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08/21/86

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES FILE DATA

PRIMARY NAME: PROSPERITY MINE GROUP

ALTERNATE NAMES:
HELMET PEAK GROUP
CAMDEN
ELSIE
TIT FOR TAT
SAMM'S CLAIMS

PIMA COUNTY MILS NUMBER: 237

LOCATION: TOWNSHIP 17 S RANGE 12 E SECTION 9 QUARTER SE
LATITUDE: N 31DEG 57MIN 09SEC LONGITUDE: W 111DEG 06MIN 21SEC
TOPO MAP NAME: TWIN BUTTES - 15 MIN

CURRENT STATUS: PAST PRODUCER

COMMODITY:
LEAD OXIDE
SILVER
ZINC OXIDE
COPPER OXIDE
GOLD LODE

BIBLIOGRAPHY:
ADMMR SAMMS CLAIMS FILE
AZBM BULL. 189, P. 137, 1974
ADMMR HELMET PEAK MINE FILE
AZBM BULL. 125, P. 90
USGS BULL. 725-J, P. 464
AZBM BULL. 156, P. 49
ADMMR BOBBY FILE
ADMMR WHITCOMB FILE
ADMMR DOGTOWN FILE
ADMMR OLIVETTE FILE

HELMET PEAK MINE

PIMA COUNTY
PIMA DIST.
T17S, R12E, Sec 10, 11, 14,15

ABM Bull. 125, p. 90

USGS Bull. 725-J, p. 464 (Prosperity Group)

ABM # 156 p. 49

ABM Bul. 189, p. 137

MILS Sheet sequence number 0040190367 PROSPERITY MINE GROUP

USGS Bul. 725, p. 424

MAP - Upstairs in the ABM rolled file boxes - 1 claim map under the name Prosperity Mines

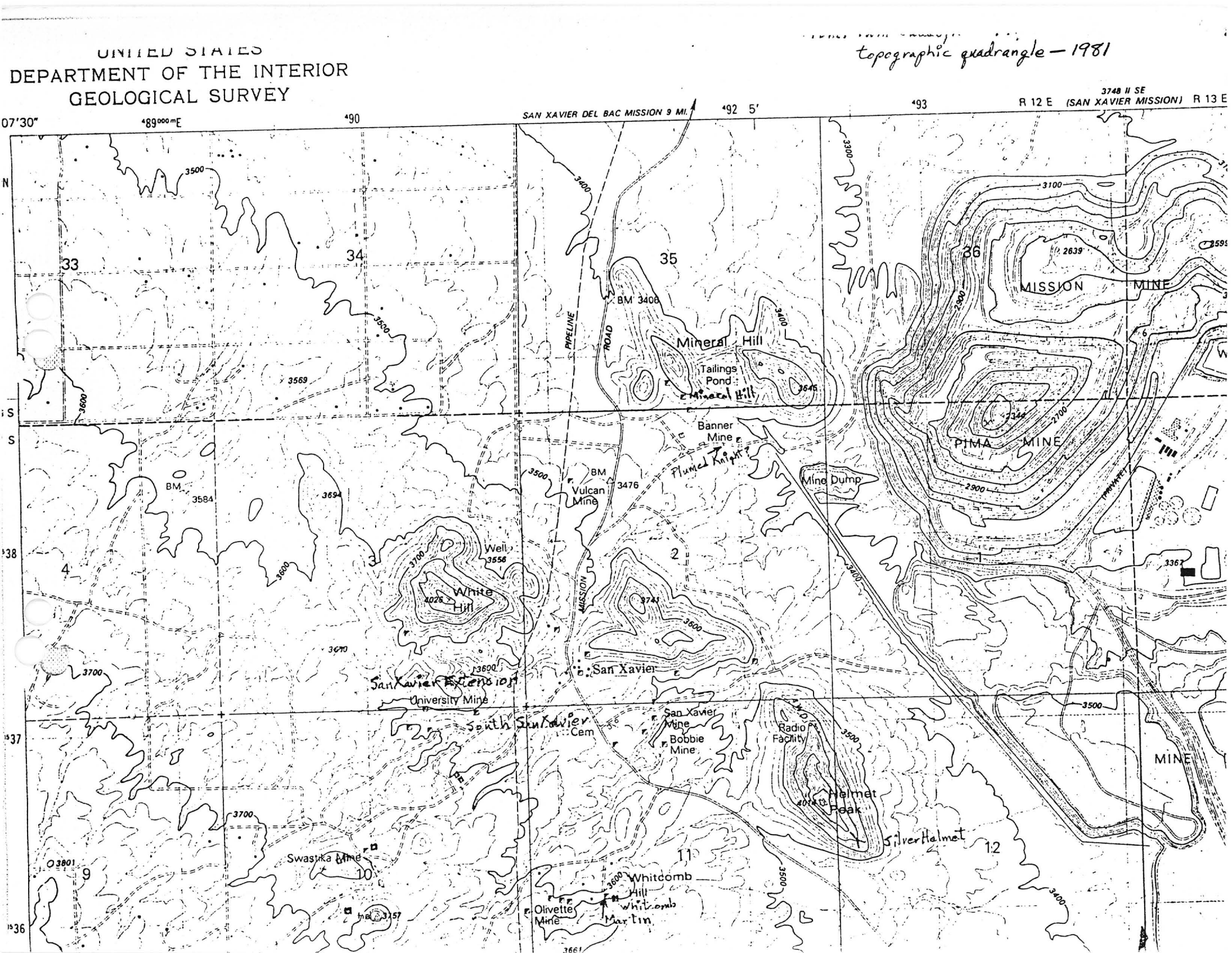
See: BOBBY (file)
dogtown (file)
Whitcomb (file)
Olivette (file)

