excellent condition, with a rated carrying capacity of a little over fifty tons per hour. The line runs from No. 3, or the main working shaft, to the railroad, a distance of 7300 feet, with a difference of elevation of about 950 feet. A synchronous motor attached to the brake drums generates power used in operations. Ore bins at the upper and lower ends of the tramway have capacities of 250 and 1000 tons, respectively.

Ore is hoisted from No. 3 shaft in mine cars, dumped in a storage bin of 500 tons capacity, and conveyed by belt conveyor to a No. 6 Telsmith gyratory crusher, and thereby crushed to five inches. It is then carried by belt conveyor, ore sorters picking out waste rock during the process, to the receiving bin at the head of the tramway.

A double drum steam hoist, converted for electric power, is in-

stalled at No. 3 shaft. The capacity is reported as 500 tons per 24 hours from the 800-foot level. Adjacent to this hoist is a 1616 foot per minute Ingersoll-Rand air compressor. Suitably well equipped machine and blacksmith shops are in operation at No. 3 shaft.

Surface hauling of miscellaneous supplies is done by one one-ton Ford trucks and one Nash Quad two-ton truck.

The office and store buildings, water lines, roads, etc., complete the surface equipment. All of these are well adapted to requirements.

The underground equipment is simple, but adequate. Excepting only rock drilling and pumping, all work is done by hand. The rock drills are of various types, mostly of Sullivan or Ingersoll-Rand manufacture. A 150-gallon per minute electric triplex plunger pump is installed on the 500-foot level, the present water level in the workings.

In general, the writer's impression of the equipment, surface and underground, is that it is excellent. Inasmuch as the mine was more or less completely rehabilitated at the start of operation in February, 1916, most of it is fairly new and of recent model.

It seems probable that some improvements of importance could be made, especially in the matter of hoisting ore from pockets by skips instead of in cars or cages. However, as a whole, the equipment is unusually good.

GEOLOGY:

The occurrence is typical of a class of ore deposits known as contact-metamorphic.

The general basement of the region is said to be the widespread Pinal Schist, on which lie a series of conglomerates and quartzites. None of these rocks are exposed in the immediate vicinity of the property, and consequently were not noted by the writer. Above the quartzite is a limestone series, with interbedded shales, which is at least more than 800 feet in thickness, as proven by No. 3 shaft and the 800 workings. Many of the beds of limestone are as much as 40 feet in thickness, before being interrupted by any important thickness of shale. The limestone beds lie comparatively flat, with minor irregularities.

Above the limestone is a tremendous andesite capping, which covers the country and forms the mountain tops for miles in all directions. The andesite has been eroded over an area of several hundred acres in the immediate vicinity of the property, exposing the limestones. This aggregate has all been cut by a big fault passing through the property immediately to the east of the mine workings, which has a northwest-southeast trend, and a throw of perhaps 500 feet, the easternmost block subsiding. As a result of this fault, which forms a general escarpment passing through the camp of Christmas, no limestones can be seen to the east except across the valley at the very foot of the andesite mountains at that point.

Subsequent to this faulting the country was disturbed by a great intrusive stock of quartz - diorite - porphyry, which cuts all of these known rocks and the fault itself, and is the undoubted cause of ore deposition. A rough outline of the porphyry stock as known on the 300 level is shown in light brown crayon on the composite level map (Map No. 1) attached hereto, showing that it is generally wedge shaped, increasing in width to the east. The outlines on the various individual level maps also show that it has a general "pitch" to the north. Irregular tongues of porphyry

extend into the limestone in places, and several fragments of limestone, notably that most persistent fragment containing the Kiegel ore body, (See Map No. 9) are contained within it. Inspection of the surface shows several long dykes of porphyry cutting the andesite in various places. There are said to be one or two other minor intrusions, small in size, and having no effect upon ore occurrence. They were not noted in place by the writer.

As is customary in contact-metamorphic deposits, the limestones adjacent to the intrusive contact are extensively garnetized, and carry other common contact-metamorphic minerals, such as epidote, wollastonite, etc. Most of this contact zone is mineralized with copper, gold and silver values, and much of it is high enough in grade to be commercial ore. Such ore occurs in absolutely irregular bodies, but in general, from the nature of things, parallel to the limestone bedding. Fragments of limestone contained within the porphyry are similarly mineralized. The orebodies show a distinct tendency to be located in "bays" along the porphyry contact, a circumstance which can be best understood by reference to the composite level map (No. 1) attached, whereon the important ore bodies are roughly outlined in light blue crayon.

Commercial ore varies in width, measured away from the porphyry contact, from a very few feet up to considerably over 100 feet. The outer limits of the ore, or of the garnetized zone in case it is not commercially mineralized, are hence very irregular. They are, however, quite abrupt, and the ores are richest close to these outer limits, as is customary in such deposits. As is also customary, the limestone, beyond the zone of contact-metamorphism is crystallized to marble.

The interbedded shales, being resistant to chemical changes, are quite barren and unmetamorphosed.

The most common mineralization seems to be of chalcocite or copper glance, occurring in tiny stringers throughout the garnetized lime, probably in cracks caused by the disturbance of the intrusive porphyry stock. Though no detailed study was made, it seems probable to the writer that this chalcocite is of secondary origin. Any important secondary enrichment at water level or elsewhere is improbable, as the impermeable shales constitute an effective barrier to everything except lateral leaching. Nearly all of the ore ~~coming~~ below the 300 level carries chalcopyrite rather than chalcocite, and is probably primary ore. It will be shown later that these ores are averaging somewhat better in copper values than those from other parts of the mine. The fact that primary ores of good commercial grade exist is most encouraging for the future of the property.

It is worthy of comment that the so-called "ore bodies", as ~~is~~ indicated roughly on the accompanying maps, are really a series of individual ore bodies in the different limestone beds, one above the other. They differ considerably in relative lateral extent, and are in all cases separated by barren shales, and often by non-commercially mineralized limestones. However, their occurrence in "bays" one above the other, forms a general ore zone which may be considered as a whole, and termed an "ore body".

Down to the 350 level ore occurrence is widespread. 400-foot level developments are quite disappointing, but not enough work has been done to condemn the level by any means. The 500 is as encouraging as would be expected, only one of the main ore zones being encountered to date, and that shows a small amount of commercial ore which may open up with development. The mine is full of water to the 500, and the writer was unable to inspect the 800 level. A section and sample map thereof accompanying this report, and the general location can be seen from the composite level map. If the

reported sampling is correct (it was done personally by Mr. Sherman, now Superintendent of the property), the ore zone (Las Novias) encountered shows distinct indications of presistence with depth, notwithstanding the fact that such development as has been done therein on the 400 is unencouraging. Mr. Sherman advised the writer verbally that the garnetized limestones encountered on the 800 show signs of considerably more intense fracturing than those of the upper levels. If this condition is widespread with depth, it may be assumed that better conditions existed for ore deposition within the limestone beds.* --- *See attached copy letter by Mr.Sherman regarding 800 level (called therein 770). Also note that he considers the chalcopyrite ore to be secondary, giving no reasons as to why the chalcopyrite is not primary,as is customary with that mineral.

