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HELMET PEAK MINE

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Pima County

MG WR 5/1/81: Mr. Javier Garay, Director of Purchasing, Material Control and Traffic, Anamax Mining Co., called to discuss Anamax's lease agreement with Arizona Portland Cement Co. The cement company mines limestone from Helmet Peak, a property in Pima County, owned by Anamax. Under the old agreement the cement company paid Anamax 25¢/ton of limestone. A new agreement is being negotiated.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

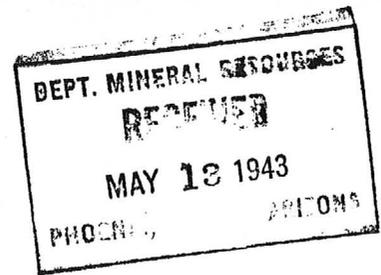
Mine

Date

District

Engineer

Subject:



to the Billings was at that time estimated at 260, 000 tons with an average value under the old prices of about \$10.00.

It was the opinion of Mr. Libbey substantiated further by John Carter Anderson, who also examined the property, that at this depth the copper replacements in the underlying limestone were beginning to come in and further development was recommended at greater depth to bring in these copper values which outcrop to the North and South in the well known Twin Buttes and Mineral Hill camps.

In conversation with a miner - a native of the district- whom we encountered during this examination, we were informed that he had been through all these workings during the period from 1928 to 1930 and that he had been employed at that time as a miner in the Billings shaft. He reported in the drift southwest of the shaft several feet of ore of milling grade interspersed with 6 inch stringers of high grade grey copper ore carrying good silver values.

At present all workings are inaccessible.

Samuel W. Brown
George A. Ballan

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA

DEPT. MINERAL RESOURCES
FIELD ENGINEERS REPORT

RECEIVED

MAY 13 1943

PHOENIX ARIZONA

Mine PROSPERITY GROUP

Date MAY 10, 1943

District HELMET PEAK

Engineer GEORGE BALLAM - B. W. BROWN

Subject: EXAMINATION PROSPERITY GROUP OF THE HELMET PEAK MINES

This property formerly operated and now owned by the Helmet Peak Mining and Milling Co. is situated in the Olive Camp section of the Pima Mining District, Pima County, Arizona, and is about 21 miles Southwest of Tucson and one mile west of the Twin Buttes highway. It is sub-leased by James P. Anderson, 715 Valley National Bank Bldg., Tucson from the Kuenzel Mining & Smelting Co., holders of the lease. It is approximately 7 miles west of Suaharita, a station on the Southern Pacific railroad. Water for ordinary mining purposes is available in the district. The property consists of fifteen claims - seven patented and eight unpatented - lying in sections 10 and 11, T17 S - R 12 E ; G & S R B & M.

The Olive Camp lies between the limestone outcroppings of Mineral Hill and San Xavier to the North and Twin Buttes on the South within a comparatively small area of andesitic and rhyolitic flow, with sedimentaries immediately adjacent to the North and East and a late tertiary granite to the West. The mineralizing solutions have apparently had their origin in the underlying intrusive mass and have caused a partial replacement in overlying areas favorable for that action.

Prior to 1893 numerous leases mined Lead-Silver ore in this area with values reported from 100 to 300 ozs. in silver and 20% in lead. Frequent streaks of grey copper ore are found in the lower horizons carrying higher values in silver than have been reported in the galena above. Following the panic and resultant silver depression of 1893 operations came to a standstill in the Olive Camp, and with the exception of the Helmet Peak property little work has been done since. About 1928 the Helmet Peak Co. resumed operations on the Prosperity Group. A vertical shaft known as the Camden #1 was then sunk to a depth of 600 ft. on the claim of the same name. About 300 ft. in a westerly direction an older shaft known as the Billings opened to a depth of about 60 ft. with about 100 ft. of lateral development work. About 500 ft. to the west on the Elsie claim of the group a vertical shaft known as #2 is reported to be about 500 ft. deep and on the same strike. In all, about 3500 ft of lateral development has been done in the two newer shafts. The latter workings are now under water which stands at a depth of 100 ft. or more. Timber down to the water level is in good condition but considerable caving is reported below the water level. The Billings shaft, which is untimbered, is dry, but the lateral drifts are reported badly caved.

According to a report made by J. M. Libbey, M.E., in 1928 following considerable sampling assays are reported as follows:

In the workings of the Billings shaft and sections of the 150 ft. level of the Camden shaft ore estimated at 100,000 tons shows an average assay value of;

Gold .01 oz. - Silver 1.2 oz. - Copper .25% - Lead 1.9% - Zinc 3.8%

The area opened up to the 400 ft. level in both shafts and the ore adjacent

UNIVERSITY OF ARIZONA

Tucson

College of Mines and Engineering

Department of Geology and Mineralogy

November 21, 1929.

Mr. J. A. Hamilton,
Tucson, Arizona.

Dear Sir:

In accordance with your request, I here present an opinion on certain phases of the geology of the Olive Camp area of the Pima Mining District, Pima County, Arizona.

It is the intention to discuss here not the detailed geology of individual properties, but rather the large geological features of the district generally, which are of fundamental importance in the matter of ore occurrence.

The discussion and opinion are based on brief personal observations made in the field, aided by a study of reports prepared by mining engineers and geologists for mining companies, by reports and maps prepared in the course of advanced degree studies by graduate students in Geology at the University of Arizona, and by the literature and government maps of the area and region.

The rocks of the immediate area comprise pre--Cambrian (?) granite, Mesozoic (Cretaceous) arkosic sedimentary beds, intrusives granitic rocks, and volcanic rocks which are chiefly andesite. The volcanics are either late Cretaceous or early Tertiary in age. Just outside of the area, particularly to the northward, occur thick formations of Paleozoic limestone and quartzite.

The major structure of the area cannot be definitely determined by the available surface and near-surface geology. It is clear, however, that a great amount of fracturing, accompanied no doubt by at least some faulting has occurred throughout the area. It is possible that folding is the most extensive type of minor deformation within the area and the cause of fracturing and faulting.

Or it may be that the fractures were generated by stresses resulting from the uneven settling of a large crustal block following the transfer of a large volume of volcanic material from deep seated to superficial positions. Or perhaps vertical upthrust of intruding magmas may have caused fracturing and faulting.

Mineralization apparently has been widespread. The rocks along fractures observed, whether on the surface or underground, have been more or less extensively altered. Ore deposition, in varying degree, seems to have occurred wherever a master fracture was available to act as a channel-way for ore-bearing solutions. The ore deposits are, in the main, of the fissure filled type, localized along major fractures, at the intersection of fractures, and in brecciated zones.

It is fairly certain that intrusive granitic rocks underlie at variable depth the entire district of which the Olive Camp area forms a part. These intrusive rocks were probably the source of all primary mineralization in the district. The ore deposits that have been developed in the past in the Olive Camp area have been chiefly small high-grade silver-lead bodies, formed mainly by fissure filling, but perhaps to some extent by wall-rock replacement, in the near-surface retaceous sedimentary and volcanic formations. In areas to the north and south important copper and zinc ore developments have been made and from which considerable tonnages of ore have been mined in the past. These deposits are principally replacement bodies in Paleozoic limestone. It appears, therefore, that replacement bodies in limestone form the important type of ore deposits for the district.

The question of major structure, and character and thickness of formations forming that structure, thus appear to be the essential questions relative to the probability of extensive ore occurrences at depth in Olive Camp area. If the ore-bearing limestone formations of the Mineral Hill-San Xavier area to the North and of the Twin Buttes area to the South are continuous or occur under Olive Camp area, then the probability of occurrence of important commercial ore deposits at depth in the latter area is greatly increased. The problem then would become one of probable depth to the favorable horizon and the determining of dominant or master fracture zones.

Mr. J. C. Anderson, in his report on the Swastka property, page 4, sets forth certain evidence and a statement of belief that limestone does occur below the superficial formations of the area.

That there is more than a possibility that these Paleozoic limestone formations do exist below the surface formations in the Olive Camp area is not an idle statement nor one made for convenience. Even brief field study of the stratigraphy and structures in this area and that immediately to the north, in the San Xavier area, justify the statement that this stratigraphic condition might exist. But more convincing still are similar indications in the results of recent detailed geologic mapping in this area to the north.

The Olive Camp area appears to be a depressed geologic structure. Either down-warped (synclinal) or a down faulted area. The Paleozoic formations of the San Xavier area distinctly dip to the south (20° - 25°) apparently plunging under the Olive Camp area. The contact between Paleozoic limestone and Cretaceous arkosic beds occurs along the southern border of the San Xavier area. The normal formational contact, produced by a break or time interval in the deposition of sediments which formed the beds; or it may be a fault contact, produced by a major rupture. If this contact is an unconformity, as the first case suggest, the limestones extend to the southward uninterruptedly below the Olive Camp area. In the event that it is a fault contact, the limestones with their overlying sedimentary beds and volcanic formations in the Olive camp area have been faulted downward.

There is some basis, of course, for expecting that additional underground development may disclose other small high-grade silver-bearing ore shoots, such as were formerly worked in the area, or perhaps larger veins and breccia bodies of ore of commercial grade and size. But it is more logical to expect that, if commercially important ore bodies are to be developed in the area, they will occur as metasomatic replacement and contact deposits in limestone.

The problem of developing possible large ore bodies in Olive Camp area thus resolves itself, in this opinion, to first ascertaining the presence or absence of underlying limestone beds. Preferrably, such development should be carried on by drilling operations. And in so doing if the location of drill holes is carefully planned, it is probable that relatively near-surface vein or breccia type deposits of value may be encountered while the deeper prospecting is in progress. The depth at which the limestone, if present, may occur is highly problematical; if in a synclinal structure, it may be comparatively shallow, if block-faulted, it may lie deeper--2,000 feet or more

Yours very truly,

R. J. Leonard.

ARIZONA DEPT. OF MINES & MINERAL RESOURCES
STATE OFFICE BUILDING
416 W. CONGRESS, ROOM 161
TUCSON, ARIZONA 85701

Olive Camp
Pima Co.

REPORT
on the property of
SWASTIKA COPPER and SILVER MINING COMPANY

Olive Camp, Pima County, Arizona.

--oOo--

LOCATION and HOLDINGS:

The Swastika Group of 12 unpatented lode mining claims and fractions, including the Richmond, Emma E, Rich Hill, Alice, Glenn, West End, Beatrice, Horse Shoe, Republic, W.K., Flora, and Gem claims, is located at Olive Camp 21 miles southwest from Tucson at an elevation of about 3,500 feet, and is reached by wagon roads from Tucson and from Sahuarita Station on the Tucson-Nogales Branch of the Southern Pacific, which is 8 miles east.

The five northern claims of the Group, the Rich Hill, Alice, W. K., Flora, and Gem claims are at present bonded to other parties who have sunk an old shaft on the Alice to a depth of 165 feet and are now developing on the 150 foot level.

Olive Camp lies in relatively flat country, showing but a few low hills, with marked structural breaks on all sides, and is that part of the Pima Mining District lying between the San-Xacier--Mineral Hill District on the north and Twin Buttes on the south. It is distinguished from those camps by the fact that it is almost wholly an area of igneous rocks while they are areas of sedimentary rocks intruded by igneous dikes and sills.

HISTORY:

A correct knowledge and interpretation of the history of Olive Camp is essential to any consideration of its future possibilities.

Like many another silver camp of the old days in Arizona, an authentic recorded history of the Camp is lacking and the total of its past production can be but approximated by a sifting out of the stories told by the old timers. Fortunately, in the case of Olive Camp, though its days of prosperity are now nearly 30 years back, there remain in Tucson a number of solid, trust-worthy men, the foundations of whose fortunes were laid in Olive Camp, including Messrs. Frank and Warren Allison, J. K. and Seward Brown and others, whose accounts may be accepted with confidence.

The Olive, the first mine located, now called the Olivette, was located in 1886 by Frank Allison, J.K. Brown, and another, and it is said that by 1887 there were 150 men leasing in the district and that shipments of ore were maintained continuously to the year 1893 when the falling price of lead and silver closed the mines which, with the exception of the Richmond, have never since been worked.

The Richmond and Emma E. claims of the Swastika Group are said to have produced about \$100,000.00 from shallow inclined shafts and small stopes. In 1913 the main working on the Richmond was gutted by leasers who took out a considerable but unknown quantity of ore and left the mine as a leaser always does, with very little in sight. No serious attempt at development has ever been made and the greatest vertical depth reached in taking out this ore was 100 feet.

Endlining the Richmond to the East and on the same or a related vein system is the Annette and next to it the Olivette. Since starting this report, the writer has again talked with Mr. Seward Brown, the original owner of the Annette. He says that he took out \$65,000.00 and left good ore in a winze at the bottom and in the end of a drift to the west. He also says that his brother, Mr. J. K. Brown, and Mr. Frank Allison and leasers shipped \$750,000.00 from the Olive and left ore in the bottom.

Still east of the Olivette on what is now known as the Wedge Group or Whitcomb Group, dump after dump shows the extent of the old work.

The Shumaker Group adjoining the Richmond on the south was another producer and a third of a mile southeast is the Prosperity Group with large dumps at several shafts, the deepest of which is said to be 310 feet on the incline. Other claims in the district also have records of production, but the principal work and the greater part of the production centers in those here named.

There is no known record of production from any of these mines that can be verified, which is not strange, owing to the manner in which the mines were worked with the number of leasers shipping irregularly as they got out a sufficient tonnage of high-grade ore. This ore is reported as running from 100 ounces to 300 ounces silver per ton with upwards of 20% in lead. The higher silver values are said to have come, as is to be expected, with those ores carrying gray copper rather than with the heavy galena ores.

The various claims, such as the Richmond, Olive, Wedge, and Prosperity, are reported as having produced from \$100,000.00 to \$750,000.00 or more each. Allison Brothers, who besides their own production ran a store and shipped ore for many of the leasers, claim a record of over \$1,000,000.00 worth of ore shipped by them and estimate the production of the District at around \$3,000,000.00. As these statements are made by men of good standing, not now interested in the properties it is but fair to accord them consideration in estimating the past returns from the Camp. From all the evidence at hand and from the number and size of the old dumps, the writer feels safe in assuming that the production for the district was in excess of the lower figure and not likely over the latter. Worked, even in the careless manner in which they were this certainly meant a good return for the amount of work done.

MINES in ADJOINING DISTRICTS:

Equally important is a knowledge of the mines in the San Xavier-Mineral Hill District to the north and Twin Buttes to the south. These are contact and replacement bodies of base ores in limestone, but it is believed that the source of the mineralization in all three camps is related and that deeper development in Olive Camp may lead to similar deposits which will be much larger and more permanent than the silver veins of the Camp.

Chief among these mines are the following:

The Mineral Hill Consolidated, where a body of copper ore is being developed in garnet along a sill contact of granite between limestone and quartzite, which is increasingly large on each deeper level with a body of mill ore from 100 to 200 feet wide on the 600, the deepest developed level. From the Vulcan, \$300,000.00 worth of copper ore was taken through two old inclines which reached a vertical depth of about 300 feet. Increasing water which could not be handled through the old inclines, which are now caved, shut this property down. A vertical shaft is being sunk to reopen the mine. The San Xavier, nearest of the developed mines to the Richmond, has developed a big body of lead-zinc and copper ore to a depth of several hundred feet, proving it to be increasingly larger in depth. This property is owned by the Empire Zinc Co., a subsidiary of the New Jersey Zinc Co., and will undoubtedly be equipped with reduction works and development continued when the policies of that Company require further supplies of ore. These may be considered as real mines with assured futures. Other properties which have produced some ore, but which are not yet developed to the point of permanent mines, are the San Xavier Extension and the South San Xavier.

In Twin Buttes the Glance, Queen, Minnie, and Senator Morgan mines have in the past produced a total of

several millions of dollars worth of copper ores from granite-limestone contact deposits, and present development on the Queen and North Star is blocking out large bodies of primary copper and copper-zinc ores which promise a still bigger future for the Camp.

GENERAL GEOLOGY OF THE OLIVE CAMP:

Unlike the San Xavier-Mineral Hill and Twin Buttes districts where large bodies of copper and zinc-lead-copper ores are found in limestone, the silver veins of Olive Camp are found in a rhyolite porphyry, which at many points resembles and has often been mistakenly called quartzite. The original extent, thickness, and age of this formation is unknown, but it is believed to be a part of one of the early Tertiary flows.

The extreme north line of the rhyolite follows a general N. 70 E. break through the Gray Copper claim of the South San Xavier and the West Extension of San Xavier and San Xavier claims of the San Xavier property. This contact is one of shearing rather than of a single strong fault and the porphyry, if not forming the hanging wall on the vein of the San Xavier, is not far in the hanging wall. Where seen on the surface, where the road passes by the shaft on the San Xavier the contact has a steep dip to the south the same as the Paleozoic limestones. In the underground workings of the South San Xavier the contact where first cut, about 100 feet north of the shaft on the 150 foot level, is quite steep, but it is much flatter where it crosses the shaft between the 150 and 200 foot levels. It is believed that limestone will be found below the porphyry over the whole area of Olive Camp but at what depth is impossible to say, as the thickness of the porphyry is unknown. South of this contact the limestone is again faulted to surface on the Ruby, Hoosier, and Vienna claims. Here again the lime has a south dip and is in contact with the porphyry which extends then unbroken, save by later igneous intrusions, for about three miles south, where limestone hills and granite flats again limit it. To the east is the uplifted limestone of Helmet Peak and the wash covered flats which extend down to the Santa Cruz River. On the west is a granite flat, the actual contact being covered by recent wash.

Throughout the rhyolite area, particularly in the neighborhood of the veins, there has been a slight dissemination of pyrite, some of which was sufficiently cupriferous to stain the walls of old mine workings with copper salts. Pieces of the wall rock taken from any of the mines at depths below surface oxidation show a few tiny crystals of pyrite. It is the oxidation of this iron which has seamed and rusted the porphyry in surface exposures.

On the Rich Hill claim of the Swastika Group a 165 foot shaft enters intrusive granite identical in character with that responsible for the mineralization in the San Xavier-Mineral Hill and Twin Buttes Districts. Where cut in the shaft this granite has an east-west strike and a very flat dip to the south, while the main veins of the Camp dip to the north. In the shaft the contact shows some alteration of the porphyry and a little sugar quartz but no mineralization. Lateral work from the station on the 150 foot level, following a streak of pyrite with a little chalcopyrite and galena having a strike of N. 70 E. and a dip to the north, is now showing veinlets and bunches of galean and copper-iron sulphides and zones of alteration in the porphyry, which seem to have taken a south dip at about the same angle as the granite. The work at this point is probably but a few feet distant from the granite cut in the shaft.