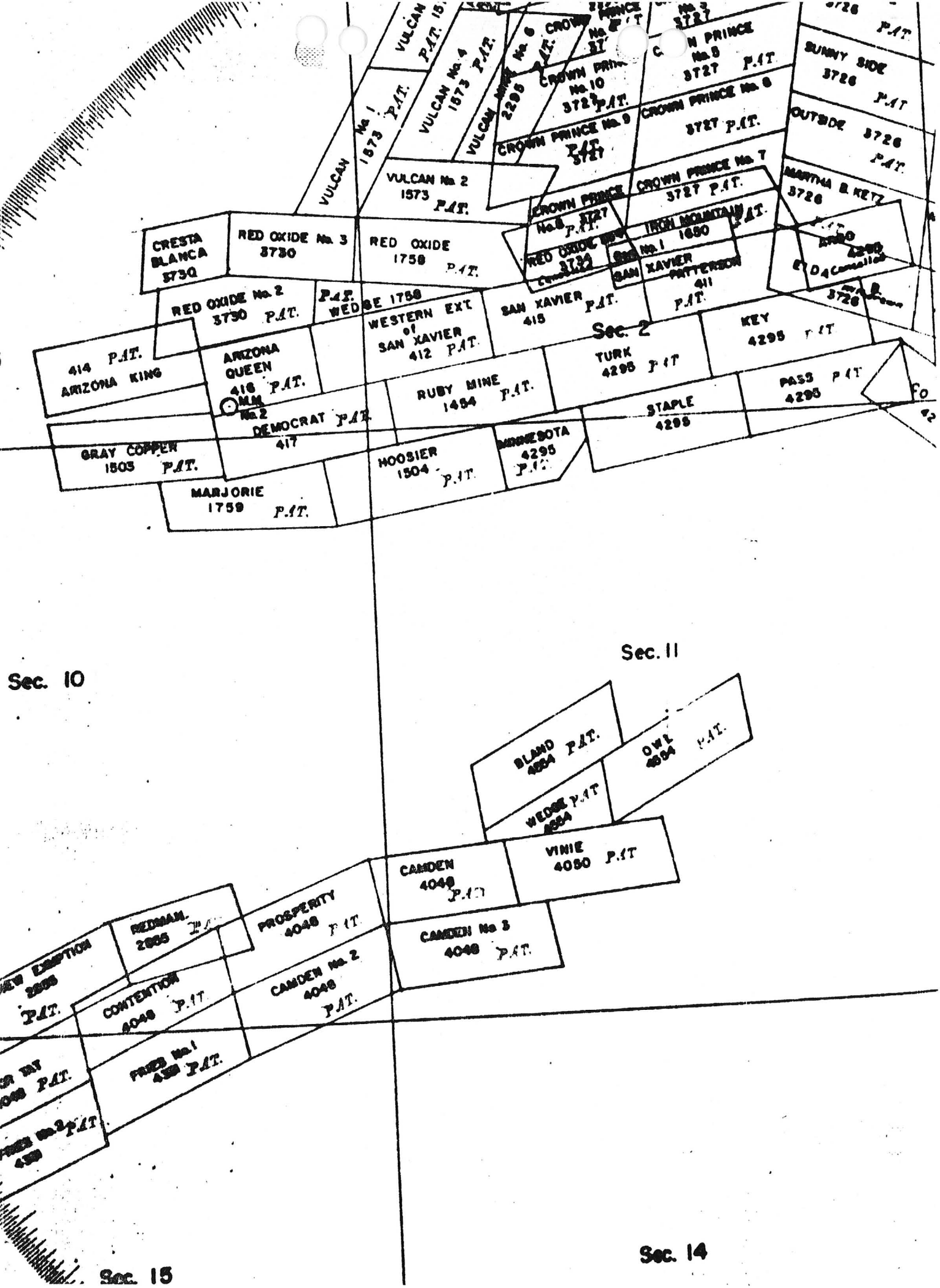
1. The Schwacher Properties (Schumacher, Camden, Redman, New Exemption, Tit for Tat, and Helmet Peak Claims)
2. Pima County, Arizona
3.
4. W. R. Jones
5. April 26, 1948
6. Silver-lead
7. "The area has some merit as a whole, but not otherwise. The operation at the Camden should be watched carefully so as to get a better idea of the potentialities of the area as a whole."
8. _____