ORE IN SIGHT:

This heading has always been a matter for discussion among mining engineers. In general it is conceded to cover blocks of ore definitely developed and open to sampling and inspection on four, three, and sometimes only two sides of the block. The number of sides exposed considered necessary to guarantee beyond a reasonable doubt the existence of the ore in place is largely a matter of personal judgment, depending upon the regularity and homogenity of the particular ore occurrence. The more regular as to shape, and the more homogenous as to character and values the ore body, the fewer definite exposures are considered necessary. Conversely, irregularly shaped deposits, spotty as to values, are considered to require comparatively complete development before ore in sight can be estimated with certainty.

As it is characteristic of contact-metamorphic deposits, the ore occurrence at Christmas is quite spotty, and absolutely irregular as to shape. Therefore, to definitely guarantee and measure certain ore reserves the most complete development would be necessary. Such development has not been done, as is the case in most mines of similar type. The irregularity is such that cheaper results may be obtained by following the ore, rather

than by risking capital to explore continually ground which is wholly problematical as to values contained. The consequence is that there is almost no ore at Christmas which is exposed on more than one side. In mining operations these faces are followed to wherever they may lead. While this is undoubtedly the best system on which to operate the property, it makes an estimate of ore in sight, according to best conventions as above outlined, and which will definitely assure the return of capital invested in the property, impossible. The spotty nature of the occurrence is such that it is out of the question to estimate with certainty the lateral extent and total value of the ore bodies now exposed on one side only. Therefore it may be said that the Gila Copper Sulphide Company has little or no ore in sight in the accepted conventional sense of the phrase.

The management advised the writer that from their knowledge of the property they could operate for one year without further development of importance and not run out of ore. The writer is inclined to agree with this statement. The following of faces now exposed and of streaks and other indications of ore as encountered, always leads to discoveries of importance in a spotty deposit of this type. Furthermore important disclosures may be made by following mineralized exposures which are just below commercial grade, away from the porphyry contact towards the marble at the edge of the contact zone, in which direction values in a deposit of this type show a distinct and very general tendency to increase, as previously stated in this report under Geology.

If the employers of the writer wish to be assured by ore in sight, conventionally estimated, of a certain return of capital invested, the mine cannot be said to warrant it, and should not be considered further. At the same time the writer believes that it has an excellent probable future, subject to certain conditions of copper market, etc., hereinafter mentioned.

If the writer's employers are interested in taking intelligent chances on future ore developments, the writer is of the opinion that the property is decidedly interesting, subject to more careful geological study, and the checking of figures furnished by the management, and accepted on faith herein, and to the recently mentioned copper market, etc., conditions, which must be carefully considered in view of the represented operating costs at the property.

The consequences of taking such "intelligent" chances will be now discussed under Probable Ore and Possible Ore.

PROBABLE ORE:

As stated above, it is probable that it will be possible to extract enough ore from development already done to keep the mine in operation for a year or more. This would not be good mining policy, as at the end of that period the mine would have great difficulties in maintaining its daily tonnage. To definitely measure the Probable tonnage of this ore, which is now mostly exposed on one side only, would require a large and expensive amount of sampling and surveying, which the writer did not feel to be warranted for a report of a preliminary nature.

He is willing to state, however, that he is of the opinion, basing this opinion on his general knowledge of such deposits, that the mine has in the vicinity of 100,000 tons of ore that may be termed probable, and which can be expected as a result of the following of present ore exposures and strong indications of ore. This ore could be expected to be of average grade, namely 2.8% copper, and from twenty-five to thirty cents in gold and silver. Mr. Julius Kruttschnitt, Jr., Southwestern Manager for the American Smelting and Refining Company, advised the writer that an estimate made by his men at the start of operations in 1916, showed roughly 250,000 tons of probable ore,

averaging 2.5% copper, and about 25 cents in gold and silver. It will be noted that Mr. Kruttschnitt takes a lower copper content figure into consideration, which would naturally raise the tonnage considered. Also it is very doubtful if the mine is now in as well a developed condition as it was at the start of operations by the American Smelting and Refining Company. The writer bases this conjecture on two facts. First, The American Smelting and Refining Company received as compensation for their services as operators 10% of net profits, which would tend to make them operate on a hand to mouth basis, and avoid expenditure for all development except that which was essential. Secondly, the statistics given later herein show that 256,815 dry tons of ore were shipped in the years 1916, 1917, 1918, while total development and prospecting footage amounted to 13,964 feet. This shows a ratio of 18.4 tons of ore mined to one foot of development accomplished. In the opinion of the writer this ratio is entirely too high to maintain such a spotty irregular deposit in good condition as to ore reserves. Many mines with large well-defined ore bodies maintain a much higher ratio than this, with safety, On the other hand, the Phelps-Dodge mines in Bisbee, Arizona, which are spotty occurrences, though somewhat different in type, find it necessary to observe a ratio of 10 tons of ore shipped to one foot of prospecting and development accomplished to maintain proper ore reserves. The writer is of the opinion that the property at Christmas could hardly exceed a ratio of twelve or thirteen tons to one foot of development and keep the mine in proper condition. Therefore, he feels sure that the mine is not in as well a developed condition as in 1916, and that his rough estimate of 100,000 tons of probable ore, is approximately checked by the more careful estimate of the American Smelting and Refining Company, made in 1916, and including lower grade ores than those considered by the writer.

POSSIBLE ORE:

The important ore zones at the property may be grouped as follows:

200 South ore body,
Las Novias ore body,
314 ore body,
Kiegel ore body,
and
Old Christmas workings.

The Old Christmas workings are now operated entirely by leasers. They are perhaps a quarter of a mile to the west of Number 3 shaft, and have no means of ore transportation other than by burro packing. Furthermore the ore shows a tendency to occur in streaks and somewhat smaller bodies. The zone is not well prospected except on the upper levels, and it is possible that further discoveries of importance might be made in depth, as maintained by the management. The writer did not inspect these workings carefully, and has no definite opinion in the matter.

The Kiegel ore body is worked out so far as known, though it has not been explored on the 200, 350, 500, or 800 levels. Inasmuch as it showed commercial ore on the 100, 300 and 400 levels, it would seem worthy of further prospecting, especially on the levels intervening between known discoveries. It is not, however, a large ore zone, as are the first three zones mentioned above, and is chiefly interesting as a limestone fragment of remarkable persistence contained within the porphyry.

The 200 South, Las Novias, and 314 ore bodies are in the main limestone series adjacent to the porphyry contact. The latter two bodies are located in well-defined "bays" in this contact. Reference to light blue crayon notations on the accompanying maps will show the location of these three ore bodies, and also the Kiegel, and the extent to which they have been explored. Taking them up one by one we have:

The 200 South ore body:

Level,	Degree of Exploration,	Results,
100	Slight,	?
200	Thorough,	Good discoveries,
300	Just starting,	Satisfactory to date,
350	None,	--
400	None,	--
500	Just starting,	Satisfactory to date,
800	None,	---

The Las Novias ore body:

Level,	Degree of exploration,	Results,
100	Fairly thorough,	Good,
200 *	None,	--
300	Thorough,	Very good,
350	Thorough,	Very good,
400	Uncomplete,	Unsatisfactory to date.
500	None,	--
800	Zone hardly touched,	Satisfactory, See Map No. 8

* Except by 301 Raise. See note on Maps Nos. 3 and 4.

314 Ore body:

Level,	Degree of Exploration,	Results.
100	None,	--
200	"	--
300	Thorough,	Good,
350	Moderate,	Fair,
400	Uncomplete,	Unsatisfactory. See note on Map 6 re. shale.
500	None,	--
800	None,	--

The above will be best understood by careful comparison with accompanying maps. The "Results" indicate, in the opinion of the writer, every indication that further discoveries of importance may be expected by more complete prospecting of these zones.