Also intruding the rhyolite and best seen between the mines and the north line of the rhyolite are tongues of andesite porphyry and a similar but more coarsely crystalline rock which are younger than the intrusive granite. At surface no connection can be traced between these andesite dikes and the mineralization. However, the dump at the Alpha and one of the dumps at the Olivette, that of the shaft on the north-south vein which crosses the main east-west vein, show some of the andesite.

Deeper development in the district must prove the relation of these two intrusives to the mineralization, but the writer is very sure that one or both of them are responsible for the ore deposition. As the granite has been so clearly proven to be associated with the origin of the ore bodies in the adjacent limestone areas, it is to be expected that a similar relation exists here. The presence of gray copper in the ores from the Olivette and the Alpha where the andesite intrusions have been found, and the presence of galena only in the veins on the Swastika Group, where granite has been found, may indicate that both of them were mineralizers.

The writer first became interested in the possibilities of Olive Camp when making a study of the geology of one of the mines in the San Xavier-Mineral Hill District. Since then he has spent much time in a study of the Camp to determine, if possible, what chances exist for finding larger bodies of ore a depth. This study has strengthened his belief that all of the veins of Olive Camp owe their origin to the intrusion of underlying formations by granitic or porphyritic rocks related to those which mineralized the limestones in the adjacent districts. The siliceous porphyry being more uniform in structure, harder and less yielding than the limestones, was cracked and fissured rather than penetrated by these intrusions and in these cracks and fissures was localized the travel of the mineralizing solutions which accompanied the intrusions, and so were formed the silver veins of the Camp.

Following the progression of mineralization which has been observed by the writer in his study of a large number of mines and mining districts in South-western Arizona, it is his belief that if these veins are followed on down below their present workings there will be a gradual change from the lead-silver ores of the past to ores containing more and more zinc and finally to copper. If these veins continue on down to an intrusive contact, as it is believed they will, they may be expected to change in strike and dip to conform with the strike and dip of the intrusive and will then continue on down as contact veins. If in depth, limestone is found under the porphyry, as is the firm belief of the writer that there will be at some depth, there are good reasons to expect that copper deposits will have been developed on the contact with the intrusive, similar to the big contact copper deposits on either side of the Camp. Herein lies, the writer believes, the real future of the district.

Unquestionably the porphyry is older than the uplift of the sediments, as it is intruded by the same granite which elsewhere in the district intruded and uplifted the limestone. While there is yet no definite evidence to prove it, it is thought to be a part of one of the early Tertiary flows which covered the country. While the crystallization of the component minerals, especially the quartz, is better developed than in most of the rhyolite flows, it nowhere shows the coarsely crystalline texture to be expected in a mass of plutonic rock of this extent, and on the hilltops it shows the characteristic felsitic texture of a surface flow.

The general geological history of this part of Arizona can perhaps best be pictured by conceiving of a vast extent of sedimentary formations of Paleozoic age, in places wholly or in part eroded away, then covered by a succession of andesitic and rhyolitic flows in early Tertiary time, covering the country as an ice sheet covers the Northern waters in winter. Into this cover of sediments and flows was intruded in Tertiary time a batholithic mass of granite which broke them up just as in the Spring break up, the thick sheet of ice is broken up and engulfed by the water. Thus you see great blocks of the older formations floating as in a sea of granite in all directions and dipping at all angles; sometimes near together, sometimes widely separated by broad stretches of granite; sometimes exposing one of the lower beds of the series on surface and sometimes all but submerged in the granite. Subsequent faulting and erosion has carved the country into high and low relief and filled many a broad valley with a great thickness of wash which still further obscures the correlation of the formations in one camp with those in another.

In the case of the sedimentary rocks, which on fossil and lithological evidence can be studied and named and an age relation carried through and rocks of the same age recognized in many widely separated exposures. Much valuable work has been done along this line by Dr. Ransome, of the U. S. Geological Survey, in his paper, "Some Paleozoic Sections in Arizona and their Correlation", and by others, but no attempt has ever been made to work out the much harder problem of a correlation of the igneous flow rocks which covered these sediments. The writer has not been able to find a single exposure of the rhyolite of Olive Camp where it is in other than fault contact with the limestones which bound it on three sides, but feels quite sure that it is a part of one of these Tertiary flows, probably a thick one, and that at some depth below the present surface will be found the same series of Paleozoic sediments which abut its margins.

It has been widely believed to be the rule that the big end of an ore deposit was up and that a vein of good width and value could normally be expected to decrease in size and value with depth. However, the writer's observations and studies in Southwestern Arizona are teaching him to look for exactly the opposite under certain geological conditions.

During the period of ore deposition which followed the intrusion of the granite batholith, extensive development of great fissure veins such as are found in other mining districts seems to have been lacking. Instead, contact and replacement bodies were formed in the intruded rocks near the intrusive granitic rocks or their related porphyritic offshoots. Travel of mineralizing solutions which accompanied these intrusions was confined to the contacts or to minor cracks and fissures and not to one or more main trunk channels such for instance as the big fault fissure gold veins in the flow rocks around Oatman.

Dikes and sills of porphyry reached far higher in the intruded rocks than the main contact and thus opened a way of escape for the solutions. Owing to the quick cooling of these dikes and sills, however, the upper, thinner portions were not open to the circulation of mineralizing solutions long enough for any large deposits to form on their contacts, nor was the force of the intrusion at its upper limit great enough to open big fractures in the intruded rocks. Some solutions carrying the lower temperature minerals, might, however, reach this high before their passage was sealed off, and branching off through such minor fractures as were developed, form small lead-silver veins.

At greater depth and under slower cooling conditions, where the channels to the main magmatic mass below remained open a longer time, there was a long continued ore deposition, in favorable formations the solutions spreading farther and farther from the contact at greater depth.

The resultant ore deposit may never have reached to the present surface, or may be represented by surface outcrops almost insignificant in appearance and value. The outcrops of this type of deposit will vary in attractive appearance in proportion to the depth to which erosion has uncovered them. But at any point between the smallest stringer of ore and the main contact below, if the structural conditions and enclosing wall rocks are favorable to the deposition of ores it is probable that the big end of the deposit is down. A good illustration of this type of deposit is found at the Mineral Hill Consolidated where an intrusive sill of granite between quartzite and lime has formed a contact deposit of copper in the limestone which is much bigger and more continuous on each deeper level. On surface there are scattering outcrops of copper carbonates below which shoots of carbonate ore were worked out to the 300 foot level without finding any big or continuous shoot of ore. On the 500 foot level, large bodies of garnet-chalcopyrite ore were found on top of the granite sill and on the 600 foot level, the garnet zone is still bigger. A cross-section of the ore deposit would show two inverted wedges. One of granite tapering out thinner and thinner as it approaches surface and a similar one of ore.

MINERALIZATION:

The ores of the District as so far developed are of two classes: those silver-lead ores carrying their silver values in association with galena, and those in which the silver values are associated with gray copper. This second class of ore carries the higher silver values, shipments running up to 300 ounces of silver per ton, being reported. The straight galena ores are not known to have carried higher than 100 ounces silver per ton. The galena ores may be expected to carry less silver in depth, while the silver value in the veins carrying gray copper may persist to somewhat greater depths. Zinc blende is beginning to show in the ore from the bottom of the Richmond, as is also a little chalcopyrite or cupriferous pyrite; and according to MR. Seward Brown, the bottom of the Annette and Olive veins was showing some zinc.

The zonal arrangement of the different metals in veins has been noted by a number of students of ore deposits in different regions, and the observations of the writer are continually adding proof to the zonal theory of the deposition of metals in Southwestern Arizona. Of the commonly mined metals in Arizona the main contacts show, as a rule, clean copper-iron ores. At some distance above the contact the admixture with zinc begins, and still higher the ore will likely contain lead-zinc-copper, then lead-zinc, and in the more superficial veins, lead-silver. The vertical extent of these zones is variable, and there is usually a considerable overlapping of one zone with the next higher, which has given rise to the complex ores which are characteristic of many districts in this region. However, with few exceptions, it is safe to predict that the superficial lead-silver veins, from which the old timers took greater or less amounts of shipping ore, will have a limited vertical range, and that deeper development will find first zincy ores and finally copper ores. These ores will be lower in grade than the surface ores, but the increase in size of the deposit may far more than offset the lowering in grade.

The mines that are paying the great dividends in these days are the mines with large bodies of low grade ores, and in the opinion of the writer, the possibilities of silver veins like those of Olive Camp should not be considered as dependent on the finding of more and larger bodies of the silver ores that the old timers took, but as to whether or not they are the leaders to a large deposit of base metal ores. It is of course possible for properly directed lateral work beyond the limited old workings to find additional shoots of the same silver ores, and once a working shaft is connected with the bottom of the old workings on the Richmond, drifts should be run as long as there is a vein to follow, even though the ore streak is very small, for the old timers found their ore by following the vein though it pinched down to but half an inch of ore.

VEIN SYSTEM:

The original vein of the Richmond has nearly an east-west strike and a dip of 35 to 50 degrees to the north, flattening somewhat in depth. This, or a parallel vein or veins continues east and west through the endlining claims for a total distance of perhaps a mile, and several different ore shoots have been worked on the different claims. In the main incline of the Richmond it has well marked walls from 2 to 6 feet apart with a vein filling of crushed country rock through which run streaks and veinlets of galena ore. The widest of these streaks now to be seen in the mine, in an east drift on the 90 foot level, is but 4 inches wide but it

is reported, and is indicated by the old filled stopes, that these streaks would open out to as much as 3 feet in width. This seems to have been characteristic of the ore shoots in all of the old mines. A similar and probably related vein is opened on the Emma E. claim, endlining the Richmond on the west, by a number of small inclines, which from the dump, must have followed one of these ore shoots.

In the main incline on the Richmond this east-west vein is cut by branching fractures of varying strike and dip, some of which show some galena. It appears that there may be a series of small branching and intersecting fissures any of which may contain ore. On the bottom level, about 80 feet northwest of the shaft is a 50 foot winze. Above this is an old partly filled stope about 40 feet long and extending at least that far above the level. It is here that the leaser in 1913 is said to have taken out the ore he shipped. The vein in the stope was quite flat and where the winze was sunk, is crossed by another break dipping about 55° which is the one followed by the winze. The main vein dips off in the hanging wall of the winze. Small stringers of galena show in both veins, but at this point are not of workable size.

Early in this year, the winze was sunk to 50 feet below the level, and 38 feet below the level a flat slip with a slight dip to the southwest crossed the winze, cutting off the slips on which it was sunk. Below this, all four sides of the winze showed low grade ore. The writer saw this showing when the winze was about 18 inches below the slip, and at that time noted with great interest the change and the manner in which the descending slips seemed to cut off. Above the slip is the north dipping vein with a little quartz and galena, below it is largely quartz with some galena. The winze continued in this ore for about 13 feet, cutting off in the bottom on another flat slip. All sides of the winze were in ore and some very good pieces of galena were taken out, but with the lower slip, water came into the shaft, rising nearly to the upper slip. This shut down the work as there was no way to handle water.

The writer regrets very much that he did not have an opportunity to see the bottom of the winze before it was flooded and note exactly the change that came in below the ore for this is apparently a flat vein, probably conforming in strike and dip with an under lying porphyry intrusion. This would have done much to furnish the information which is essential to a proper location of any new work. While the ore is not of shipping grade, it is mill ore and apparently a much stronger vein than those originally worked. Its encounter greatly increased the writer's opinion of the future possibilities of the property and confirmed his belief that the property warrants the expenditure of the amount necessary to prove it.

It strengthens his theory as to the manner of formation of these veins, as does in a fuller measure, the finding of the intrusive granite in the bottom of the Rich Hill Shaft.

About 230 feet northwest of this incline is a vertical shaft 65 feet deep, 4' x 6' in the clear and partly timbered, which was sunk as a prospect shaft by leasers. A little above the bottom, it cuts an east-west vein showing a little manganese stained quartz with some lead-silver values. This is probably a parallel vein in the hanging wall of the one in the incline and like it, may open out to workable size and value at some points. It appears to be widening fast in the few feet in which it is exposed. None of the veins of Olive Camp have a strong outcrop, and while a number of ore shoots have been opened along a certain general strike, one cannot on surface follow on the vein from one to the other, but it is believed that at depth they will all be found to be in some manner connected.

On the Rich Hill claim several old cuts and shallow shafts open a well marked fault with a strike of about N. 70 E. and a dip to the north, showing some quartz and mineralization. The same break is opened again on the Alice claim to the east by a shaft originally 70 feet deep with small stope drifts at about 40 feet and at bottom. This work shows some quartz and a little mineralization but the vein is faulted just below 70 feet by a fault with a flat dip to the west. The present leasers have sunk this inclined shaft to 165 feet, cutting intrusive granite at 155 feet. In the shaft the upper contact of the granite has a flat dip to the south and a nearly east west strike. On the 150 foot level they have cross-cut north and south in badly shattered rhyolite with tiny seams of pyrite and occasionally of galena through it. About 40 feet south of the shaft a drift turns N. 70 E. following a north dipping seam of pyrite beyond which small bunches and seams of pyrite and galena with a little chalcopyrite apparently dipping to the south are coming in. Some of these bunches of galena are very solid and heavy and of high grade. Zones of alteration in the rhyolite have a flat dip to the south about like that of the granite in the shaft and probably in sympathy with it. The granite contact cannot be far distant and it appears as though mineralization was turning south to follow the contact. A winze is being started at this point and its progress will be watched with great interest.

RECOMMENDATIONS FOR DEVELOPMENT:

It is out of the question to carry on new development through the old incline. It would entail an

added cost of mining that would soon exceed the cost of sinking a working shaft.

The 65 foot vertical shaft might be continued but it is 190 feet west of the bottom of the winze and for a connection, would take 100 feet of sinking and 190 feet of cross-cutting. It would probably encounter the vein before going that distance, but our present knowledge of the way the vein is going is so limited that it might easily miss it until driven to a connection. And it is very probably that it would then be found to be so located with respect to the ore that it would require excessively long cross-cuts on lower levels. If this shaft were deepened, it would have to be stripped and retimbered to make it 4' x 7' in the clear as with water to be handled, it is too small for the work to be done.

The few feet of sinking that was done in the winze last winter did more to predict a future for the property than all the work ever done in Olive Camp, and a few more feet of work there may easily do as much good in guiding the real work of development.

When the further development of this property is undertaken, it will be necessary to make provision for the handling of the water for it is certain that water must be handled in the sinking. The amount of water met in any of the old mines was small and can be easily handled in a vertical shaft with modern equipment. The greatest flow known in the Camp is that met by Mr. Charles Taylor on the 200 foot level of the Bonanza, the claim just north of the Richmond. In his recent work on that claim, he has had to handle a flow of about 40 gallons a minute from 200 feet. A small gas engine driven generator to furnish power for electric pumping will be the least expensive and most efficient provision for pumping water.

If, at that time, this equipment be utilized to get the water out of the winze to permit the doing of a little more work there with a windlass, or preferably by raising out to surface above the winze and then doing a little more work on the vein, the cost would be saved times over by determining the correct location of the new shaft. Not over 70 feet of raising will be necessary to connect this winze with the surface, and it could be done without any stops for hoisting by letting the muck fill up the winze and the old stope and drifts on the bottom level. Then the winze could be cleaned out rapidly, using the 8 H.P. gasoline hoist belonging to the property, the raise timbered up and used as a working shaft until enough was learned to show where the new shaft should be sunk.

As soon as a little additional work in the bottom of the winze has determined the question of the strike and dip

of the vein there discovered and whether or not the north dipping veins end on that vein or continue below it, a new shaft should be started to develop this ore showing at depth. At the present stage of development, a one and one-half-compartment shaft 4' x 7' in the clear and timbered with 6" x 6" timbers is amply large to test the ground with the least expense and it is big enough to handle any high-grade ore that may be found in extending the old workings. It should be planned, located, and equipped to go at least 500 feet, with connections with the vein at 100 foot levels. On the correct location of the shaft will depend the distances to be cross-cut on the several levels and a poorly located shaft may easily entail excessive expense in cross-cutting.

Coincidentally with the deeper development of the property as soon as connection is made with the bottom of the old workings, drifts should be started to find other shoots of high-grade ore which might easily pay very well for the work done.

CONCLUSIONS:

As with everything else which is under development in this region, the possibilities of the Swastika property cannot be judged nor measured by the size or value of the ore exposures left by old leasers who worked the mines for the high-grade silver ores. There is the possibility of finding other shoots of ore than those formerly worked, by well directed development, and in a property like the Swastika, where so small a proportion of the length of the veins have been prospected, and where the continuation of this vein system on adjoining properties yielded such large returns, the chances for finding profitable shoots of high-grade ore well warrant their development.

The real future of the property lies in finding in depth of larger and more permanent bodies of base ores. The writer has made a long study of the geological conditions governing the formation of such deposits in Southwestern Arizona and has tried in this report, to clearly set forth his reasons for believing that the lead-silver veins of this property may lead down to them. He believes therefore, that the development of this property is a good mining speculation with possibilities of profit more than warranting the risk of development.

Faithfully submitted,

Tucson, Arizona.
August 30, 1920.

JOHN CARTER ANDERSON.

26 March 1940

H. P. Mining and Milling Company,
90 North Church Street,
Tucson, Arizona.

Gentlemen:

I am enclosing herewith a copy of Mine Owners
Report on the ~~Helmet~~ Peak Mine which you have filed in this
office.

I am also returning the copy of Opinion sent
for examination.

Yours very truly,

J. S. Coupal
Director

JSC-jrf
encls.

Reg Mail

May 14, 1943

MEMORANDUM

Prosperity Group
Helmet Peak Mines

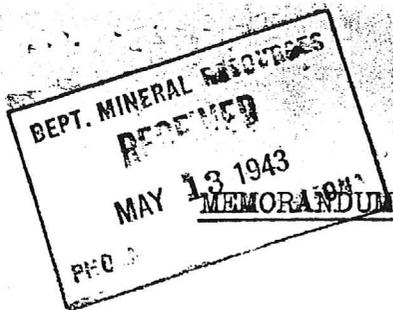
TO: George A. Ballam

FROM: J. S. Coupal

I have received your memorandum on this subject and also your report on the property.

If Mr. James P. Anderson, Tucson, contacts the private capital, I believe he should not hesitate to put in an application for an accessibility loan for \$5000.

The next time you see him tell him that you have two good M.I.T. men who will be working for him.