Addendum by G. J. Duff - May 22, 1951: A Canadian organization, called the Great Northern Exploration Company, did some work on all or part of this group of claims but more particularly on the Tit-for-Tat in late 1948. Eagle-Picher milled about twenty tons of ore, which constituted their entire production. They shortly afterwards relinquished their lease. Mr. F. W. Galbraith, geologist at the University of Arizona, recommended the property, and Mr. Harry E. Krumlauf, professor of mining at said university, was in charge of operations. The property has remained idle until taken over recently by a party from Los Angeles named Warren Hazler, whose local engineer is Sam Coldren. They have asked if we would be interested in milling their production.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

topographic quadrangle — 1981




VULCAN
VULCAN No. 1
1573 PAT.
VULCAN No. 4
1573 PAT.
VULCAN No. 2
1573 PAT.
CROWN PRINCE No. 10
3727 PAT.
CROWN PRINCE No. 9
3727 PAT.
CROWN PRINCE No. 8
3727 P.AT.
CROWN PRINCE No. 7
3727 P.AT.
CROWN PRINCE No. 6
3727 P.AT.
CROWN PRINCE No. 5
3727 P.AT.
CRESTA BLANCA
3730
RED OXIDE No. 3
3730
RED OXIDE
1758 P.AT.
RED OXIDE No. 2
3730 P.AT.
WEDGE 1758
WESTERN EXT of SAN XAVIER
412 P.AT.
SAN XAVIER
415 P.AT.
SAN XAVIER PATTERSON
411 P.AT.
IRON MOUNTAIN No. 1
1650 P.AT.
SUNNY SIDE
3726 P.AT.
OUTSIDE
3726 P.AT.
MARTHA B. KETZ
3726
414 P.AT.
ARIZONA KING
ARIZONA QUEEN
416 P.AT.
MM No. 2
DEMOCRAT P.AT.
417
RUBY MINE
1454 P.AT.
KEY
4295 P.AT.
TURK
4295 P.AT.
PASS P.AT.
4295
STAPLE
4295
GRAY COPPER
1505 P.AT.
HOOSIER
1504 P.AT.
MINNESOTA
4295 P.AT.
MARJORIE
1759 P.AT.
Sec. 2
Sec. 10
Sec. 11
BLAND
4654 P.AT.
OWL
4654 P.AT.
WEDGE P.AT
4654
VINIE
4050 P.AT
CAMDEN
4048 P.AT.
CAMDEN No. 3
4048 P.AT.
CAMDEN No. 2
4048 P.AT.
PROSPERITY
4048 P.AT.
REDMAN
2885 P.AT.
CONTENTION
4048 P.AT.
Sec. 15
Sec. 14