The following table, showing tonnage with copper assay, produced in January, 1919, from these three ore bodies by horizons is interesting:

Horizons,	200 South,		Las Novias,		314	
	Tons,	% copper,	Tons,	%copper,	tons	%copper.
Above 200	2244	2.75	207*	4.19*		
200 to 300	339	2.55				
300 to 350			1434	3.28		
250 to 350					1836	3.14
500	102	3.61				
800			See Map	No. 8.		

* 301 Raise, mentioned as just cutting Las Novias zone on 200 level.

NOTE: These assays are taken from samples made before waste was picked out by hand sorting on the conveyor belt, and therefore should be slightly low.

With the exception of 301 Raise in the Las Novias body on the 200, this table shows a gradual increase in values, in the deeper workings, which is a most encouraging feature. As previously mentioned most of the ore below the 300 level is chalcopyrite, and probably of primary grade.

Therefore, the writer is of the opinion that excellent chances for ore discoveries exist in unexplored portions of known ore zones, and that there is no indication that values will diminish with depth, until the quartzite basement is encountered. At the same time it should be borne in mind that exploration on the lower levels has been most meagre, and that it is impossible to substantiate this opinion with facts.

Probably wellover 75% of the main porphyry contacts within the property limits are totally unexplored, and it seems probable that important ore zones now totally unsuspected might be discovered by such further prospecting.

Everything considered, the writer does not hesitate to state that in his opinion intelligent prospecting will keep the mine well supplied with ore of grade equal to that now being produced, for many years to come.

MINING METHODS, ETC.:

The ideal method of extracting ores at Christmas would be by the room and pillar system, especially in the thicker beds. Unfortunately there is an unwritten, but none the less official, ruling of the State Mine Inspector which prohibits miners from working more than twelve feet below an untimbered roof or back. Therefore, all thicker beds must be taken in separate slices, or else by an adaptation of the shrinkage system, which permits the miner to work on broken rock at all times and keeps him close to the back of the stope. The necessity of such methods adds considerably to mining costs, but is unavoidable. In the thinner beds, and in the old Christmas workings where ore occurs in small irregular bodies, there is no opportunity for an intelligently planned system of mining, ordinary "gouging" being in vogue.

As previously cited, there is no general method of "blocking out" reserves previous to extraction. The ore occurrence is probably too simple as a whole and too complicated and irregular in its smaller aspects to justify it. In the case of a few shrinkage stopes, systematic extraction level development has been undertaken, with accessory extraction raises accordingly.

In general, however, prospecting and extraction drifts are driven roughly parallel to the porphyry contact, raises put up till the beds are

tapped, and ores broken in both directions, towards and away from the porphyry contact, from these raises. It is very questionable if any more far-seeing system can be devised, except in occasional instances, as the spotty nature of the ore occurrence makes all advance work very risky. However, the system results in a conspicuous use of the wheelbarrow in stopes, well known as a most expensive method of handling ores.

All operations in the old Christmas workings and those at various parts of the surface are conducted on a leasing basis by typical "gophering" methods. Ore produced is packed by burros to No. 3 shaft, where it is weighed and sampled. The gross value is figured, all local, transportation and smelting costs deducted, and the resulting net check split between the leaser and the company. After sampling, the ore is delivered to the tramway and mixed with company ore from the main No. 3 workings. The method of figuring the cost of lease ore may be seen from SEGREGATED COSTS following soon hereafter. All INDIRECT mine expenses are prorata-ed, according to tonnage, against Lease and Mine ore, the company bearing all INDIRECT COSTS. While this lease ore cost runs considerably higher than the orthodox company mining costs, it is doubtful if it could be bettered except by an improvement in transportation methods to replace the burros. The leasing system gives impetus to individual initiative, which is essential in small relatively isolated ore bodies, which are difficult to supervise, and where clean mining and the holding of timber and supply consumption at a minimum is important.

MINING COSTS:

Following are comparative costs of Mine and Lease ore production, the most significant items being underlined in red.

Total costs including both Mine and Lease ore, will be taken up hereafter under the heading DISCUSSION OF TOTAL COSTS AND PROFITS WITH RELATION TO COPPER MARKET.

~~will be taken up hereafter, under the heading DISCUSSION OF TOTAL COSTS AND PROFITS WITH RELATION TO COPPER MARKET.~~

The comparative mine and Lease ore figures are;-

	1916	1917	1918
Comparative Statement of Mine Ore Sales	58,234 tons	79,989 tons	73,388 tons
Value FOB RR cars of Mine ore sold	$522,117.99	$667,028.53	$555,323.81
Cost FOB RR cars of Mine ore sold * * Amortization not included.	180,401.41	293,346.95	297,644.93
Gross Profit on Mine ore sold	341,716.58	373,681.58	257,678.88
Per ton value FOB RR cars of Mine ore sold	8.97	8.34	7.57
Per ton Cost FOB RR cars of Mine ore sold* *Amortization not included	3.10	3.67	4.06
Per ton Gross Profit on Mine ore sold	5.87	4.67	3.51
Gold Assay per ton of Mine ore sold	.007 oz	.007 oz	.007 oz
Silver Assay per ton of Mine ore sold	.26 oz	.27 oz	.29 oz
Copper Assay per ton of Mine ore sold	2.74%	2.56%	2.6476%

Comparative Statement of Lease Ore Sales	13,554 tons	10,291 tons	17,482 tons
Value FOB RR cars of Lease ore sold	$161,562.22	$135,479.67	$226,686.00
Cost FOB RR cars of Lease ore sold	108,751.35	80,188.86	134,005.95

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	1916	1917	1918
Gross Profit on Lease ore sold	$ 52,810.87	$ 55,290.81	$ 92,680.05
Per ton Value FOB RR cars of Lease ore sold	11.92	13.17	12.97
Per ton Cost FOB RR cars of Lease ore sold *	8.02	7.82	7.67
* Amortization not included.			
Per ton gross profit on Lease ore sold	3.90	5.35	5.30
Gold Assay per ton on Lease ore sold	.007 oz	.006 oz	.006 oz
Silver Assay per ton on Lease ore sold	.30 oz	.23 oz	.24 oz
Copper Assay per ton on Lease ore sold	3.47%	3.61%	4.13%

SEGREGATED COSTS.