May
April 10, 1943

Prosperity Group
Helmet Peak Mines

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

Jas. P. Anderson has purchased the Kuenzel lease on the Helmet Peak Mine and is preparing to finance opening up the old workings. At present he appears to have a chance to raise some private capital in Los Angeles, but in the event it does not materialize, he will apply for an RFC accessibility loan. The reason for this sequence of procedure is obvious.

Mr. Brown and I went out to the property. We took with us one Jesus---etc, a Mexican who had worked in the mine during its operation or development in 1928. He is an intelligent chap and a good miner. At present he is mine foreman for Kuenzel on the Olivet. Having been reared in the district, he was familiar with it. He informed us that the workings in the Camden No. 1, and Billings are all under water, and that the ground is bad, in that the vein matter is wide and walls were not contacted. It would cost more than \$5000 to unwater and retimber. However, he was very enthusiastic about the Billings, the 60 foot shaft, which is dry but drifts caved to some extent. He said he saw gray copper ore with high silver values, as stringers in a vein of milling ore several feet in width. Despite the fact that this ore was well sampled in the adjacent and lower levels of the Camden and No. 2, showing over one-half million tons of \$10 ore at old prices, he claims that the easily-accessible and high-grade ore is in the Billings, and in the event that the leaser gets under operation, he has made arrangements with Jesus ---etc., to take over the job.

Anderson is a good operator and has had a lot of experience in Mexico, Colorado, and other places. Graduate ME, M.I.T. '22.

George A. Ballam

UNIVERSITY OF ARIZONA

TUCSON

COLLEGE OF MINES AND ENGINEERING

DEPARTMENT OF GEOLOGY AND MINERALOGY

November 21st, 1929

Mr. Albert L. Fritz, Civil Engineer,
Tucson, Arizona.

Dear Sir:

In accordance with your request, I have presented an opinion on certain phases of the geology of the Olive Camp area of the Pima Mining District, Pima County, Arizona.

It is the intention to discuss here not the detailed geology of individual properties, but rather the larger geological features of the area and district generally, which are of fundamental importance in the matter of ore occurrence.

The discussion and opinion are based on brief personal observations made in the field, aided by a study of reports prepared by mining engineers and geologists for mining companies, by reports and maps prepared in the course of advanced degree studies by graduate students in Geology at the University of Arizona, and by the literature and government maps of the area and region.

The rocks of the immediate area comprise Pre-Cambrian (?) granite, Mesozoic (Cretaceous) arkosic sedimentary beds, intrusive granite rocks, and volcanic rocks which are chiefly andesite. The volcanics are either late Cretaceous or early Tertiary in age. Just outside of the area, particularly to the northward, occur thick formations of Paleozoic limestone and quartzite.

The major structure of the area can not be definitely determined by available surface and near-surface geology. It is clear, however, that a great amount of fracturing, accompanied no doubt by at least some faulting has occurred throughout the area.

*By Leonard
Duplicate*

By Raymond J. Leonard

10

6

It is possible that folding is the most extensive type of minor deformation within the area and the cause of fracturing and faulting. Or it may be that the fractures were generated by stresses resulting from the uneven settling of a large crustal block following the transfer of a large volume of volcanic material from depth-seated to superficial positions. Or perhaps vertical upthrust of intruding magmas may have caused fracturing and faulting.

Mineralization apparently has been widespread. The rocks along fractures observed, whether on the surface or underground, have been more or less extensively altered. Ore deposition, in varying degrees, seems to have occurred wherever a master fracture was available to act as a channel way for ore-bearing solutions. The ore deposits are, in the main, of the fissure-filled type, localized along major fractures, at the intersection of fractures, and in brecciated zones.

It is fairly certain that intrusive granitic rocks underlie at variable depth the entire district of which Olive Camp area forms a part. These intrusive rocks were probably the source of all primary mineralization in the district. The ore deposits that have been developed in the past in the Olive Camp area have been chiefly small high-grade silver-lead bodies, formed mainly by fissure-filling, but perhaps to some extent by wall-rock replacement, in the near-surface Cretaceous sedimentary and volcanic formations. In areas to the north and south important copper and zinc ore developments have been made and from which considerable tonnages of ore have been mined in the past. These deposits are principally replacement bodies in Paleozoic limestone. It appears, therefore, that replacement bodies in limestone form the important type of ore deposits for the district.

The questions of major structure, and character and thickness of formations forming that structure, thus appear to be the essential questions relative to the probability of extensive ore occurrences at depth in the Olive Camp area. If the ore-bearing limestone formations of the Mineral Hill-San Xavier area to the north and of the Twin Buttes area to the south are continuous or occur under Olive Camp area, then the probability of occurrence of important commercial ore deposits at depth in the latter area is greatly increased. The problem would then become one of probably depth to the favorable horizon and the determining of dominant or master fracture zones.

Mr. John Carter Anderson, in his report on the Swastika property, page 4, sets forth certain evidence and a statement of belief that limestone does occur below the superficial formations of the area. That there is more than a possibility that these Paleozoic limestone formations do exist below the surface formations in the Olive Camp is not an idle statement nor one made for convenience.

Even brief field study of the stratigraphy and structures in this area and that immediately to the north, in the San Xavier area, justify the statement that this stratigraphic condition might exist. But more convincing still are similar indications in the results of recent detailed geologic mapping in this area to the immediate north.

The Olive Camp area appears to be a depressed geologic structure - either a down-warped (synclinal) or a down-faulted area. The Paleozoic limestone formations of the San Xavier area distinctly dip to the south (20° - 25°), apparently plunging under the Olive Camp area. The contact between Paleozoic limestone and Cretaceous arkosic beds occurs along the southern border of the San Xavier area. The origin of this contact is not clearly indicated; it may be normal formational contact, produced by a break or time interval in the deposition of sediments which formed the beds; or it may be a fault contact, produced by a major rupture. If this contact is an unconformity, as the first case suggests, the limestones extend to the southward uninterrupted below the Olive Camp area. In the event that it is a fault contact, the limestones with their overlying sedimentary beds and volcanic formations, in the Olive Camp block have been faulted downward.

There is some basis, of course, for expecting that additional underground development may disclose other small high-grade silver-lead ore shoots, such as were formerly worked in the area, or perhaps larger veins and breccia bodies of ore of commercial grade and size. But it is more logical to expect that, if commercially important ore deposits are to be developed in the area, they will occur as metasomatic replacement and contact deposits in limestone.

The problem of developing possible large ore bodies in the Olive Camp area thus resolves itself, in this opinion, to first ascertaining the presence or absence of underlying limestone beds. Preferably, such development should be carried on by drilling operations. And in so doing, if the location of drill holes is carefully planned, it is probably that relatively near-surface vein or breccia type deposits of value may be encountered while the deeper prospecting is in progress.

The depth at which the limestone, if present, may occur is highly problematical; if in a synclinal structure, it may lie comparatively shallow, if block-faulted, it may lie much deeper - 2,000 feet or more.

Yours very truly,

(Signature)
Raymond J. Leonard.

4

STATEMENT OF LUKE CORDA, RELATIVE TO THE
OLIVETTE MINING CLAIM, PIMA MINING DISTRICT,
PIMA COUNTY, ARIZONA.

I came into the section known as Olive Camp, Pima Mining District, in 1886 and am living in the community at this time.

I had charge of the San Xavier Mines, now owned by the Empire Zinc Company, and situated in this District, for something over four years, and was in charge of the Paymaster Mine, also in this District, for three years.

At the time the Olivette closed down, in 1893, I was a part-owner of adjoining property known as the Matchless, now known as the Prosperity, which has produced several hundred thousand dollars of ore. The Matchless was worked to a depth of 312 feet and was in good ore when operations on it ceased.

I was on this adjoining property when the Olivette closed down and I know that the shut-down was intended to be temporary. After a while parts of the mine caved in and it has not since been dewatered nor opened up in any way.

I know that when the Olivette closed down they were in ore as good and the veins were as strong as at any time during the operation of the Olivette.

LUKE J. CORDA

19

*Now Prosperity patented claim -
Jm*

The Helmet Peak Mine

The Helmet Peak Mining Property consists of fifty-seven claims, (seven of which are patented) and is situated twenty one miles Southwest of Tucson, with a good road all the way, and is seven miles due west of Sahauri~~ia~~ station on the Nogales R. R.

There is one six hundred foot shaft, and one four hundred foot shaft about four hundred feet apart, connected on the two hundred fifty and four hundred foot levels. Both are fully equipped with hoist, air compressors, blacksmith shop, etc and also seven air jack hammers and drilling steel. Just north of the shaft, running east and west thru the property, is a Mother vein of lead-silver-gold ore, with several shafts, one of which is three hundred twelve feet deep. These were worked several years ago by hand, but owing to the low price of silver, work was stopped, and they are now somewhat caved, and have considerable water in them. The claims were taken up by two miners, who shipped ore as they needed money. The first sixty feet was left on the dump, but below that the ore was sorted and shipped. The vein is thirty-six inches wide, nine inches or more of high grade ore. At the 200 foot level, the ore run 200 ozs. silver, one half oz. gold, and twenty to ~~twenty-five~~ per cent lead; at the three hundred feet, three hundred ozs. silver one oz. gold, and twenty to twenty-five per cent lead.

From the six hundred foot shaft, a drift was run on the three hundred fifty foot level to within one hundred forty feet of this vein, and the work was ordered stopped by George Gray, who it appears, did not want to get into shipping ore. It is proposed to continue this drift the rest of the way to the vein, get out the ore, sort it, and ship the high grade, until we can pay dividends, and accumulate a sufficient surplus to put in a suitable mill. To continue the drift and take out at least two cars of shipping ore, it will cost ~~twenty~~ to twenty-five thousand dollars, which is all the money needed to put the mine in operation and keep it going.

Attached is a copy of Joe Flannery's report, and we also have several engineers reports on the property.

Respectfully submitted

W. S. King, Pres. Helmet
Peak Copper Company.

WSK/r

(18)

**STATEMENT OF SEWARD BROWN RELATIVE TO THE
ANNETTE MINING CLAIM, PIMA MINING DISTRICT,
PIMA COUNTY, ARIZONA.**

I was the original locator and owner of the Annette Claim, which adjoins the Olivette. I took out of this claim over \$55,000.00 worth of ore. In 1893, owing to the low price of metals at that time, the mine closed down and has never since been operated. The shaft has not been dewatered since the time the mine was closed down. My operation of the mine was entirely without machiner.

At the time the mine closed down, in 1893, operations were in 100 ounce silver ore in a winze at the bottom and 250 ounce ore in a drift to the West.

My brother, J. K. Brown, was one of the locators and owners of the adjoining claim, the Olivette, and there was shipped from this claim, the Olivette, over \$750,000.00 of ore, and good ore left in the bottom when operations were discontinued.

I am not the owner of nor interested in any mining property in the Pima Mining District.

SEWARD E. BROWN

17

C O P Y

ASSAY CERTIFICATE

EAGLE-PICHER MINING & SMELTING CO.

Sahuarita Mill Operations

Conductor

4

X Tit Per Tot
Test #1

DESCRIPTION	AU Ozs. per ton	AG. Ozs. per ton	PB Per Cent	ZN Per Cent	CU Per Cent	FE Per Cent	Insul
Pb Conct	.12	44.6	61.5	4.5	3.00	5.8	2.0
" Mid	.04	26.8	14.7	11.6	1.38	17.8	
Zn. Conct	.01	3.6	.6	56.5	.42	4.7	2.8
" Mid	.01	9.5	2.0	8.1	.37	15.0	
Tails	.002	.41	.13	.35	.03	1.9	
94.23 Heads Total	.01	5.9	6.4	8.4	0.40		56.03
Oxide			0.18	0.48			

23

Olive C. Pima County.
Arizona
Oct. 9, 31

Mr. Wm. J. Bishop,
Tucson, Arizona.

By Bright

Dear Mr. Bishop:

Complying with your instructions I have made an examination of the Helmet Peak Copper Company mining property, and submit the following facts. (11)

Location.

The property is located in Pima Mining district, Pima County, Arizona, twenty miles southwest from Tucson, on the old Tucson-Nogales highway. On the north is the property of the Empire Zinc Co. a developed mine. On the south is the property of Twin Buttes Mines, with a shipping record in excess of five million dollars and with immense tonnage of ore developed.

Geology.

Geologic conditions indicate large deposits of high grade Silver-Lead, Zinc, and Copper which cover an area of six or more miles, equal and possibly superior to any district in the southwest.

Owing to the limit of time to my disposal I am giving you the results as complete as possible:

The geology of an area of several miles has been examined by a number of eminent geologists, their reports being reliable and thorough, may be obtained by applying at the office of the Helmet Peak Copper Company. The company having spared no effort to obtain all possible data of the mineral content of the district.

The geology of the district is practically the same as many of the large copper mines of the United States, Mexico, and South America, consisting of areas of sedimentary deposits, intruded by later granatoid igneous rocks.

On the north we find the precambrian granite in

places showing through the soil. South of this the paleozoic rocks appear as in small areas of quartzite and Martin limestone, and South and West Mesozoic sediments as far as my examination extends.

The intrusive granite is the principal mineralizer in the ore deposits of Arizona.

The presence of intrusive granite associated with the sedimentary rocks form an ideal condition for large deposits of ore. Where these conditions exist with a great number of mineralized veins encountered over the surface, it is almost a certainty of immense deposits of commercial ore, only requiring capital and intelligence in development work to locate them.

There is evidence of large deposits of commercial ore, on the contact of the granite and paleozoic rocks, by development of the Mineral Hill, Vulcan and other properties.

There has been several million dollars worth of ore shipped from the district.

The Helmet Peak Copper Company's property consists of a group of sixty two claims, approximately 1240 acres.

Mineralization.

There are two principal vein systems traversing the property, one striking north 10 degrees east, dipping to the west, and the other running north 80 degrees east dipping northwest.

That the zonal theory is correct in these veins is very evident, high grade Silver, Lead, Zinc, and copper ores are and will be encountered as depth is gained.

The veins are continuous in trend and have well defined walls and give evidence of continued depth.

Development.

The development consists of efforts to take out ore at a comparatively shallow depth, which proves without question the wide distribution of valuable ore at the surface of the property.

11 the surface exploration development was accomplished by the original owners, who did the work without the aid of machinery or scientific principles of mining.

The Helmet Peak Mining & Milling Company formerly owning a portion of the property now owned by the Helmet Peak Copper Company sunk two shafts in an Andesite intrusion, both shafts are vertical, number 1 having a depth of 600 feet, number 2 a depth of four hundred feet and about 500 feet apart. A great part of the drifting has been driven in an Andesite Breccia, in contact with the Andesite intrusion, and is not a mineralizing contact, the mineralization being the result of deposits from mineralized solutions from the fissures, which is the proper place to look for ^{ore} ~~them~~, although I believe that profitable bodies of ore will be found in the vicinity of the Billings shaft as indicated by a shoot or pipe of copper (bornite) located there, by following the ~~pipe~~ ^{shoot}.

I believe that by continuing the drift of the 150 foot level the Billings ore body will develop a nice body of high grade ore, and also continue the drift from the 350 foot level, following the ore to the Prosperity vein.

There is an abundance of evidence of valuable ore bodies along the vein running through the Prosperity claim, which can be developed economically by drifting from number 1 shaft at the 350 foot level, a continuation of the present drift will necessitate approximately 140 feet to cut this vein, after this has been accomplished, drifting in both directions to open the ore body and provide stoping ground.

In the above mentioned section there is a large tonnage of good milling ore, that can be easily developed.

It is a good policy to locate ore bodies by diamond drilling, which is far more economical than sinking shafts,

by which to locate bodies of copper ore, as copper deposits lie in zones.

Almost all of the big mines of today were operated on a small scale and developed in the early stages without machinery or scientific direction, extracting the high grade ore near the surface in a small way until the depth was too great, or the ore became complex, or no metallurgical process for profitable treatment at the time and other causes which delayed development for many years in some cases.

The problems of the past do not exist on this property as metallurgical difficulties have been solved, the water, a valuable asset for milling, being present for flotation purposes.

The geology indicates immense bodies of ore as depth is attained.

All indications in Olive camp as well as Pima mining district point to one of the largest and most profitable copper camps in Arizona, and possibly in the United States, or Mexico, with development and depth.

The Helmet Peak Copper Company are making great efforts to develop the property correctly.

Mr. James A. Hamilton who is president of the company and a mining man of many years experience and thoroughly competent to develop and operate the property with great economic results, having the advantage of knowing that there is ore in the drifts at depth in the development of the former operators, is advantageous to the present plan of development.

The plans as discussed with the officers of the company for the future development are carefully laid, conservative, and along approved engineering plans.

Respectfully submitted,

Wm. Bright. E. M.

COPY

Property of Fred W. Tinkler
Tucson, Arizona.
October 25, 1934.

Box 256
Tucson, Ariz.
Please return.



Capt. W. S. King,
90 North Church Street,
Tucson, Arizona.

My dear Captain:

Replying to your inquiry regarding the Prosperity Mine: I have known this mine since its location sometime in the nineties. The main shaft is down some 320 feet and I do not recall the amount of drifting that has been done. This shaft was started about 1898, and was worked by the owners, Mike and Luke Corda, until the drop in the price of silver in 1903. During this time the Cordas became worth about fifty thousand dollars apiece from the profits of the mine. They had no hoist on the property, but after the shaft became too deep for a windlass, they operated it with a whim drawn by mules.

The first 60 feet of the shaft was a chloride ore that was not shipped and is probably still on the dumps. At 60 feet sulphides were encountered that assayed 30 ozs. silver and a few dollars gold. The ores became steadily richer as the shaft was sunk, and at the bottom of the shaft assayed 300 ozs. silver and 1 oz. gold. I took a sample on the 200 foot level that assayed 200 ozs. silver and about \$12.00 gold.

The shaft follows the vein down, and flattens out in places, so that it is very crooked. The vein is better than three feet in width, and the pay streak 8 to 10 inches or better. The balance of the vein was milling ore carrying some chlorides that was thrown on the dump.

Luke Corda died in 1922, and I was administrator of his estate. Among his effects were scrap books containing assays, bills of lading and smelter returns covering the entire operation of the Prosperity. I kept these records for some years, but, unfortunately, later I destroyed them.

Very truly yours,

Signed: Joseph Flannery.

20

FRED W. FICKETT
535 Shell Point Village
Fort Myers, Florida 33901

Dear Mr. Irwin:

8/12/75.

My son, Howard, told me you wanted old
mining data. Enclosed is my old file
on ~~the~~ Camden - Tit-fa - Fat - part of the
old Helmet Peak Mining Co. group. Patented
claims. These are being purchased now
by Anaconda under contract. I believe
Anaconda has seen all of the enclosed data.