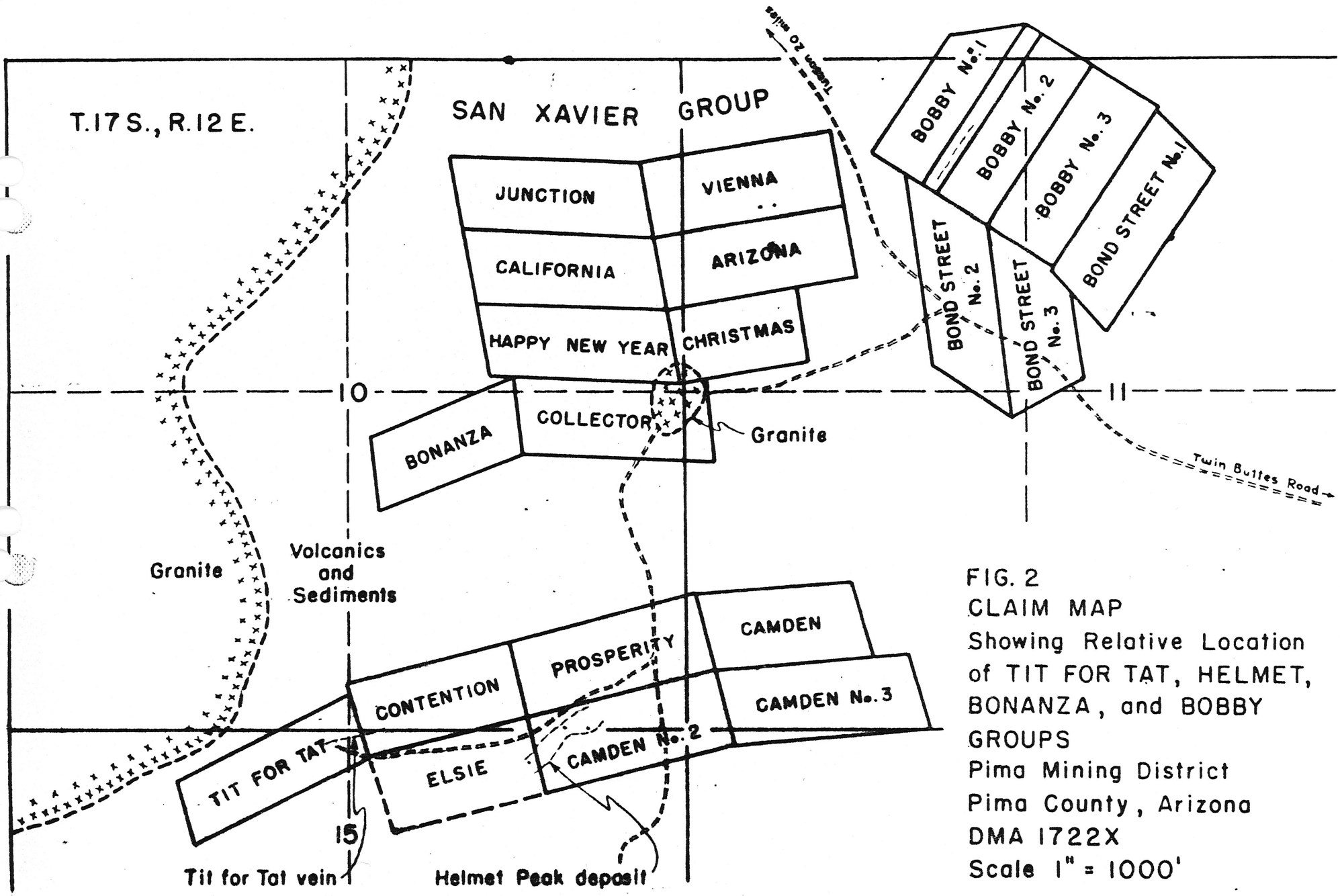
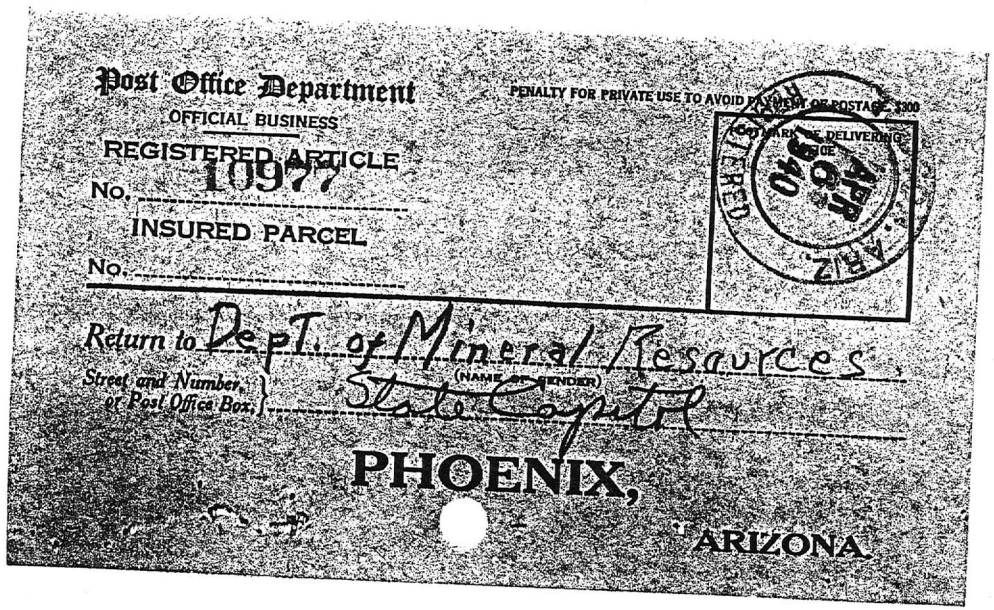