	1916	1917	1918
Number of days worked	?	342.5 days	323 days
Cost per ton of all ore Lease and Mine combined produced-direct.	1.98	3.08	3.66
Cost per ton of all ore Lease and Mine combined produced - indirect *	2.04	1.07	1.08

* Amortization not included

DIRECT MINE ORE COSTS

Cost per ton of Mine ore production - Direct	$ 2.132	$ 2.58	$ 2.965
Cost per ton of Mine ore production- Breaking and Stoping	.942	1.169	1.69
Cost per ton of Mine ore production -Crushing and Conveying	.078	.047	.087
Cost per ton of Mine ore production - Development	.493	.627	.408
Cost per ton of Mine ore production - Draining	.101	.124	.157
Cost per ton of Mine ore production - Hoisting	.126	.106	.126
Cost per ton of Mine ore production - Maintenance of Haulage ways	?	.015	.003
Cost per ton of Mine ore production - Sampling	.024	.029	.025

	1916	1917	1918
Cost per ton of Mine ore production - Sorting, weighing and loading	$ .126	$ .112	$ .085
Cost per ton of Mine ore production - Timbering	.035	.092	.105
Cost per ton of Mine ore production - Tramming	.184	.255	.279

INDIRECT MINE ORE COSTS

Cost per ton of Mine ore production - indirect*	.960	1.109	1.087
* Amortization not included			
Cost per ton of Mine ore production - General expense	.28	.413	.436
Cost per ton of Mine ore production - Amortization	None	Not included	.165
Cost per ton of Mine ore production - Insurance	.003	.003	.002
Cost per ton of Mine ore production - Laboratory	.02	.024	.012
Cost per ton of Mine ore production - Lighting	.016	.029	.035
Cost per ton of Mine ore production -Miscel. supplies		.009	.004
Cost per ton of Mine ore production -N.Y. office AS&RCo	.15 (repayment loan)	none	none
Cost per ton of Mine ore production - Salaries	.167	.191	.195

	1916	1917	1918
Cost per ton of Mine ore production - Machine shop	-	.055	.095
Cost per ton of Mine ore production - Taxes*	.18	.223	.127
*Writer's note: Probably reserve fund for State Taxes only: in amount	$10,770.57	$17,706.07	$9,304.74 for first half of 1918.
Cost per ton of Mine ore production - Tools	-	.015	.013
Cost per ton of Mine ore production - Tramway	.118	.136	.167

MEMORANDUM
IN RE: COST OF LEASE ORE PRODUCTION

Following items used in computing costs;

DIRECT

1916	1917	1918
Burro Packing	Burro packing Labor Shoveling Sampling Tools and Supplies Paid Leaser Misc. Supplies	Burro packing Labor shoveling Sampling Tools and Supplies Paid leaser Misc. Supplies Surface Tramming Hoisting

INDIRECT

1916	1917	1918
Salaries	Salaries	Salaries
General Expense	Liability Insurance	Liability Insurance
Laboratory Sampling and shovelling	Laboratory	Laboratory
Tramway & Loading	Tramway & loading	Tramway & Loading
Paid Leaser		Amortization *
Floating Indebtedness		

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Readjustment of Direct and Indirect costs in 1917 explains the great difference in direct and indirect cost per ton in 1916 and 1917

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*To maintain comparative value of figures, amortization is not actually included in total or indirect cost for 1918.

DIRECT LEASE ORE COSTS

	1916	1917	1918
Cost per ton of Lease Ore production - Direct	$ 1.322	$ 6.946	$ 6.577
Cost per ton Lease ore production - air drills &pipe	none	none	.025
Cost per ton Lease ore production - Development	"	"	.231
Cost per ton Lease ore production - Draining	"	"	.08
Cost per ton Lease ore production - Hoisting	"	"	.033
Cost per ton Lease ore production -labor shovelling	Incl. with Labor and sampling.	.279	.201

	1916	1917	1918
Cost per ton of Lease Ore production - Misc.supplies	None	$ .012	$ .063
Cost per ton of Lease ore production - Burro packing	$ 1.322	1.333	1.024
Cost per ton of Lease ore production - paid leaser*			
* According terms of lease.	5.863	5.057	4.673
Cost per ton of Lease ore production - Power	none	none	.017
Cost per ton Lease ore production - Sampling	Incl.with labor and shovelling	.279	.087
Cost per ton of Lease ore production - Surface Tramming	none	none	.016
Cost per ton of Lease ore production - Taxes	-	-	.014
Cost per ton of Lease ore production - Tools,supplies and shop expenses	none	.069	.041

INDIRECT LEASE ORE COSTS

Cost per ton Lease ore production - Indirect	$ 6.733	$ .787	$ 1.061
Cost per ton Lease ore production - Amortization*	none	not charged	.174 *

* See Memorandum

Cost per ton Lease ore production -Floating Indebtedness	.008	none	none

	1916	1917	1918
Cost per ton Lease ore production - General Expense	$ .026	none	$ .216
Cost per ton Lease ore production - Laboratory, Sampling & shovelling	.45	(See direct costs	See Direct Costs
Cost per ton Lease ore production - Laboratory	see above	.061	.037
Cost per ton Lease ore production -Liability Insurance	none	.203	.133
Cost per ton Lease ore production - Salaries	.222	.36	.482
Cost per ton Lease ore production - Tramming & Loading	.164	.164	.179

PROSPECTING AND DEVELOPMENT COSTS AND FOOTAGES.

Total Cost Footage per foot not including dead work	-	$ 10.97	$11.92
Total Labor cost footage per foot - not including dead work	-	7.19	6.90
Total Material and Power cost footage per foot - not including dead work	-	3.78	5.02
Development Footage	2,333 feet	3,448 feet	2,792 feet
Development cost per foot		$ 12.30	$10.84
Development Cost per foot -Labor		7.14	6.30
Development cost per foot Mat'l and Power		4.24	4.54
Prospecting Footage	1,081 feet	3635 feet	675 ft

	1916	1917	1918
Prospecting cost per foot	-	$ 10.58	$16.19
Prospecting Cost per foot-Labor	-	7.25	9.26
Prospecting Cost per foot Mat'l and Power	-	3.33	6.99

As mentioned previously, these costs could doubtless be improved by the adoption of room and pillar system of mining, could the State Mine Inspector be pursuaded to permit it. Hoisting by skips, or the abolition of ore hoisting and pumping by the construction of a drainage tunnel might improve matters appreciably.

The writer is also inclined to believe that a detailed system of mine costs, along general efficiency lines, would show leaks and chances for improvement, which are not now recognized. The mine evidently has no such system, and it is extremely necessary to efficient operation of any large and involved enterprise. These suggestions are merely offered as worthy of more detailed investigation, should the writer's employers be come interested.

The writer is very definitely of the opinion, however, that the present organization is not getting sufficient work out of the men underground. He bases this opinion on

his knowledge of labor, with which he has had considerable more or less intimate contact, his personal underground observations of labor at the property, and certain significan figures complied by the American Smelting & Refining Company during their management. One such figure shows average mine cars mucked per man at approximately eight per shift. Mucking is almost wholly a matter of muscle and willingness to work, and the writer is of the opinion that the figure is at least 100% too low, even taking into account local conditions and the quality of the labor. As labor is the principal cost item, here exists a great opportunity for reducing costs. In a property whose cost per pound of copper runs as close to the normal metal market as in the case of the Gila Company, this saving is a matter of prime importance.

The cost of labor at the Christmas property is approximately 60% of the total cost. The writer is definitely of the opinion that it would be an easy matter for intelligent, determined and forceful management to increase the output per man by at least 25%, perhaps more. A 20% saving of 60% of the whole amounts to a saving of 12% of total costs With the present production cost per pound of copper in the vicinity of 15½ cents a saving of 12% would reduce it by 1 9/10 cents, or to a little over 13½ cents per pound of

copper. The importance of this cannot be over estimated as at present copper markets it means the difference between profit and loss. While the writer is personally convinced from his knowledge of labor, that this is possible; it depends so much on the policy of the company in getting high class, well paid, forceful foremen, bosses, etc., that he does not feel permitted to take it into consideration in his estimate of the property.

The writer is therefore of the opinion that there is a distinct opportunity to better production costs, but will use past average performances only in his estimate of the commercial possibilities of the property.

