CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

RPM

ANACONDA COPPER MINING COMPANY

GEOLOGICAL DEPARTMENT

REPORT
ON
BAGDAD COPPER CORPORATION PROPERTY
YAVAPAI COUNTY, ARIZONA

BY

R. B. MULCHAY

JUNE 1940

REPORT ON

BAGDAD COPPER CORPORATION PROPERTY

YAVAPAI COUNTY, ARIZONA,

BY

ROLAND B. MULCHAY

JUNE, 1940.

INTRODUCTION

Since 1906 extensive copper mineralization on the property of the Bagdad Copper Corporation west of Hillside, Arizona, has been prospected by churn and diamond drill holes, and underground exploration and development. The property has been examined by many engineers, and several detailed reports are available. In 1934 an examination for the Anaconda Copper Mining Co. was made by Mr. V. D. Perry and Mr. R. B. Mulchay, and in 1936 a supplementary report on current work was written by Mulchay. At the request of Mr. R. H. Sales, further field work at the property was done by Mulchay and Mr. R. S. Moehlman from May 13 - 25, 1940. This examination had for its primary objective the investigation of geologic possibilities for extensions of the Bagdad orebody. A detailed ore estimate was made at Inspiration, Arizona, in which the records of the Bagdad Corporation and other reports were used. While the field work was in progress, the Bagdad Corporation requested a loan from the International Smelting Company. As bearing upon this proposition considerable detailed operating data was obtained from the manager at the property, Mr. J. W. Still. The cost and production data have not been checked but are believed to be reliable records of the present operation.

LOCATION AND PHYSICAL FEATURES

The property is located in the Eureka Mining District, Yavapai County, Arizona, in Sections 4 and 5, T. 14 N, R 9 W, and Sections 29, 32, and 33, T 15 N, R 9 W. The mine and camp at Bagdad are connected with Hillside station on the Santa Fe Railroad by 27 miles of graded improved road. Hillside is 20 miles by good graded road from the Phoenix - Prescott surfaced highway near Congress Junction. Various routes to connect Bagdad with rail transportation have been surveyed, but all are difficult and costly.

Water at the rate of approximately 80 gallons per minute is now obtained from wells, springs and the mine. Water rights on Boulder and Burro Creeks are owned by the company and are respectively 2.5 and 7.5 miles from the present millsite. To supply water for a suggested 500-ton per day operation, present plans call for a pumping plant at Boulder Creek to furnish 150 gallons per minute against a head of 544'. This supply is believed by Mr. Still to be sufficient to provide water for eleven months of the year, with one month to be provided by water stored behind an earth dam below the mill, and the present supply. For a larger tonnage operation, water would be pumped from Burro Creek against a 1000' head.

Power is supplied for the present operation by Fairbanks-Morse diesel engines with 975 rated horsepower which deliver on intermittent load about 650 HP. For the Schlereth-Whitaker report an estimated cost of $40,000 was made for a power line, including transformers, from the Arizona Public Service lines to Bagdad. This estimate was based on power for a 1000 ton per day operation.

The main drainage of the Bagdad area is through Copper Creek, which cuts southwesterly across the main orebody and then swings to the northwest. Copper Creek, although dry during most of the year, occasionally carries flash flood waters. Some provision for such water would have to be made in any plan for mining the main orebody.

The mine is now making water at the rate of about 20 gallons per minute. No special mining problems should be created by present underground water conditions. There is no timber in the district.

PRESENT OPERATION

In early 1937 preparations were made to mine and mill a part of the Bagdad orebody as a test for possible large scale operations. Two one hundred feet square blocks have been undercut on the 2990 level, and an intermittent production on a 200 - 300 ton per day basis has been in progress since 1937. To May 1, 1940, a total of 157,537 tons had been extracted from the stopes and surrounding development. Since October, 1937, the property has been operated under the direction of Mr. Still, who supplied the following figures:

	Tons Treated	Total % Cu.	Oxide Cu	Tons Conc.	% Cu Conc.	Ratio of Conc.	% Recovery
Oct., 1937, to April, 1938,	48,026	1.51	0.11	1,224.9	46.50	39.2	78.7
April, 1938, to Nov., 1939,	Shutdown						
Nov., 1939, to May 1, 1940,	44,346	1.498	0.17	1,041.6	45.73	42.6	71.7

Since November, 1939, monthly tonnages treated have varied from 6367 to 8093 tons. The present operation is hampered by a failing water supply. Production would be maintained about at mill capacity of 6000 tons per month if there were no water or equipment failures. Concentrates are shipped by truck to the International Smelting Co. at Miami, Arizona. Cost data are summarized at the end of this report.

During May the Bagdad Corporation, acting through Mr. C. Q. Schlereth and Mr. Still, made a request for a loan of $150,000 - $200,000 from the International Company for needed plant expansion and working capital. The loan would be secured by a mortgage upon the property of the Bagdad Corporation. According to Mr. Still, the loan, if obtained, would be expended as follows:

Mill	
Reequip and rebuild present mill for 500 ton per day operation	$ 50,000.00
Water Supply	
Pipe line to Boulder Creek, pumping plant for 150 gallons per minute against 600' head, and earth storage dam in Maroney Gulch	18,000.00
Tailings Disposal Line	
7000'	7,000.00
Power	
Install 200 HP Diesel engine	25,000.00
Working Capital	50,000.00
Total	$150,000.00

GENERAL GEOLOGY

At Bagdad a monzonite intrusive with several acid phases has intruded older schists and coarse grained granitic rocks. North and east of Copper Creek the intrusive monzonite and the older rocks are covered by gravels and capped by a basalt flow. Within the monzonite area there has been widespread primary mineralization, parts of which have been enriched by secondary processes to form tabular bodies of secondary copper ore. The older rocks also contain traces of primary sulphide mineralization but there is no evidence of high grade primary or secondary ore within these rocks. No orebodies are to be expected, therefore, outside the monzonite. There is no major faulting in the area, although there are numerous small clays which have some small displacement. In the area near the Giroux tunnel and to the east, the Hawkeye fault movement displaces the northeast side downward relative to the southwest side. No bodies of secondary chalcocite ore have been found southwest of the fault in this area.

The secondary ore blanket developed at Bagdad is related to an old erosion cycle in which the principal drainage was through a canyon, now gravel filled and capped with basalt, which extended northwesterly across the present course of Copper Creek immediately north of CDH 108. Copper Creek here cuts across gravels about 500' wide, and as developed in a shaft put down for water, from 125 to 150' deep. North of this gravel the rock exposed is monzonite with many included schist fragments and little primary mineralization. North of this contact rock breccia schist is exposed. Immediately east of CDH 108 the schist - monzonite contact cuts irregularly across Copper Creek. The contact strikes northwesterly on the west side of the canyon and about N 75° E on the opposite side. This contact to the east is assumed to swing to the south toward the exposures of schist and granitic rocks found along the Bagdad - Hillside road above the mill.

From Copper Creek northwest there is no good evidence to show the strike of the contact. It is possible that the old canyon more or less followed this major feature of the rock pattern of the district. CDH 102, drilled about 3200' northwest of CDH 108, was lost in gravels at an elevation of 3020'. CDHs 108, 100, 101, 98, and 97 are reported to have been drilled into primary mineralization in monzonite at elevations above the botton of the channelway. The drill records show these holes are located along the southerly side of this old erosion feature.

General notes on the rock relations and mineralization features of the areas south and southwest of Copper Creek are posted upon the surface geological map which accompanies this report. Further description of these areas is given under section 1 of the discussion of possible ore extensions.

In the northwestern part of the property the Black Mesa breccia pipe has been partly explored by a tunnel and two short winzes, a churn drill hole and a diamond drill hole. The breccia is exposed at surface for a width of 200' and a length of 600', disappearing under gravels and surface wash to the northeast. It is similar structurally to oval shaped breccia pipes developed at Cananea. The mineralization, which cements angular fragments of monzonite, in the tunnel is composed of white quartz, pyrite, chalcopyrite, chalcocite and few specks of molybdenite. Near and around the southwest nose on the tunnel level there is good chalcocite mineralization, and a 40' winze is reported to have averaged 4% copper. A diamond drill hole drilled into this structure to a depth of 700' below surface showed quartz - pyrite - chalcopyrite - molybdenite mineralization to persist to that depth.

No chalcocite was observed in the lower part of the hole. Copper assays were uniformly low.

MINERALIZATION

The monzonite intrusive has been mineralized with seams and disseminations of pyrite, chalcopyrite, quartz, and little molybdenite, and secondary enrichment in the northerly part of the area has formed secondary chalcocite orebodies. Oxidized minerals at and near surface are malachite, chrysocolla, native copper, cuprite and azurite. On the 2960 level in the north part of 800 W XCN there are small seams which contain quartz, galena, sphalerite, and tetrahedrite. On this level there appear to be wide variations in the intensity of the primary mineralization. In the section in 800 W XCN from 625 N to 775 N there is prominent quartz, chalcopyrite, pyrite, molybdenite and little chalcocite in both seams and disseminations. The seams strik N 75 - 85° W and N 20 - 25° E and dip very steeply. In 700 W XCN at 30' south of 525 XCE on the 2960 level there is an occurence of native copper with disseminated chalcocite, chalcopyrite and pyrite.

On the 3080 and 3020 levels two narrow northwest stringer veins have been developed and a small tonnage was selectively mined from them in 1936. These veins on the 3080 level contain from 4" to 24" of pyrite, chalcocite and quartz. On the easterly vein, or 43-1/4 vein which dips steeply to the west, the structure at 600 N coordinate has broken into two thin parallel clay gouges with 1" - 4" of pyrite, quartz and chalcocite. On the 3020 level vertically below the structure is similar but with even less mineralization. Vertically below this area on the 2960 level the vein was not mapped although it may have passed through the workings behind timber. To the southeast on this level the vein showed weak, bunchy pyrite, quartz mineralization with very little chalcocite. On the more westerly vein, or 8.30, which dips to the east, development on the 3080 level showed that northwesterly the vein breaks up into a number of small fractures, some of which have an E - W strike. A short drift on this vein on the 3020 level showed weak mineralization.

The first eleven lots of concentrates shipped to the International Smelter had the following average analysis:

Tons.	Total % Cu	Oxide %Cu	Ounces Ag	Ounces Au	% Fe	% S	% MoS2
375.0	44.80	2.76	1.4	0.01	10.5	21.6	1.25

Examination of these concentrates shows that a large proportion of the contained copper is in the form of chalcocite. Calculation from smelter analyses indicates that from 85 - 90% of the sulphide copper in the concentrates is contained in chalcocite, and that the remainder of the sulphide copper is chalcopyrite. Examination of numerous drill hole samples by Mr. P. C. Benedict indicated that malachite was by far the most important mineral of the oxide group.

ORE RESERVES

During past years many estimates of Bagdad ore reserves have been presented by various engineers. The present calculation has been made largely from Bagdad drill hole information, on which there is no good check, supplemented by the Witt and Benedict report.

Only that mineralization which appeared to be mineable in an established mining plan has been considered. This has necessitated the elimination of some narrow and spotty sections along the south and southeast sides of the orebody. A limit of about 65' height at 1.25% copper has been used as a minimum mining grade. The level assays have been used where assumptions of grade or ore extension were necessary. The ore reserve blocks were calculated on vertical sections spaced at one hundred foot intervals parallel to the mine coordinates at N 9° 15' E. The outlines of the various undercut level blocks have been transferred from the sections to the level plan maps which accompany the report. A volume of 13 cubic feet in place has been used as equivalent to one ton.

In the Giroux area widely spaced scout holes have shown a certain amount of secondary mineralization. This information is so scanty that the ore reported from this section must be considered as probable but not developed. In the main Bagdad area some of the ore blocks are much more thoroughly explored by drilling than others. However, in all of these blocks the tonnage seems reasonably assured, and further exploration would only make more certain the grade of the ore.

The calculation has been made on the basis of three undercut levels at the 2930, 2990 and 3050 elevations. Following is a summary of the ore reserves:

<u>BAGDAD</u> Sulphide			
3050 Level	4,625,390 tons	1.370% copper	93' height of ore
2990	2,517,390	1.254	105'
<u>2930</u>	<u>6,894,720</u>	<u>1.247</u>	<u>156'</u>
TOTAL	14,037,500	1.291	126'

<u>GIROUX</u> Sulphide	Probable Ore 1,548,000 tons	1.39%	80'

Above the Bagdad secondary ore blanket there are large amounts of copper oxide mineralization. Using a lower limit of 0.6% copper, a tonnage of oxide copper mineralization above the sulphide ores has been calculated as follows:

<u>BAGDAD</u> Oxide			
3050 Level	676,540 tons	0.805% copper	49' height of ore
2990	92,310	0.870	120'
<u>2930</u>	<u>2,267,220</u>	<u>0.824</u>	<u>85'</u>
TOTAL	3,036,070	0.82	76'

<u>GIROUX</u> Oxide Probable Ore

535,540 tons 0.71% coppe r 30' height of ore.

There are in addition two other areas in which substantial amounts of oxide ore are indicated. In GDH 104 and the area developed near the portal of the Giroux tunnel, 121,150 tons of 1.2% plus oxide copper would be developed if the ore area has the same height as shown by the drill hole. This zone may have some lateral extension, but is limited to west and east by GDHs 105 and 107. Between the Giroux tunnel oxide area and the main Bagdad area, CGH 115 cut 220' of 1.04% oxide mineralization from 115 to 335'. There is no other exploration north of the Hawkeye fault in this area and considerable tonnages of oxide ore could be developed around this hole.

The ore reserve calculation has been largely based upon drill hole assay information provided by the Bagdad Corporation. There is no accurate check on these records. Stope Block 1, which has been nearly completely mined, calculated from drill hole records, would show a grade of 1.7% copper. As calculated from development assays by Mr. Still the grade is 1.5%. In this case, the drill holes appear high. However, two of the holes on the corners of this block may be salted by cutting through the two northwest veins previously described. The apparent discrepancy may, therefore, be greater than an average of many drill holes would show. Calculation of 50' sections of the drill holes through the 3080 level to compare with averaged crosscut samples around drill holes showed wide variations, but a fairly good check on average.

POSSIBLE ORE EXTENSIONS

Possibilities for ore extensions may be divided into four groups as follows;

1. Possible secondary orebodies south and southwest of Copper Creek.

2. Extension of the main Bagdad orebody northeasterly.

3. Extension of the main Bagdad orebody northwesterly.

4. The Black Mesa Breccia pipe.

1. Copper Creek, which forms the present main drainage channel for the Bagdad area, cuts southwesterly across the eastern part of the monzonite intrusive and then turns northwesterly through the monzonite area. South and west of Copper Creek there are extensive rock exposures unscreened by gravel, basalt or extensive surface wash as found to the north and northeast of Copper Creek. In Maroney, Mineral and Alum creeks, which are tributary to Copper Creek from the south, there are extensive exposures of the monzonite and older rocks which have been stained with iron oxide, and locally with copper oxides. Throughout these areas in surface exposures and in short tunnels and cuts fresh pyrite with occasional chalcopyrite can be observed. Three diamond drill holes were drilled in attempt to develop secondary ore under one of the better appearing areas where a clay gouge and crushed zone shows copper oxide minerals at surface. The results of these holes is tabulated below:

DDH 126	440-455'	3.3% Cu	Other assays below 1%, generally below 0.8%
DDH 127	All assays below 0.45% Cu.		
DDH 128	85 - 100'	1.5% Cu	Other assays below 1.0% Cu, generally below 0.5%

General notes on these areas are posted upon the surface geological map which accompanies this report. The fresh primary mineralization exposed at and near surface throughout these areas definitely disposes of any hope that secondary enrichment processes have been operative over periods great enough to produce important enrichment.

2. Possible northeast extension of the Bagdad mineralization is screened at surface by gravels, surface wash and a basalt

capping. Underground development on the 3080 level toward this area is now inaccessible. Churn drill and diamond drill information must therefore be used as a basis for discussion of possibilities for ore extension into the northeast.

Churn drill holes 112, 113, 114, 96, 99, 121, 122 and 123, all drilled to the south and east of the Bagdad orebody, show primary mineralization without appreciable secondary enrichment. A narrow, thin ore blanket extending to the northeast is indicated by diamond drill holes 309, 310, 313, and 316 drilled from the 3080 level. These holes show thicknesses of 25' to 125' of fair secondary mineralization below the 3080 level. Churn drill records indicate that this level is close to the top of the secondary ore blanket in this area. The lateral width of this mineralization is limited on the northwest by CDH 32 which cut 60' of 0.81% copper, and on the southeast by CDH 121 which cut 30' of 1.25% copper before it passed into straight primary mineralization.