FIG. 2
CLAIM MAP
Showing Relative Location of TIT FOR TAT, HELMET, BONANZA, and BOBBY GROUPS
Pima Mining District
Pima County, Arizona
DMA 1722X
Scale 1" = 1000'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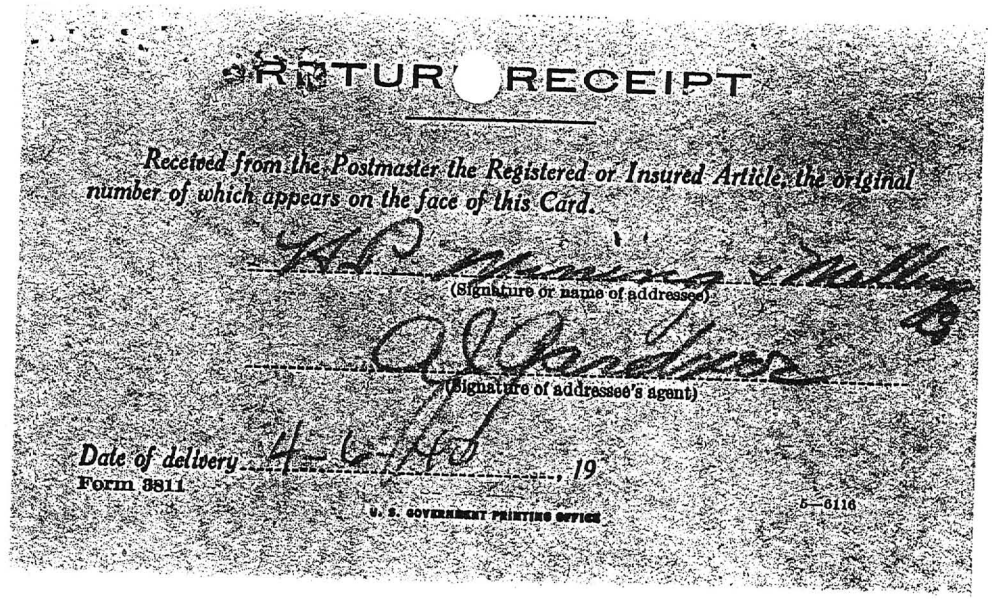

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5—6116

GEOLOGIC MAP SHOWING DEVELOPMENT OF HELMET PEAK MINING AND MILLING CO. PIMA MINING DISTRICT, PIMA COUNTY, ARIZ.