TRANSPORTATION AND COSTS:

The aerial tramway has been described under EQUIPMENT. The cost of operation thereof is said to be about 17½ cents per ton of ore. The writer has operated an almost exactly similar tramway in Utah, under less favorable conditions and for more than twice the tramming distance, for about 14 cents per ton. It is reported that a large part of the present cost is due to defective materials, resulting from war conditions. This seems probable. In the writer's opinion the cost should average from 25% to 35% lower at least, than at present.

The freight rate from Christmas station to the Smelter at Hayden is but 30 cents, plus war tax of 3%, per ton of ore. This is an extremely favorable circumstance, and cannot be equaled by many large companies who own their own smelters and have placed them where they saw fit to do so.

SMELTING:

All ore produced at the mine is shipped to the American Smelting and Refining Company Smelter at Hayden, about eight miles away, where it is treated under custom contract. ~~A copy of this contract is attached hereto.~~

The mineralogical composition of the ores is such that they are almost ideally proportioned as to Lime (Ca O) Iron (Fe) and Silica (SiO_2), the latter assay being actually for all insolubles, and including alumina. There is no apparent indication of a high alumina content. As a result the ores are to all practical purposes self fluxing and can be smelted very cheaply.

The Smelter contract held by the Company is the most favorable agreement of the sort ever seen by the writer. It is probably closely on a par with contracts held with the American Smelting and Refining Company by such Companies as the Ray Consolidated, Chino, Utah Copper, etc.- who are in a position easily to smelt their own ores in case

they could do better than by custom contract. The cause of this contract is undoubtedly the great desirability of the ores from a chemical standpoint, in Hayden operations, and the fact that it was negotiated at a time when the Mining Department of the American Smelting and Refining Company was about to undertake the management of the property, and be paid on a basis of a percentage of net profits.

The contract has about seven years yet to run, which would be one of the greatest assets of the company, except for litigation connected therewith, which will be discussed under the next heading.

It is worthy of comment ~~to note~~ that the contract is drawn without penalties, pays for a very large percentage of the copper, pays for gold and silver contents so small that they would be beneath minimum contents allowed in all standard contracts, and has a relatively low treatment charge. Furthermore, the contract pays for Lime (Ca O) up to 510 tons per month, which possibly satisfies the Smelter's requirements for use against the iron of the Ray concentrates, which are smelted at the same plant in large quantities. As monthly shipments from Christmas always exceed a 510 ton lime content, the Gila Company is not paid in full for all lime shipped.

The contract is limited to 7500 dry tons per month, and the Smelting Company has steadfastly refused to

allow this maximum to be exceeded. This is unfortunate, as the mine could easily produce a greater tonnage. However, it is a most favorable contract in spite of this,

There is some talk locally of construction of another smelter in this vicinity, to operate on the ores of the Ray Hercules Company and the Magma Copper Company, the Smelter to be owned jointly by these companies. So far as known by the writer, this Smelter is still entirely problematical. However, should it be constructed, an outlet for a further tonnage of the desirable ores from Christmas could doubtless be found, and with freight rates not greatly in excess of those now in effect to Hayden.

SMELTER CONTRACT LITIGATION:

In July 1918, shortly after the U.S.Government made its 25% increase in freight rates, custom smelters throughout the country arbitrarily cancelled their outstanding contracts, and increased smelting rates. Three contracts with properties under the management of the writer, in New Mexico, Arizona and Utah respectively, were similarly treated at that time. The American Smelting and Refining Company carry the following clause, or an equivalent thereof, in all contracts:

SMELTING CONTRACT
CLAUSE 10.

" In case the Mining Company and the Smelting Company or either of them, are hindered in the performance of this contract by any one or more of the following causes;- act of nature, strike of employees affecting operations, fire, flood, traffic interruption, war insurrection or mob violence, requirement or regulation of government, financial crisis, or any other cause whatsoever beyond the control of the said parties or either of them, and such cause shall operate to make it impossible except at heavy loss or undue sacrifice or impracticable without unusual hardship, or burdensome in unreasonable degree on the part of the Seller to mine, ship or deliver the ores herein contracted for, or, on the part of the Buyer to receive, purchase or treat the same, or to market or otherwise dispose of the metals produced therefrom, then, and in any such event, no liability, for damages or otherwise, shall accrue by reason of any failure or refusal to mine, ship, deliver, receive,purchase or treat such ores so long as any such cause shall remain operative as aforesaid, but the operation of this contract shall be suspended until the cause of the disability shall be removed or become inoperative, and the time of performance of the contract shall be extended for a period equal to such period of suspension, provided, however, that the said contract, and the provisions thereof, shall come into full force and effect immediately upon the termination

of the disability induced by any of the causes aforesaid".

The Smelting companies announced that the raising of freight rates by the Government affected their cost of coke, and other supplies, and the cost of shipping copper bullion to refineries in the east. They maintained that the particular emergency is covered in their contracts by the phrase "requirement and regulation of government", and made the contracts "burdensome" etc. Therefore, they cancelled all contracts and announced their willingness to stand suit in the matter.

The Smelting Company demanded an increase in treatment in amount $1.50 per ton from the Gila Company, who refused payment and obtained temporary injunction forcing the Smelting Company to accept their ores, as heretofore outlined under HISTORY . The writer is advised that the matter is now pending in the Courts of New York State and is as yet entirely undecided.

The importance to the Gila Company of the outcome of this suit can be seen from the following figures, which show that if the Smelting Company wins its full claims under litigation, the cost of production per pound of copper will be increased by about 3.1 cents.

	1916	1917	1918 1st. 4 mos.
Total Value Shipments	$1,022,156.36	$1,127,358.25	$ 361,110.73
Smelting Charges	251,663.82	301,974.32	102,149.87
% of Total Value	24.62%	26.78%	28.29%
Per ton	$ 3.33	$ 3.35	$ 3.36
If smelting rate had been $1.50 more than it was: Smelting charges would have been increased	$113,501,02	$135,417.78	$45,661.72
Increased total smelting charges	$365,164.84	$437,392.10	$147,811.59
% of Total Values	35.72%	38.80%	40.93%
Per Ton	$ 4.83	$ 4.85	$ 4.86
All Shipments:			
Total value per ton	$ 13.50	$ 12.48	$ 11.86
Smelting and converting	3.33	3.35	3.36
Gross value per ton	10.17	9.13	8.50
Freight per ton	.65	.24	.33
Net value per ton	9.52	8.89	8.17
Cost per ton	4.03	4.14	4.57
Profit per ton	5.49	4.75	3.60
Mine Ore Shipments;			
Net value per ton	$ 8.97	$ 8.34	$ 6.92
Cost per ton	3.10	3.67	4.07
Profit per ton	$ 3.90	$ 5.35	$ 7.25
Lease Ore Shipments:			
Net Value per ton	$ 11.92	$13.17	$14.21
Cost per ton	8.02	7.82	6.96
Profit per ton	$ 3.90	$ 5.35	$ 7.25
Profit on all: If smelting rate had been $1.50 more per ton. Profit on all shipments would have been.	$ 3.99	$ 3.25	$ 2.10
Profit on mine ore would have been	$ 4.37	$ 3.17	$ 1.35
Profit on lease ore would have been	$ 2.40	$ 3.85	$ 5.59
Avge Copper quotation	$.273861	$.273009	$.2350
Cost per lb Copper	.15328	.165933	.15498
Profit per lb*	$.120681	$.107076	$.08002
% of profit = quotation / profit	44.05%	39.92	34.05

* Does not include amortization, depreciation, depletion, bond interest or any New York overhead.