The extent of this mineralization to the northeast cannot be estimated with any certainty. The monzonite - schist contact as projected at surface should cut across the trend of this ore zone within four to five hundred feet, and no extension past this contact can be expected. From present information, therefore, no large increase in ore reserves can be predicted from exploration of this area.

3. As in the case of the possible northeast extension of the orebody, the surface to the north and northwest is covered by gravels, surface wash, and basalt. Underground development on the 3080, 3020 and 2960 levels gives additional evidence for use with drill hole information in this area.

It has been suggested that the northwest stringers in the main Bagdad orebody might indicate a trend or direction for the stronger disseminated mineralization. These veins as developed on the 3080 level are most strongly mineralized northwest of the shaft and south of coordinate 600N. Southeast of the shaft the 45 1/4 vein is very poorly mineralized, with 1"-6" quartz, pyrite and iron oxide. It also appears to be weaker with depth as suggested by development on the 3020 and 2960 levels. The S.30 vein is not strong where developed on the 3020 level. These structures, while locally strong in relation to the other seams and disseminations of the orebody, do not appear to be structurally dominant features which might be expected to control mineralization trends or to be expressions of underlying structures which do control extensive primary mineralization channels. Close inspection of mineralization features of the 2960 level leads to the belief that the monzonite is mineralized over irregular areas by seams and disseminations of quartz, pyrite, chalcopyrite, etc., which are locally much stronger than in adjacent areas.

Possible extension of the orebody to the north or northwest under the basalt mesa is limited by drill hole information, CHH 108 and DDH 130 north of the orebody contain neglible amounts of copper mineralization. DDH 131 cut 55' of 1.008% copper before it went into leached material and was lost at an elevation of 2934'. CDH 94 and 95 to the northwest showed some secondary mineralization. CDH 95 contained 40' of 1.32% copper and bottomed in primary mineralization. CDH 100 approximately 300' northwest of CDH 95, cut 50' of 0.65% copper and then passed into primary mineralization.

Possible extension to the northwest under the basalt mesa is limited in size by the above mentioned drill holes. Should some such small extension exist, as between DDH 151 and CDH 100, it would necessarily be further limited on the north by the westward projection of the schist-monzonite contact exposed in Copper Creek; and by the possibility that the deep main drainage channel of the old erosion cycle had cut well into primary sulphides as has Copper Creek south and west of the orebody. It is unlikely therefore, that any great extension of the Bagdad secondary orebody can be expected from exploration north and northwest of CDH 108, 94 and 95, and DDHs 150 and 151.

South of CDH 100 and northwesterly from CDHs 80, 78, 79, and 94 there will probably be an extension of the main Bagdad mineralization toward CDHs 76 and 77 located between the Giroux area and the Bagdad. Following are the better mineralized sections cut in these holes:

CDH	Height	% Cu	
80	80 feet at	1.0%	1300' southeast of CDH 77
78	95 "	0.98%	1000' " " "
79	129 "	1.08%	1100' " " "
94	115 "	1.19%	900' " " "
77	75 "	0.97%	
76	85 "	1.45%	400' northwest of CDH 77

The drill hole information on this possible extension of the Bagdad orebody indicates that the secondary mineralization is relatively thin and low grade. Further to the northwest and north of the Giroux exploratory holes, CDGs 101, 97 and 98 were drilled into low grade primary mineralization and did not cut sections of appreciable secondary enrichment. These holes definitely limit possible northerly extension of good secondary mineralization under the basalt in this area.

4. The Black Mesa breccia is a strongly mineralized pipe structure which contains primary mineralization of a type often associated with high grade copper deposits. As a possible locus for a copper orebody it has been the subject of considerable geological speculation. The Diamond drill hole 129 drilled at an inclination of -56° in a N 85° E direction from the tunnel portal was lost at a depth of 843'. The breccia was cut in this hole at 290' and the core to 362' shows irregular white quartz mineralization with pyrite, chalcopyrite, and little molybdenite. From 362' to the bottom of the hole no sludge was recovered and the core was crushed for assay. Inspection of these samples showed the same type of mineralization persisted to 818', the last sample available. Assays of five samples selected at random are as follows:

465' to	470'	0.32% Copper	0.012% Mo.
533	538	0.44	0.007
610	616	0.36	0.008
763	769	Tr	0.006
802	807	Tr	0.008

Samples throughout were less than 0.8% copper and were generally less than 0.5%. The hole was lost before it cross cut the entire breccia, but it is probable that the end of the hole is approximately at the east edge of the structure and at about 700' below surface. The hole does not eliminate this structure as a possible locus for a primary copper ore deposit, but it does make more remote the possibility that such a concentration of primary ore minerals exists within limits of exploration by drilling. Should further exploration of this structure be attempted on the long chance that such ore might be found, the tunnel should be extended across the structure, and later drilling planned on the results of this work. Logical exploration of the structure should be directed toward the noses of the pipe where experience has shown that better primary mineralization is often found.

MINING

Present production from the mine is from two caving block stopes undercut on the 2990 level and drawn through extraction level at 2960 elevation. Boundary drifts around the two one hundred foot square blocks approximately 120' in height were run on the 3020, 3050 and 3080 levels. No grizzly level is used. The ore is drawn directly from the undercut level to the 2960 level through draw points spaced on 25' centers in extraction drifts on 50' centers. Haulage drifts below the stopes are about 50% timbered, and require very little maintenance. Chute mouths permit passage of 18" diameter pieces which are easily broken through grizzlies on the station. The rock is extremely brittle, although it stands well without support on the haulage level. The results of the present stopes indicate that the ground is well suited to caving operations, Closer spacing of draw points to insure greater over all extraction and lessen chances of channeling might cause greater maintenance cost. However, a higher pillar between undercut and haulage levels might eliminate any difficulty of this kind. Mining of larger blocks would reduce boundary drift development costs. As the ground stands well, scraper haulage might be utilized for extraction of blocks well above the main extraction level to minimize development costs.

During April, 1940 a total of 7601 tons was mined and milled with an average grade of 1.476% copper which included 0.171% oxide copper. 174.99 tons of concentrate were produced with an average grade of 45.76% copper. The mill recovery was 71.3% and the ratio of concentration was 43.4 : 1. Smelter analyses averages show the concentrates to contain 2.76% oxide copper and 1.25% molybdenite.

Present average operating costs at the mine and Mr. Still's estimate of costs on a 500 ton per day operation are as follows:

	Present Operation	Estimate on 500 tons per day basis
Mining	$0.66	$0.65
Milling	1.04	0.76
General	0.10	0.08
Total	$1.80	$1.49

These costs do not include charges for income taxes, insurance, eastern office expense, depreciation, or depletion. Without including these items, on the 500 ton basis Mr. Still believes that copper can be produced at a cost of 8.5 to 9.0 cents per pound, as against a present cost of approximately 11 cents. This figure does not include a credit for molybdenum.

The reduction in costs in this estimate over the present operation would be gained in the mill. The larger items would be lessened labor and power costs, and increased extraction. Tests made for the Bagdad Corporation are said to show recoveries of plus 85% of the total copper as compared with the present recovery of 70-75%. The large amount of oxide copper in the ore will undoubtedly make a recovery of 85% difficult, and perhaps impossible of realization by flotation.

The smelter contract with International Smelting Company is as follows: $3.00 per ton treatment; pay for contained copper less 20 lbs. at New York quotation, less 2¢; pay for contained silver less 5% at net realized price, presently 70.625¢. Smelting charges amount to about 2.5 cents per pound of copper shipped to the smelter, and transportation to the smelter on the present grade of concentrates about 0.66¢ per pound.

<u>CONCLUSION:</u>

Results of recent investigation of possibilities for ore extensions at the Bagdad property may be summarized as follows:

1. South and west of the orebody low-grade primary sulphide mineralization is exposed at surface and in near surface workings. No secondary copper orebodies can be expected in areas showing such mineralization as surface features.

2. Drill hole information indicates that a narrow thin ore blanket may extend northeast of the main Bagdad orebody between

CHDs 32 and 121. Such a northeasterly extension may continue to the schist-monzonite contact which from surface evidence should be not more than 500' from the present development. It does not appear that a large increase in ore reserves can be expected from exploration in this area.

3. While no positive conclusion can be stated drill hole information and underground notes do not show that substantial ore tonnages can be expected northwest of the Bagdad orebody beneath the basalt mesa in the area east of CDH 100 and northerly from CDHs 108, 94 and 95 and DDH 131. Should such an ore extension be present it would be limited on the north by the channelway of the previous erosion cycle which from mineralization evidence reported in holes 100, 101, 97 and 98 probably cut deeply into primary mineralization much as Copper Creek does south and west of the orebody.

Northwest toward the Giroux area andCDH 77 from CDHs 80, 78, 79 and 94 low grade relatively thin secondary mineralization can probably be developed. From present information this mineralization may or may not be of value as an ore reserve.

In the vicinity of CDH 115 and near the portal of the Giroux Tunnel additional tonnages of oxidized copper mineralization of fair grade may be expected.

4. The results of DDH 129 drilled into the central part of the Black Mesa breccia to a vertical depth of 700' are not encouraging. This hole does not eliminate this structure as a possible source of high grade primary copper ore. However, that such ore does exist in this structure within present limits of drilling from surface is made much more doubtful by DDH 129.

Compared with ore reserves at other low grade copper properties, the 14,000,000 tons of 1.29% copper with an average thickness of 126', and 3,000,000 tons of 0.82% oxide copper overlying the sulphide at the main Bagdad orebody is not an impressive total. At present there are no good possibilities that this tonnage can be doubled. Whether or not this ore reserve can be profitably exploited under present conditions is a subject for detailed operating study. Aside from the problem presented by Copper Creek and sudden flood waters, the mining of the ore reserve should present no special problems and might be done at a low cost. Metallurgy of the ore and transportation problems are more difficult of solution. At best, on an 11¢ copper market the property could not be expected to produce a large profit.

Respectfully submitted,

BAGDAD COPPER CORPORATION

PRODUCTION OCT. 1937 - MAY 1, 1940. - NO PRIOR FIGURES AVAILABLE

	Tons Treated	% Total Cu.	Pounds	Oxide Cu. %	Tons Conc.	Conc. % Cu.	Recovered Pounds	Conc. Ratio	% Recovery of Total
Oct. '37 thru Apr. '38	48,026	1.514%	1,450,457	0.11%	1,224.93	46.59%	1,142,253	39.2	78.3%
Apr. '38-Nov. '39	SHUTDOWN								
Nov. '39 thru Apr. '40	44,346	1.498%	1,328,945	0.17%	1,041.58	45.73%	952,647	42.6	71.7%
TOTAL	92,372		2,779,402		2,266.51		2,094,900		

NOTE:

Tons treated figure obtained from number of aerial tramway buckets, calibrated by weight factor.

Head sample is daily composite of three samples obtained from following places: 1. belt from primary crusher at mine; 2. from aerial tram buckets; 3. feed to ball mill.

Tonnage and grade of concentrates obtained from smelter settlement sheets.

PRODUCTION

	Tons Treated	% Total Cu.	Pounds	Oxide Cu. %	Tons Conc.	Conc. % Cu.	Recovered Pounds	Conc. Ratio	% Recovery of Total
April 1940	7,601	1.476	224,382	0.171	174.99	45.76	160,150	43.4	71.3%

~~Camp Maintenance~~	~~.033~~
~~Mine Office~~	~~.019~~
~~Social Security & Arizona Unemployment Taxes~~	~~.030~~
~~Arizona Production Tax (March)~~	~~.017~~
	~~.100~~
~~Total Operating Cost at Mine~~	~~$1.797 Per Ton~~

BAGDAD COPPER CORPORATION

~~NOTE:~~ COSTS FOR APRIL, 1940

~~COSTS FOR APRIL 1940~~ ~~These costs do not include charges for income taxes, eastern office expense, depreciation or depletion.~~

These costs approximate average for preceding five months of operation.

	Labor	Supplies	Misc.	Power	Total	
Development cost					.243	
Stoping	.308	.063	.022	.014	.407	
Stope Maintenance					.012	
Total Mining						.662
Crushing & Tramming	.090	.016	.003	.010	.119	
Milling	.182	.155	.007	.326	.670	
Tails Disposal					.093	
Hauling Conc. to Miami @ $6 per ton/conc.					.153	
						1.035
Camp Maintenance					.033	
Mine Office					.019	
Social Security & Arizona Unemployment Taxes					.030	
Arizona Production Tax (March)					.017	
						.100
Total Operating Cost at Mine						$1.797 Per Ton

NOTE:

These costs do not include charges for income taxes, eastern office expense, depreciation or depletion.

BAGDAD COPPER CORPORATION

	Dry Tons Milled		Total % Cu.	COSTS Mining	Milling	Gen. Camp	Total	Mill Rec. %
Oct. 1937	7,165	@	1.399%	.714	1.032	.198	$1.945	83.1
Nov. "	5,800	"	1.42 %	.723	1.101	.155	1.980	81.4
Dec. "	5,836	"	1.534	.621	1.300	.190	2.112	81.9
Jan. 1938	6,806	"	1.55	.644	1.119	.197	1.963	80.9
Feb. "	6,432	"	1.57	.703	.929	.237	1.87	76.8
Mar. "	8,700	"	1.57	.648	.854	.154	1.657	72.6
Apr. "	7,260	"	1.51	.634	1.163	.188	1.986	77.4
18 MONTHS SHUTDOWN								
Nov. 1939	6,367	@	1.536	.882	1.026	.087	1.996	69.2
Dec. "	7,829	"	1.499	.738	.934	.067	1.740	72.5
Jan. 1940	6,557	"	1.485	.678	1.054	.098	1.832	72.8
Feb. "	7,899	"	1.48	.654	..925	.086	1.667	74.8
Mar. "	8,093	"	1.518	.636	1.036	.084	1.757	68.3
Apr. "	7,601	"	1.476	.662	1.035	.100	1.798	71.3

Above costs are to Concentrate at Hillside Station, except April, 1940. Costs for that month are to Concentrate at Smelter at Miami.

NOTE:

These costs do not include income taxes, insurance, Eastern office expense, Depreciation, Depletion.

If 5% of Cu is present @ $CuFeS_2$

$$5\% \ Cu : x = \overset{Cu}{34.5} : \overset{Fe}{30.5}$$

$$34.5x = 152.5$$

$$x = 4.4\% \ Fe$$

4.4
345 | 152.5
1380
1450

5.07
345 | 1750
1725
2500

$$5\% \ Cu : x = \overset{Cu}{34.5} ; \overset{S}{35}$$

$$x = \frac{175}{34.5} = 5.1\% \ S.$$

Then 42 − 5 = 37% is present as Cu_2S

or $37 : x = 79.8 : 20.2$

$$x = \frac{747.4}{79.8} = 9.3\% \ S.$$

9.3%
798 | 747.4
7182
2920

9.3
5.1
14.4

21.6
14.4
7.2

Then 10.5% Fe − 4.4 Fe = 6.1%

$$46.6 : 53.4 = 6.1 : x$$

$$~~46.6~~ x = 53.4 \times 6.1 = \frac{325.7}{46.6} = 7\%$$

7
466 | 325.7
3262

5/40

OR WITH 5% Cu as $CuFeS_2$

5% $CuFeS_2$	4.4% Fe $CuFeS_2$	5.1% S $CuFeS_2$
37% Cu_2S	6.1% Fe FeS_2	9.3% S Cu_2S
42	10.5	7.0 S FeS_2
		21.4

against 21.6

2.76

FeS_2		Cu_2S		$CuFeS_2$		
46.6	53.4	79.8	20.2	34.5	30.5	35.0

Total Cu

44.8 oxide

2.86

42% Cu in conc. with 10.5% Fe and 21.6% S.