It is O.K. with me if you put it all in
the waste basket. W. O. with it as you please.

Best regards.

Fred W. Fickett

27

Copy

ASSAYS AND ANALYSIS CERTIFICATES ON 250 FT. LEVEL.
HELMET PEAK MINING AND MILLING COMPANY.

Feet indicate distance to face of drift from shaft cross-cut.

	Gold.	Silver.	Copper.	Lead.	Zinc.	Total Value.
Dec. 9th.						
#5 East Drift 26 ft.	.01	.7	.05	2.5	1.4	\$ 6.67
#6 East Drift 29 ft.	.01	.8	.12	3.6	2.1	9.67
Dec. 15th						
#7 East Drift 32 ft.	.01	.7	.05	3.6	6.5	15.56
#8 East Drift 36 ft.	.01	.8	.02	1.2	6.2	11.28
#9 East Drift 40 ft.	.02	1.2	.02	2.4	7.1	13.27
Dec. 18th.						
#10 East Drift 44 ft.	.02	.9	.02	2.4	5.6	12.60
#11 East Drift 48 ft.	.01	1.0	.02	1.1	6.2	11.20
#12 East Drift 56 ft.	.02	1.2	tr.	1.5	5.2	10.58
#1 A.						
--	.03	1.6	.25	3.1	7.1	17.01
#13 East Drift 60 ft. 4ft.wide	.01	.9	.05	2.6	4.5	11.25
#14 East 65 ft. 4 ft. "	.01	.8	.02	2.5	6.6	12.76
Dec. 28th						
#15 East 71 ft.	.01	.6	.05	1.7	2.4	6.69
#16 East 78 ft. 4 1/2 ft. "	.02	3.2	1.5	2.5	3.8	15.60
#1 B. assorted ore.	.03	16.1	3.5	9.5		33.70
Jan. 15th						
#18 C.C.#2 East	.03	2.4	.5	5.1	4.6	16.35
#19 160 ft. West	.02	1.2	.05	2.9	3.0	9.43
Jan 20						
#19 West 165 to 190 ft.	.02	2.2	.05	1.5	3.1	8.03
#20 west 165 to 190 ft.	.02	.6	.05	2.6	2.1	7.58
#2 A. 165 to 190 ft.	.01	.8	tr.	3.2	1.9	7.94
Jan 25						
#21 East 88 ft.	.02	1.2	"	2.7	4.4	10.87
#22 East 94 ft.	.02	1.4	"	3.8	4.2	11.56
#23 west 193 ft.	.01	4.4	.05	2.3		6.23
#24 West 197 ft.	.01	4.1	.15	3.8		8.60
#25 assorted ore.	.02	26.4	9.9	3.2		46.25
Feb. 1st.						
#26	.02	6.0	2.1	5.5	6.5	26.15
#27 Tit-for-Tat	.03	26.2		30.6		62.27
#28 Surface Outcropping		34.1		50.2		95.70

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
OWNERS MINE REPORT

Date November 15, 1939

Mine **Helmet Peak**

District **Pima Mining Dist.**

Location **21 miles S.W. from Tucson**

Former name

Owner

Address

Operator **H. P. Mining and Milling Co.**

Address **90 N. Church St., Tucson**

President **J. S. Ayres**

Gen. Mgr.

Mine Supt.

Mill Supt.

Principal Metals **Gold, Silver and Lead**

Men Employed

Production Rate

Mill: Type & Cap.

Power: Amt. & Type **2 Hoists and Compression**

Operations: Present **None**

HELMET PEAK

Au, Ag, Pb

Pima

10 - 6

T 17 S, R 12 E

Operations Planned

Helmet Peak Mng. & Milling Co., 90 Church St., Tucson '43
(Returned. Records searched, no address on file. 8/5/46)

Number Claims, Title, etc. **7 patented, 50 unpatented**

Description: Topog. & Geog.

Mine Workings: Amt. & Condition

(over)

Geology & Mineralization

Ore: Positive & Probable, Ore Dumps, Tailings

Mine, Mill Equipment & Flow Sheet

Road Conditions, Route **Good**

Water Supply

Brief History

Special Problems, Reports Filed

Remarks

If property for sale: Price, terms and address to negotiate.

W. S. King, 90 N. Church St.
Tucson, Ariz.

Signed..... W. S. King

Use additional sheets if necessary.

A. L. Pellegrin & Son
 Formerly for 6 years U. S. Assayer
ASSAYERS and CHEMISTS

Testing for Rare Metals and
 Minerals. Cyanide and other
 Metallurgical Laboratory tests

P. O. Box 246
 100 South Stone Avenue
 TUCSON, ARIZONA

Assay and Analysis Certificate

MR. Helmet Peak Mining Co.

Sept 28, 1928

NO. OR MARKS	FIRE ASSAY--PER TON				CHEMICAL ANALYSIS--PER CENT					TOTAL VALUE
	GOLD OZ	VAL AT	SILVER OZ	VAL AT	COPPER @ 15¢	LEAD @ 6¢	ZINC @			
<i>conspicuous NW corner contented quartz vein</i>										
<i>location 1</i>	<i>01</i>	<i>\$ 0 20</i>	<i>4 5</i>	<i>\$ 2 55</i>		<i>6 3</i>	<i>\$ 8 20</i>			<i>\$ 10 95</i>
<i>" 2</i>	<i>01</i>	<i>\$ 0 20</i>	<i>3 1</i>	<i>\$ 1 75</i>		<i>6 8</i>	<i>\$ 8 85</i>			<i>\$ 10 80</i>
<i>Ohio Top Rock</i>	<i>02</i>	<i>\$ 0 40</i>	<i>11 2</i>	<i>\$ 6 40</i>	<i>3 2</i>	<i>\$ 9 75</i>	<i>51 1</i>	<i>\$ 66 45</i>		<i>\$ 83 00</i>
<i>Shaver Hill</i>										

23

CHARGES 6.00 *Pay*

A. L. Pellegrin & Son ASSAYERS

A. L. Pellegrin & Son
 Formerly for 6 years U. S. Assayer
 ASSAYERS and CHEMISTS

Testing for Rare Metals and
 Minerals. Cyanide and other
 Metallurgical Laboratory tests

P. O. Box 546
 100 South Stone Avenue
 TUCSON, ARIZONA

Assay and Analysis Certificate

MR. Helmet Peak Mining Co.

Feb. 22, 1928

NO. OR MARKS	FIRE ASSAY—PER TON				CHEMICAL ANALYSIS—PER CENT				TOTAL VALUE
	GOLD OZ	VAL AT	SILVER OZ	VAL AT	COPPER	LEAD	ZINC		
<u>Spec. No. 1</u>									
<u>Clas. No. 1</u>	<u>.05</u>	<u>1.00</u>	<u>41.0</u>	<u>23.65</u>		<u>13.5</u>	<u>66.7</u>		<u>\$41.50</u>
<u>New find about center of claim</u>									

CHARGES 2.00 Lab

A. L. Pellegrin ASSAYERS

(33)

FRED W. FICKETT
535 Shell Point Village
Fort Myers, Florida 33901

Dear Mr. Irwin:

F/12/75.

My son, Howard, told me you wanted old
mapping data. Enclosed is my old file
on ~~the~~ Camden - Tit-fa - Fat - part of the
old Helmet Peak Mapping Co. group. Patented
claims. These are being purchased now
by Anaconda under contract. I believe
Anaconda has seen all of the enclosed data.

It is O. K. with me if you put it all in
the waste basket. Do with it as you please.

Best regards.

Fred W. Fickett

THE FAMOUS
MATCHLESS OR PROSPERITY LODE

BY C. L. OREM - ME

ON PATENTED
PROSPERITY CLAIM.

Operated in the early days and closed down in 1903, when lead dropped to 3-1/2¢ per pound and silver below 45¢ per ounce. Encountering of zinc-copper-sulfides in some of the ores in this area of silver-lead-gold, also caused difficulties in treating the ores in the early days.

Property is patented. Situated 21 miles south of Tucson, in the Pima Mining District, - a few hundred yards from the Tucson-Twin Buttes County Highway. An old Tucson-Twin Buttes road runs through the property.

Property held on contract for \$35,000, payable out of royalties, - 10% of the net smelter returns. Minimum labor requirements are 40 working shifts per month.

Property covers a little over a half mile on the lode, - being two patented claims. From north to south the various local camps in this district are called: Mineral Hill; San Xavier; Olive Camp; Twin Buttes.

Mineral Hill and San Xavier have had a large production record and Twin Buttes area has produced over 10 million dollars. The Olive Camp, just south of the San Xavier, produced 3 million in silver-lead-gold ores before 1903.

This is a depressed area stratigraphically compared to the areas around it. To the north, east, and south the areas are all in paleozoic limestone, - to the west, in granite which comprises the core of the mountain range.

All the adjoining areas have been productive. The mines are contiguous and numerous in each. In this area the formations on the surface are mesozoic sediments, volcanics, and intrusive porphyries. There are at least four types of ore deposits: fissure veins; breccia zones; metamorphic replacement deposits in paleozoic limestones; and contact deposits.

Production in the Olive Camp area in the past has been limited to very high grade fissure veins, which is the smallest of all the above types of deposits. Breccia zones between the fissure veins have had some work done on them and considerable areas exposed of these ores (over 100 ft. wide in places), but although about a quarter of million tons has been blocked out on one such zone just south of this property, the copper, very little production to date has resulted. The old time miner working by hand tools followed the extremely rich lenses in the fissures. Considerable evidence shows the breccia zone type of deposit may be more generally prevalent than previously supposed.

Only the last few years has modern custom milling been available in the area. The Matchless is about 9 miles from the Eagle Richer's selective flotation plant near Sahuarita over the County road and is 11 miles from the railroad at Sahuarita, which is 18 miles south of Tucson on the paved Nogales State Highway.

The Matchless lode produced about \$400,000 before 1903, in very rich silver-lead-gold ore. They only had a segment of a vein opened not over 300 feet long of which less than half was worked and the deepest of 6 shafts being 300 feet on a steep incline, - one shaft is 40 feet, another shaft not over 60 feet, and another not over 50 feet. So only a fraction of the 300 feet in depth of the 300 feet in length on the vein was worked.

The vein was low grade on the surface, -not over 20-30 ounces silver and low gold. At the 200 foot it was averaging 200 ounces of silver and a half ounce in gold. The 300 foot level showed 300 to 350 ounces silver and one ounce in gold on ores averaging about 25% lead. This work was, all done by hand, using winalass and later horse-him. Old miners living here who worked in or were on the property state concerning the ore left in the mine when the market broke.

This was in a vein up to 10 or 15 feet or better in thickness in places, but being only about 3 to 5 feet wide in others, and carrying a high grade lense or lenses of from a few inches up to several feet, but mostly 3 to 18 inches in thickness, the balance of the veins being mill or lower grade ore.

Briefly, this vein is cut by at least two other series of veins, some of which are large and never prospected on as the ground is mostly covered by gravel and debris from the higher mountain slopes to a depth of from 1 to 10 or 15 feet on the transverse hogbacks. This debris is fine in size with no large boulders and is ideal for ballast or ground to rapidly expose the veins. Others of these veins on adjoining properties have had a large production of very high grade ore. In places small traces of manganese in some of the veins may account for the low gold and silver average values above the water level which stands at from 50 to 100 feet depending on the elevation of the surface.

This vein system on the surface lies in formations of volcanic and mesozoic sediments and porphyries that are block faulted and is probably underlain by granitic intrusives and paleozoic limestones.

26 The area has a gentle rolling topography. The crests of the hogbacks are covered to as deep as 10 or 15 feet in debris from the higher hills, while the ravines between expose the formations in place at not over a foot or two.

The Eagle Picher ranked about fifth last year in lead-zinc in the State from the San Xavier area, and have built up a custom plant at Sahuarita capable of handling 600 tons per day of lead-zinc ores. They have been and are extensively drilling the paleozoic limestone area about a half mile north of this property and have been getting very good results. They have drilled over 1500 feet in depth. They have drilled through the mesozoic in places and into paleozoic.

These formations are dipping south 20 to 25 degrees under this property and it remains to be seen whether they have the big mine of the area. Transverse faults and tongues of granitic material and porphyries obscure the picture.

I have done some shallow geophysical work over the surface and find footwall and hanging wall sections over the winalass vein that shows strong evidence of sulphides. Some deeper geophysical work indicates from 40 to 100 ft. of strong sulphide mineralization on other portions, although still in the volcanics and mesozoic sediments. I have been trying to get some deep geophysical work done to indicate more intensely mineralized areas in the base metal areas in the deep zones such as the paleozoic.

2

Good results are shown on these ores by concentration in previously made mechanical concentration tests and late selective flotation tests, - the gold and silver values following the lead and copper concentrates and being very low in the zinc concentrates.

I am quoting from a letter by the former owner, now dead, of the Matchless, - written about an adjoining mine, the Olivette, but which states about the ore condition and production of the old Matchless.

"I came into the section known as Olive Camp, Pima Mining District, in 1886 and am living in the community at this time.

"I had charge of the San Xavier Mines, now owned by the Empire Zinc Company, (now Eagle Picher), and situated in this district, for something over four years, and was in charge of the Logmaster Mine, also in this district, for three years.

"At the time the Olivette closed down, in 1893, I was a part-owner of adjoining property known as the Matchless, now known as the Prosperity, which has produced several hundred thousand dollars of ore. The Matchless was worked to a depth of 312 feet and was in good ore when operations on it ceased."

/s/ Luke J. Corda

I am also quoting from a letter by the owner of the Olivette who as administrator for the estate of Luke Corda, - knew the Matchless very well.

Joe Flannery's letter states

Replying to your inquiry regarding the Prosperity Mine, (adjoins the Olivette on the south side). I have known this mine since its location sometime in the nineties. The main shaft is down some 312 feet and I do not recall the amount of drifting that has been done. This shaft was started in the 9-'s and was worked by the owners, Mike and Luke Corda, until the drop in the price in silver in 1905. During this time the Cordas became worth about fifty thousand dollars apiece from the profits of the mine. They had no hoist on the property, but after the shaft became too deep for a winlass, they operated it with a whim drawn by mules.

"The first 60 feet of the shaft was a chloride (oxidized) ore that was not shipped and is probably still on the dumps. At 60 feet sulphides were encountered that assayed 30 oss. silver and a few dollars gold. The ores became steadily richer as the shaft was sunk, and at the bottom of the shaft assayed 300 oss. silver and 1 o. gold. I took a sample on the 200 foot level that assayed 200 oss. silver and about \$12.00 gold."

Many old timers' and miners, some still living about Tucson, were familiar with the production and showing in these old workings. It was rated the highest grade in the area. Data secured from these sources indicate that one high grade stop above the 200 ft. level was in the process of being mined when the shut down came and the ore left in place. It seems, from all the old data I can gather, that they expected only a short shut down, and left the working tools in the faces in some instances. The shut down extended however, for many years, - through the panic of 1906 and 1907, and the old Matchless finally passed into the hands of a promotion corporation and was never reopened. After the crash of 1929, this corporation was dormant and after over 10 years of delinquent taxes the patented claims were sold for taxes at sheriff's sale.

with the domestic price of silver set by Federal Law at 90.5 cents per ounce and market prices for lead at 12 cents per pound, zinc 9 cents per pound, and copper 16 cents per pound, very high priced products could be produced.

These factors offer great inducement for new domestic production of silver and gold, with our military and Naval Departments demanding 500 million dollars of strategic metals to be stock piled for national safety this next fiscal year, it looks like the prices for metals will be good for a period of years, probably the greatest single factor the Government could add for a great stimulation of domestic metal mining would be suspension of Federal taxes for a few years on new initiative in domestic metal production. This is unlikely, although it has gained considerable force in some portions of the U.S. as the miner, unlike the early day miner, has practically no voting power compared to the manufacturing, agricultural, and servicing industries. This is due partly to the fact that many of the strongest mining interests of this country are interested in foreign production of metals.

Intelligent work on new development on this property, taking advantage of modern geophysical methods, checked by drilling and development openings will show additional parallel veins and intersecting fissures, with considerable breccia ores, and a wonderful opportunity to develop larger base metal ore bodies containing good silver-gold values in the more favorable geological formations below the surface on this property. Shallow geophysical mapping indicates that much larger tonnages than the old prospector produced can still be produced on this property using modern machinery and methods, in the rich silver-lead-gold ores near the surface.

However, at present it is desirable for immediate sure returns to concentrate on the high grade silver-gold production.

C. L. CROMB
Mining, Metallurgical Engineer
and Geologist

OPEN TRENCH, CUT, OR PIT PRODUCTION- CAMDEN MINE -

AS PROPOSED BY C. L. OREM - (M. E.)

It is proposed to first scrape out a trench or open cut (open on one end) over the S. E. crosscut of the 52 ft. level of the Billings Shaft and the last or the S. W. crosscut on the 150 ft. level of the 612 ft. Camden Shaft. This will require 15-~~20~~ ft. of surface to be stripped off by bulldozer above the lowest point on the surface.

Then to ship this product direct to the smelters (see cost sheet on copper cut(2)), mining by small 3/8 yd. shovel and trucks, or dragline scraper, widening the trench or open cut by benches as the ore uncovered warranted, - while diamond drilling between levels to prove continuity of ore bodies.

As a lead-zinc-copper cut estimate, block (1), was entered, - to wash the material through heavy trommel screens, discharging on a short sorting belt where the larger boulders of lead-zinc-copper sulfides could be taken off for a very high grade mill product. An assay of this character of ore gave 13.2% lead, 19.8% zinc, 3.48% copper, 5.4 ozs. silver, and 0.03 ozs. gold.

The oxidized copper in this material could be washed out as the mine water is acid and most of the copper is in the sulfate form. In places this material shows 2-~~3~~% copper as a copper sulfate. This material could be precipitated on scrap iron as practiced by many mines in the handling of their mine waters. The recovered product would assay 80% copper or better.

As a trench or pit was deepened these areas could be connected with the 150 ft. level of the Camden shaft (70 ft. below the 52 ft. level of the Billings shaft), by raises which could later be "belled out" and the broken ore in them maintained at any level desired by scraping into them by dragline scrapers or a bulldozer working on benches around them. Thus the open pits would become glory holes as far down as it proved practical to carry them before substituting underground methods.

As estimated blocks of ore were mined out on the 150 and 250 ft. levels and the shrinkage stopes drawn off, additional stripping of the pit could be done through raises into the shrinkage, cut and fill, or open stopes, materially cheapening the mining costs by eliminating considerable mine timbering.