Total Pounds Copper paid for in 1916	3,738,913.83
" " " " " " 1917	4,125,527.28
" " " " " " 1918	4,607,080.29
" " " " " " three years	12,471,521.40

Total dry tons ore shipped in 1916	75,667.35
" " " " " " 1917	90,278.52
" " " " " " 1918	90,869.33
" " " " " " three years	256,815.20

256,815.20 x $1.50 increased smelting charge = $385,222.80 increased smelting cost.

$385,222.80
12,471,521.40 lbs Cu = $.031 increased cost per lb. copper if smelting rates increased $1.50 per ton.

	1916	1917	1918
Costs per pound copper	$.15328	$.165933	$ .16289
Estimated increase per lb.	.031	.031	.031
Past costs if smelting charge had been increased $1.50 per ton	$.18328	$.196933	$.19389

The writer's understanding of the situation is that the smelting companies are justified in their stand to the effect that increased freight rates constitute a "regulation of government". Therefore, the outcome of the suit should depend on the intent to which the contract can be proved to be "burdensome". Testimony of this nature will involve both technical and cost accounting experts for both sides, and the matter is entirely too complicated and uncertain to be considered in more than a general way in a report of this nature.

It is, however, a matter of prime importance to the immediate future of the property, as can be seen from the preceding figures when compared with the present copper market. It should be considered most carefully, and competent legal and technical advice sought in the matter, should the employers of the writer decide that they are interested in the acquisition of the property.

DISCUSSION OF TOTAL COSTS AND PROFITS WITH RELATION TO COPPER MARKET.

Following are cost figures giving general ideas of operations of the past three years. The most important items being underlined in red. Certain comments follow the figures:

	1916	1917	1918
Tons ore produced	77,020 Tons	89,830 Tons	91,000 Tons.
% of Copper	2.892 %	2.689 %	2.934 %
Cost per lb. Copper*	$ .15328**	$ .165933**	$ .16289**

* Including freight, insurance and commission on bullion. New York overhead including Bond interest, depletion, depreciation, amortization, etc. not included. (Writer's note: Federal taxes are not mentioned as being included - Mr Morris is of the opinion they are not included.)

** Average for 3 years - $0.160701

Earnings*	$440,611.08	$443,153.27	$303,746.70
*See note immediately above.			
Amortization	none	14,657.96	15,170.25
Depreciation	none taken upon mine books		13,043.76
Dry Tons Ore shipped	75,667.35	90,278.52	90,869.33
% Moisture per ton	4.6%	3.1%	2.9%
Total Value	$1,022,156.36	1,127,358.25	1,115,237.80
" " Gold	9,940.38	11,581.26	12,100.23
" " Silver	11,159.47	15,480.76	19,946.84
" " Copper	966,872.51	1,062,939.56	1,046,470.73
" " Lime (CaO)	34,184.00	37,356.67	36,720.00
" Treatment Charges	251,663.82	301,974.32	304,939.11
Gross Value	770,491.96	825,383.93	810,298.69
Total Freight Charge	51,722.29 *	23,329.21 *	29,137.64*

*For about two months in 1916 shipments were made to Sasco at greatly increased rate. In June 1918 increased rates went into effect.

Net Value	718,769.67	802,054.72	781,161.05

	1916	1917	1918
Total value per ton	$ 13.50	$ 12.48	$ 12.27
Value Gold " "	.13	.12	.13
" Silver " "	.15	.17	.22
" Copper " "	12.77	11.78	11.52
" Lime (CaO) "	.45	.41	.40
Total Treatment chgs. per ton	3.36	3.34	3.35
Gross Value per ton	10.18	9.14	8.92
Freight charges per ton	.68*	.26*	.32*
Net value per ton *See note foot preceding page	9.50	8.88	8.60
Gold Assay per ton	.007 oz.	.007 oz.	.007 oz
Silver " " "	.27 "	.26 "	.28 "
Copper " " "	2.869%	2.685%	2.935%
Iron (Fe)" " "	17.9%	16.7 %	19.7 %
Lime (CaO)" " "	25.9%	26.9 %	25.3 %
Silica " " " (probably insolubles - writer)	33.1%	32.2 %	31.4 %
Total ounces Gold shipped and paid for	532.779 oz.	622.264 oz.	648.212 oz.
Total ounces silver Shipped	20,581.866 "	23,794.261 "	25,710.990 "
" " " paid for	16,395.703 "	18,977.169 "	20,478.346 "
" pounds Copper shipped	4,345,573.84#	4,848,693.45#	5,334,034.63#
" " " paidfor	3,738,913.83#	4,125,527.28#	4,607,080.29#
Average price received for gold per oz.	$19.00	$19.00	$19.00
Average market quotation Silver per oz.	$ .68063	$ .815757	$ .974045
Average market " copper per lb.	.27396	.273	.242196
Average net price received per lb. copper paid for	.258597	.257649	.227144
Average price received for lime (CaO) per unit (20 lb.)	.06	.06	.06
Comparative statement of ore sales	71,788 tons	90,285 tons	90,770 tons
Total net value of all ore sold F.O.B. R.R. cars	$683,680.21	$802,508.42	$782,009.81
Total cost F.O.B. R.R. cars of all ores sold*	289,152.76	373,747.69	431,650.88
*Amortization not included			
Total Gross Profit on all ore sold	394,527.45	428,760.73	350,358.93
Per Ton net value F.O.B. cars of all ore sold	9.52	8.89	8.61
Per ton cost F.O.B. R.R. cars of all ore sold*	4.03**	4.14**	4.75**
*Amortization not included			
**Average for 3 years $4.31 per ton.			
Per ton Gross Profit on all ore sold	5.49	4.75	3.86

The average cost per pound of copper for the last three years has been shown to be $0.160701. This figure does not include New York overhead, Federal Taxes, Bond Interest, etc. which, of course, are actual costs. The figures were not available at the property, and hence are not included by the writer.

The average cost of ore, with the above mentioned items also not included, F.O.B. the railroad cars, is shown to have been $4.31 per ton. In the opinion of the writer the latter figure is entirely too high. The mine is well equipped, has little heavy ground and consequently requires little timber - is comparatively dry, selective mining is practised only in a general way, and everything considered, conditions may be said to be favorable to low costs. The writer is of the opinion that costs could be reduced by at least 25%, and perhaps considerably more. Materials, supplies, and labor are gradually getting cheaper. Also labor is now plentiful and an apportunity exists to bring pressure to increase the output per man. For the past two years, when labor has been scarce, this condition has not existed. As stated previously in this report there is a distinct opportunity at Christmas to decrease the cost of copper by increasing the efficiency of the labor. If the cost of ore per ton can be decreased by 25%, as a result of cheaper supplies and increased output per man, the cost per pound of copper would be decreased proportionately, (excepting as affected by New York overhead, etc.) which would bring it to the vicinity of 12 cents.

This figure would, it seems probable, show a profit on all markets for the next few years. However, this cost reduction depends completely on the management and the organization at the mine.

Therefore, with a copper production cost of about 16 cents per pound, which may be said to be susceptible of important reductions, and which may be increased even to as much as 19 cents should smelter contract litigation be decided entirely adversely to the Gila Company, it is evident that the future of the property depends very delicately upon the future of the market price of copper.

The employers of the writer should hence consider the future probabilities in copper sales quotations with great care, securing competent advice thereon, before deciding to acquire the property.