If all Fe is present as FeS_2

$$46.6 : 53.4 = 10.5 : X$$

$$\frac{53.4 \times 10.5}{46.6} = X$$

$$\frac{560.7}{46.6} = X = 12.0\ \%\ S.$$

1.203
466) 560.7
466
947
932
1500

Then 21.6 S − 12.0 S = 9.6 % S to satisfy 42 % Cu

If present as Cu_2S

$$79.8 : 20.2 = 42 : X$$

$$\frac{42 \times 20.2}{79.8} = X = \frac{848.4}{79.8} = 10.6\ \%\ S.$$

10.63
798) 848.4
798
5040
4788
2520

if 10% as $CuFeS_2$ Fe S

$CuFeS_2$ 10 Cu 8.8% 10.2 32

Cu_2S 32 8.8

21.6
18.2
3.4

10.5
8.8
1.7

798 | 6464 = 8.8
5856
6080

~~Then~~ only 3.4% S to satisfy 1.7% Fe as FeS_2

	Tons	%Cu		%Fe		%S	
1.	32.9	47.26	1554.9	9.9	325.7	21.7	713.93
2.	31.5	45.44	1431.4	10.2	321.3	21.2	667.8
3.	33.3	44.47	1480.8	10.0	333.0	21.0	699.3
4.	34.8	45.30	1576.4	10.8	375.8	22.1	769.1
5.	35.7	46.02	1642.9	11.2	399.8	22.6	806.8
6.	36.0	46.49	1673.6	11.2	403.2	22.5	810.0
7.	34.0	45.08	1532.7	10.2	346.8	21.6	734.4
8.	34.4	45.20	1554.9	9.7	333.7	21.2	729.3
9.	34.8	42.08	1464.4	10.7	372.3	21.0	730.8
10.	32.9	41.60	1368.6	10.6	348.7	21.1	694.2
11.	34.7	43.84	1521.2	10.6	367.8	21.6	749.5
	375.0	(44.8)	16801.8	(10.47)	3928.1	(21.6)	8105.1

44.80
375 | 16801.8
1500
1801
1500
3018
3000
1800

10.47
375 | 3928.1
375
1781
1500
2810
2625
1850

21.61
375 | 8105.1
750
605
375
2301
2250
510

500 x 250	125000
150 x 150	22500
100 x 100	10 000
500 x 150	75 000
215 x 100	21500
800 x 100	80000
500 x100	50000
600 x 100	60 000
500 x 100	50000
450 x 100	45000
250 x 100	25000
300 x 100	30000
	594,000

594,000 x 156.6 = 93,0126,400 / 13 = 7,15541

7,128,000 / 92664

128 x 200	25600
300 x 100	30 000
165 x 100	16 500
125 x 100	12 500
200 x 100	20 000
150 x 100	15 000
110 x 200	22 000
210 x 100	21 000
150 x 100	15 000
125 x 300	37 500
100 x 100	10 000

400 x 260 =	104000
600 x 100 =	60000
330 x 100	33000
250 x 100	25000
400 x "	40000
300 x	30000
225 x 200	45000
425 x 100	42500
550 x	55000
350 x	35000
450	45000
7	70000
8	80000
150 x 200	30000
	694,500,00

13) 65,144,100 = 5,011,080

160,000
40000
2500
37500
45500
25000
5500
3000
319,000,00

13) 33654,500 = 2588,800
26
76
65
115
104
114
104
105

2576 / 33495

Comparison of Block I

ave 59 + 81

59 125 @ 1.01 = 126.25
(81) 130 @ 1.78 = 231.40
255 357.65
127.5 1.40 +

for Int.

59.
65 - 1.30 = 84.5
60 0.7 42
125 126.5 (1.01
125
150
1.402
255) 357.65
255
1026
1020
650

---

ave for N side Block I

(81) 130 @ 1.78 = 231.4
Int 127.5 @ 1.40 = 178.5
(257.5) 409.9
128.7
1.59

1.59
2575) 409.9
2575
15240
12875
23650
23175
4750

54 3353
2990
363

AVE for W side Block I

82. 105' @ 1.52% 159.6
Int 127.5 @ 1.40 178.5
(232.5) 338.1
116.2 1.45%

3366
2990
376

AVE for S side Block I

54 155' @ 2.01 311.55
82 105 1.52 159.6
260 471.15
130
1.81%

AVE for E side

54 155' @ 2.01 = 311.55
81 130 @ 1.78 = 231.40
285 542.95
142.5
1.91

AVE FOR BLOCK I

N. side	128.7	@ 1.59	=	204.63
W.	116.2	1.45	=	168.49
S	130.0	1.81	=	235.30
E	142.5	1.91	=	272.17
	517.4			880.59
	129.3			

$$\frac{100 \times 100 \times 129.3}{13} = 99,470 \text{ Tons}$$

@

1.70%

129.3' height.

$880.59 \div 517.4 = 1.70$

517.4 | 880.59
5174
36319
36218
10100

$129.3000 \div 13 = 99.469$

13 | 129.3000
117
123
117
60
52
80
78
120

Development Est for Block I.

3080	3050	3020	2990
1.21	1.22	1.37	1.33
1.39	1.27	0.84	1.00
1.79	1.28	1.00	0.73
1.84	1.61	1.81	1.19
6.23	5.38	5.02	4.25
1.557	1.345	1.255	1.062

1.557
1.345
1.255
1.062
4) 5.219
1.305
1.31

54	155	201	311.55
82	105	1.52	159.60
Int	127.5	1.40	178.50
81	130.0	1.78	231.40
	517.5		881.05) 1.702

881.05
517.5
363 55
362 25
1 30 00

SUMMARY

SULPHIDE

	Tons	%	height		
3050	4 625 390	1.376	93.8	6,366,569	433,766,790
2990	2 517 390	1.254	105.5	3 156 686	265 537 560
2930	6 894 720	1.247	156.6	8 598 136	1 079 723 140
	14 037 500			18 121 391	1 779 027 490
		1.291	126.7		

OXIDE

3050	676,540	0.805	49.4	544,488	33 435 070
2990	92,310	0.87	120.0	80,309	11 077 200
2930	2,267,220 ~~2 228 750~~	0.824 ~~0.825~~	83.1 ~~79.7~~	1,867,537 ~~1 839 069~~	188 514 040 ~~177,714 440~~
	~~2 997 600~~			~~2463866~~	~~222 226~~ 710
	3,036,070	~~0.82~~ 0.82	~~74.1~~ 76.7	2,492,334	233,026,310

2 997 600
38 470
3 036 070

3050 SULPHIDE

AREA 3	640,000 ✓	1.0	80	640,000	51,200,000
10 W	429,630 ✓	1.03	101	442 519	43, 392,630
9 W	357,000 ✓	1.18	137	421 260	48 909 000
8 W	298,080 ✓	1.34	155'	399 427	46, 202, 400
7 W	329,470 ✓	1.17	107	385 799	35 253 290
6 W	289,620 ✓	1.40	126	405 468	36 492 120
5 W	182,310 ✓	1.77	105	322 688	19 142 550
4 W	135,000 ✓	1.98	78'	267 300	10 530 000
3 W	190,390 ✓	2.03	58'	386 492	11 042 620
2 W	154,610 ✓	1.35	67'	208 723	10 358 870
2W - N	144,230 ✓	1.41	75'	203 364	10 817 250
1 W	53,850 ✓	1.30	70'	70 005	3 769 500
1 W - N	125,000 ✓	1.45	65	181 250	8 125 000
0-0	146,150 ✓	1.36	95	198 764	13 884 250
0-0N	105,770 ✓	1.50	55	158 655	5 817 350
1E	377,310 ✓	1.66	70	626 334	26 411 700
2E	476,580 ✓	1.42	77	767 436	36 696 660
3E	92,310 ✓	1.54	80	142 157	7 384 800
4E	98,080 ✓	1.41	85	138 928	8 336 800
	4 625 390			6 366 569	433, 766, 790
				1.376	93.8

3050 OXIDE

AREA 3	400 000	0.65	50	260,000	20,000,000
10 W	92,310 ✓	1.44	60	132 926	5 538 600
8 W	76,920 ✓	0.80	40	61 536	3 076 800
6 W	23,080 ✓	1.20	30	27 696	692 400
5 W	84,230 ✓	0.74	49	62 330	4 127 270
				544 488	33 435 070
	676,540	0,805	49.4'		

2990 SULPHIDE

4W	783,080	1.13	127'	884 880	99,451,160
2W	540,000	1.20	88'	648 000	47 520 000
0-0	294,230	1.20	90	353 076	26 480 700
2E	230,770	1.33	80	306 924	18 461 600
AREA NE	669,310	1.44	110	963 806	73 624 100
	2,517,390			3 156 686	265 537 560
		1.254	105.5		

2990 OXIDE

4W	92,310	0.87	120'	80 309	11,077,200

2930 Sulphide

AREA 1.	1,356,920	1.09%	112'	1,479,042	151,975,040
" 2	744 230	1.21	129'	900 518	96,005 670
9W	266,540	1.23	165'	327 844	43,979 100
8W	1,053,850	1.28	171	1 348 928 ×	180, 208, 350
7W	671,260	1.35	175	906 201	117, 470,500
6W	757,340	1.35	169	1 022 409 ×	127, 990 460
5W	663,420	1.385	172	918 837	114, 108 240
4W	606,920	1.25	175	758 650	106, 211 000
3W	349,620	1.31	182	458 002	63, 630, 840
2W	139,230	0.97	181	135,053	25 200 630
1W	141,540	1.12	184	158, 524	26 043 360
0-0	143,850	1.28	187	184, 128	26 899 950
	6 894 720	1.247	156.6	8,598,136 ✓	1,079,723,140 ✓

2930 OXIDE

AREA 1.	448,270	0.89	37'	398 960	16 585 990
" 2	375,000	0.87	65'	326 250	24 375 000
9W	80,770	0.70	105'	56 539	8 480 850
8W	443,850	0.825	82	366 176	36 395 700
7W	211,210	0.75	58	158 407	12 250 180
6W	440,120 (~~401,650~~)	0.74 (~~0.74~~)	145 (~~132~~)	325 689 (~~297 221~~)	63, 817 400 (~~53 017 800~~)
5W	191,080	0.83	99	158 596	18 916 920
2W	76,920	1.00	100	76 920	7 692 000
	~~2 228 750~~ 2,267,220	0.824 ~~0.825~~	83.1 79.7	~~1 839 069~~ 1,867,537	~~177, 714 440~~ 188, 514, 040

Summary

```
                1.2909
14037500 | 18 121 391
           14 037 500
           ----------
            4083 8910
            2807 5000
           ----------
            1276 39100
            126337500
           ----------
             13,016,000
```

```
                     126.7
14037500 | 1 779 027 490
           1 4037 500
           -----------
             375277 49
             2807 5000
           -----------
              94527 490
              84225 000
           -----------
              103024900
```

```
              .822
2997600 | 2463 8660
          2398 0800
          ---------
           6578,600
           5995200
          ---------
            5834000
```

```
              74.1
2997600 | 222 226 710
          209 83200
          ---------
          12394710
          11990400
          ---------
           4043,100
           2997 600
          ---------
           10455000
```

Ore grades

3050 S

```
              1.376%                                  99.7 (3 written over second 9)
4625390 | 6 366 569                    4625390 | 433,766,790
          4 625 390                              41 628 510
          1 741 1790                              17 481 690
          1 387 6170                              13 876 170
            353 56200                              360 55200
            323 77730                              323 77730
             29 784700                              36774700
             27
```

3050 OXIDE

```
           .805
           .8048                                   49.4
67654o | 544 488.0                     676,540 | 33 435 070
         541 2320                                27 06160
           3 256000                               6373470
           2706160                                6078860
            5498400                               2646100
```

Ore Grades

2990 Sulphide

1.254
2517390 / 3 156 686
2 517 390
639 2960
503 4780
1,358,1800
1,2586950
9,948,500

105.5'
2517390 / 2,65 537 560
251 7390
1,379,8560
1,2586950
121 16100

2930 Sulphide

1.247
6894720 / 8 598 136
6 894 720
1703 4160
1378 9440
32447200
27578880
48683200
48263040

156.6
6,894,720 / 1 079 723 140
6894720
390 2511 4
34473600
45515140
41 368320
4146 8200

2930 oxide

.825
2,228,750 / 1 839 0690
1 783 0000
5,60 6900
4 457500
11,494,000
11,143,750

89.7
2228750 / 177 714 440
15599250
21721 940
20058750
16,631,900

1. NW area

Hole 94

el 3683
2930
753

113' @ 1.19 134.47

Hole 79

3559
2930
629

129' @ 1.08 139.32

Hole 78

3565
2930
635

95' @ .98 93.10

(337 366.89

112 1.09

AREA

1,356,920 Tons @ 1.09' and 112' height.

250 x 500 125000
100 x 100 10000
150 x 150 22500

157500 sq ft.
112'
315000
157500
157500
13)17640000 ~~1787,700~~ 1,356,920 Tons @ 1.09

oxide

78. 45' @ .78 35.1
79. 30 @ .78 23.4
94. 35' @ 1.15 40.3

(110 .89 98.8
37'

37 x 157,500 sq ft.
37
1102500 448,270 Tons
472500
13)5827500 ~~548,270~~ Tons @ 0.89

448,270 Tons @ 0.89%
37' height.

2. NW area Sulphide 2930

AVE AREA W Side section ave

$112 \times 500 \times 1.09 = 56000 \times 1.09 = 61040$ (60940)

AREA ON SECT. 8W
FROM 6.5N to 11.5N.
ave grade 1.3

$146 \times 500 \times 1.30 = 73000 \times 1.30 = 94900$

258 / 129 — 1000 — 129000 — 155940

129 height

64500 (1.21)

height 6.5N 175
10 N 135
155 × 350 = 54200 (54250)
125 × 150 = 18 800 (18750)
500 — (73 000 (73 200)
146

$\frac{64500 \times 150}{13} =$

1.21
129 | 155.940
129
269
258
114

744,230
13 | 9 675 000
91
57
52
55
52
30
29
40

$\frac{9,675,000}{13} = 744,230$ T. @ 1.21

129' height

OXIDE

W. side ~~area~~
E " "

$37 \times 500 @ 0.89 = 18500 \times .89 = 16465$

$93 \times 500 @ 0.865 = 46500 \times .865 = 40222$

(65' height) — 65000 — 56687

32500 (0.87)

height 6.5N 36
10 N 140
176
88

88 × 350 = 30800
105 × 150 = 15750
500 — 465.50
93

$\frac{32500 \times 150}{13} = \frac{4875,000}{13} = 375,000$ T. @ 0.87%

65' height

.872
65 | 56687
520
468
455
137

375000
13 | 4 875000
39
97
91
65

2. NW AREA

AUE AREA Westside } Sections (112 × 700) × 1.09 = 78400 × 1.09 = 85456
" " East "

Blocks 93-81 62000 1.31 81220
93 north 18750 1.27 23812
height 147 80750 105032

130

105032
80750
242820
242250
57000

112
700
78400
1.09
705600
784000
8545600

80750
1.3
242250
80750
104975.0

147
112
159

130
700
9100

80750 × 1.30 = 104975
159150 190431

79575 sq ft. 1.20%

NG

1.196

159150)190431
159150
312810
159150
1536600
1432350
1042500
1114050

TONS

79575 × 150 / 13 = 918,942 @ 1.20%

79575
150
3978750
79575
13)11936250 918942
117
23
13
116
104
122
117
55
52
30

146.8
55)80750

SEE NEW SHEET

NG

NG

OXIDE

AUE AREA W. SIDE 37 × 700 @ 0.89 = 25900 × 0.89 = 23100
" " E " 47750 @ 0.865 = 41325
73650 64425
36825 0.87

north 93 15750 @ 1.1 17325
93-81 32000 @ 0.75 24000
47750 41325
0.865

36825
150
1841250
36825
5523750
424900

36825 × 150 / 13 = 424,900 Tons @ 0.87

3. AREA SW   3050. Sulphide

AVE of areas on 10W
2.5N to 6.5N

59N	65 × 60 × 1.30 = 3900 × 1.30 = 5070		
59-55	73 × 184 × 1.22 = 13432 × 1.22 = 16387		
55-83	107 × 203 × 0.93 = 21721 × 0.93 = 20053 +		
	447	39053	41500

1.08%
39053 / 41500
39053
244700
232424

87.3
447 / 39053
3576
3293
3129
1640

Hole 80

80' @ 1.0%

FOR Block around 80' CDH

assume height 80' grade 1.0%

area 260 × 400 × 1.0 = 10400.0 × 1.0 = 104000

80
8000
640000

Tons = 260 × 400 × 80 / 13 = 640,000 Tons @ 1.0%
height 80'

For Block around 80 CDH oxide

Hole 78 45 @ .78
" 79 30 @ 7.8
" 55 60 @ 1.44

Hole 80 65' @ 0.63

assume 50' @ .65

50
8000
400000

260 × 400 × 50 / 13 = 400,000 Tons @ 0.65%
50' height

10 W 3050 Sulphide

59 N

65@1.3 84.5

$65 \times 60 \times 1.30 = 3900 \times 1.30 = 5070.$

59 - 55

65 × 1.3 84.5
65 × 1.3 84.5
15@0.5 7.5
145 176.5
1.22

$73 \times 184 \times 1.22 = 13432 \times 1.22 = 16387.$

55-83

80 × 1.15 92.0
135 × 0.8 108.0
215 200
107 .93

$107 \times 203 \times 0.93 = 21721 \times 0.93 = 20053$

83 - 56

165@1.11 183.5
42@0.5 21
207 204.5
.99

207 99
107 93
314
157

$157 \times 107 \times 0.97 = 16799 \times 0.97 = 16295$

554 55852 57805

(101') (1.03)

$\frac{55852 \times 100}{13} = 429,630$ Tons @1.03
101' height

3050 oxide

around 55 $60 \times 200 \times 1.44 = 12000 \times 1.44 = 17280$

$\frac{12000 \times 100}{13} = 92,310$ Tons @ 1.44%
60' height

9W 2930 Sulphide

South of 82
(82) 165' of 1.48

165' × 50 × 1.48 = 8250 × 1.48 = 12210

490
5N to 6N
1.21
1.22
0.84
1.00
.88
.70
assume 65.85
.98

average
1.48 hole
.98 workings
2.46
1.23

165 × 110 × 1.23 = 18150 × 1.23 = 22324

6N to 6.5N

assume
165 × 50 × 1.0 = 8250 × 1.0 = 8250
210 34650 42784
165
(1.23) area

21 / 34650

3465) 42784 (1.23
3465
8134
6930
12040
10395
16450

$\frac{34650 \times 100}{13}$ = 266,540 Tons @ 1.23
265.39
165' height

2930 OXIDE
A
AROUND 82

105 × 100 × 0.7 = 10500 × .7 = 7350.0
area

$\frac{10500 \times 100}{13}$ = 80,770 Tons @ 0.7%
105' height

80769
13 / 1050000
104
100
91
90
78

9W 3050 Sulphide.