The products below an inch or inch and a quarter in size could be passed over jig, - tables or sink-float units by way of preliminary treatment to cheaply step up the mill product to a very high grade bulk concentrate. The slimes could be passed over flotation cells, taking out the balance of the values.

By opening a trench for a preliminary check sampling of over a hundred feet wide of the breccia ores, - complete testing of these products could be cheaply made on a large scale mill test without much equipment, - while drilling to prove the continuity of these ores between levels. Sampling in the oxidized zone in the Billings shaft in rather poor breccia type ores indicate that the silver values over the high grade sulfide areas of the pit may pick up to \$6 or \$7 per ton or better.

The advantages of this method would be: With the water being utilized in a preliminary washing operation, the mine would be quickly opened without a large dewatering cost. A 300 to 500 ton per day rate could be quickly reached with the products going direct to smelter or custom plant or a much smaller final plant on the property would be required which however would be handling a very high grade product.

With the 335 ton per day plant estimated to handle the present ore estimates in four years, - a successful demonstration from pit operation that a 10 to 1 preliminary concentration was possible, large tonnages of very low grade breccia ore areas could be handled by cheap methods, making the product to the final plant or a custom plant of a much better grade, - resulting in better profits. A 10 to 1 preliminary concentration ratio in a pit or glory hole method would mean a million tons handled per year of very low grade breccia ores instead of a hundred thousand tons of \$20.40 value as of the present ore estimates. This would mean 3350 tons per day and very low costs could then be realized. The water could be pumped over and over through sumps and only discharged sufficiently to keep from building up too heavily in deleterious compounds.

Naturally a large amount of testing would be required and could only be had on a practical scale without undue costs by opening the initial trench.

2

Camden Costs: Blocks (1) (2) (3) (4) estimates - taking out sorting belt product and giving the balance a 10 to 1 preliminary treatment and milling the product on the property (estimated on the basis of the custom mill costs at Sahaurita)

300 Ton Daily

Au.	-	.01 oz.	-	3 oz.	-	.3 oz.	-	2.7 oz.
Ag.	-	1.64 oz.	-	492 oz.	-	54.0 oz.	-	438.0 oz.
Cu.	-	0.64%	-	192 units	-	35.0 units	-	157.0 units
Pb.	-	1.18%	-	354 units	-	132.0 units	-	222.0 units
Zn.	-	3.36%	-	1008 units	-	198.0 units	-	810.0 units

Sorting Belt Product 10 tons Daily

Au.	-	.03 oz.	-	.3 oz.
Ag.	-	5.4 oz.	-	54.0 oz.
Cu.	-	3.48%	-	34.8 units
Pb.	-	13.2%	-	132.0 units
Zn.	-	19.8%	-	198.0 units

Preliminary Plant Treatment

			Concentrated		30	per
			10 to 1		tons	ton
300 tons containing -	2.7 oz. Au.	-	20% loss -	0.54 oz.	-	2.16 oz. .07
	438.0 oz. Ag.			88.0 oz.	-	350.0 oz. 11.7
	157.0 units Cu.			31.0 units		126.0 units 4.
	222.0 units Pb.					
	810.0 units Zn.					

Olive Camp
Pima Co

Libby-12/5/28 - REPORT ON THE PROPERTY
of

C
O
P
Y

THE HELMET PEAK MINING & MILLING COMPANY

The property of the Helmet Peak Mining & Milling Company is situated in the well known "Olive Camp" section of the Pima Mining District, Pima County, Arizona.

Situated a distance of about 21 miles in a Southwesterly direction from Tucson, the property is easily accessible by good roads.

A well maintained highway, leading from Tucson to Sahaurita, Amadoville, Nogales and other points on the Nogales Branch of the Southern Pacific Lines, passes within a mile distance of the Helmet Peak Company's property.

A good road connects with the highway affording available shipping points along the line as may be required.

The Twin Buttes Camp, two or three miles to the Eastward, has railroad connection with the Nogales Line at Sahaurita, providing a convenient outlet for the surrounding country.

PROPERTY HOLDINGS

The property held by the Helmet Peak Company comprises a group of seventeen mining claims.

Seven of these claims are patented and the balance are being held under contiguous claim locations.

GENERAL STRUCTURE

The surface ground of the property lies mainly within the area of older Andesites, although in some parts, out-croppings of highly altered sedimentary rocks are in evidence.

Considerable folding and shearing action is observable and the older sedimentaries and basas aggregates show evidence of extensive intrusions by later igneous rocks.

The metal bearing areas are found in the brecciated sections of the Andesitic aggregates where cross faulting and shearing has accompanied the intrusion of Granitic and Dioritic Porphyries and the subsequent adjustment in place.

The mineralizing solutions have undoubtedly had their origin in the underlying intrusive mass and in their migrations therefrom have caused a partial replacement of the contiguous formation in such parts as were favorable for that action.

ORE OCCURENCE.

The mineralized area within which the most important development work has been done, lies within an extensive shear zone having a Southwesterly Northeasterly trend through the Camden No. 2 and Elsie claims.

Secondary fissuring and cross-faulting accompanying the shearing and adjustment periods has resulted in extensive areas of brecciated rock mass which furnished favorable locations for replacement action and the deposition of ore bodies.

The boundaries of the shear zone, outlined by the surface and underground development, indicate a zone of mineralization approximately 200 feet in width, with a length traceable for several hundred feet on either side of the working shafts.

The ore measures outlined by the present stage of development lie within the shear zone, with considerable regularity and demonstrate that mineralizing solutions have traversed certain series of fissures closely related to the faulting and intrusive periods.

Replacement action in brecciated areas and favorable sections of the sheeted Andesite by solutions bearing Silver, Copper, Lead and Zinc has formed the ore bodies now exposed in the mines.

Extended development work has emphasized the relation of the cross fracturing and sheeting of the rock mass to the nature of the ore deposits.

Throughout the underground workings is shown the tendency for the better class of ore to be found in the sheeted blocks adjacent to certain well defined shear planes or fissures.

This condition is analagous to the occurrence of replacement ore bodies in the bedding of sedimentary rocks.

CHARACTER OF ORE

The ores developed at this time are essentially complex in nature; but are not refractory in character.

Tests have shown that the ore would yield readily to modern metallurgical treatment.

The valuable minerals Galena, Chalcopyrite, Tetrahedrite and Sphalerite occur throughout the ore measures in the form of disseminated minerals, nodules and segregated masses.

A strong tendency is shown for like minerals to group together, that is: - to segregate into nodules and lenses of separate minerals.

In some areas the Copper-silver minerals will predominate in value and in others the Lead-Silver or Zinc-Silver will predominate.

It is the accepted theory, that: in this section of Arizona the copper minerals will finally replace the Lead Zinc minerals at depths approaching the origin of mineralization and that the resultant primary ores will be essentially copper bearing.

The more recent development of the lower levels of this mine substantiate this theory as the proportion of copper minerals in the unaltered primary ore is gradually increasing as the work approaches the underlying Granitic rocks to the Southward and below.

As this basal structure is approached at depth the degree of mineralization and proportionate value of the minerals should be increased.

Neighboring mines of the Twin Buttes area on the East and the Mineral Hill area on the North have at times produced large quantities of high grade copper ore.

Their relative position is closer to the basal granitic rocks than the workings of the Helmet Peak Company and it is therefore safe to predict that the latter company will find improved mineralizing conditions at a lower geological horizon.

DEVELOPMENT

The principal development work has been done within the ore zone upon the Camden No. 2 Claim and the Elsie Claims.

Work has been done at other points; but that is not covered in detail at this time.

The Billings Shaft, about fifty feet in depth has been previously worked on a moderate scale and the portion now accessible shows about one hundred feet of lateral development work.

The Zinc Shaft, about seventy feet in depth has been sunk near the westerly edge of the ore zone.

Shaft No. 1 on the Camden No. 2 Claim, is 600 feet in depth, well timbered the full length, equipped with station platforms, ladders and all accessories necessary for development work or mining.

Shaft No. 2 on the Elsie Claim about five hundred feet Southwesterly from Shaft No. 1, is 400 feet in depth, well timbered all the way and fully equipped for work.

Tributary to Shafts No. 1 and No. 2 about 3500 feet of lateral has been done in the ore zone.

ORE MEASURES.

During the course of development a number of assay samples have been taken from time to time in order to determine the tenure of metal content and value of ores encountered.

Sections which showed distinct mineralization and appeared to be ore were mainly sampled.

Approximately fifty percent of the lateral development footage shows distinct mineralization and has been sampled as ore.

Owing to the fact that the various ore areas, outlined on the levels have not been connected up directly with upraises or zinzes, the actual thickness of the ore areas which would govern the actual amount of ore contained in the blocks, is more or less problematical.

In the estimate of tonnages the apparent thickness of the mineralized sheeted rock mass as disclosed by the sample cuts is a factor that can be effectigely used for the third dimension.

50' LEVEL - BILLINGS SHAFT & 150' LEVEL

The available ore in the Billings Shaft area and sections of the 150' level of Shaft No. 1 has been previously estimated at 100,000 tons.

An average of assays shown on this section, -

Gold	Silver	Copper	Lead	Zinc
.01 oz	1.2 oz	.25%	1.9%	3.8%

The gross value of the metallics contained is \$8.90 per ton

250' LEVEL SHAFT NO. 1 AND SHAFT NO. 2

The development work on the 250' level has opened up an extensive mineralized area between Shaft No. 1 and Shaft No. 2.

The estimated amount of ore in this area as outlined by the openings and assay sampling is approximately 100,000 tons.

An average of the metallic content of the area as shown is:

Gold	Silver	Copper	Lead	Zinc
.01 oz	1.5 oz	0.27%	1.3%	3.0%

The value of the metallics by this average is \$7.37 per ton.

250' LEVEL TO 300' LEVEL

Later development work upon the 300' level and 400' level of Shaft No. 2 has opened up an interesting section.

The general formation exposed on these levels is more uniform in texture, shows less alteration by circulating ground water and the sheeting is more pronounced.

The minerals in the ore on these levels show more of a tendency to segregate into bunches and bands of higher grade ore.

The block of ground lying between the 250' level and the 300' level, tributary to Shaft No. 2, indicates an available tonnage of approximately 15,000 tons.

The average of assays taken along the exposures of this block shows a metallic content of:

Gold	Silver	Copper	Lead	Zinc
.02 oz	1.3 oz	.72%	1.5%	3.5%

The gross value of these metallics is \$9.78 per ton.

300' LEVEL TO 400' LEVEL SHAFT NO. 2

Between the 300' level and 400' level at Shaft No. 2 the present stage of development outlines a block of ore which would contain approximately 5,000 tons.

An average of the assays taken on this block shows metallics:

Gold	Silver	Copper	Lead	Zinc
.02 oz	.53 oz	0.82%	0.9%	6.4%

The gross value of the metallics in this average is \$12.53

400' LEVEL SHAFT NO. 1.

On the 400' level of Shaft No. 1 a partially developed ore body is outlined; which from the area and exposures sampled is estimated to contain approximately 5,000 tons.

The average metallic content of the samples taken is:

Gold	Silver	Copper	Lead	Zinc
.01 oz	.9 oz	.64%	0.8%	3.1%

The gross value of metallics contained is \$7.67 per ton.

SUMMARY OF ORE MEASURES

Assays

Location	Gold oz.	Silver oz.	Copper %	Lead %	Zinc %
50' & 150'	.01	1.2	1.07	.7	1.9
250' North	.01	1.2	.25	1.9	3.8
250' 1 & 2	.01	1.5	.27	1.3	3.0
250' to 300'	.02	1.3	.72	1.5	3.5
300' to 400'	.02	.5	.82	.9	6.4
400' Shaft No. 2	.01	.9	.63	.8	3.1
General Average	.01	1.3	.50	1.2	3.3

Tonnage

Location	Estimated Tons	Gross per Ton	Gross Value
50' & 150'	100,000	\$ 7.60	\$ 760,000.00
250' North	35,000	8.90	311,500.00
250' 1 & 2 Shafts	100,000	7.37	737,000.00
250' to 300' No. 2	15,000	9.78	146,700.00
300' to 400' No. 2	5,000	12.53	62,500.00
400' Shaft No. 1	5,000	7.67	38,350.00
	<u>260,000</u>		<u>2,056,200.00</u>

600' LEVEL SHAFT NO. I

The section of the shaft between the 400' level and the 600' level being temporarily impassable, conditions there can not be definitely described at this time.

From reports of daily work it is evident that the rock structure on this level becomes more regular and conformable and the action of circulating water not so evident.

Mineralization similar to the levels above was found in some sections and undoubtedly a continuance of development at this level would be of vital importance and furnish valuable data regarding the possible change in the mineralizing action at increased depth.

SELECTIVE MINING

Taken in the aggregate, the large tonnage represented in the ore measures is of a grade which anticipates the recovery of the metallic values by metallurgical treatment.

Tests have been made which show the ores to be amenable to concentration and the product marketed at a margin of profit.

In the vein areas certain sections show sampling values sufficient to suggest the possibility of developing and mining these sections separately and incidentally blocking out the true ore measures.

Along this line of development an upraise could be driven from the 400' level, west of Shaft No. 2, at the point from which samples No. 404 and 405 were cut, to follow the inclination of the sheeted ore deposit toward the 300' level above.

In a similar manner an upraise could be run from the 300' level to the 250' level above to good advantage.

Upraises following the apparent slope of the ore deposits, from one level to another, would add valuable data concerning the possible continuity of the ore bodies indicated at the various levels.

In the area tributary to the Billings Shaft, good assay values are shown and it is reported that commercial ore was being uncovered in the lower workings at an earlier time.

It seems that certain sections could be mined selectively at a margin of profit, either through the shaft itself or by connecting up with the underground workings of Shaft No. 1

A cross-cut tunnel driven from the 150' level a distance of about 125 feet would cut the general formation beneath the Billings Shaft and prove up this area effectively.

GENERAL

It is the consensus of opinion, that: the future of this property in the light of a potential shipping mine depends on the degree of concentration of the metal content either through a construction of the boundaries or a more general segregation of the mass value at an increased depth.

From the results obtained from the extensive development work that has been done upon the property to date, it is evident that the factor of increased depth of exploration is of primary importance.

It is assumed in reason that mineralization will become more intensified as the source thereof is approached and that fissures and sheeted rock masses will become more generally ore-bearing and show a relatively increased concentration of the contained minerals.

The origin of the mineralization undoubtedly lies within a zone between the ore areas now manifest and the granitic sill which underlies the series, and the mineralizing fissures may be simply offshoots from much larger ore bodies below.

To effectively prove the truth or fallacy of the supposition a vertical section of the rock series to the Granite sill beneath should be obtained.

This could be arrived at most economically and effectively by drilling the ground.

The logical action would be to send down a drill hole, as a pilot, from some point of vantage and the subsequent development be regulated according to the results obtained from the drilling.

Judging from the large area and tonnage of milling ore now exposed in the mines, it is a logical belief that the ores of more concentrated mineralization will surely be found at some point in the ore zone.

EQUIPMENT & MACHINERY

The mines of the Helmet Peak Company are well equipped on the surface and underground to carry on mining and development operations.

Shaft No. 1 Surface equipment consists of a 25 h.p. Fairbanks Morse Gasoline Hoist, a 50 h.p. Commercial Gasoline Engine with duplex belt driven air compressor, blacksmith shop and necessary tools.

The machinery is well housed and an office building and small cook shack is provided.

Shaft No. 2, Surface equipment consists of a 25 h.p. Fairbanks Morse gasoline hoist and a Chicago Pneumatic hot head air compressor.

Both shafts have good headframes dumping chutes and surface equipment for handling ore and waste and pumps are installed in Shaft No. 1 in favorable locations to handle all water encountered in both shafts.

An adequate equipment is maintained for drilling in either or both shafts or tributary lateral work.

All arrangements are made so that development work or ore extraction could be carried on effectively and economically on a scale commensurate with the size of the plant and equipment.

Respectfully submitted,

(Signed) J. M. LIBBEY

Registered Mining Eng'r

Tucson, Arizona
December 5th, 1928.

✓ Olive O
Arizona
Oct. 9, 31

✓ Pima County.

Mr. Wm. J. Bishop,
Tucson, Arizona.

ARIZONA DEPT. OF MINES & MINERAL RESOURCES
STATE OFFICE BUILDING
416 W. CONGRESS, ROOM 161
TUCSON, ARIZONA 85701

Dear Mr. Bishop:

Complying with your instructions I have made an examination of the Helmet Peak Copper Company mining property, and submit the following facts.

Location.

The property is located in Pima Mining district, Pima County, Arizona, twenty miles southwest from Tucson, on the old Tucson-Nogales highway. On the north is the property of the Empire Zinc Co. a developed mine. On the south is the property of Twin Buttes Mines, with a shipping record in excess of five million dollars and with immense tonnage of ore developed.

Geology.

Geologic conditions indicate large deposits of high grade Silver-Lead, Zinc, and Copper which cover an area of six or more miles, equal and possibly superior to any district in the southwest.

Owing to the limit of time to my disposal I am giving you the results as complete as possible:

The geology of an area of several miles has been examined by a number of eminent geologists, their reports being reliable and thorough, may be obtained by applying at the office of the Helmet Peak Copper Company. The company having spared no effort to obtain all possible data of the mineral content of the district.

The geology of the district is practically the same as many of the large copper mines of the United States, Mexico, and South America, consisting of areas of sedimentary deposits, intruded by later granatoid igneous rocks.

On the north we find the precambrian granite in

places showing through the soil. South of this the paleozoic rocks appear as in small areas of quartzite and Martin limestone, and South and West Mesozoic sediments as far as my examination extends.

The intrusive granite is the principal mineralizer in the ore deposits of Arizona.

The presence of intrusive granite associated with the sedimentary rocks form an ideal condition for large deposits of ore. Where these conditions exist with a great number of mineralized veins encountered over the surface, it is almost a certainty of immens deposits of commercial ore, only requiring capitol and intelligence in development work to locate them.

There is evidence of large deposits of commercial ore, on the contact of the granite and paleozoic rocks, by development of the Mineral Hill, Vulcan and other properties.

There has been several million dollars worth of ore shipped from the district.

The Helmet Peak Copper Company's property consists of a group of sixty two claims, approximately 1240 acres.

Mineralization.

There are two principal vein systems traversing the property, one striking north 10 degrees east, dipping to the west, and the other running north 80 degrees east dipping northwest.

That the zonal theory is correct in these veins is very evident, high grade Silver, Lead, Zinc, and copper ores are and will be encountered as depth is gained.

The veins are continuous in trend and have well defined walls and give evidence of continued depth.

Development.