FINANCIAL STATUS:

The writer has made no investigations, except as roughly outlined heretofore under History, into the general financial status of the Gila Copper Sulphide Company. While this is a matter of first importance, it has been assumed that it will be cared for by the employers of the writer in person.

CONCLUSIONS:

The writer is of the opinion that the future success of The Gila Copper Sulphide Company depends directly on the following factors:

1. Success of future prospecting for ore.

2. Outcome of smelter contract litigation.

3. Reduction of costs of production.

4. Future average copper sales market.

The probability of future ore discoveries of important tonnage and of a grade at least equal to present showings is excellent, but this ore is not definitely known to exist in necessary quantities according to best accepted methods of estimating.

The outcome of the smelting contract litigation is a matter to be passed upon by metallurgical cost experts and attorneys. It may result in increasing the cost of copper production by as much as 3.1 cents per pound, though it seems improbable that the smelter will win its full claims.

The reduction of the cost of production depends solely on the management of, and organization at, the property.

If smelter contract litigation results in full favor of the Gila Company, and production costs are reduced as the writer believes they can be, the property should produce copper at close to 12 cents per pound. If costs are not reduced and litigation is completely adverse, the costs per pound of copper should be in the vicinity of 19 cents. Neither of these figures include New York overhead, bond interest, Federal Taxes, etc.

The future probable performances of the copper sales market seem bright after "reconstruction" has properly set in.

However, this is a matter of conjecture, and the writer will leave it to his employers to set their own figure.

Under the present limited tonnage smelting contract an annual production of copper paid for should be about 4,500,000 pounds, corresponding profits or losses depending on the factors cited above.

If the employers of the writer, after investigation, are willing to take chances on these factors, the property is decidedly interesting. If not, the writer can not recommend that they make investment therein.

W. Burns.

GILA COPPER SULPHIDE CO.

Copy to be used in connection with Map #8.

Christmas, Arizona, August 1, 1913.

Mr. F. M. Murphy,
Prescott, Arizona.

My dear Mr. Murphy:

The importance of the recent developments on the 770* level of No. 3 shaft can hardly be over-estimated. In general, the work there has proved several things of the greatest importance to the whole property, namely: - The finding of ore on that level enriched by a secondary deposition of chalcopyrite and also the occurance of some chalcocite replacing pyrite tends to prove that the ground water level has no bearing on this secondary deposition and does not limit it as to depth, as the 770 level is five hundred feet below the general water level of the shaft. It means that secondary deposition of copper sulphides will be found at least as low as the lime measures extend. The occurance of ore on this level, better than has been found on the upper levels would make it appear that our richest ores will be found at a still greater depth.

The ground opened so far on the 770 level is more open and shattered and consequently more favorable to ore deposition than any ground opened on the upper levels, The indications also are that the porphyry is more extensive at this depth and a corresponding increase in the amount of ore can, therefore, be expected. This would follow for one reason at least. A greater mass of porphyry would crush and shatter the

* Writer's note - identical with 800 level.

contiguous lime measures more than a smaller mass would, and would therefore, make the ground more susceptible to the deposition of ore.

In general it might be said that the 770 cross-cut has crossed the main porphyry contact, and is now skirting along the west edge of a large mass of porphyry that apparently projects out into the lime measures for quite a distance. This is indicated in the cross-cut by the presence of porphyry which occurs in the form of flat beds or sills intruding on the right side of the cross-cut.

The cross-cut is now in a distance of 385 feet from No. 3 shaft, and the last one hundred feet is under the Las Novias Stope on the 300 level. For a distance of 150 feet back, at which point the cross-cut passed out of a red stained, seamed and shattered porphyry into a crushed and altered lime shale, ore has been found in varying quantities. Close to the above point some ore containing about 4% copper was found in the floor, and a recent caving of the ground near this place has exposed some ore in the roof, a sample of which contained 3.5% copper. The lime shale formation extended for 40 feet and then a narrow tongue of porphyry was encountered. On the north side of this porphyry at a distance of 312 feet from No. 3 shaft a body of ore was cut and exposed in the roof of the cross-cut for a distance of 16 feet, finally dipping up and out through the roof. This ore has been exposed for a width of 18 feet, and an upraise through it has exposed a vertical thickness, to date, of 16 feet. Samples

of this ore in the roof of the cross-cut and drift, and for a distance of six feet up in the raise averaged 5% copper. Its sulphur content is also good and would run 10% or 12%, making the ore about the best in the mine. About 6 feet in the raise the ore is intruded by a thin stringer of porphyry and some fragments of shale and the mineralization was not as good for several feet. Assays showing from 1.8% to 2.5% copper. However, the top is in better ore again and the last sample, taken 14 feet above the bottom, contained 3.9% copper. The ore slacks on exposure to the air and had to be supported by timbers almost as soon as it was opened up.

Below the ore body just described, and extending further along in the cross-cut to where porphyry begins to appear again at a distance of 350 feet from No. 3 shaft, ore occurs close to the floor and samples of it contained from 2.5% to 3.5% copper. The presence of this ore extending beyond the point where our good ore disappeared in the roof argues the continuation of that orebody overhead and that it could be reached by additional upraises from the cross-cut. For a distance of 35 feet back, the cross-cut has been partly in porphyry and partly in a crushed shale that shows evidence of mineralization in the fracture seams.

The drift, No. 802, started from the cross-cut to determine the extent of ore to the left or south or south west, ran under the ore at a distance of ten feet from the cross-cut. Beyond that the drift has been mostly in a crushed shale. The drift is now in a distance of 23 feet. At a distance of 20 feet

in, an almost vertical seam of soft grayish black ore about one foot in thickness, was cut. Samples of this ore contained about 2.5% copper. The drift is again in a crushed shale but fragments of lime-garnet ore are beginning to appear, the mineralization seems to be getting stronger as the drift advances.

Not enough development work has been done on the 770 level to base an estimate of tonnage, but judging from the ore found, the general character and favorable structure of the ground on the 770 level, particularly in the last 150 feet of the cross-out everything indicates the existance of a great area of ore bearing ground, much greater in extent than on the upper levels. In connection with this I might add that the Las Novias orebody which lies above, has been opened up for a length of almost five hundred feet, and an average width of over fifty feet and thickness of about seventy feet.

The developments on the 770 level of No. 3 shaft not only have a bearing on the immediate neighberhood of the No. 3, No. 1 and the Hackberry workings, but also on the Christmas workings on the south contact of the porphyry mass. The upper beds of the Christmas workings have been correlated after careful study by Mr. O. A. Hershey, with the Copper Knob beds of the No. 1 and No. 3 workings on the north contact of the porphyry mass. Therefore, the occurence of ore almost 800 feet below the Copper Knob ore beds has its important application to ore on the south contact of the porphyry mass, on which the Christmas and No. 2 workings are situated. The surface conditions there being in the region of No. 1 and No. 3 workings there is every

reason to expect that as good ore and ore in as large quantities exists on the south contact and that the ore will extend fully as deep as ore extends on the north contact, as shown in the 770 level of the No. 3 workings.

Yours Very truly,

Sgs. S.H.Sherman.