AVE. AREA W side
from 1N to 435N.

56-83	157 × 107 × 0.97 =	16799	× 0.97	= 16295
83-55	107 × 203 × 0.93 =	21721	× 0.93	= 20053
55 north	80 × 35 × 1.15 =	2800	× 1.15	= 3220
	345	41320	0.96	39568

20200.

ave

AVE AREA E. SIDE
1N to 435N.

around 50	155 × 250 × 1.34	38750	× 1.34	= 51925
around 61	150 × 85 × 1.42	12750	× 1.42	= 18105
	335	51500	1.36	70030

W side	41320	0.96	39568
E "	51 500	1.36	70 030
	92820		109598
	46410	1.18	

39667
70040

height 137'

46,410 sq ft @ 1.18 = 54764.0

46410
1.18
371280
46410
46410
54763.80

$$\frac{46,410 \times 100}{13} = 357,000 \text{ Tons @}$$

1.18%
137' height.

No oxide

357000
13 | 4641000
39
74
65
91

136.5
680 | 92820
68
248
204
442
408
340

Sect 8W

Sulphide.

2930

North of 93	(150 × 125) × 1.27	= 18750 × 1.27	23812.5
93-81 low?	(400 × 155) × ((1.27 + 1.35)/2) 1.31	= 62000 × 1.31	81220.0
81-54	(100 × 195) × ((1.35 + 1.28)/2) 1.37	= 19500 × 1.37	26715.0 26705
54-61	(100 × 235) × ((1.39 + 1.17)/2) 1.28	= 23,500 × 1.28	28080.0 30080 no change
61 + 50	(50 × 265) × 1.17	13250 × 1.17	15,502.5
	800 (171.2)	137000 (1.28)	175,330.0

1,053,850 Tons

3050

50	(250 × 155) × ((1.58 + 1.00)/2) 1.34 from core 40-56	38750 × 1.34	51,925.0

partly assumed

Prob

$$\frac{38750 \times 100}{13} = 298,080 \text{ Tons @ } 1.34\%$$

155 height

oxide

2930

North of 93	(150 × 105) × 1.1	15750 × 1.1	17,325
93-81	(400 × 80) × .75 assumed from 1.1 + .6	32000 × .75	24,000
81-54	(100 × 20) × .6	2000 × 0.6	1200
54-61	(100 × 47) × .63	4700 × .63	2961
61 + 50	(50 × 65) × .63	3050 3250 × .63	2047
	800 (82.1)	57700 (.825)	47,533

$$\frac{57700 \times 100}{13} = 443,850 \text{ Tons}$$

@ 0.825%

82.1 height

3050 GW oxide

(250 × 40) × ((1.00 + 0.6)/2) 0.8 assumed — 10000 × 0.8 — 8000

$$\frac{10000 \times 100}{13} = 76,920 \text{ Tons @ } 0.8\%$$

40'

175
150
6250
125
18750
1.27
131250
37500
18750
2381250

155
400
62000
131
62000
262000
786
81220.00

137
19500
68500
1233
137
26715.00

23,500
128
1880
270
235
2808 0.00

265
50
13250
117
92750
13250
13250
1550250

155
250
7750
3100
387.50
1.32
21700
32550
10850
1432200

105
150
5250
105
15750
15750
173250

75
32000
150
225
240000.0

47
63
141
282
2961

3250
63
9750
19500
2047.50

1,054,000
137000

1,054,000 tons 1.28 sulphide
443,800 " 0.82 oxide

1.28
137 | 175.330
137
383
274
1093
1096

38750
134
155000
116250
38750
5192500

171.2
8 | 137000

82.1
8 | 57700

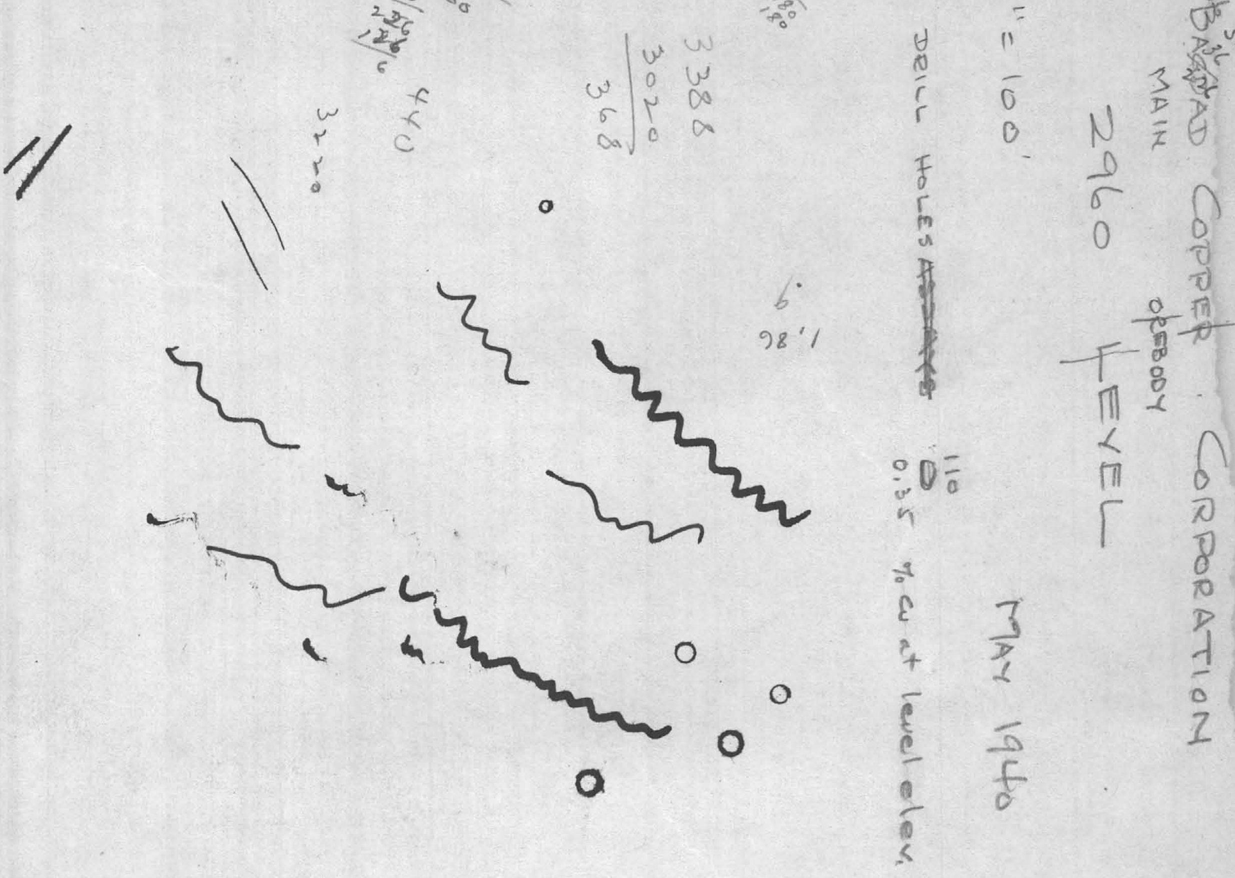
.825
577 | 475.33
4616
1373
1054
3190

443,800
13 | 57700
52
57
52
50
8
110
104

1054000
13 | 137000000

40'
125
80
25
115
80
60
65 not through
115

316
310
313
309
30
31
32
29
116



MR. RH SALES
ANACONDA COPPER MIN. CO.,
25 BROADWAY,
NEW YORK CITY.

YOUR LETTER JUNE 7 RECEIVED. IMPOSSIBLE TO FINISH ORE RESERVE CALCULATION AND HAVE REPORT IN NEW YORK BY FRIDAY. THEREFORE AM SENDING MAP COPIES AND SUMMARY LETTER BY AIR MAIL TUESDAY

ROLAND B. MULCHAY

7W 6930 Sulphide.

7.0N – 8.50N

ave grade 8W 1.31
" " 6W 1.05
2.36
1.18

152 × 150 × 1.18 = 22800 × 1.18 = 26904

6N – 7N

ave from blocks
1.94
1.95
1.30
1.33
1.04
0.75
8.31
1.38

173 × 100 × 1.38 = 17300 × 1.38 = 23874

5N – 6N

2.2
1.9 assumed
1.5
1.3 "
1.0
0.7 "
8.6
1.43

160 × 100 × 1.43 = 16000 × 1.43 = 22880

60 – 51

51 40 – 62.79
2 @ 1.20 ass
42 63.99
1.51

210 @ 1.51
198 @ 1.22
408
(1.37)

318
242
560

204 × 106 × 1.37 = 21624 × 1.37 = 29625

South of 51

212 × 45 × 1.51 = 9540 × 1.51 = 14405

501 87264 117688

(175) (1.35)

1751
501 | 87264
501
3716
3507
2094
2005
890

1.34
87264 | 117688
87264
304240
261792
424480
349056
754240

$\frac{87264 \times 100}{13}$ = 671,260 Tons
@ 1.35%
175' height

671261
13 | 8726400
78
92
91
16
13
34
26
80

7 W - 3050 Sulphide

North 89 97 × 50 × 1.17 = 4850 × 1.17 = 5674~~8~~

89 - 41 87 × 107 × 1.23 = 9309 × 1.23 = 11450.0

100 @ 1.17 117.00
75 @ 1.31 98,
175 215

41 - 40

(40) 40' @ 0.5 20
100' 1.58 158
140 1.27 178

107 × 96 × 1.28 = 10272 × 1.28 = 13148.0

75' @ 1.31 98
140 @ 1.27 178
215 276

40 - 88

20' 21.25
4 2.40
24 23.65
0.98

120 @ 0.98 117.5
140 @ 1.27 178
260 295.5

1.12 1.165

130 × 88 × 1.12 = 11440 × 1.12 = 12813.0

107.3
399 | 42831
399
2930
2793
1370

42831 | 49906
42831
70750
42831
279190
256986
222040

329469
13 | 4283100
39
38
26
123
117
61
5/90

South of 88 120 ~~×~~ 58 × 0.98 = 6960 × 0.98 = 6821
(107) 399 (1.17) 42831 49906

$\frac{42831 \times 100}{13}$ = 329,470 Tons @ 1.17 107' height

7W oxide 2930 None on 3050

area of blocks from 6N to 8.5N on 6W + 8W

(6W) { 7000 sq ft 0.75 5250
33415 " 76 25395
40415 30645

8W

height 95
20
115
58 × 250 + 75

14500 " .75
2 | 54915 .75
27,457

27,457 sq ft. × 0.75 = 20,593

2 1 1 2.07
$\frac{27,457 \times 100}{13}$ = 211, 210 Tons @ 0.75%
58' height.
?

59,915

6W 2930' Sulphide

Just name 58 million at 1.37

Around 53 — $(140 \times 150) \times \left(\frac{1.63 + 0.68 + .84}{3}\right) = 21000 \times 1.05 = 22,050.0$ (1.05)

50 @ 1.06 53.0
80 @ 0.7 56
130 109

North of 52 — $\left(\frac{150+190}{2} \times 110\right) \times \frac{1.33 + 1.05}{2} = 18700 \times 1.19 = 22,253.0$ (170 × 110; 1.19)

32 47.10
assume 7 4.90
39 52.00
1.33

52 - 91 — $\left(\frac{155+190}{2} \times 80\right) \times 1.22 = 14240 \times 1.22 = 17373$

195 @ 1.33 258
115 @ 1.34 154.2
assume 43 @ 0.5 21.5
353 433.7
1.22

115 154.2
43 21.5
158 175.7 1.15

91 - 90 — $\left(\frac{158+175}{2} \times 112\right) \times 1.54 = 18704 \times 1.54 = 28804$ (167)

158 @ 1.15 175.7
175 @ 1.97 336
333 @ 1.54 511.7
167

90 - 43 — $(180 \times 92) \times 1.71 = 16560 \times 1.71 = 28317$

175 @ 1.97 336
105 @ 2.16 227
80 @ 0.7 56
360 619
180 1.71

South of 43 (50') — $(185 \times 50) \times 1.53 = 9250 \times 1.53 = 14152$

105 227
80 56
185 283
1.53

1020 594

98454 132,949

168.8 1.35

$\frac{98454 \times 100}{13} = 757,340$ Tons @ 1.35%

169' height

757,338 Tons.

6 W Sulphide 3050

42 north	115 × 50 × 1.97	5750 × 1.97	11327.5
42 - 39	130 × 100 × 1.55	13000 × 1.55	20150.0
39 - 87	131 × 100 × 1.15	13100 × 1.15	15065.0
87 south	116 × 50 × 1.07	5800 × 1.07	6206.0
		37.650	52748

42 north

115' @ 1.97

42 - 39

115 @ 1.97		226
70 @ 1.90		132
75 @ 0.60		45
260		403
130		1.55

39 - 87

70 × 1.90		132
75 × 0.60		45
145	1.22	177
75	@ 1.33	100
41	0.6	24.6
		301.6
261	1.15	
131		

87 south

75 @	1.33	100
41	0.6	24.6
116	1.07	124.6

125.5 300 1.4

126'

$$\frac{37650 \times 100}{13} = 289,620 \text{ Tons}$$

@ 1.4%

126' height

13 | 3765000 = 289615
26
116
104
125
117
80
78
20

6W 3930 oxide

Correction Sheet

	length	area	area x %
	395	57215	42445
height	145'	%0.74	

145
395 | 57215
395
1775
1580
1950
1955

$$\frac{57215 \times 100}{13} = 440,120 \text{ Tons @ } 0.74\%$$

145 height

440,120
401,650
38,470 Tons to add

325,689
297,221
28,468 to add to tons x %

638,17,400
53017800
10,799,600 to add to height x Tons

~~#7~~

2,228 750
38 470
2,267,220

1,839 069
28 468
1,867,537

0.824 %

177 714 440
10 799 600
188,514,040

83.1'

---

676 540
92 310
2267 220
3036 050

544,488
80 309
1,867,537
2,492,334

33 435 070
11 077 200
188 514 040
233.026 310

.82
303605 | 2492334
2428840
634940
607210
2730

76.7
303605 | 233026310
2125235
2050281
1821630
2286510

6 W oxide 2930

53 north	~~240'~~ 12' × 50 × 0.75	~~7000~~ 12000 × 0.75	~~5250.0~~ 9000
53-52	163 × 205 × 0.76	33415 × 0.76	25395.0
52 South	95 × 40 × 0.75 (~~assumed~~ on interpolation)	3800 × .75	2850.0
43 around	80 × 100 × 0.65 (assumed on interpolation)	8000 × .65	5200.0
		52215	38695
		57215	42445

230' @ 0.75 172.2
95 @ 0.8 76.
325 248.2
163

578 395

~~132.2~~ 145.0 0.74

4016
13) 5221500
52
021
13
85

440,120 corrected

$$\frac{52215 \times 100}{13} = 401,650$$ Tons @ 0.74

132' height

---

6 W oxide 3050

87 around	30 × 100 × 1.20	3000 × 1.20	3600.0

23077
13) 300000
26
40
39
100

$$\frac{3000 \times 100}{13} = 23,080$$ Tons

@ 1.2%

30' height

5W 3050 Sulphide

	height	length				
38 south	120	× 75'	× 1.74	= 9000 × 1.74	=	15660
38 - 86	108	× 100	× 1.75	= 10800 × 1.75	=	18900
86 North	78 ×	50	× 1.93	= 3900 × 1.93	=	7527
		225		23700		42087

120' @ 1.74
95' @ 1.76
215
108

95' 1.77
60' 2.17
155
78
1.93

168
131
299

(1.77)

(105')

1.78

$$\frac{23700 \times 100}{13} = 182,310 \text{ Tons}$$

@ 1.77%
105' height.