The development consists of efforts to take out ore at a comparatively shallow depth, which proves without question the wide distribution of valuable ore at the surface of the property.

All the surface exploration development was accomplished by the original owners, who did the work without the aid of machinery or scientific principles of mining.

The Helmet Peak Mining & Milling Company formerly owning a portion of the property now owned by the Helmet Peak Copper Company sunk two shafts in an Andesite intrusion, both shafts are vertical, number 1 having a depth of 600 feet, number 2 a depth of four hundred feet and about 500 feet apart. A great part of the drifting has been driven in an Andesite Breccia, in contact with the Andesite intrusion, and is not a mineralizing contact, the mineralization being the result of deposits from mineralized solutions from the fissures, which is the proper place to look for them, although I believe that profitable bodies of ore will be found in the vicinity of the Billings shaft as indicated by a shoot or pipe of copper (bornite) located there, by following the pipe.

I believe that by continuing the drift of the 150 foot level the Billings ore body will develop a nice body of high grade ore, and also continue the drift from the 350 foot level, following the ore to the Prosperity vein.

There is an abundance of evidence of valuable ore bodies along the vein running through the Prosperity claim, which can be developed economically by drifting from number 1 shaft at the 350 foot level, a continuation of the present drift will necessitate approximately 140 feet to cut this vein, after this has been accomplished, drifting in both directions to open the ore body and provide stoping ground.

In the above mentioned section there is a large tonnage of good milling ore, that can be easily developed.

It is a good policy to locate ore bodies by diamond drilling, which is far more economical than sinking shafts,

by which to locate bodies of copper ore, as copper deposits lie in zones. Almost all of the big mines of today were operated on a small scale and developed in the early stages without machinery or scientific direction, extracting the high grade ore near the surface in a small way until the depth was too great, or the ore became complex, or no metalurgical process for profitable treatment at the time and other causes which delayed development for many years in some cases.

The problems of the past do not exist on this property as metalurgical difficulties have been solved, the water a valuable asset for milling being present for flotation purposes.

The geology indicates immense bodies of ore as depth is attained.

All indications in Olive camp as well as Pima mining district point to one of the largest and most profitable copper camps in Arizona, and possibly in the United States, or Mexico, with development and depth.

The Helmet Peak Copper Company are making great efforts to develop the property correctly.

Mr. James A. Hamilton who is president of the company and a mining man of many years experience and thoroughly competent to develop and operate the property with great economic results, having the advantage of knowing that there is ore in the drifts at depth in the development of the former operators, is advantageous to the present plan of development.

The plans as discussed with the officers of the company for the future development are carefully laid, conservative, and along approved engineering plans.

Respectfully submitted,

Wm. Bright. E. M.

COPY

Olive Camp
Pima Co

UNIVERSITY OF ARIZONA

Tucson

College of Mines and Engineering

Department of Geology and Mineralogy

November 21, 1931

Mr. J. A. Hamilton
Tucson, Arizona

Dear Sir:

In accordance with your request, I here present an opinion on certain phases of the geology of the Olive Camp area of the Pima Mining District, Pima County, Arizona.

It is the intention to discuss here not the detailed geology of individual properties, but rather the large geological features of the district generally, which are of fundamental importance in the matter of ore occurrence.

The discussion and opinion are based on brief personal observations made in the field, aided by a study of reports prepared by mining engineers and geologists for mining companies, by reports and maps prepared in the course of advanced degree studies by graduate students in Geology at the University of Arizona, and by the literature and government maps of the area and region.

The rocks of the immediate area comprise pre--Cambrian (?) granite, Mesozoic (Cretaceous) arkosic sedimentary beds, intrusives, granitic rocks, and volcanic rocks which are chiefly andesite. The volcanics are either late Cretaceous or early Tertiary in age. Just outside of the area, particularly to the northward, occur thick formations of Paleozoic limestone and quartzite.

The major structure of the area cannot be definitely determined by the available surface and near-surface geology. It is clear, however, that a great amount of fracturing, accompanied no doubt by at least some faulting has occurred throughout the area. It is possible that folding is the most extensive type of minor deformation within the area and the cause of fracturing and faulting. Or it may be that the

- 1 -

fractures were generated by stresses resulting from the uneven settling of a large crustal block following the transfer of a large volume of volcanic material from deep seated to superficial positions. Of perhaps vertical upthrust of intruding magmas may have caused fracturing and faulting.

Mineralization apparently has been widespread. The rocks along fractures observed, whether on the surface or underground, have been more or less extensively altered. Ore deposition, in varying degree, seems to have occurred wherever a master fracture was available to act as a channel-way for ore-bearing solutions. The ore deposits are, in the main, of the fissure filled type, localized along major fractures, at the intersection of fractures, and in brecciated zones.

It is fairly certain that intrusive granitic rocks underlie at variable depth the entire district of which the Olive Camp area forms a part. These intrusive rocks were probably the source of all primary mineralization in the district. The ore deposits that have been developed in the past in the Olive Camp area have been chiefly small high-grade silver-lead bodies, formed mainly by fissure filling, but perhaps to some extent by wall-rock replacement, in the near-surface Cretaceous sedimentary and volcanic formations. In areas to the North and South important copper and zinc ore developments have been made and from which considerable tonnages of ore have been mined in the past. These deposits are principally replacement bodies in Paleozoic limestone. It appears, therefore, that replacement bodies in limestone form the important type of ore deposits for the district.

The question of major structure, and character and thickness of formations forming that structure, thus appear to be the essential questions relative to the probability of extensive ore occurrences at depth in Olive Camp area. If the ore-bearing limestone formations of the Mineral Hill-San Xavier area to the North and of the Twin Buttes area to the South are continuous or occur under Olive Camp area, then the probability of occurrence of important commercial ore deposits at depth in the latter area is greatly increased. The problem then would become one of probable depth to the favorable horizon and the determining of dominant or master fracture zones.

Mr. J. C. Anderson, in his report on the Swastka property, page 4, sets forth certain evidence and a statement of belief that limestone does occur below the superficial formations of the area. That there is more than a possibility that these Paleozoic limestone formations do exist below the surface formations in the Olive Camp area is not an idle statement nor one made for convenience. Even brief field study of the stratigraphy and structures in this area and that immediately to the north, in the San Xavier area, justify the statement that this stratigraphic condition might exist. But more convincing still are similar indications in the results of recent detailed geologic mapping in this area to the north.

The Olive Camp area appears to be a depressed geologic structure--either down-warped (synclinal) or a down faulted area. The Paleozoic formations of the San Xavier area distinctly dip to the south (20° - 25°) apparently plunging under the Olive Camp area. The contact between Paleozoic limestone and Cretaceous arkosic beds occurs along the southern border of the San Xavier area. There is normal formational contact produced by a break or time interval in the deposition of sediments which formed the beds; or it may be a fault contact, produced by a major rupture. If this contact is an unconformity as the first case suggests, the limestones extend to the southward uninterruptedly below the Olive Camp area. In the event that it is a fault contact, the limestones with their overlying sedimentary beds and volcanic formations, in the Olive Camp area have been faulted downward.

There is some basis, of course, for expecting that additional underground development may disclose other small high-grade silver-bearing ore shoots, such as were formerly worked in the area, or perhaps larger veins and breccia bodies of ore of commercial grade and size. But it is more logical to expect that, if commercially important ore bodies are to be developed in the area, they will occur as metasomatic replacement and contact deposits in limestone.

The problem of developing possible large ore bodies in Olive Camp area thus resolves itself, in this opinion, to first ascertaining the presence or absence of underlying limestone beds. Preferably, such development should be carried on by drilling operations. And in so doing if the location of drill holes is carefully planned, it is probable that relatively near-surface vein or breccia type deposits of value may be encountered while the deeper prospecting is in progress. The depth at which the limestone, if present, may occur is highly problematical; if in a synclinal structure, it may be comparatively shallow, if block-faulted, it may lie deeper- 2,000 feet or more.

Yours very truly,

R. J. Leonard.

Note: This property adjoins the
Mineral Belt Mines, Inc.,
on the south.

Olive Camp
Pima Co.

REPORT

On the property of the

HELMET PEAK MINING AND MILLING COMPANY.

Pima Mining District,
Pima County, Arizona.

by

C. J. Barle, - Mining Geologist.

Tucson, Arizona.

August 25th. 1928.

• For eight years Professor of Geology, University of Arizona.

REPORT

On the property of the

HELMET PEAK MINING AND MILLING COMPANY.

LOCATION:

The property of the Helmet Peak Mining and Milling Company is situated in the Pima Mining District, Pima County, Arizona; near the northeasterly edge of the Sierrita Mountains, at an elevation of about 3600 feet above tide and 21 miles south and west of the City of Tucson.

The property centers about the corner to Sections 10, 11, 14, and 15, in Township 17 South, Range 13 East. Locally, this portion of the Pima District is known as "OLIVE CAMP".

An excellent highway between Tucson and the mining camp of Twin Buttes, four miles to the south, passes the property, a mile to the east of the mine, with which it is connected by a good mine road.

Sahuarita, eight miles east, a station on the Tucson-Nogales Branch of the Southern Pacific, is the shipping point.

HOLDINGS:

The property comprises 12 unpatented lode claims, six owned by the company and six held under bond and lease. Those claims owned by the company are collective known as the "Harper-Martinez Group" and are named: South Camden, South Camden Nos. 1 and 2, Refugia, Refugia Nos. 1 and 2. The claims under bond and lease comprise the "Emery Group", and include the Tit-for-Tat, Contention, Prosperity, Camden, Camden Nos. 2 and 3. These twelve claims are contiguous and have an area of nearly 340 acres, extending eastward and westward for a mile and three-quarters and with a maximum width of almost half a mile.

TOPOGRAPHY AND GENERAL GEOLOGY OF THE REGION AND SIERRITA MOUNTAINS.

The dominant relief features in the topography of this general region are north-south to northwest-southeast trending fault-block mountain ranges, with broad, intervening, alluvial-floored valleys or plains.

The Sierrita Mountains form one of the several relatively small mountains, roughly aligned, which separate the Altar-Abra Valley, on the west, from the Santa Cruz Valley, on the east. These mountains like the ranges paralleling them to the eastward and westward, were formed by crustal fracturing and uplift in the late Tertiary and early Pleistocene times.

Since then, weathering and erosion have profoundly modified their form and relief. Thus, by erosion, the original Sierrita Mountains mass has been deeply dissected and its flanks have retreated several miles from their original position. Over this area, an outwardly

sloping rock floor, a lowland, has been developed about a mere remnant of the original mountain mass. From the summit of the plat cone, or mountain pediment, thus developed by erosion, the remnant stands as an irregular, declivitous ridge seven to eight miles in length and four to five miles in width, dominated slightly by Samaniago Peak, whose summit rises to approximately 6500 feet above tide. Here and there, however, peaks of more resistant rocks, due to differential erosion, rise above the plain. For example, on the westerly side, the central mass is flanked by a narrow belt of foothills. At other points, as on the eastern side, other eminences rise from this plain, such as the Twin Buttes, Helmet Peak, San Xavier Ridge, Democrat Peak, and Mineral Hill. Peripherally, the rock plain passes beneath alluvial slopes, detritus deposited by ephemeral streams, formed by stormwaters running from the mountain slopes to the Altar-Abra and the Santa Cruz Valleys.

Far out on these alluvial slopes, the only visible indications of the nature of the rock floor beneath, or for that matter, that the Sierrita Mountains extended so far valleyward, are a few hills of rock, left by circum-erosion. But towards the mountain axis the detritus covering this beveled rock slope become a mere veneer, through which low hills and ridges, between sand-filled wash-bottoms, reveal extensively the underlying rock formations.

The profound erosion to which the Sierrita Range has been subjected has laid open to its core, revealing its innermost structure and constituent formations. Great thicknesses of rock, once covering the entire uplift, have been wholly removed from the central area and reduced to disconnected marginal remnants or scattered inliers; many of these fragments only escaping due to their position in the fault mosaic.

A reconnaissance of the range shows the rock series in order of age to be as follows:

Resting on a basement of such older Pre-Cambrian granites, gneisses, and some schists, generally much cut by aplitic and pegmatitic dikes and sometimes by grano-diorite; is a Paleozoic marine series of strata, mainly limestones, originally several thousand feet in thickness, referable in age to upper Cambrian, Devonian, Mississippian, and Permian-Pennsylvanian. Mesozoic strata, once originally many thousand feet in thickness, overlie the Paleozoic series. This series consists of an almost endless conglomerates, arkosic sandstones and shales with occasional zones of this limestones. This is mainly a fresh water continental deposit, as shown by its lithological character and fossils. Marine, Comanchean, Cretaceous fossils, found in this series in the Patagonia Mountains, some fifty miles to the southeastward, however, establish the age of the series.

Outlying the eroded surfaces of the older formations are remnants of a thick series of Tertiary andesites and rhyolites - surface flows. Of these, there appears to have been an older and younger series.

Dikes and sills of related type, found cutting the older underlying formations, particularly the Mesozoics, are probably syngenetic. Upon these, but more localized, were early Quaternary volcanics - mainly basalt though including some andesites and interbedded rhyolitic tuffs.

The core of the range is a great Tertiary granite batholith, varying in phase from a coarse, porphyritic biotite granite to a fine grained biotite granite, and to a highly

silicious coarse grained rock containing little biotite. The first phase is most typically developed in the Piedmont area along the eastern side of the central mass and in the vicinity of Twin Buttes. The second phase shows in the eastern and western slopes of the central mass. The third phase is found in the OLIVE CAMP region. Probably some of the porphyritic minor intrusives of the area are genetically connected with this granite.

FORMATION OF THE SIERRITA MOUNTAINS:

The formation of the Sierrita Mountains probably should be considered as a process, initiated early in Tertiary time, passing thru a climacteric stage in closing Tertiary and early Pleistocene time, a very long period, though short geologically considered.

The process began with a general elevation or crustal upwarping of the country, and the opening of large fissures in the rock crust, through which ascending lavas, reaching the surface, spread widely. Finally, crustal readjustments began in which faulting played the leading role and the region, so to speak, collapsed to essentially its present attitude. In this adjustment the thick Tertiary lava cap, as well as the underlying older formation, were heaved into linear and anastomosing ridges of tilted fault blocks, with parallel trending, depressed areas between, thus forming the present mountain ranges and valleys.

This mountain-forming process was by no means cataclysmic, but involved a long period of time, even for its last stage of final minor adjustment. It was not so rapid but that many antecedent streams in Southern Arizona were able to maintain their uninterrupted way, occasional down-cutting of their channels keeping pace with the growth of the mountains athwart their courses. Likewise, in the case of the Sierrita Mountains, the uplift outstripped the agencies of degradation, general erosion had made deep inroads into the mass before active uplift had ceased. Moreover, structural readjustments, within and about the range, may still be expected at intervals as time goes on.

THE SIERRITA GRANITE BATHOLITH, AND ITS GENETIC CONNECTION WITH ORK DEPOSITS:

Simultaneously with the final faulting and the uplift of the Sierrita Range, a subjacent, upward movement of acidic lavas, on a gigantic scale, took place.

This extremely hot, viscous, fluidal mineral-solution, under enormous rock pressure, hydrostatically buoyed up the fault blocks, wedging itself upward between their bases, forcing them upward and outward in all directions. Many blocks, loosened from their neighbors, are seen to have foundered in the still pasty mass beneath, and others, top-heavy, turned over on their sides, some even partially inverting. The magmatic movement may have occurred in successive stages, the intervals between permitting a certain amount of magmatic differentiation.

The batholith imparted a dome shape to the Sierrita uplift. This is obscured now, however, by its present dissected condition.

Another effect of the ascent of the magma was to dynamically metamorphose the sedimentary rocks, now exposed in the residual foothill ridges, along the western base of the central mass. Here sediments and accompanying intrusives were greatly compressed against a large upfaulted mass of Pre-Cambrian granite which abuts their western side. The rocks were folded and contorted, the limestones squeezed into segments, often showing flow-structure and marbleization. The terrigenous rocks were extensively washed and sheared, and in places converted into slates and vein schists. Closely following this, ascending mineralizing solutions, emanating from the underlying granitic magma, deposited the ores, now being prospected in this belt, in the Papago Mining District.

On the eastern side of the range, in the Pima Mining District, though the rock formations are locally contorted and folded, yet the evidences of dynamic metamorphism, such as schistosity and slaty cleavage, are practically wanting. The evidences of igneous metamorphism, on the other hand, are seen almost everywhere. The alteration was mainly effected by a suffusion of the rocks by hot solutions - perhaps gases and vapors - the volatile constituents of the granitic magma making their way upward, in part forced out by its gradual crystallization, or congelation, into granite.

Through the action of these solutions, considerable portions of the limestones have been crystallized into marble, silicified and garnetized; portions of clayey limestones have been extensively altered to garnet and epidote; sandstones converted into quartzites, epidotized and garnetized; arkosic sandstones in places leached and the contained feldspars recrystallized into sericite, until it is often difficult to distinguish them in the field from altered quartz-porphyr, or a washed and reconstructed rhyolite; shales extensively hornfelsitized, porcelanized and silicified; and large masses of the rock have been charged with finely disseminated pyrite; which in weathering has widely stained the rocks. But such alteration is by no means as universal as this list of igneous metamorphic changes might suggest, for many of the rocks superficially show little alteration - well preserved fossils even being found in some of the limestone masses.

Such widespread evidence of intrusive igneous metamorphism of the rocks of a region usually presages the presence of ore deposits.

The significance to us of the occurrence of this granite batholith is the large number of valuable deposits of ore found in the disrupted and intruded overlying older rock formations, formed by mineralizers escaping into them, or forced into them, from the fluid granite magma before and during its crystallization.

Thus where the fluid acid magma directly came into contact with steep walllike faces of the fault blocks, especially if limestone or calcareous shales, contact-metamorphic or bodies were formed, large masses of garnet and sulphide ores being formed along the contact at the expense of the latter rocks.

At the same time ore solutions working through the mineralogically more congenial portions of the rock and into the shattered zones, made extensive metasomatic replacement of ore in them, often reaching such areas by traveling some distance from the contact through fissures and along fault contacts.

In this manner the large contact ore bodies in the Paleozoic limestones at Mineral Hill and the Vulcan Mine, two miles north, and the partially developed ore bodies of the west and South Xavier, a mile to the north and east of the Helmet Peak Mining and Milling Company's property, were formed, likewise, the ores in limestones of the Glance, Queen, North Star, and Senator Morgan Mines at Twin Buttes, four miles to the south.