Partnership Agreement Announced for Miami Smelter: Inspiration Consolidated Copper Co. announced an agreement in principal with Amoco Minerals Co. for the latter to become an equal partner in its copper smelter at Miami, AZ. The agreement is expected to be completed on May 1, 1984. Amoco's Cyprus Bagdad Mining Co. subsidiary will provide the smelter with 85,000 tons of copper concentrate per year beginning January 1, 1987; Inspiration will remain responsible for

USBM "Minerals & Materials"

Dec 1983/Jan 1984

operations and continue to toll smelt copper concentrates obtained from other sources. The companies will also share costs of a $70 million construction program to bring the smelter into compliance with EPA clean air standards. Cyprus Bagdad's contract to treat its copper concentrates at the Phelps Dodge Corp. Hidalgo, NM, smelter expires on December 31, 1986.

ARIZONA DEPARTMENT OF HEALTH SERVICES

Division of Environmental Health Services

BRUCE BABBITT, Governor
Boyd Dover, Acting Director

JOINT NOTICE OF PROPOSED ACTION

by the

U.S. Environmental Protection Agency
Region 9 (M-5)
215 Fremont Street
San Francisco, CA 94105

415/974-7410

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

State of Arizona
Department of Health Services
1740 West Adams Street - Room 212
Phoenix, AZ 85007

602/255-1262

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 Health Services (ADHS) 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. 15-84-AZ May 7, 1984

Inspiration Consolidated Copper Company
Christmas Area
P.O. Box 4444
Claypool, Arizona 85532
NPDES Permit Number AZ0020516

The applicant operates a copper mine located in the Christmas Area in Gila County, Arizona. The existsing discharges, number 002 - Recycle Dam and number 003 - McDonald Shaft overflow, consist of mine drainage water. Discharge number 002 at latitude 33° 05' 24" N, longitude 110° 42' 36" W and discharge number 003 at latitude 33° 05' 55" N, longitude 110° 44' 52" W are both discharging to Dripping Springs Wash tributary to the Gila River. This segment of the Gila River (San Carlos Lake to San Pedro) has protected uses of Aquatic and Wildlife, Full Body Contact and Agriculture Livestock Watering. The draft permit contains effluent limits on Flow, Suspended Solids, Copper, Zinc, Lead, Mercury, Cadmium and pH. This permit, as proposed will expire June 30, 1989.

The Department of Health Services is An Equal Opportunity Affirmative Action Employer. All qualified men and women, including the handicapped, are encouraged to participate.

Public Notice No. 17-84-AZ May 7, 1984

Pinto Valley Copper Corporation
P.O. Box 100
Miami, Arizona 85539
NPDES Permit Number AZ0020401

The applicant operates a copper mine located approximately 8 miles west of Miami in Gila County. There are four existing discharge points. The effluent consists of process water and storm water runoff. The discharge points, No. 002 at latitude 33° 23' 39" N, longitude 110° 59' 05" W; No. 003 at latitude 33° 25' 20" N, longitude 110° 59' 50" W; No. 004 at 33° 23' 02" N, longitude 110° 58' 12" W and No. 005 at latitude 33° 22' 44" N, longitude 110° 57' 23" W all discharge to Pinto Creek. The protected uses of Pinto Creek are Aquatic and Wildlife, Partial Body Contact, Agriculture Irrigation and Agriculture Livestock Watering. The draft permit contains effluent limitations for Total Suspended Solids, Copper, Zinc, Lead, Mercury, Cadmium and pH. The permit, as proposed will expire September 30, 1988.

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 thirty (30) days from the date of this notice, either in person or by mail to:

U.S. Environmental Protection Agency
Region 9 (M-5)
Attn: GPA Permits Clerk
215 Fremont Street
San Francisco, CA 94105

Telephone: 415/974-7410

State of Arizona
Department of Health Services
Attn: BWQC Permits Unit
1740 West Adams Street - Room 212
Phoenix, AZ 85007

Telephone: 602/255-1262

All comments or objections submitted within thirty (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 thirty (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 thirty-three (33) days following the date of mailing by the EPA of the final permit. If no comments requested 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 Grants and Permits Administration Clerk, (M-5), within thirty-three (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.

CHRISTMAS MINE

Financial Results

Operations at the Christmas mine showed some improvement over 1963 but were still far from satisfactory. A small profit was earned in May and June, but for the full year 1964 the property showed a net loss of $345,000 or 14¢ per share. This compares with a loss of $1,090,000 or 46¢ per share in 1963. This improvement is primarily attributable to the tax savings allocated to the Division although price, cost and production factors have also made a positive contribution.

Copper Production

	Tons Ore Treated	% Copper	Pounds Copper Produced	% Overall Recovery
1964	953,231	1.493	24,952,471	87.69
1963	658,609	1.717	20,232,893	89.48

Mining

The Christmas ore body has turned out to be more difficult to mine than had been indicated by earlier development and experimental work. Contours of the ore body are more irregular and faulting is more extensive than was expected. Ground support is more of a problem, and where filling of mined areas is needed it must be done more promptly than was first anticipated. Water has ceased to be a direct impediment to mining but its continued presence, even in lesser amounts, makes the mine hot and humid in certain areas. Ventilation requires improvement.

In addition to these problems there are those of assembling, organizing and training a supervisory and labor force able to deal with them. A development program for supervisors has been started. Skilled miners and mechanics are scarce, and this situation is being eased by lowering our hiring standards and stepping up on-the-job training efforts. Mining crews, organized in contract groups to work in specific areas, show an average absenteeism rate of about 20%. These unscheduled absences are an important contributor to lack of efficiency, but they should diminish as training and experience progress.

Lower-than-average grade ore was found to extend considerably beyond estimated limits. This is favorable in the long run. But currently it had the effect of lowering the overall average copper content of ore mined, because to mine this area properly it is necessary to advance headings to the outer economic grade-limits of the ore before starting to retreat and extract ore left in pillars. Higher-grade areas are now available for mining, and 1965 should see an improvement in revenue per ton mined.

While the problems outlined are not insoluble, they are difficult and have so far kept the property from earning a profit. At the present time the mine is producing about three-fourths of its projected tonnage of 4,000 tons per day, and the operation is approaching a break-even basis. With increased production the mine should begin to show a profit.

Metallurgy

The extractive metallurgy at Christmas meets or exceeds expectation as to tonnage-capacity, grade of concentrate and extraction.

Christmas 1915

Development has again been started on this property near Winkelman and is progressing very steadily at present; about 100 men are employed and more are being taken on as progress permits. This is good news for this district which is considered a very important one. The Christmas mine was worked for some years back and had a small smelter erected upon it. Development work on the mine proved up large ore bodies of different grade and it is generally conceded that the property has the making of one of the big mines of Arizona. Its operation will be the means of calling good healthy attention to the district which really abounds in exceedingly favorable possibilities in the mining line.

News From Christmas Camp 8-1-15

The American Smelting and Refining company is to put down churn drill holes all over the 2300-acre estate, just acquired from the London-Arizona Copper company. Drilling operations should be under way by August 1.

The company may also resume sinking in the main shaft, which is down 300 feet. Another shaft is down 200 feet. That either of these will be the main working shaft is unlikely.

The plan is to ascertain the exact location and trend of the orebody and put down four compartment shaft in the most favorable location.

An aerial tram is to be constructed to transport the London-Arizona ores to the Hayden smelter. This will be in additin to the tram now being built from Christmas to Hayden.

One electrical transmission line, however, will be made to serve both the London-Arizona and Christmas. It will extend through a pass in the hills, straight to the center of the London-Arizona ground, and a branch will be run from there to Christmas.