5W 3050 OXIDE

38 South	30 ×	75'	× 0.78	= 2250 × 0.78	=	1755
38-86	57 ×	100	× 0.74	= 5700 × 0.74	=	4218
86 north	60 ×	50	× 0.71	= 3000 × 0.71	=	2130
		225		10950		8103

40
60
30

75 @ .72
40 @ .78
115
57
0.74

54
31.2
85.2

75 .72 54
10 0.6 6
85 .71 60

(49')

.74

$$\frac{10950 \times 100}{13} = 84,230 \text{ Tons @ } 0.74$$

49' height.

5W 2930 Sulphide.

·37 South

height
180 × 50 × 160 = 9000 × 1.6 = 14400

165@1.71 282
18@ 0.5 9.0
183 291.0
1.60

37-48

180 @1.80 28.95
175 @2.0 350.0
355 (1.8) 639.5
178

178 × 93 × 1.80 = 16554 × 1.8 = 29797

AVE area on 6W
4N to 7N...

90-91 167 × 112 × 1.54 = 18704 × 1.54 = 28804
91-52 178 × 80 × 1.22 = 14240 × 1.22 = 17373
52N 170 × 110 × 1.19 = 18700 × 1.19 = 22,253
× 302 51644 68430
171' 1.32

AVE areas on 4W
4N to 7N

36-49 174 × 200 × 1.26 = 34800 × 1.26 = 43848
49N 177 × 100 × 1.00 = 17700 × 1.0 = 17700
300 52500 61548
175' 175 1.17

USE 170' (smaller on N end) and 1.24%

170 × 357 × 1.24% = 60690 × 1.24 = 75255
143 86244 (172.4
500 119452 (1.385
(172) 86244
(1.385) 332080
258732
733480
689952
435280
431220

6634.15
86244 × 100 = 663,420 Tons
13 @1.385
172' height

hole 47

5 W 2930 OXIDE

37 south 27 × 50 × 0.71 = 1350 × 0.71 = 958.5

37 - 48 80 × 93 × 0.83 = 7440 × 0.83 = 6175.2

10 - 0.6 6.0
150 - .840 126
160 42 132
126
0.83

48 N 150 × 107 × 0.84 = 16050 × 0.84 = 13482.0
250
24840
20615.7 (.83
19872.0
74370
74520

99' (0.83)

99.3
25 | 2484.0
225
234
225
90

$$\frac{24840 \times 100}{13} = 191,080 \text{ Tons @ .83}$$

99' height

191077
13 | 2484000
13
118
117
14
13
100
91
90

4W 2990' Sulphide.

	height	length		
N 92	120' x	100 x	1.13	= 12000 x 1.13
92 - DDH 125	127 x	200 x	1.13	= 25400 x 1.13
DDH 125 S.	135 x	100 x	1.13	= 13500
	(127)			50900 127.25

120
135
127

783077
13 | 10180000
91
108
104
40
39
100
91
90

$\frac{50900 \times 200}{13}$ = 783,080 T.
@ 1.13 %
127' height.

4W 2930 Sulphide

Hole 49
75 @ 1.24
102 @ 0.7
177 1.0

93.
84
177

3262
230
3032

102' @ 0.7 assume

	height		
49 N.	177 x 100 x 1.0 =	17700 x 1.0 = 17700	
49-36	174 x 200 x 1.26 =	34800 x 1.26 = 43848	
	176 x 150 x 1.41 =	26400 x 1.41 = 37224	
	450	78900 1.25	98772 (1.25

177 - 1.0
171 - 1.53
348
4.9.45 (1.26)
30 2.4
4 5185
34 1.53
171

177
262
439

36 to interpolation between 37 + 47
183 - 1.60
181 - 0.98
182 1.29 rlt.

(175')

(36) 171 - 1.53
Int 182 - 1.29
353
176
497 (1.41
.353
1440
1412
2800

262
235
497

175.3
45 | 7890
45
339
315
240
225
150

98772
78900
198720
157800
409200
394500
147000

$\frac{78900 \times 100}{13}$ = 606,920 Tons
@ 1.25 %
175' height.

no oxide
606923
13 | 7890000
78
90
78
120
117
30

4W 2190 OXIDE

around 92 $120 \times 100 \times 0.87 = \frac{12000 \times 100}{13} = 92,310$ Tons

@ 0.87

120' height.

92307
13 | 12000 00
117
30
26
40
39
100

4W 3050 Sulphide
from 0.25 to 2.50 N

See 3W areas 46S
46-47

$50 \times 182 \times 2.6 = 9100 \times 2.6 = 23660$

$57 \times 93 \times 2.12$ = 5301 × 2.12 = 11 238

(52) 275 2.42 14401 (2.42) 34898

52
275 | 14401
1375
651
550
1010

2.42
14401 | 34898
28802
60960
57604
33560

5W areas

38S $120 \times 75 \times 1.74 = 9000 \times 1.74 = 15660$

38-86 $108 \times 100 \times 1.75 = 10800 \times 1.75 = 18900$

86 N $78 \times 50 \times 1.93 = 3900 \times 1.93 = 7527$

(105) 225 23700 (1.77) 42087

AREA 0.25 N to 2.5 N on 4W

105' @ 1.77 185.8
52 @ 2.42 125.8
157 311.6
78'

(1.98)

1.98
157 | 311.6
157
1546
1413
1333
1256
820

height

$78 \times 225 \times 1.98\% = 17550 \times 1.98\%$

$\frac{17550 \times 100}{13}$ (1350) = 135,000 Tons
@ 1.98%
78' height.

no oxide

3W | 3050 Sulphide

height length

South of 46 — 50 × 182 × 2.6 = 9100 × 2.6 = 23660

46-47

50 @ 2.6 130.0
65 1.75 114
115 244
57 2.12

57 × 93 × 2.12 = 5301 × 2.12 = 11238

47-45

(45) 70 @ 1.08 75.60
assume 8 @ 0.7 56
78 81.20
1.04

78 1.04 81.2
57 2.12 121.0
135 202.2
68 (1.5)

68 × 100 × 1.5 = 6800 × 1.5 = 10200

45 N.

(44) 65 @ 1.93 122.5
78 1.04 81.2
143 203.7
71 1.42

71 × 50 × 1.42 = 3550 × 1.42 = 5041

425 — 24751 — 2.03 — 50139

(58')

58.2 — 2.03%

24751 | 50139

$$\frac{24751 \times 100}{13} = 190,390 \text{ Tons}$$

@ 2.03%

58' height

No oxide

13 | 2475100 = 190392

3W ~~2~~930 Sulphide

(44)
El 3211
2930
281

185 @ 1.76

44 S. $185 \times 50 \times 1.76 = 9250 \times 1.76 = 16280$ ~~17280~~ / no change

Interpolate
35
El 3211
2930
281

assume 180' @ 1.0%

170 @ .99
11 @ 0.7
181' @ 0.97
(49) 177 1.00
358
179

168.3 .992
7.7
1760
1629
1310
1267
430

44 – Interpolate $182 \times 100 \times 1.38 = 18200 \times 1.38 = 25116$

185 @ 1.76 = 325
180 @ 1.00 = 180 1.38
365
182

505
365
1400
1095
3050
2920
1300

Interpolation north $180 \times 100 \times 1.0 = 18000 \times 1.0 = 18000$

250 45450

59396 (1.307
45450
139460
136350
311000

(1.31)

(182')

no oxide

181.8
250 / 45450
250
2045
2000
450
250
2000

$\frac{45450 \times 100}{13}$ = 349,620 Tons
@ 1.31%
182' height

34961 5
13 / 4545000
39
64
52
125
117
80
78
20
13
70

1.32
4545 / 60396
4545
14946
13635
13110

2W •3050 Sulphide
2.5N to 5.5N.

ave on 3W

46 - 47	57 x 93 x 2.12 =	5301 x 2.12	= 11238
47 - 45	66 x 100 x 1.50 =	6800 x 1.50	= 10200
45 - 44	71 x100 x 1.42 =	7100 x 1.42	= 10082
45 N	65 x 50 x 1.93 =	3250 x 1.93	= 6272
	(65') 343	22451 (1.68)	37792

AVE on 3W 2.5N to 5.5N 65' of 1.68 = 109.
" " 1W " " 70' of 1.05 = 73.5
135 (1.35) 182.5
67

135)182.5 = 1.35
135
475
405
700
675

AVE on 1W 2.5 to 5.5 N

23 around	70 x 100 x 1.30	= 7000 x 1.3	= 9100
22 around	70 x 200 x 0.93	= 14000 x .93	= 13020
	(70)	21000	22120 (1.053

21
112
105
70

$$1.35\% \times \left(\frac{67' \times 300 \times 100}{13} \right) = 154,610 \text{ Tons @}$$

1.35%
67' height

67 300
13) 2010000 (154,615
13
71
65
60
52
80
78
20
13
70

no oxide ✓

8.50

CDH 108

2W 2930 Sulphide

around 35 height 181' × 100 × 100 / 13 = 1810000 / 13 = 139,230 Tons @ 0.97% 181' height

181' @ 0.97%

13) 1810000 = 139231

2W 2930 Oxide 1% ore

around 35 100' × 100 × 100 / 13 = 76,920 Tons @ 1.0% oxide 100' height

13) 1000000 = 76923.0

2W 3050N sulphides.

around 34 height 75' × length 250 × 1.41

75' - 1.41

no oxide

250 × 75 = 1250 + 1750 = 18750

18750 × 100 = 13) 1875000 = 144230

144,230 Tons @ 1.41%

height 75'

2 W- 2990 Sulphides

height

84 S. 100' × 100 × 1.0 = 10000 × 1.0 = 10,000

84 - 85

100' @ 1.0 = 1.00
75 @ 1.45 = 109
175 209
88 1.2

88 × 200 × 1.20 = 17,600 × 1.2 = 21120

85 N 75 × 100 × 1.45 = 7500 × 1.45 = 10,875

400 35100 41,995

(88) 88

93
21890
90

1196
351 | 41995
351
689
351
3380
3159
2210

2700
area

35,100 × 200
13
= 540,000 Tons
at 1.20%
88' height.

no oxide

1.45
53
15 2175
15
60

1W 3050 Sulphide

around 23

height
70 × 100 × ~~1.30~~ = 7000

$\frac{7000 \times 100}{13}$ = 53,850 Tons @ 1.30%

70' height

no oxide

1W 2930 Sulphide.

around Interpolation between 35 + 24

(35) 181' @ 0.97 = 176

(24) 187 @ 1.28 = 239

368 415

184 1.12

24 el. 3247
2930
317

165 @ 1.37
22 @ 0.6 assum
187 @ 1.28

184 × 100 × 1.12

$\frac{18400 \times 100}{13}$ = 141,540 Tons @ 1.12

184' height

no oxide

1W 3050 Sulphide N

Interpolation from 34 and section 0-0.

section 0-0 55' @ 1.50 82.5
hole 34 75' @ 1.41 106
130 1.45 188.5
65'

65 N to 9 H

height
65' × 250 × 1.45 = 16250 × 1.45

1250
$\frac{16250 \times 100}{13}$ = 125,000 Tons @ 1.45%

65' height.

no oxide

O.W. 3050 S. Sulphide

13 S

height

90' x 50 x 1.0 = 4500 x 1.0 = 4500

50' @ 1.52 = 60.80
assume 50 @ 0.6 30.
90 90.8

16 - 13

95 x 100 x 1.36 = 9500 x 1.36 = 12920

(16) 50 @ 2.39 = 119.50
assume 50 @ 1.0 50
100 1.69 169.50

100 @ 1.69 169.5
90 @ 1.00 90.
190 259.5
(95) 1.36

16 N

100 x 50 x 1.69 = 5000 x 1.69 = 8450
200
(95') 19000 (1.36) 25870
95

no oxide

$$\frac{19000 \times 100}{13} = 146{,}150 \text{ Tons @ } 1.36\%$$

95' height

O W 2930 Sulphide

height

around 24 187' @ 1.28 187' x 100 x 1.28 = 18700 x 1.28 = 23936

$$\frac{18700 \times 100}{13} = 143{,}850 \text{ Tons @ } 1.28$$

187' height.

no oxide

O W 3050 Sulphide N.

all interpolation from 24 & 110

assume average 55 height @ 1.5

from 6.5N to 9N

$$\frac{55' \times 250' \times 100}{13} = 105{,}770 \text{ Tons @ } 1.50\%$$

55' height,

no oxide

O.W. 2990N. Sulphide N.

height length

around 110. 90' x 200 x 1.2 = 18,000 x 1.2

Small area
+ 50 x 50 x 90
45000
225000

width
18000 x 200 = 3600000
225000
13) 3825000 (294230
26
122
117
55
52
30
26
40

No oxide

294,230 Tons @ 1.2%

90' height

1E 3050 Sulphide

height

17 South — 90 x 50 x 1.49 = 4500 x 1.49 = 6705

17-20

(17) 90 x 1.49 1341
(20) 60 x 1.42 851
150 (1.46) 2192
75

75 x 100 x 1.46 = 7500 x 1.46 = 10950

Int between 25 + 109

(25) 65 x 1.0 65
109 75 @ 1.68 126
140 1.37 191
70

20 - Int

Int 70 @ 1.37 959
20 60 @ 1.42 851
130 1.39 1810
65

65 x 200 x 1.39 = 13000 x 1.39 = 18070

Int - 27

Int 70 . 137 95.9
27 80 . 2.26 180.8
150 276.7
75 1.84

75' x 100 x 1.84 = 7500 x 1.84 = 13800

27 N. — 80' x 100 x 2.26 = 8000 x 2.26 = 18080

Int part - 7-8.5N

Sect 0-0
55' high @ 1.5 82.5
60' " 1.75 105.00
115 1.63 187.5
57

57 x 150 x 1.63 = 8550 x 1.63 = 13936

70' — 700 —)49050 7007 — 49050)81541 (1.66
49050
324910
294300
306100

377307
13)4905000

$$\frac{49050 \times 100}{13} = 377,310 \text{ Tons}$$

@ 1.66%

70' height.

No oxide some mixed ore in 27 hole.

2E 3050 Sulphide

height

10 S

95 @ 1.11 105.5
32 @ 0.7 22.4
127 127.9

127 × 50 × 1.0 = 6350 × 1.0 = 6350

10 - 18

127 @ 1.0 127.
71 @ 1.03 73.3
198 200.3
99 1.01

(18) 55 1.13 62.1
16' 0.7 11.2
71' 1.03 73.3

99 × 100 × 1.01 = 9900 × 1.01 = 9999

18 - 109

(18) 71 - 1.03 = 73.3
(109) 75 - 1.68 126.
146 1.36 199.3
73

73 × 300 × 1.36 = 21900 × 1.36 = 29784

109 to 26

(109) 75' @ 1.68 126.
(26) 80 @ 1.83 146.4
155 1.76 272.4
77

77 × 165 × 1.76 = 12705 × 1.76 = 22360

26 - 30

(26) 80 - 1.83 146.4
ave 30 40, 1.6 64.0
309 120 (1.75) 210.4
313 60

(30) 40 - 1.55
309 40 - 1.50
313 40' - 1.74
(50') 4.79
1.75 | 597

120 | 210.4
120
904
840
640

60 × 185 × 1.75 = 11100 × 1.75 = 19425

(77') 800

8) 619.55
77.4

61955) 87927 (1.42
61955
259720
247820
119000
61955
570450

13 | 6195500
476577
52
99
91
85
78
75
65
100
90

61955 × 100 / 13 = 476,580 Tons @ 1.42

ave height 77'

no oxide

2E 2990 Sulphide

DDH 313 – 31

DDH 313
100' at 1.41 = 141
(31) 60 @ 1.20 = 72
160 ... 213
80

160) 213 (1.33
160
530
480
500

no oxide

13) 3000,000 (230769

80 × 250 × 1.33
80
20000

$\frac{20,000 \times 150}{13} = \frac{3000,000}{13} = 230,770$ Tons

@1.33

height 80'

3E 3050

4.5N to 6N

Interpolate

height

80' x 150 x 1.54 = 12000 x 1.54

2E around 109
75' @ 1.68 126

4E 85' @ 1.41 120
160 246
80 1.54

no oxide

$$\frac{12000 \times 100}{13} = 92\,310 \text{ Tons @ } 1.54\%$$

80 height

9 2 3 0 7
13) 1200000
117
30
26
40
39
10

4E 3050 Sulphide

ave
111 - 28

105 @ 1.61 = 169
85' @ 1.17 = 99.2
(190) 268.2
85 1.41

4.5N - 6N.