The large and valuable ore deposits of the San Xavier Mines, a mile north of the Company's property, in gray Pennsylvanian limestone, was formed by solutions ascending from the subjacent magma, following the fault plane between this limestone and upedged Mesozoic sandstones, shales and intruded sills of volcanic rock.

Again, where the solutions ascended through fissures in less soluble roof rocks, the walls confined the solutions and valuable veins and shoots of ore were formed. Many veins of this type have been worked in the OLIVE Camp. Examples of such veins are the Olivette Vein, the Annette, Wedge, Richmond, Emma E. and Schmacher, located just north of the Company's holdings; the Tit-for-Tat, Contention and Prosperity veins on their ground; the Frais veins and Alpha vein to the south; and the Paymaster veins to the southwest. Other veins, cropping, have not yet been worked, and many not showing at the surface, doubtless will be encountered in cross-cutting, as the district is more systematically developed.

* A fourth and very important type of ore deposit is found in the district. At present it is represented by a single known occurrence, the with future exploration and development in depth of OLIVE CAMP it is confidently expected to become the source of a large scale production of base ores. ***

** There are bodies of disseminated ores occurring in crushed and brecciated zones in the less permeable and replaceable rocks. Of this type, is the ore body now being developed by the Helmet Peak Mining and Milling Company on their property. Here, the mineralizing solutions, ascending from the granite magma, have formed a large ore body in brecciated andesite. *****

**** The contact-metamorphic ores of the district are essentially copper-iron sulphides, with depth; though a zonal arrangement of ore minerals is found to take place upward, where erosion has not destroyed the upper portions of deposits. In this sequence the relatively pure copper-iron ores give place upward to a mixture of copper and zinc, then zinc-copper-lead and zinc-lead-silver, and lastly, to lead-silver. In this case the low temperature minerals have ascended to the higher or peripheral zone. *****

As a result of the magmas of Southern Arizona in general being relatively copper-iron rich, and as these minerals come down at a relative

vely high temperature, and precipitation and enrichment are heaviest near the source of the mineralizing solutions, it is the rule that these ore bodies increase in size downward. The lead-silver end of the series usually carries the higher values, but the copper ores, though lower in grade, generally made up for this many times over in quantity.

The fissure veins of the OLIVE CAMP, essentially lead-silver and tetrahedrite-silver-lead ores, which were worked between 1888 and 1893, should be regarded as upper, attenuated ends of ore bodies, grading downward through zinc-copper ores to copper-iron ores of much greater volume. Discontinuance of operations on these veins was due mainly to encountering the mid-zone of copper-zinc ores, which because of their complexity, and no practical way of treatment at that time, could not be economically handled. The abandonment of the camp, however, was due to the falling prices of lead and silver. *****

GEOLOGY OF OLIVE CAMP AND COMPANY'S PROPERTY:

OLIVE CAMP lies in the northeastern part of the pedimentary area, or flanking, erosional lowland of the Sierrita Mountains. Low, flat divides, rising here and there into rounded rocky hills, separated by shallow, eastwardly draining washes and arroyos. Patches of alluvium occur, but in general the rock formations are fairly well exposed.

On the north and northeast the area is bounded by faults, along which rise eroded blocks of Paleozoic strata, whose visible portions are composed of great thicknesses of Pennsylvanian (Carboniferous) and Permian-Pennsylvanian gray limestones. Helmet Peak on the northeast, one of these fault-blocks, rises several hundred feet above the general plain, while crossing the area on the north, in east-west line, are San Xavier Ridge on the east, and Marble Mountain on the west.

The formations flooring OLIVE CAMP consist of Mesozoic sedimentary rock, early Tertiary andesite and late Tertiary granite, (See Geological Map of Olive Camp).

The Mesozoic strata form a belt nearly a mile wide, which underlies the northern end and the eastern side of the Camp. Southward the outcrop broadens, its westerly edge swinging southwestward.

The strata stand nearly vertical and aggregate many hundreds of feet in thickness. Their strike and dip is variable. In the northern part of the belt the strike ranges from 40 deg. to 65 deg. east of north; southwestward it departs widely from this in places. Considerable portions of the rock are so shattered, weathered and metamorphosed that their original structural planes are recognized with difficulty and frequently the formation has been mistaken for an igneous rock.

The rock varies from heavy-bedded arkosic conglomerate and gritty arkosic sandstone, often quartzitized and sericitized; to usually thin-bedded, fine-grained, gray sandstone or quartzite, interbedded with purple shale. There are also some thin beds, of gray to brown, impure gritty limestone.

Occasionally sills of felsite or porphyry and sometimes of more basic rock occur in plane with the stratification.

The andesite in OLIVE CAMP fills a broad bay-like re-entrant in the western edge of the Mesozoic belt. Its northern edge, curving to the southeast, crosses the property of the Helmet Peak Mining and Milling Co. about three hundred feet northeast of the mine. The western half of the Company's holdings, therefore, lies on the Tertiary andesite and the eastern, on the Mesozoic sedimentary rocks. The andesite as a whole is massive, though portions, distinguished by containing andesite fragments congealed in the andesite, therefore an andesite breccia, may be stratiform.

Whether the contact of the andesite with the Mesozoic sediments is intrusive, or brought about by faulting, has not been fully determined. Andesites do occur, however, intrusive into the Mesozoics.

In some cases though these occurrences, especially where the rock is coarsely porphyritic, are judged to be of a later period than that of the formation of the major mass of andesites. In places the contact between andesite and sedimentary rock is marked by a zone of brecciation and superficially, at least, by leaching.

The granite forms a sinuous southwestward trending contact along the western edge of both the Mesozoic rock and the andesite of the area. Thence it spreads widely as the floor of the pediment.

The granite, in its typical development, is a gray, medium grained, biotite granite, containing large feldspar phenocrysts.

Near contact with the older formations it is often very silicious, the mica appearing much reduced in amount. In some cases observed by actual intrusion of the granite into the older rocks the difference appears to be merely textural, the grains a little finer and the large feldspar phenocrysts absent.

Half a mile northeast of the Helmet Peak Mine, a small area of outcropping granite occurs in the midst of the upthrust Mesozoic strata. It represents a tongue of the molten magma which penetrated these rocks some hundreds of feet, before slowly crystallizing and cooling. Other examples of intrusion of the granite magma into the Mesozoic strata may be seen in the sides of a deep arroyo, just south of the United States Mineral Monument No. 2, situated on Democrat Hill, a mile north of the Company's property. A short distance west of the property in an occurrence of the granite, which erosion has exposed in the heart of the Sierrita Mountains, shows the whole Pima Mining District as underlain at depth by this granite, and that the fault-blocks, formed by the breaking up of the old Paleozoic and Mesozoic sediments and Tertiary volcanic country rock, rest upon or are imbedded in its surface. (See Stereogram of OLIVE CAMP).

ORE DEPOSITS OF OLIVE CAMP:

It has been stated that the ore bodies of the Pima Mining District were formed by mineralizing solutions escaping from the molten, crystallizing granite magma, into older rock rocks, during a late

stage in the uplift of the Sierrita Mountains.

The copiousness of these solutions and their richness in metallic elements is attested by the large bodies of copper-iron and copper-iron-zinc sulphides mixed with granite, found in limestone, where the magma contacted the Paleozoic sedimentary rocks, as in the Mineral Hill-San Xavier and TwinButtes Camps. Also, by the large body of ore, as in the San Xavier Mine, formed by metasomatic replacement of limestone, caused by solutions migrating to a distance from the granitic magma to more soluble portions of the lime.

Although no occurrences of either of these types of ore deposits have yet been found in OLIVE CAMP, its intermediate position and closeness to these camps and the evidences of widespread mineralization shown by the many argentiferous-galena and argentiferous-tetrahedrite veins, which have been worked in this camp, together with the subjacent occurrence of the common mineralizer, the granite, implies a high degree of probability that large ore bodies will be discovered in the OLIVE CAMP zone deep and systematic mining is undertaken there.

Mention has been made of a more or less definite arrangement of the ore minerals, recurrently met in the ore deposits of Southern Arizona. This circumstance is often voiced in the expression - "She'll go to copper with depth". In this sequence, somewhat overlapping, relatively pure copper-iron minerals at depth give place upward to copper-iron-zinc, copper-zinc-lead, zinc-lead silver to lead-silver ores.

At the same time the ore bodies usually increase in size with depth. This is partially due to the magmas of the region being relatively rich in the base metals, and also high temperature minerals which precipitate comparatively near the source of mineralization and at greater depth, while the lead-silver ores, relatively low temperature minerals and in lesser amount, are precipitated as the much reduced upward continuation of the ore body.

Work on the many veins of OLIVE CAMP was discontinued after the high grade silver ores were mined out and the complex base ores had begun to appear with depth - between 200 and 300 feet. On many of these veins work was carried far enough, however, to indicate that the zonal arrangement of ores, or metals, holds here and that at some greater depth, had mining been continued, the pure copper-iron sulphides would have been encountered, and presumably in volume which would more than have made up for their lower tenor, had the methods of milling of these ores been as well understood at that time as it is today.

In other words, these veins may well be investigated today as it will almost certainly prove that some, if not all, of them are but the upper attenuated ends of the larger bodies of base ores.

The veins of OLIVE CAMP vary in trend between northeast and east. Some cross veins, like the Olivette, occur. They occur in fractures and fault planes, in both the Tertiary andesite and the Mesozoic argillaceous arenaceous sediments; in the latter of ore in the plane with the bedding.

The major part of the worked veins of OLIVE CAMP have been listed on page 6 of this report. Some lie north of the Helmet Peak Co. prop-

erty, some south. The property lies at about the center of the vein area. The Tit-for-Tat-Contention vein and the Prosperity vein are on the Company's property.

The Tit-for-Tat-Contention vein lies west of the Helmet Peak Mine. It is in the andesite and stands verticle and trends N. 85° E., and was developed for about five hundred feet and to a depth of perhaps two hundred feet. The Prosperity workings lie three hundred to four hundred north of the mine, in a mesozoic quartzite conglomerate. It apparently lies in the plane of stratification, striking N. 70° E., approximately, and dipping north at a 50° angle, which flattens considerably with depth. The vein was worked from three inclined shafts, to a depth on the incline, of 310 feet. Some good shipping ore is said to have been left in the bottom of these workings. *****

I have been unable to ascertain what the production of either of these veins was. The dumps are large and the production probably compared favorably with that of similar veins of the camp, having dumps indicating about the same amount of development.

The Annette vein, about 1200 feet northeast of the Prosperity vein, strikes N. 80° E., dipping 55° E., is in Mesozoic strata and is said to have been produced and operated to the extent of \$65,000.00 in ore. The Olivette, adjoining, but with a strike of S. 20° E., and dip of 70° W., is reported to have yielded \$750,000.00 in shipped ore.

These mines were worked between the years 1888 and 1893. Since that time, none of them have been operated, except the Richmond, which is now being developed by the Swastika Copper and Silver Mining Company.

Estimates by oldtimers, of the total production of these partially worked veins of OLIVE CAMP, approximate, in round figures, \$3,000,000.00.

***Unworked veins occur, and probably many which are blind will be encountered when systematic exploration and development of the camp is undertaken. Several showings on the Company's holdings deserve careful investigation. The camp was abandoned only when the price of silver and lead fell. But, as stated, valuable as these ores are, and well worth developing, the major future values of this camp, in my opinion, are likely to lie in the development possibilities of the high bodies of base ores with depth. There is no reason to suppose that, with all these surface showings, mineralization within this area was not so intensive as that indicated by the large contact-metamorphic and metasomatic replacement ores of the district, given the right conditions for the entrance and catchment of the mineralizers.

In lieu of the easily replaceable limestone and considering the relatively inhospitable nature of the andesite and Mesozoic sediments to replacement, some other favorable offsetting condition must be afforded. These requirements seem to have been met by the occurrence of zones of close fracturing and brecciation in these rocks, permitting a diffusion of the mineralizing solutions and the formation of disseminated ores in breccia. One such example, apparently, has been discovered in the large ore body now being developed by the Helmet Peak Co.

In many cases conditions recognizable by the geologist, followed by systematic drilling, will almost certainly develop other similar ore bodies in the Company's property.

When mining has been carried, say, to the 400 foot level in the mine, it might be advisable to drift beneath the old Prosperity workings, cutting possible ores along the contact in the brecciated zone, between the andesite and the Mesozoic sedimentaries, and opening up the base ores of the Prosperity vein at depth.

Knowledge gained in the continued development of the Helmet Peak ore body may be expected to furnish information of service in looking for similar ore bodies elsewhere on the property.

The curving contact between the andesite and Mesozoic clastics is regarded as potential ore ground. A tunnel which has been started in the base of the "Red Hill", near the western end of the South Camden No. 2 claim, E. 50° S. from Helmet Peak Shaft, in a leached and brecciated zone in this contact, offers possibilities warranting continuing of work.

Should expectations be realized, and ore found with depth here, it will probably lead to development of this contact back around toward the mine.

There are other good surface indications of metalization on this large property, which should be given more study. I prophesy that eventually a careful geological study and mapping of the structure of these twelve claims will be made, and a careful exploration with the drill will be carried out; for conditions indicate that the chances for valuable ore bodies with depth are exceedingly good in OLIVE CAMP and on the property in an area which past developments have proved highly mineralized.

ORE RESERVES :

From the present workings Mr. Harper, Supt, estimates that there can be produced 105,000 tons of milling ore, with a gross value of \$8.00 per ton. I have carefully gone over these estimates with him, both underground and on the map of workings, and have taken check assays.

The accompanying tabulation gives these assays, footage and values, and the numbers of the Geological Sketch Map show their positions.

If the areas out in taking assays Nos. 1 to 9 and 12 to 14, inclusive, and No. 20, representing the 50, 70 and 150 foot levels, are considered, it is believed safe to regard these as roughly defining a curved zone of milling ore, 325 feet long, approximately 40 feet wide and 100 feet deep, lying between the 50 and 100 levels. Based upon the average value per foot of openings available, this block containing 100,000 tons would have a gross value of \$10.00 per ton. As stated, the samples are averaged according to the width of the ore they represent, and constitute as accurate an average of this zone as the present development permits. Mr. Harper's estimate is therefore regarded as very conservative.

There are zones of much higher grade ore than this average: for example, assay No. 8, out across 14.5 feet, runs \$14.88; No. 9, across 11.7 feet, \$18.61; and No. 13, across 4.5 feet, \$18.87.

Many other assays have been taken, especially in the main cross

cut from the foot of the 150 foot shaft. These all show a general mineralization of this large brecciated zone, though not of a grade high enough for milling.

The present development, considering the size of the ore body, cannot be considered as more than indicating a part of the milling ore which will be found between the 50 and 150 foot levels.

DEVELOPMENT ADVISED:

The present drift in ore along the footwall, on the 150 foot level should be carried on in exploration of the ore in this direction.

From this drift a cross-cut should be driven to a point beneath the Billings (the 52foot) shaft and a raise made, connecting through it with the surface.

The main shaft should be sunk as rapidly as possible to water level, probably another 100 feet. The footwall, allowing for dip, should here be perhaps 10 or 12 feet from the bottom of the shaft. Cutting to the footwall, drifts should be run both ways. A cross-cut also should be driven from the shaft to the hanging wall, and other cross-cuts made on either side of it at 50 foot intervals, from the footwall across the ore body. Then, as soon as development permits, a raise should be driven from this level to the 150 foot level to connect with the Billings shaft.

The Billings shaft thus deepened will then insure good ventilation and drainage of the mine, and also can be used in raising waste, thereby relieving congestion at the main shaft, while handling etc.

This program carried out, besides greatly increasing ore output, should raise the grade of ore, facilitate selective mining and milling of the ore, and at the same time furnish ample water for milling.

The exploration work being done in the brecciated and leached zone at the contact between Mesozoic and andesites at the foot of the "Red Hill", on the westerly end of the South Camden No. 2 claim, should be continued, a shaft sunk and a cross-cut run.

For the development of the several other ore possibilities observed on this property, plans later can be evolved.

Sufficient capital should be assured, before this program of immediate development is started, to insure its economical execution.

All development work should be pushed as fast as possible to place the mine on a large producing basis, in the shortest possible time.

This will require experienced, competent mine operators, eager for results.

Much credit is due the present Supt., Mr. Harper, for the able manner in which he has succeeded, under great economic difficulties, in operating and opening up and showing the merits of the property.

Detailed geological maps should be made of the surface and of the present workings, and the map kept up to date as a guide to the most economical development of the property.

The development work should be followed closely by accurate

and systematic assaying. All of the data thus secured should be placed on an assay map for the future reference, to further insure the economical mining of the ores as developed and as an aid in the opening up of the better sections of the new ground.

Accurate metallurgical tests should be run on average representative lots of the ore, by a reliable metallurgical engineer, to determine the best methods of treatment, before selecting equipment for the mill.

PRESENT EQUIPMENT:

The present mining equipment consists of a 50 H.P. Commercial engine; an 8" x 10" Rand Duplex Compressor; A 6 H.P. Fairbanks-Morse Hoisting Engine; a stoper; two jackhammers; two mounted rock drills; (all of Ingersoll-Rand make), and a Denver Rock Drill. The 150 foot, compartment and a half, main shaft is well timbered. A No. 3 Worthing Blake Knowles type pump is installed in this shaft at the 150 foot level, and it is equipped with air and water pipe lines. There are about 500 feet of laid track, one mine car, two mine trucks and three mine buckets.

The hoists and compressor are housed in a 23 x 31 foot building. There is also a 1500 gallon water tank. A Ford, one ton truck, owned by the Company, is used for hauling equipment and supplies from Tucson.

ADDITIONAL EQUIPMENT REQUIRED:

A larger hoist will be required in deepening the main shaft to waterlevel and to handle the ore and waste when development starts on the deeper level. The 6 H.P. hoist now in use should be installed at the Billings Shaft. Then as soon as a raise has been driven connecting with this shaft it can be used in raising waste from the 150 foot level.

As soon as drifting and cross-cutting on the new level has been started, a 50 ton pilot mill should be erected. Milling of the ore mined in this development should cover a considerable part of the expense of operation, and increasingly so as to work of extension and the opening of new faces.

The ore reserve of 105,000 tons, estimated from present development, will supply a mill of 50 tons capacity, without allowing for lost time, over five years. So soon as sufficient water has been assured, the capacity of the mill can be increased by adding a second 50 ton unit.

WATER AND TIMBER :

From evidence derived from mining on adjoining properties, water adequate for milling may be expected from development of the mine at a depth not to exceed 300 feet.

Timber and fuel will have to be hauled either from Sahuarita Station, 8 miles, or from Tucson, 21 miles.

CONCLUSIONS:

The present development work shows a property of great promise, justifying liberal financing for the purpose of further development.