1.41
19 | 268.2
19
78
76 / 22

height
85 × 150 × 1.41 = 12750 × 1.41 = ~~17977~~

98077
13 | 1275000
117
105
104
100
91
90

$$\frac{12750 \times 100}{13} = \frac{1275000}{13} = 98,080 \text{ Tons}$$

@ 1.41

85 height

3

AREA NE

28 150' @ 1.19 = 178.5 should be 1.76

116 90' @ 2.21 = 198.9

29 102' @ 1.06 = 108.1

DDH 310
d 3089 collar to 2990 165' @ 1.52
100' vert @ 1.52 = 152.0

637.5

442

110' @ 1.44%

AREA
125 x 350 = 43750
50 x 65 = 3250
150 x 112 = 16800
100 x 153 = 15300
79100 sq ft

79100 sq ft x 110' / 13 = 8,701,000 / 13 = 669,310 Tons @ 1.44 at 110' height

669308
13 | 8701000
78
90
78
121
117
40
39
100

GIROUX AREAS HOLES 72-77

	height	length				
NW of 72	65 ×	100 × 1.15	=	6500 × 1.15	=	7475
72-73	102 ×	420 × 1.28	=	42840 × 1.28	=	54835
73-74	102 ×	190 × 1.44	=	19380 × 1.44	=	27907
74-103	60 ×	440 × 1.58	=	26400 × 1.58	=	41712
103 SE	55 ×	100 × 1.48	=	5500 × 1.48	=	8140
	(80.)	1250		100620		140069

140 × 1.34 188
65 1.15 74.5
205 262.5
102 1.26

140 - 1.34 188
65 1.67 108
205 1.44 296

65 - 1.67 108
55 1.48 81.4
120 1.58 189.4

1.39

80.5
1250 | 100620
10000
6200
6250

1.392
10062 | 140069
10062
39449
30186
92630
90558
20720

$$\frac{100620 \times 200}{13} = 1,548,000 \text{ Tons}$$

@ 1.39%

80' height.

1,548,000
13 | 20124000
13
71
65
62
52
104

GIROUX 72-77
OXIDE

	height		
72 NW	40' x 100 x 0.71	= 4000 x 0.71	2840.00
72-73	27 x 420 x 0.76	= 11340 x 0.76	8618.4
73-74	33 x 190 x 0.70	= 6270 x 0.7	4389.0
74-103	30 x 440 x .68	= 13200 x 0.68	8976.0
	1150	34810	24823.4
	(30)	(0.71)	

40-0.71 = 2840
15 88 = 13.20
55 4160

15 @ 88 = 13.20
50 @ .65 32.50
65 45.70

50 @ .65 32.50
10 @ 8 8
60 40.50

~~103 SE~~

115) 3481.0 = 30
345
310

3481) 24823 = .71
24367
4560
3481
190

13) 348100.00 = 26776.9
26
88
78
101
91
100
91
90

26777.9
2
535540

34810 x 200 / 13 = 535,540 Tons
@ 0.71
30' height.

GIROUX AREA

TUNNEL PORTAL + Hole 104.

AREAS $75 \times \frac{140}{2} = 5250$

$130 \times \frac{140}{2} = 9100$

$\frac{50}{2} \times 75 = 1875$

$\frac{75+50}{2} \times 130 = 4775$

21000

Ave grade on level from XCs 1.50%

AREA 6650 — Hole 104 75' of 1.2% begins 10' below Tunnel lvl

If same thickness maintained

$\frac{21000 \times 75'}{13} = 121,150$ Tons @ 1.2 – 1.4%

121,154

REPORT ON
BAGDAD COPPER CORPORATION PROPERTY
YAVAPAI COUNTY, ARIZONA

BY

ROLAND B. MULCHAY

JUNE ~~193~~ 1940

INTRODUCTION.

Since 1906 extensive copper mineralization on the property of the Bagdad Copper Corporation west of Hillside, Arizona has been prospected by churn and diamond drill holes, and underground exploration and development. The property has been examined by many engineers, and several detailed reports are available. In 1934 an examination for the Anaconda Copper Mining Co. was made by Mr. V. D. Perry and Mr. R. B. Mulchay, and in 1936 a supplementary report on current work was written by Mulchay. At the request of Mr. R. H. Sales further field ~~examination~~ work at the property was done by Mulchay and Mr. R. S. Moehlman from May 13-23, 1940. This examination had for its primary objective the investigation of geologic possibilities for extensions of the Bagdad orebody. A detailed ore estimate was made at Inspiration, Arizona in which the records of the Bagdad Corporation and other reports were used. While the field work was in progress the Bagdad Corporation requested a loan from the International Smelting Company. As bearing upon this proposition considerable detailed operating data was obtained from the manager at the property, Mr. J. W. Still. The cost and production data have not been checked but are believed to be reliable records of the present operation.

LOCATION AND PHYSICAL FEATURES.

The property is located in the Eureka Mining District, Yavapai County, Arizona in Sections 4 and 5, T. 14 N, R 9 W, and Sections 29, 32, and 33, T 15 N, R 9 W. The mine and camp at Bagdad are connected with Hillside station on the Santa Fe Railroad by 27 miles of graded improved road. Hillside is 2o miles by good graded road from the Phoenix-Prescott surfaced highway near Congress Junction. Various routes to connect Bagdad with rail transportation have been surveyed but all are difficult and costly.

Water at the rate of approximately 5o gallons per minute is now obtained from wells, springs and the mine. Water rights on Boulder and Burro Creeks are owned by the company and are respectively 2.5 and 7.5 miles from the present millsite. To supply water for a suggested 5oo ton per day operation, present plans call for a pumping plant at Boulder Creek to furnish 15o gallons per minute against a head of 544'. This supply is believed by Mr. Still to be sufficient to provide water for eleven months of the year with one month to be provided by ~~storage~~ water stored behind an earth dam below the mill, and the present supply. For a larger tonnage operation water would be pumped from Burro Creek against a 1ooo' head.

Power is supplied for the present operation by Fairbanks-Morse diesel engines with 975 rated horsepower ~~a rated horsepower of~~ which deliver on intermittent load about 65o HP. For the Schlereth-Whitaker report an estimated cost of $4o,ooo was made for a power line, including transformers, from the Arizona Public Service lines to Bagdad. This estimate was based on power for a 1000 ton per day operation.

The main drainage of the Bagdad area is through Copper Creek which cuts southwesterly across the main orebody, and then swings to the northwest. Copper Creek although dry during most of the year occasionally carries flash flood waters. Some provision for such ~~occurences~~ flood water would have to be made in any plan for mining the main orebody.

The mine is now making water at the rate of about 20 gallons per minute. No special mining problems should be created by present underground water conditions. There is no timber in the district.

PRESENT OPERATION.

In early 1937 preparations were made to mine and mill a part of the Bagdad orebody as a test for possible large scale operations. Two one hundred feet square blocks have been undercut on the 2990 level, and an intermittent production on a 200-300 ton per day basis has been in progress since 1937. To May 1,1940 a total of 157,587 tons had been extracted from the stopes and surrounding development. Since October, 1937 the property has been operated under the direction of Mr. Still, who supplied the following figures:

	Tons treated	Total % Cu	Oxide Cu	Tons Conc.	%Cu Conc.	Ratio of Conc.	% Recovery
Oct. 1937 to April 1938	48,026	1.51	0.11	1224.9	46.59	39.2	78.7
April 1938 to Nov. 1939	Shutdown						
Nov. 1939 to May 1, 1940	44, 346	1.498	0.17	1041.6	45.73	42.6	71.7

Since November, 1939 monthly tonnages treated have varied from 6367 to 8093 tons. The present operation is hampered by a failing water supply. Production would be maintained about at mill capacity of 8000 tons per month if there were no water or equipment failures. Concentrates are shipped by truck to the International Smelting Co. at Miami, Arizona ~~at a cost of $6.00 per ton~~. Cost data are summarized at the end of this report.

During May the Bagdad Corporation, acting through Mr. C. Q. Schlereth and Mr. Still, made a request for a loan of $150,000 - $200,000 from the International Company for needed plant expansion and working capital. The loan would be secured by a mortgage upon the property of the Bagdad Corporation. According to Mr. Still, the loan, if obtained, would be expended as follows:

Mill Reequip and rebuild present mill for 500 ton per day operation.	$ 50,000.00
Water Supply Pipe line to Boulder Creek, pumping plant for 150 gallons per minute against ~~about~~ 600' head, and earth storage dam in Marooney Gulch	18,000.00
Tailings disposal line: 7000'	7,000.00
Power: Install 200 HP ~~additional~~ diesel engine	25,000.00
Working Capital	50,000.00
Total	$150,000.00

GENERAL GEOLOGY.

At Bagdad a monzonite intrusive with several acid phases has intruded older schists and coarse grained granitic rocks. North and east of Copper Creek the intrusive monzonite and the older rocks are covered by gravels and capped by a basalt flow. Within the monzonite area there has been widespread primary mineralization , parts of which have been enriched by secondary processes to form tabular bodies of secondary copper ore. The older rocks also contain traces of primary sulphide mineralization but there is no evidence of high grade primary or secondary ore within these rocks. No orebodies are to be expected, therefore, outside the monzonite. There is no major faulting in the area, although there are numerous small clays which have some small displacement. In the area near the Giroux tunnel and to the east, the Hawkeye fault drops the east side relative to the southwest side. No bodies of secondary chalcocite ore have been found south of this fault in this area.

The secondary ore blanket developed at Bagdad is related to an old erosion cycle in which the principal drainage was through a canyon, now gravel filled and capped with basalt, which extended northwesterly across the present course of Copper Creek immediately north of CDH 108. Copper Creek here cuts across gravels about 500' wide, and as developed in a shaft put down for water, from 125 to 150' deep. North of this gravel the rock exposed is monzonite with many included schist fragments and little primary mineralization. North of this section schist is exposed. Immediately east of CDH 108 in Copper Creek the schist - monzonite contact cuts irregularly across Copper Creek. The contact strikes northwesterly on the west side of the canyon and about N 75°E on the opposite side. This contact to the east is assumed to swing to the south toward the exposures of schist and grainitic rocks ~~expos-~~ found along the Bagdad Hillside road above the mill. From Copper Creek northwest there is no good evidence to show the strike of the contact. It is possible thatthe old canyon more or less followed this major feature of the rock pattern of the district. CDH 102 drilled about 3200' northwest of CDH 108 was lost in gravels st an elevation of 3020'. CDHs 108, 100,101,98, and 97 are reported to have been drilled into primary mineralization in monzonite at elevations above the ~~apparent~~ bottom of the channelway. ~~From~~ The drill records show these holes are ~~apparently~~ located along the southerly side of this old erosion feature.

General notes on the rock relations and mineralization features of the areas south and southwest of Copper Creek are posted upon the surface geological map which accompanies this report. Further description of ~~this~~ these areas is given under section 1 of the discussion of possible ore extensions.

In the northwestern part of the property ~~a~~ the Black Mesa breccia pipe ~~known-as-the~~ has been partly ~~developed~~ explored by a tunnel and two short winzes, a churn drill hole and a diamond drill hole. The breccia is exposed at surface for a width of 200' and a length of 600' disappearing under gravels and surface wash to the northeast. It is similar structurally to oval shaped breccia pipes developed at Cananea. The mineralization, which cements angular fragments of monzonite, in the tunnel is composed of white quartz, pyrite, chalcopyrite, chalcocite and few specks of molybdenite. Near and around the southwest nose on the tunnel level there is good chalcocite mineralization, and a ~~forty foot~~ 40' winze is reported to have averaged 4% copper. A diamond drill hole drilled into this structure to a depth of ~~about~~ 700' below surface showed ~~the~~ ~~primary~~ ~~the~~ quartz-pyrite-chalcopyrite molybdenite mineralization to persist to that depth. ~~although there was no chalcocite~~. No chalcocite was observed in the lower part of the hole. Copper assays ~~in this hole~~ were uniformly low.

MINERALIZATION.

The monzonite intrusive has been mineralized with seams and disseminations of pyrite, chalcopyrite, quartz, and little molybdenite, and secondary enrichment in the northerly part of the area has formed secondary chalcocite orebodies. Oxidized minerals at and near surface are malachite, chryscolla, native copper, cuprite and azurite. On the 2960 level in the north part of 800W XCN there are small seams which contain quartz, galena, sphalerite, and tetrahedrite. On this level there appear to be wide variations in the intensity of the primary mineralization. In the section in 800W XCN from 625N to 775N there is prominent quartz, chalcopyrite, pyrite, molybdenite and little chalcocite in both seams and disseminations. The seams strike N 75-85°W and N 2o-25°E and dip very steeply. In 7ooW XCN at 3o' south of 525 XCE on the 296o level there is an occurence of native copper with disseminated chalcocite, chalcopyrite and pyrite.

On the 3o8o and 3o2o levels two narrow northwest stringer veins have been developed and a small tonnage was selectively mined from them in 1936. These veins on the 3o8o level contain from4" to 24" of pyrite, chalcocite and quartz. On the easterly vein, or 43 1/4 vein which dips steeply to the west, the structure at 6ooN coordinate has broken into two thin parallel clay gouges with ~~one-to-four-inch~~ 1"- 4" of pyrite, quartz, and chalcocite. On the 3o2o level vertically below the structure is similar but with even less mineralization. Vertically below this area on the 296o level the vein was not mapped although it may hav passed through the workings behind timber. To the southeast on this ~~le~~ level the vein showed weak bunchy pyrite, quartz mineralization with very little chalcocite. ~~Southeast of the shaft on the 3o8o level this vein is very weak carrying from 1-6" of quartz and pyrite with little chalcocite and iron oxide~~. On the more westerly vein, or 8.3o which dips to the east, development on the 3o8o level showed that northwesterly the vein breaks up into a number of small fractures some of which have an E -W strike. A short drift on this vein on the 3o2o level showed weak mineralization.

The first eleven lots of concentrates shipped to the International Smelter had the following average analysis:

Tons	Total % Cu	Oxide % Cu	Ounces Ag	Au	% Fe	% S	% MoS_2
375.o	44.8o	2.76	1.4	o.ol-	1o.5	21.6	1.25

9A

The ore reserve blocks were calculated on vertical sections spaced at one hundred foot intervals parallel to the mine coordinates at N 9° 15' E. The outlines of the various undercut level blocks has been transferred from the sections to the level plan maps which accompany the report. A volume of 13 cubic feet in place has been used as equivalent to one ton.

Examination of these concentrates shows that a large proportion of the contained copper is in the form of chalcocite. Calculation from smelter analyses indicates that from 85-90% of the sulphide copper in the concentrates is contained ~~an~~ in chalcocite, and that the remainder of the sulphide copper is chalcopyrite. Examination of numerous drill hole samples by Mr. P. C. Benedict indicted that malachite was by far the most important mineral of the oxide group.

ORE RESERVES.

During past years many ~~figures~~ estimates of Bagdad ore reserves have been presented by various engineers. The present calculation has been made largely from Bagdad drill hole information, supplemented by the Witt and Benedict report, on which there is no good check. Only that mineralization which appeared to be mineable in an established mining plan has been considered. This has necessitated the elimination of some narrow and spotty sections along the south and southeast sides of the orebody. A limit of about 65' height at 1.25% copper ~~grade~~ has been used as a minimum mining grade. The level assays have been used where assumptions of grade or ore extension were necessary. In the Giroux area widely spaced scout holes have shown a certain amount of secondary mineralization. This information is so scanty that the ore reported for this section must be considered as probable but not developed. In the main Bagdad area some of the ore blocks are much more thoroughly explored by drilling than others. However, in all of ~~the~~ These blocks the tonnage seems reasonably assured, and further exploration would only make more certain the grade of the ore.

Put in also notes on other sheet

¶ The calculation has been made on the basis of three undercut levels at the 293o, ~~level~~ 299o and 3o5o elevations. Following is a summary of the ore reserves:

~~Above the~~

~~The ore reserve calculation summary is as follows:~~

BAGDAD	Sulphide			
3o5o Level	4,625,39o tons	1.376% copper	93'	height of ore
299o	2,517,39o	1.254	1o5'	
293o	6,894,72o	1.247	156'	
TOTAL	14,o37,5oo	1.291	126'	

GIROUX	Sulphide	Probable ore.		
		1,548,ooo tons	1.39%	8o'

Above the Bagdad secondary ore blanket there are large amounts of copper oxide mineralization, ~~in which the dominant~~ chief ~~copper mineral~~ is malachite, ~~as reported by the Witt and Benedict examination of numerous drill hole samples. is malachite.~~ Using a lower limit of o.6% copper, ~~certain areas~~ tonnage of oxide copper mineralization above the sulphide ores ~~have~~ has been calculated ~~with the following results:~~ as follows:

Bagdad	Oxide			
3o5o level	676,54o tons	o.8o5% copper	49'	height of ore
299o	92,31o	o.87o	12o	
293o	~~2,228,75o~~ 2,267,220	~~o.825~~ 0.824	~~79~~ 83	
Total	~~2,997,6oo~~ 3,036,070	~~o.82~~ 0.82	~~74'~~ 76'	

Giroux	Oxide	Probable ore		
	535,54o tons	o.71% copper	3o'	height of ore.

There are in addition two other areas in which substantial amounts of oxide ore are indicated. In CDH 1o4 and the area developed near the portal of the Giroux tunnel, 121,15o tons of 1.2% plus oxide copper would be developed if the ore ~~section~~ area has the same height as shown by ~~drill hole 1o4.~~ the drill hole. This zone may have some lateral extension, ~~Extension, laterally of this zone may exist~~ but is limited to west and east by CDHS 1o5 and 1o7. Between the Giroux tunnel oxide area and the main Bagdad area, CDH 115 cut ~~22o~~ 220' of 1.o4% oxide mineralization from 115 to 335'. There is no other ~~development~~ exploration north of the Hawkeye fault in this area and considerable tonnages of oxide ore could be developed ~~in this section, which could extend norhterly toward CDHs 76 and 77 and easterly toward CDHS 78, 79 and 8o.~~ around this hole.

The ore reserve calculation has been largely based upon drill hole assay information provided by the Bagdad Corporation. There is no accurate ~~way to~~ check on these ~~assay~~ records. Stope Block 1, which has been nearly completely mined, ~~as~~ calculated from drill hole records ~~shows~~ would show a grade of 1.7% copper. As calculated from development assays by Mr. Still the grade is 1.5%. In this case, ~~while~~ the drill holes appear high. However two of the holes on the corners of this block may be ~~they may be locally~~ salted by ~~passing~~ cutting through the two northwest veins previously described, ~~and therefore mya make~~ the apparent discrepancy may therefore be ~~appear~~ greater than an average of many drill holes would show. ~~necessary actual.~~ Calculation of 5o' sections of the drill holes through the 3o8o level to compare with averaged crosscut samples around drill holes ~~on the 3o8o level~~ showed wide variations, but a fairly good check on ~~averaged of~~ average.

with even less mineralization. Vertically below this on the 2960 level the structure was not mapped although it may have passed through workings behind timber. To the southeast near the shaft on this level it showed weak bunchy pyrite quartz mineralization with very little chalcocite. On the westerly vein, or 8.30 which dips to the east, development on the 3080 level showed that to the northwest the vein appeared to be breaking up into a number of small fractures some of which have a more or less east and west strike. A short drift on this vein on the 3020 level showed weak mineralization.

The first eleven lots of concentrates shipped to the International smelter have averaged as follows:

Tons	Total Cu %	Oxide Cu	Ounces Ag	Au	SiO_2 %	Al_2O_3 %	Fe %	% S	% CaO	MoS_2 %
375.0	44.8	2.76	1.4	0.01-			10.5	21.6		1.25

Examination of these concentrates indicates that a large propoertion of the contained copper is in the form of chalcocite. Approximate calculation from the smelter averages indicate that not more than 10 -15% of the sulphide copper in the concentrates is contained in chalcopyrite, and that the rest of the sulphide is chalcocite.

ORE RESERVES.

Discussion of Possible Ore Extensions.

POSSIBLE ORE EXTENSIONS

Possibilities for ore extensions may be divided into four groups as follows:

1. Possible secondary orebodies south and southwest of Copper Creek.

2. Extension of the main Bagdad orebody northeasterly.

3. Extension of the main Bagdad orebody northwesterly.

4. The Black Mesa Breccia pipe.

1. Copper Creek which forms the present main drainage channel for the Bagdad area ~~at Bagdad~~ cuts southwesterly across the eastern part of the monzonite intrusive and then turns northwesterly through the monzonite area. South and west of Copper Creek there are extensive rock exposures unscreened by gravel, basalt or extensive surface wash as found to the north and notheast of Copper Creek. In Marooney, Mineral and Alum creeks, which are tributary to Copper Creek from the south, there ~~are~~ extensive exposures of the the monzonite and older rocks which have been stained with iron oxide, and locally with copper oxides. Throughout these areas in surafce exposures and in short tunnels and cuts fresh pyrite with occasional chalcopyrite can be observed. Three diamond drill holes were drilled in attempt to develop secondary ore under one of the better appearing areas where a clay gouge and crushed zone shows copper oxide minerals at surface. The results of these holes is tabulated below:

DDH 126	440-455' 3.3% Cu ~~copper~~ other ~~rest of~~ assays below 1%, generally below 0.5%
DDH 127	All assays below 0.45% Cu ~~copper~~
DDH 128	85-100' 1.5% cu other assays below 1.0% Cu, generally below 0.5%

General notes on these areas are posted upon the surface geological map which accompanies this report. The fresh primary mineralization exposed at and near surface throughout these areas definitely disposes of any hope that secondary enrichment processes have been operative over periods great enough to produce ~~appreciable~~ important enrichment.

2. ~~The~~ Possible northeast extension of the Bagdad mineralization is screened at surface by gravels, surface wash and a basalt capping. Underground development on the 3080 level toward this area is now inaccessible. Churn drill and diamond drill information must therefore be used as a basis for discussion of possibilites for ore extension into the northeast.

Churn drill holes 112, 113, 114, 96, 99, 121, 122 and 123 all drilled to the south and east of the Bagdad orebody show primary mineralization without appreciable secondary enrichment. A narrow, thin ore blanket extending to the northeast is indicated by diamond drill holes 309, 310, 313, and 316 drilled from the 3080 level. These holes show thicknesses of 25' to 125' of fair secondary mineralization below the 3080 level. Churn drill records indicate that this level is close to the top of the secondary ~~enrichment~~ ore blanket in this area. The lateral width of this mineralization is limited on the northwest by CDH 32 which cut 60' of 0.81% copper, and on the southeast by CDH 121 which cut 30' of 1.25% copper before it passed into straight primary mineralization.

The extent of this mineralization to the northeast cannot be ~~accurately estimated~~ estimated with any certainty. The monzonite-schist contact as projected at surface should cut across the trend of this ore zone within four to five hundred feet, and no extension past this contact can be expected. From present information therefore ~~it does not a pear likely that a~~ no large increase in ore reserves can be predicted from exploration of this area.

3. As in the case of the possible northeast extension of the orebody, the surface to the north and northwest is covered by gravels, surface wash, and basalt. Underground development on the 3080 ~~level,~~ 3020 and 2960 levels gives additional evidence for use with drill hole information in this area.

It has been suggested that the ~~stronger~~ northwest stringers ~~in the westerly part of~~ in the main Bagdad orebody might indicate a trend or direction ~~inwhich~~ for the stronger disseminated mineralization. ~~might~~ These veins as developed on the 3080 level~~s~~ are most strongly mineralized northwest of the shaft and south of coordinate 600N. Southeast of the shaft the 43 1/4 vein is very poorly mineralized, ~~and~~ with 4"-6" quartz, pyrite and iron oxide. It also ~~it~~ appears to be ~~much~~ weaker with depth as suggested by development on the 3020 and 2960 levels. The 8.30 vein is not strong ~~especially weak~~ where developed on the 3020 level. These structures, ~~therefore~~ while locally strong in relation to the other seams and disseminations of the orebody, do not appear to be structurally dominant features which might be expected to control ~~ore~~ mineralization trends or to be expressions of underlying structures which ~~would~~ do control extensive primary mineralization channels. Close inspection of mineralization features on the 2960 level leads to the belief that the monzonite is ~~irregularly~~ mineralized over irregular areas by seams and disseminations of quartz, pyrite, chalcopyrite, etc., ~~and that within~~ which are locally much stronger than in adjacent areas,

16

these better mineralized areas there aresmall but definite quartz seams with definite alignments both northwest and northeast. Within these areas it appears that all seams contain better mineralization, but there seems no good evidence that following the general trend of any particular group of semas is there better secondary mineralization. Possible extension of the orebody to the north or northwest under the basalt mesa is further limited by drill hole information, CDH 108 and DDH 130 north of the orebody contain neglible amounts of copper mineralization. DDH 131 cut 55' of 1.08% copper before it went into leached material and was lost at an elevation of 2834'. CDH 94 and 95 to the northwest showed some secondary mineralization. CDH 95 contained only 40' of 1.42% coper and bottomed in primary mineralization. CDH 100 approximately 300' northwest of CDH 95, cut 50' of 0.65% copper and then passedinto primary mineralization. CDHs 78, 79 and 77 showed a northwest of CDHs 94 contained appreciable thicknesses of secondary mineralization, and there will probably be some extension of the Bagdad mineralization through this area toward the Giroux mineralization.

Possible extension to the northwest under the basalt mesa is limited in size by the above mentioned drill holes. Should some such small extension exist as between DDH 131 and CDH 100, it would necessarily be further limited on the north by the westward projection of the schist-monzonite contact ex posed in Copper Creek; and by the possibility that the deep main drainage channel of the old erosion cycle had cut well into primary sulphides as has Coppeer Creek south and west of the orebody. It is unlikely therefore, for a variety of reasons that any great extnsion of the Bagdad secondary orebody can be expected from exploration north and norhtwest

South of CDH 1oo and northwesterly from CDHs 8o, 78, 79 and 94 there will probably be an extension of the main Bagdad mineralization toward CDHs 76 and 77 located between the Giroux area and the Bagdad. Following are the better mineralized sections cut in these holes:

CDH ~~Hole~~	Ore height	% Cu	
80	8o feet	at 1.0%	13oo' southeast of CDH 77
78	95'	~~at~~ o.98%	1ooo' " " "
79	129'	~~at~~ 1.o8	11oo' " " "
94	113'	~~at~~ 1.09	9oo' " " "
77	75'	~~at~~ o.97	
76	85'	~~at~~ 1.45	4oo northwest of CDH 77

The drill hole information on this possible extension of the Bagdad orebody ~~mineralization~~ indicates that the secondary mineralization is relatively thin and low grade. ~~and is not~~ Further to the northwest and north of the Giroux exploratory holes, CDHs 1o1, 97 and 98 were drilled into low grade primary mineralization ~~without~~ and did not cut sections of appreciable secondary enrichment. These holes definitely limit possible northerly extension of ~~this~~ good secondary mineralization under the basalt in this area.

17

of CDHs 1o8, 94 and 95, and DDHs 13o and 131.

XXX Insert ... (17A) +XX

4. The Black Mesa breccia ~~as~~ is a strongly mineralized pipe structure ~~containing~~ which contains primary mineralization of a type often associated with high grade ~~primary~~ copper ~~ore bodies~~ deposits. ~~has been a subject for considerable~~ As a possible locus for a copper orebody it has been the subject of geological speculation. ~~The~~ Diamond drill hole 129 drilled at an inclination of -56° in a N 85° E direction from the tunnel portal was lost at a depth of 843'. The breccia was cut in this hole at 29o' and the core to 362' shows irregular white quartz mineralization with pyrite, chalcopyrite, and little molybdenite. From 362' to the bottom of the hole no sludge was recovered and the core was crushed for assay. Inspection of these~~s~~ samples showed the same type of mineralization ~~to persist to 818' the last sample available. Assays of five samples selected at random are as follows:~~

~~Following is a summary of the ore reserves:~~

18

persisted to 818', the last sample available. Assays of five samples selected at random are as follows:

465'	to 470'	0.32 % copper	0.012 % Mo.
533	538	0.44	0.007
610	616	0.36	0.008
763	769	Tr	0.006
802	807	Tr	0.008

Samples throughout were less than 0.8% copper and were generally less than 0.5%. The hole was lost before it cross cut the entire breccia, but it is probable that the end of the hole is approximately at the east edge of the structure and ~~is~~ at about 700' below surface. The hole does not eliminate this structure as a possible locus for a primary copper ore deposit, but it does make more remote the possibility that such a concentration of primary ore minerals exists within limits of exploration by drilling. Should further exploration of this structure be attempted on the long chance that such ore might be found, the tunnel should be extended across the structure, and later drilling planned on the results of this work. ~~Logical exploration of the structure should be concentrated on the noses of the pipe where experience has shown that better primary mineralization is often generally located.~~

Logical exploration of the structure should be directed toward the noses of the pipe where experience has shown that better primary mineralization is often ~~localized~~ found.

MINING.

Present production from the mine is from two caving block stopes undercut on the 2990 level and drawn through an extraction level at 2960 elevation. Boundary drifts around the one hundred foot square blocks approximately 120' in height were run on the 3020, 3050 and 3080 levels. No grizzly level is used. The ore is drawn directly from the undercut level to the 2960 level through draw points spaced on 25' centers in extraction drifts on 50' centers. Haulage drifts below the stopes are about 50% timbered, and require very little maintenance. Chute mouths permit passage of 18" diameter pieces which are easily broken through grizzlies on the station. The rock is extremely brittle, although it stands well without support on the haulage level. The results of the present stopes indicate that the ground is well suited to caving operations, Closer spacing of draw points to insure greater over all extraction and lessen chances of channeling might cause greater maintenance cost. However, a higher pillar between undercut and haulage levels might eliminate any difficulty of this kind. Mining of larger blocks would reduce boundary drift development costs. As the ground stands well scraper haulage might be utilized for extraction of blocks well above the main extraction level to minimize development costs.

During April, 1940 a total of 7601 tons was mined and milled with an average grade of 1.476% copper which included 0.171% oxide copper. 174.99 tons of concentrate were produced with an average grade of 45.76% copper. The mill recovery was 71.3% and the ratio of concentration was 43.4 : 1. Smelter analyses averages show the concentrates to contain 2.76% oxide copper and 1.25% molybdenite.

Present average operating costs at the mine and Mr. Still's estimate of costs on a 5oo ton per day operation are as follows:

	Present Operation	Estimate on 5oo ton per day basis
Mining	$o.66	$o.65
Milling	1.o4	o.76
General	o.1o	o.o8
Total	$1.8o	$1.49

These costs do not include charges for income taxes, insurance, eastern office expense, depreciation, or depletion.. Without including these items, On the 5oo ton basis Mr. Still believes that copper can be produced at a cost of 8.5 to 9.o cents per pound, as against a present cost of approximately 11 cents. This figure does not include a credit for molybdenum.

The reduction in costs in this estimate over the present operation would be gained in the mill. The larger items would be lessened labor and power costs, and increased extraction. Tests made for the Bagdad Corporation are said to show recoveries of plus 85% of the toal copper as compared with the present recovery of 7o-75%. The large amount of oxide copper in the ore will undoubtedly make a recovery of 85% difficult, and perhaps impossible of realization by flotation.

The smelter contract with International Smelting Company is as follows: $3.oo per ton treatment; pay for contained copper less ~~1.0%~~ twenty pounds at New York quotation less 2.o cents; pay for contained silver less 5% at net realized price, presently 7o.625 cents.

Smelting charges amount to about 2.5 cents per pound of copper shipped to the smelter, and transportation to the smelter on the present grade of concentrates about¢. ~~$0.0066~~ ~~cent~~ 0.66 cents per pound.

CONCLUSION.

~~Possi~~ Results of recent investigation of possibilities for ore extensions at the Bagdad property may be summarized as follows:

1. South and south west of the orebody low grade primary sulphide mineralization is exposed ~~in~~ at surface and in near surface workings. ~~This type of mineralization~~ at surface definitely ~~eliminates~~ these areas as ~~possible sources of~~ secondar copper ~~orebodies~~. No secondary copper orebodies can be expected in areas showing such mineralization as surface features.

2. Drill hole information indicates that a narrow thin ore blanket ~~will~~ may extend norhheast of the main Bagdad orebody between CHDs 32 and 121. Such a northeasterly extension may continue to the schist-monzonite contact which from surface evidence should be not more than 500' from the present development. It does not appear that a large increase in ore reserves can be expected from exploration in this area.