While the present workings have shown the ore exposed to be a portion, merely the apex, of a large ore body widening downward, the work cannot be considered as in any direction reaching the limits of the ore zone or as showing how large the area underlain by ore may be.

Ample cheap labor, low haulage and shipping costs, and ore bodies permitting of cheap stoping methods in mining and other conditions as favorable as in other camps in the country, all make for reasonable mining and milling costs.

Average market prices of metal and the comparatively recent improvements made in the milling of such complex ores, a good profit is assured from the large tonnage of the present and better grades of ore, which development may be confidently expected to open up at depth.

The large number and wide distribution of strong veins which have been mined superficially for their rich lead-silver ores in OLIVE CAMP, proves it beyond question to be in an exceptionally richly mineralized area. That these veins in the majority of cases lead down to much larger bodies of commercial base ore has been explained. The large bodies of contact-metamorphic and metasomatic replacement ores of copper and copper-zinc sulphides, mined in contiguous camps, point, with a high degree of probability, to other ore bodies of these metals, of the same order of magnitude, existing at depth in OLIVE CAMP. The central position of the Helmet Peak Mining and Milling Company's property, in this area, the excellent showing development of their ore body has already made, and other strong surface indications, found on their large holdings, warrant confidence that their mining operations will meet with gratifying economic results.

Signed C. J. Sarle.

Mining Geologist.

Tucson, Arizona.

August 25th. 1926.

This report was loaned with the approval of Mr. Sarle
and the Helmet Peak Mining and Milling Co.
November 1930.

TABULATION OF ASSAYS,

Showing

Width Cut.

These assays made by G. J. Sarle to accompany his report on the property of the Helmet Peak Mining and Milling Company, which report was dated August 25, 1926.

NOTE:

The position of these assays is shown on the accompanying geologic sketch map, of the Helmet Peak Mining and Milling Company.

Number of Assay	% Cu.	% Pb.	% Zn.	Oz. Au.	Oz. Ag.	Width Cut	Gross Value.
1	1.05	0.2	1.0	Trace	0.5	6.0 ft.	\$5.09
2	0.20	1.1	1.4	"	0.5	21.0 "	4.89
3	0.46	1.0	1.6	"	0.6	9.0 "	5.79
4	0.40	1.0	3.2	0.01	1.6	9.0 "	8.80
5	0.66	1.4	2.5	0.02	3.4	5.3 "	10.55
6	0.65	1.4	4.0	0.01	1.8	6.0 "	11.52
7	0.41	1.2	2.3	0.01	1.1	5.7 "	7.55
8	4.05	0.3	1.0	0.01	2.1	14.5 "	14.88
9	1.62	2.0	3.9	0.02	3.8	11.7 "	16.61
10	0.05	tr.	0.7	0.01	0.1	14.2 "	1.43
11	0.61	0.4	1.5	0.01	1.2	4.7 "	5.58
12	2.11	0.2	0.5	tr.	0.8	5.0 "	7.52
13	4.92	0.3	1.8	0.01	2.7	4.5 "	18.87
14	2.75	0.2	1.8	0.01	2.0	12.0 "	12.17
15	0.59	0.2	0.9	0.01	1.1	12.0 "	4.22
16	0.25	0.5	2.0	0.01	1.2	12.0 "	5.48
17	0.15	0.1	2.5	tr.	0.5	12.0 "	4.59
18	0.05	0.1	0.5	0.01	0.2	13.0 "	1.39
19	0.11	0.3	1.8	tr.	0.4	18.5 "	3.74
20	0.32	0.9	4.0	0.01	0.8	26.0 "	9.08

Assays by E. A. Jacobs, Registered Assayer, Tucson, Arizona.

(Prices based on market quotations for Aug. 25th, 1926, E.&M.J.P., Cu. 14.025, Pb. 8.90, Zn. 7.35, Ag. 62 5/8).

39. JT PENNINGTON ST.
TUCSON, ARIZONA
TELEPHONE 2065

COPY

W. M. Snow B. Sc. E. M.
Chandler, Arizona

Olive Camp
Pima Co.

April 28th, 1930

Mr. H. S. Brown,
Lakeview, Iowa.

Dear Sir:

In accordance with your request, I herewith submit report on the properties of the Helmet Peak Copper Company, located in Olive Camp, Pima County, Arizona.

Introduction

A thorough study of the property has been made to determine the geologic and economic merit of the property and to outline a campaign of development.

The geology of the area has been most thoroughly studied by the best geologists obtainable and elaborate detailed reports are available on this very important phase of the subject. No effort has been spared by the Helmet Peak Copper Company to compile the most detailed data possible greatly facilitating my work which comprised a careful checking of the data which is found to be surprisingly accurate.

It is therefore only necessary that I deal to a great extent in generalities, authoritative details being available for those who wish to study them.

Location

The property, composed of 60 mining claims, is located 20 miles southwest of Tucson in the Olive mining camp which is a part of the Pima Mining District, Pima County, Arizona. It is four miles from Twin Buttes, the nearest railroad point. The main Tucson-Twin Buttes hi-way traversing the property is well adapted to cheap truck or tractor haulage.

The San-Xavier-Mineral Hill district joins it on the north and west.

- 1 -

ARIZONA DEPT. OF MINES & MINERAL RESOURCES
STATE OFFICE BUILDING
416 W. CONGRESS, ROOM 161
TUCSON, ARIZONA 85701

History

Mining in the Pima District began in the sixties and reached its maximum stage of activity from the early eighties to 1893, when the demonitization of silver caused the discontinuation of work on many of the veins which were reaching the water level and increasingly complex zinc-lead-copper-silver ores for which no suitable metalurgical process was then available.

It is estimated that the total production of the district is approximately \$10,000,000.00 which may be considered from superficial development. This compares very favorably with what may be considered the preliminary development of many of the larger mining camps of the United States.

Geology

The geology of the district is the same as many of the important mining districts of Arizona; consisting of a series of sediments, distorted, intruded and mineralized by late granatoid igneous rocks.

As we approach the area from Tucson the first formation encountered, scarcely showing through the alluvial, is the Pre-Cambrian granite. The Paleozoic sediments next appear represented by comparatively small areas of Bolsa Quartzite, Abrigo and Martin limestone followed by an area of Mesozoic sediments. Further to the southwest these sediments are covered by volcanics, principally andesite. This entire area is invaded by intrusive granite in the form of dikes and sills. Further to the south this granite assumes batholithic proportions and form the main range of the Sierrita Mountains.

The intrusive granite is conceded to be the mineralizer in the principal ore bodies of Arizona. The presence of this, associated with a depository of sedimentary rocks constitute the ideal geological conditions for the formation of large commercial deposits and when these formations are encountered with abundant surface expression of mineralized veins, it is almost a certainty that such deposits exist it only requiring sufficient development work to locate them.

The problem then resolves itself into a matter of a detailed geological study resulting in the most accurate deductions possible with the evidence at hand, assisted by properly directed and recorded development work.

Geology (Continued)

That large deposits of commercial ore are formed on the contact between the intrusive granite and Paleozoic limestones have been proven by the development accomplished at the Mineral Hill, San Xavier, Vulcan and San Xavier Extension properties to the north and west and in Twin Buttes to the southeast.

The Helmet Peak Copper Company property is covered by Mesozoic sediments immediately adjoining the Paleozoic formations to the south and east. The depth to which the Paleozoic formations are covered is problematical and depends on the amount of unconformity, fault displacement, and the original topography upon which the Mesozoic formations were deposited.

It has been the writers experience to observe the Paleozoic formation extending upwards in small areas thro the Mesozoic or overlying formation, appearing as tho it might be the top of a peak of the older formation which was later covered. When one observes the abruptness of the sides of Helmet Peak immediately adjoining the property it is easy to conceive of such a possibility.

Near Tombstone, Arizona an occurrence of this nature was noted. A very small area of Paleozoics was uncovered by erosion and a very valuable mine developed therein. No place throughout the extensive workings could evidence of faulting on a sufficiently large saale be observed to account for the thousands of feet of stratigraphic displacements indicated by the place in the geological column of the two formations.

The above facts are mentioned to bring out the thought that original topography may have played an important part in the present geological relationship as well as expressive faulting which, in this opinion is not sufficiently marked by physical evidence of thousands of feet of movement.

The Mesozoic sediments consists of a series of Arkosic sandstones and shales with occassional zones of thin bedded limestones. Areas of very hard dense silifious sandstones or ~~siliceous~~ quartzites appear. These are frequently difficult to distinguish in the field from the more acid phases of intrusives and are frequently confused with them. In places these masses contain finely disseminated pyrites which when weathered, produce red or black hills.

Although no theoretical reason can be given for this, these red and black hills in the Mesozoics have throughout the area been frequently observed to be closely associated with the Paleozoic limestones. If this is true in this area they will be encountered at no great distance below the surface.

Geology (Continued)

Intrusive granite also occurs near one of these showings on the Wellington claim and a convergence and flattening of veins at this point indicate a possible centering of mineralization together with the stratigraphic elevation of formations. The hill at this point is covered with iron and manganese stain. Believe a series of diamond drill holes in this area would give favorable results.

Vein System & Mineralization.

There are two principal vein systems traversing the property one striking north ten degrees east and dipping to the west at an angle of about seventy degrees, and one striking north, wighty-three degrees east and dipping to the north. These veins start down at an angle of about sixty degrees and flatten to forty-five degrees as depth is gained.

That the zonal theory os deposition holds good in these veins is without question. Near the surface high grade silver ores are encountered which pass into lead-zinc and finally copper ores as depth is gained. These zones somewhat overlap forming complex ore that until recently were difficult to separate.

The veins are continuous in strike, have well formed walls and give evidence of continuation in depth.

Development.

The development consists almost entirely of an effort to pick up ore bodies at comparatively shallow depth and has resulted in proving the fertility of the area at the surface.

The most extensive workings are those of the Helmet Peak Mining Company where two perpendicular shafts have been sunk 480 feet apart, one to a deoth of 400 feet and the other to a depth of 600 feet. They are in the andesite and much of the drifting accomplished is in an andesite breccia which is possibly closely related to the contact between thismformation and the Mesazoic sediments. This contact cannot be regarded as a conductor of mineralized solutions, but rather a depository for mineralization carried by the principal fissures therefore it would seem more appropriate to look for deposits of ore at points in line with the fertile vein.

Although due to obscure surface expressions, direct evidence of such an occurrance could not be obtained, believe that one such area is located near the Billings shaft. A brecciated ore body containing some high-grade copper zinc ore is in evidence at this place. A drift has been run on the 150 foot level and has encountered this same zone with good ore showing. No drifting or cross cutting has been accomplished at this place.

Conclusions.

Each worth while mining camp passes through which might be termed three stages of development. First: the prospect stage carried on for high grade streaks generally by the original locators. Second: development on a slightly broader scale by inexperienced companies organized for that purpose who are successful as long as the grade of ore remains high and no real mining or metallurgical difficulties are encountered. Third: the profitable era develops when those experienced in the profession make the best use of geological and operating talent backed with sufficient funds to carry out a carefully planned campaign of development.

The first and second stages have been accomplished in Olive Camp. The water encountered by past operators, which is comparatively small in quantity can now be made a material asset for metallurgical purposes with the present electrical equipped pumping machinery. The metallurgical question has been solved beyond the possibility of a doubt by selective flotation.

The geology is right, the mineralization points to probably large bodies of commercial ore with depth (copper) and the Helmet Peak Copper Company by the thorough manner in which they are undertaking the enterprise, have convinced me of their sincerity and ability to carry out an extensive campaign of development to thoroughly prove Olive Camp with the possibility greatly in favor of a very profitable enterprise.

Recommendations.

Although it may be possible to develop and extract some profitable ore bodies in the upper zones of mineralization the greater possibilities are in the development of the property with depth.

As a preliminary means of obtaining information in reference to ore occurrences and general geology recommend that diamond drilling be resorted to in the vicinity of the black hill on the Wellington claim previously described.

When this is accomplished and the data correlated the correct conclusions can be reached as to the kind of shaft to be sunk for the purpose of extracting the ore. First class equipment is now available to accomplish this work.

A little work should be accomplished in the Helmet Peak workings. The drift on the 150 foot level could be easily cleaned out and sufficient work accomplished to determine the extent of the Billings ore chute.

Reccomendations (Continued)

When the rake of this chute is determined it may be possible to locate it on the lower levels and thereby develop a profitable body of ore.

The north crosscut on the 350 foot level should be extended to cut the vein system represented by the Prosperity workings.

Diamond drilling from the lower working of the Helmet Peak development would give an advantage of several hundred feet from surface and give additional knowledge of the relationship of formations.

Very truly yours,

W.M. Snow
Mining Engineer.

Libby 10-25/27

Olive Camp
Pima Co.

Helmet Peak Mining & Milling Co.
Tucson, Arizona.

Gentlemen,-

Since your mine was sampled and reported upon, as of September 1st, 1927, a considerable amount of extended development work has been done upon the 250 Ft. Level.

Approximately 500 feet of additional drifting and cross-cutting has been done in the Westerly section of that level and an extensive area of mineralized ground has been encountered therein; which materially increases the available tonnage of commercial ore in the mine.

General conditions, in evidence, are favorable for the continuance of the metal values through the further extension of the lateral and vertical dimensions.

Assured Ore

The mineralized area in the Westerly section of the 250 Ft. Level, as outlined by present development, and which can be classified as Commercial Ore, has a vein area of approximately 5,250 square feet.

The ore-bearing rocks, lying in a sheeted or bedded form, have been exposed, by the work, to a thickness of 60 feet; supplying the factor of known vertical extent.

The resultant content of the block, indicated by these factors is seen to be approximately 26,000 tons.

The mineralization, of commercial value, occurs in the form of Sulphides of Copper, Lead and Zinc, with additional values in Silver, and Gold.

The character of the ore bearing material and the mineralization is similar to the ore area in the Northerly section of this level.

Samples were cut from the ore exposures within the Westerly block and assayed with the following results,-

Average of samples No. 25 to 31 Incl., Length of cut-10 ft., Interval between cuts- 4 feet, from Westerly end of block,-
Gold .15 oz. Silver 2.10 oz. Copper .5%, Lead 1.69%, Zinc 3.83%.

At the present price of metals, the Gross Value would be \$9.55 per ton.

Average of samples No. 32 to 37 Incl. Length of cut 8 to 12 ft. Interval between cuts - 4 ft. from Northerly end of block,-
Gold .15 oz. Silver 1.12 oz. Copper .05%, Lead .2%, Zinc 3.05%

At the present price of metals the Gross Value would be \$5.01 per ton.

The average value of the block outlined would be \$7.45 per ton Gross.

From the estimated tonnage of 26,000 a Gross Value of the Block is calculated at approximately \$ 194,700.

To summarize the amount of available ore in the mine, assured at this time, we have in,-

The 250' Level North - 35,000 tons @ \$8.53 gross	\$298,550
The 250' Level West - 26,000 tons @ \$7.45 gross	194,700
The Billings Shaft - 3,500 tons @ \$8.13 gross	28,450
And a Gross Total of	<hr/> 521,700

The above estimates are based on the present low market price of metals.

As previously stated,- by inspection, the ores should yield readily to treatment and adequate laboratory tests would indicate the amount of margin of profit to be expected from mining and milling of the ore.

Possible Ore

In the new area opened up by the later development work, the proportion of the commercial ore bears a ratio of 30% to the whole area.

Assuming that the ore zone extends to the surface, a supposition amply justified by visible conditions, then it is assumed that the commercial ore ratio will maintain throughout the ore zone extended.

With these factors as a basis, the calculated amount of commercial ore to be anticipated within the extension of the Westerly block will be approximately 97,000 tons.

To summarize the Possible Commercial Ore in the mine, to date, from the 250' Level to the surface, we have in,-

The 250' Level North - 110,000 tons	\$ 938,300
● \$8.53 gross	
The 250' Level West - 97,000 tons	722,650
● \$7.45 gross	
The Billings Shaft - 3,500 tons	25,450
● \$8.13 gross	
And a Gross Total of	<u>1,786,400</u>

In round numbers the anticipated gross value of commercial ore in the mine from the 250' Level to the surface, as outlined by present development, may be set at between \$ 1,750,000 and \$ 2,000,000.

Extended development at greater depth will naturally increase the actual amount of available ore and will also greatly augment the theoretical amount of possible ore to be anticipated.

In General

The most Westerly section being developed at the time of the sampling, showed a strong tendency for the minerals to segregate into bands, or veins, and the samples taken from the ore exposures showed an unusual degree of enrichment in spots.

It will not be surprising to find the ore occurring in veins and deposits of workable size and of a value sufficient to permit of direct shipment to the smelter.

It is a noticeable fact that considerable leaching action has taken place along the shear planes and jointings of the rock and this action has undoubtedly impoverished the ore deposits on this horizon, to a considerable extent.

Development at greater depth will, no doubt, show that the ore zone will be more uniformly mineralized and that the ore deposits will be more dependable in form and degree of mineralization.

The various areas opened up by the development work done upon the 250' Level of the mine, indicate very plainly that the ore deposits occur within a well defined mineralized zone, having a linear extent of over five hundred feet and which will extend downward to a depth well worthy of consideration.

Conclusion

The results obtained from this later work have surely justified the expenditure and also assure the ultimate success of more extended development at greater depth and lateral extension from all levels.

Respectfully Submitted
(Sgd) J M Libby

Tucson, Arizona
October 25th. 1927

Registered Professional Engineer

No. 235

30 So. Main St.
P. O. Box 1889

JACOBS ASSAY OFFICE

Phone 2-0813

DUPLICATE

Certificate No. 52062

REGISTERED ASSAYERS

"Dan Harper" Claim

Tucson, Arizona Dec 17, 1955

Sample Submitted by Mr. J. L. Splane

SAMPLES FROM CHURN DRILL HOLE

SERIAL	SAMPLE MARKED	GOLD Ozs. per ton ore	GOLD Value per ton ore *	SILVER Ozs. per ton ore	COPPER Per cent Wet Assay	LEAD Per cent Wet Assay	Per cent Wet Assay
145981	20-25	0.005	\$ 0.17	0 3/10	0.03		
82	45-50	Trace		0 2/10	Trace		
83	70-75	Trace		0 2/10	Trace		
84	95-100	0.01	0.35	0 3/10	0.03		
85	120-125	0.005	0.17	0 2/10	0.02		
86	145-150	0.005	0.17	0 3/10	0.02		
							(2)

* Gold Figured \$35.00 per oz. Troy

Charges \$ 16.50

Very respectfully,

Ben P. Jacobs