3. While no positive conclusion can be stated Drill hole information and underground notes do not show ~~allow expectations~~ that of substantial ore tonnages can be expected northwest of the Bagdad orebody beneath the basalt Mesa in the area east of CDH 100 and northerly from CDHs 108, 94 and 95 and DDH 131. Should such an ore extension be present it would be limited on ~~to~~ the north by the ~~old erosion~~ channelway of the previous erosion cycle which from ~~primary~~ mineralization evidence reported ~~drill hole evidence~~ in holes 100, 101, 97 and 98 ~~appears to have~~ probably cut deeply into ~~the~~ primary mineralization much as Copper Creek does south and west of the present orebody.

~~Extending~~ Northwest toward the Giroux area and CDH 77 from CDHs 80, 78,79, and 94 ~~there will probably be an extension of~~ low g rade relatively thin secondary mineralization ~~average which~~

can probably be developed. From present information this mineralization ~~will be of marginal~~ may or may not be of value as an ore reserve.

In the vicinity of CDH 115 and near the portal of the Giroux Tunnel additional tonnages of oxidized copper mineralization of fair grade may be expected.

4. The results of DDH 129 drilled into the central part of the Black Mesa breccia to a vertical depth of 700' are not encouraging. ~~While~~ This hole does not eliminate this structure as a possible source of high gtade primary copper ore. However, that such ore ~~exisits~~ does exist in this structure within present limits of drilling from surface is ~~at least~~ made much more doubtful by DDH 129.

Compared with ore reserves at other low grade copper properties, the 14 million tons of 1.29% copper ~~and~~ with an average thickness of 126' ~~with~~ and 3 million tons of 0.82% oxide copper overlying the sulphide ~~at Bagdad~~ at the main Bagdad orebody is not an impressive total. At present there ~~do not seem~~ are no good possibilities that this tonnage can be doubled. Whether or not ~~estimated~~ this ore reserve ~~operating costs comparable and believed to be possible by the present operator to those reported from the present operation, assuming they are reliable, can be made on an operation scaled to suit the ore reserve~~ developed can be profitably exploited under present conditions is a subject for detailed operating study.

~~Neglecting~~ Aside from the problem presented by Copper Creek and sudden flood waters, the mining of the ore reserve should present no special problems and might be done at a low cost. Metallurgy of the ore and transportation problems are more difficult of solution. At best, on an 11 cent copper market the property could not be expected to ~~be a large profit~~ produce a large profit.

Respectfully submitted,

320-B **THE CANANEA CONSOLIDATED COPPER COMPANY, S. A.**

Al Señor	Departamento
~~P. L. Osborne~~	~~Electrical~~
~~G. R. Mendez~~	~~Serv. Publicos~~
~~G. A. Barnet~~	~~Eléctrico~~
~~R. Torrance~~	~~de Costos~~
R. B. Mulchay	—

Al Señor	Departamento

TRIP TO BAGDAD, ARIZONA AREA OCT. 18-19, 1952 WITH AIME GEOLOGICAL SECTION

At Bagdad mine is producing about 3000-4000 tons per day with grade probably varying from about 0.6% to 1.1% dependent on part of pit production comes from. Damm across Copper Creek almost at 3500 ft. elevation and bench upon which production is made is at 3130; one lower bench now serving as sump for water from behind Copper Creek dam. Rock termed quartz monzonite, primary mineralization chalcopyrite with some molybdenite, pyrite and quartz. New loan will make stripping back to Black Mesa rim possible, and make greater area of ore to west of Copper Creeek available. Are stacking large amount of leachable waste to south and southeast of pit in arroyos tributary to Copper Creek. Colville (Geo.) chief egnineer and in charge of trip arrangements, also Jones. Using Euclid and Dart trucks. Concentrates sent to Hillside about 26 miles for $2.75 per ton. West side of pit in alluvium and starting to slide; pit slope on this side originally about 50-55°. Plant buildings prevent additional stripping to south on east side of Copper Creek but are probably near ore limits in any case. Visited Black Mesa breccia pipe.

At Old Dick Mine southwest of Bagdad, lense of strong mineralization in schist, probably generally parallel to schistocity. No strong alteration in schist but considerable mineralization works out in HW on 225 level. Oreshoot probably about 200 ft. long on upper levels, rake flatly to southwest. Dip steep, strike northeast. Mineralization in oreshoot on 225 level up to 20 ft. thick, probably local. Crosscut on 300 level has just cut ore zone and 15 ft. of strong chalcopyrite, pyrite, spahlerite mineral is exposed with more in face. Is very good showing, and indicates strong mineral continuing with depth. On 225 level some rhyolite on east side, and though stated to be later than schist, may be part of schist series. Grade of shipments last year 17-32% Zn, 2-4% Cu. Ore now being shipped to Deming.

On Sunday visited Tungstona and Black Pearl tungsten mines northeast of Hillside Mine. Tungstona operates through tunnel from Boulder Creek. Is on persistent stringer zone, individual stringers disconsinuous, which can be traced over 2000 ft. Other less persistent zones on west side. Grade reported to be 0.2 - 0.35% WO_3 and occurs chiefly as wolframite with some scheelite. Now drilling churn drill hole for ventilation near end of tunnel. Operated on money supplied by Bagdad interests.

At Black Pearl property, owned by Jim Cazier and Ed Scholz, who hold lease and bond until 1959, definite vein structure from few inches to five feet wide, probably averages 3.0 ft. with white quartz, massive pyrite, light colored mica (muscovite ?), and wolframite. Some specularite, magnetite where veins echelon, and some irregular beryl. Walls are granite, and vein structure is persistent with small echelon offsets. Can be traced over 2000 ft., reported. Now setting up small jigging operation to handle fines from hand sorting of coarse wolframite massives which are later cleaned by magnetic separator.

Cazier and Scholz also operate the Copper King zinc mine, now down, and shipped 2200 tons of 35% zinc at 19.5 cent price last year and this year. Reported in schist and on same zone as Old Dick.

BAGDAD CHANGES FROM UNDERGROUND

TO

OPEN PIT MINING

****

Most mining men of this state are somewhat familiar with the ore body at Bagdad therefore, I will not attempt a lengthy discussion on the geophysics of this property. Briefly, the Bagdad ore body is a monzonite porphyry carrying copper values fairly evenly distributed from the surface down through the primary zone.

The ore body is tabular and extends over several hundred acres. The oxidized zone averages about sixty feet in thickness and assays about 0.50% copper and under which is the chalcocite zone, or the zone of secondary enrichment, which averages about one hundred feet in thickness and assays about 1.4% copper. Under this zone lies the primary zone and extends in places to a known depth of about one hundred and fifty feet and averages in grade about 0.60% copper.

The block caving method of extracting the ore from the chalcocite zone was installed several years ago when it was necessary to draw only about 250 to 300 tons per day, which was the capacity of the old milling plant.

Early in 1943 the new 2500 ton daily capacity concentrator was completed and put into production. Drawing ore from the developed stopes in sufficient tonnage to furnish the mill at capacity proved unsuccessful in more ways than one. First, drawing the ore at an accelerated rate caused a large amount of dilution, thereby lowering the grade, and also caused funneling through the surface. The surface material was very detrimental to milling metallurgy. The development of these stopes was very costly per ton of ore extracted, and did not prove well adapted in our case from an economical standpoint. The grade of ore extracted was decreased, making it impossible to maintain a mill head of over nine-tenths of one percent copper. The cost of development, drawing, tramming and hoisting this ore averaged $1.05 per ton and was only able to furnish the mill an average of 45,000 tons per month of less than one percent ore. It was a losing proposition.

Other methods of extracting this ore were given careful consideration. A careful survey was made of the possibility of mining this ore by the open pit-glory hole method. Several things entered into the picture, such as getting RFC permission to change our method of mining; our ability to secure the necessary equipment - shovels, trucks, bulldozers, etc.; and last, but not least, the finances needed to make the change-over.

The cheapest way out was to use the glory hole method and the present underground haulage system, then later, when conditions permitted, install a conveyor from the pit to the mill. This plan was finally agreed upon and stripping was begun in May 1945, and two raises, which were to be used as ore passages for the ore mined on the surface after the overburden was removed, were finished from the haulage level to the surface.

By December 1945, the mill was running at full capacity, seventy-five percent of the ore coming from the open pit and the balance being drawn from the remaining developed stopes.

In July 1946, we completed the fourth raise to the surface, giving us four ore passages from the surface to the haulage level. By August 1st., 1946, ninety-seven percent of all ore furnished to the concentrating plant came from the open pit. Total mining cost was cut considerably. Tonnage was increased to full mill capacity with an average grade of better than one percent copper for the first six months of this year.

Cost comparisons of mining by the block caving and the open pit-glory hole methods follow:

For the year 1945	Total Mining Cost $1.054
For the first 8 months, 1946	Total Mining Cost 0.87

By changing from underground to open pit-glory hole method, a saving of $0.184 per ton is effected, and the mill supplied at full capacity with ore averaging one percent copper.

A greater saving is to be made beginning about January, 1947, as we are now installing a large crusher in the pit and a 36" conveyor, 1000 ft. long, from the bottom of the pit to the present crushing plant. This installation, when completed and in operation, will make a further saving of $0.44 per ton of ore mined as no further underground operation will be required.

The following is an estimated total cost for stripping, mining and conveying ore to the mill after the conveyor is in operation:

Stripping or development	$0.2031
Mining, shoveling & trucking	.1668
Primary crushing & conveying	.0619
Total cost per ton ore	$0.4318

ERNEST R. DICKIE, General Manager

October 25, 1946 BAGDAD COPPER CORPORATION

CYPRUS
BAGDAD

1/28/44

Answered 2/4/44

January 22 1944
P.O.Box 1612
Prescott,Arizona.

Mr.Roland B.Mulchay
Cananea Consolidated Copper Co.,
Cananea,Sonora,Mexico.

Dear Mr.Mulchay:

As you might have heard,I resigned at Bagdad on the 1st of the year-and am at the present time looking around for a new payroll to perch on.

Knowing that you are quite active and are probably pretty well acquainted with conditions in Mexico,I thought I would write on the chance that you might be able to give me a lead or two that might be a bet.

After all the long slow years at Bagdad I hated to have to pull the plug-but conditions finally got so sticky that there was little else to do.I had to sit on the job as manager and take the responsibility for the whole operation, and I did not have the authority that had to go along with the job.The net result was that we were not doing (to my way of thinking) anywhere near as good a job as should have been done. At any rate after months of trying to work it out ,I could see that it was no soap-so I sawed myself off.The Bagdad people have a bear by the tail-for with a 2½ million dollar debt plus a limited time on copper premiums-to come anywhere near coming out the operation has to be one where you are getting out the last drop. With three or four cooks trying to stir the soup it just wont work.

Hope this finds you and yours all in the pink. The Stills are all enjoying life-and taking on the usual cargo of meat and drink with regularity and gusto.Two of the boys are in the service-Bob in England as a mechanic in the Air Force-and Jack will graduate as a Navigator at Ellington Field ,Texas this coming month.Art is in his last year of High School here in Prescott and is all hot to join the marines this coming summer.

This epistle is just about to run off the sheet-so will wind it up.With best regards,I am,as ever,

Yours very truly,

J.W. Still.

Cananea, Sonora, Mex.,
Sept. 8, 1934.

Mr. G.G.Thomas,
Bagdad Copper Corporation,
Hillside, Arizona.

Dear Mr. Thomas:

Mr. Perry has asked me to forward to you the maps and drill logs which he borrowed at the time of his visit at Bagdad. Under separate cover, therefore, I am sending the following :

1 800 scale geologic map by Witt and Benedict
1 100 scale plan of the 3080 level
1 100 scale surface map showing locations of drill holes and claims
1 Book of churn drill logs.

Our chief chemist, Mr. J.M.Smith, has supplied us with an outline of the method used in making assays for molybdenum here at Cananea. A copy is enclosed for your information. Mr. Smith has informed us that this method is only suitable when the molybdenum is contained in the ore as a sulphide.

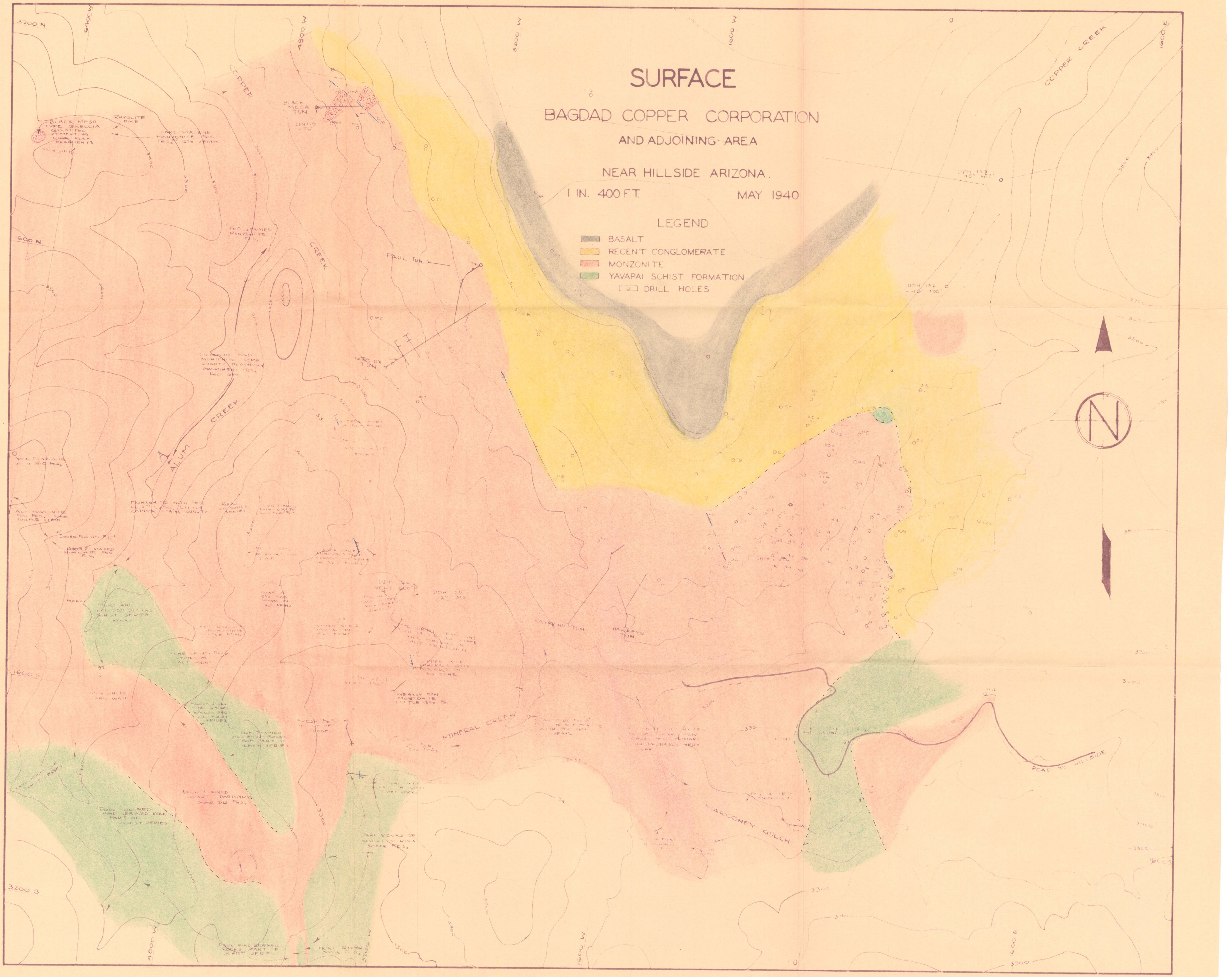
I am also enclosing prints of the snapshots we took while there. They were not a complete success as you will readily appreciate. In spite of the lack of light at the time the pictures of the deer were taken, the principal difficulty appears to have been our distance from the subjects. The pictures taken the next morning must, however, ~~of course~~, stand on their own merits.

Perry and I wish again to express our appreciation for your many kindnesses to us while we were at Bagdad, and to send our warm regards to yourself and family, and to Mr. Mueller. We would appreciate an acknowledgment of the receipt of the above maps, etc.

Yours very truly,

92

INTERDEPARTMENTAL CORRESPONDENCE


SURFACE
BAGDAD COPPER CORPORATION
AND ADJOINING AREA
NEAR HILLSIDE ARIZONA.
1 IN. 400 FT.
MAY 1940
LEGEND
BASALT
RECENT CONGLOMERATE
MONZONITE
YAVAPAI SCHIST FORMATION
DRILL HOLES
COPPER CREEK
ALUM CREEK
MINERAL CREEK
MALONEY GULCH
PAUL TUN.
ROAD TO HILLSIDE
N
3200 N
1600 N
1600 S
3200 S
4800 W
3200 W
1600 W
0
1600 E