As of April 1, 1927.

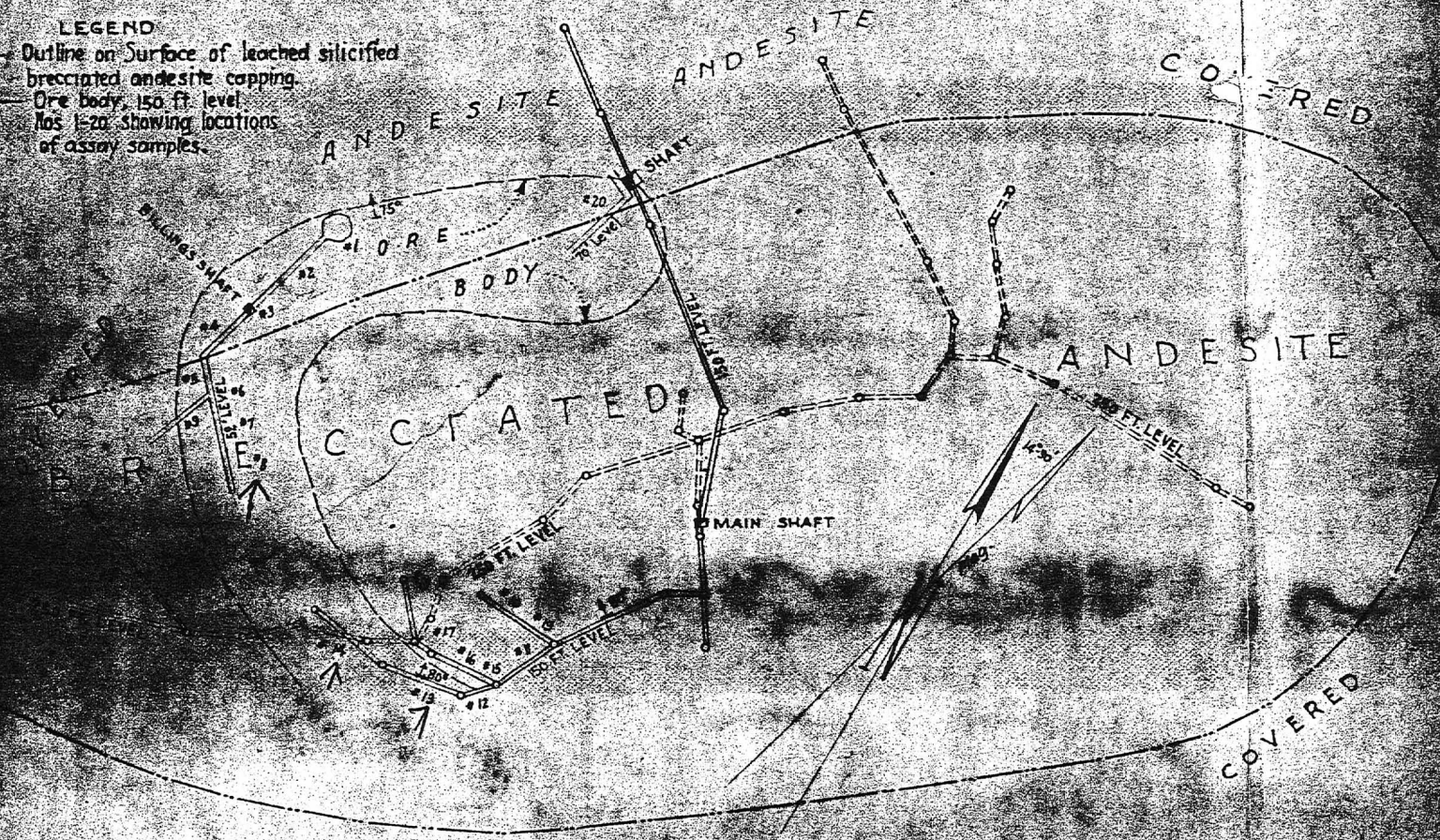
SCALE 0 25 50 FEET

LEGEND

Outline on Surface of leached silicified brecciated andesite capping.

Ore body, 150 ft level

Nos 1-20 Showing locations of assay samples.

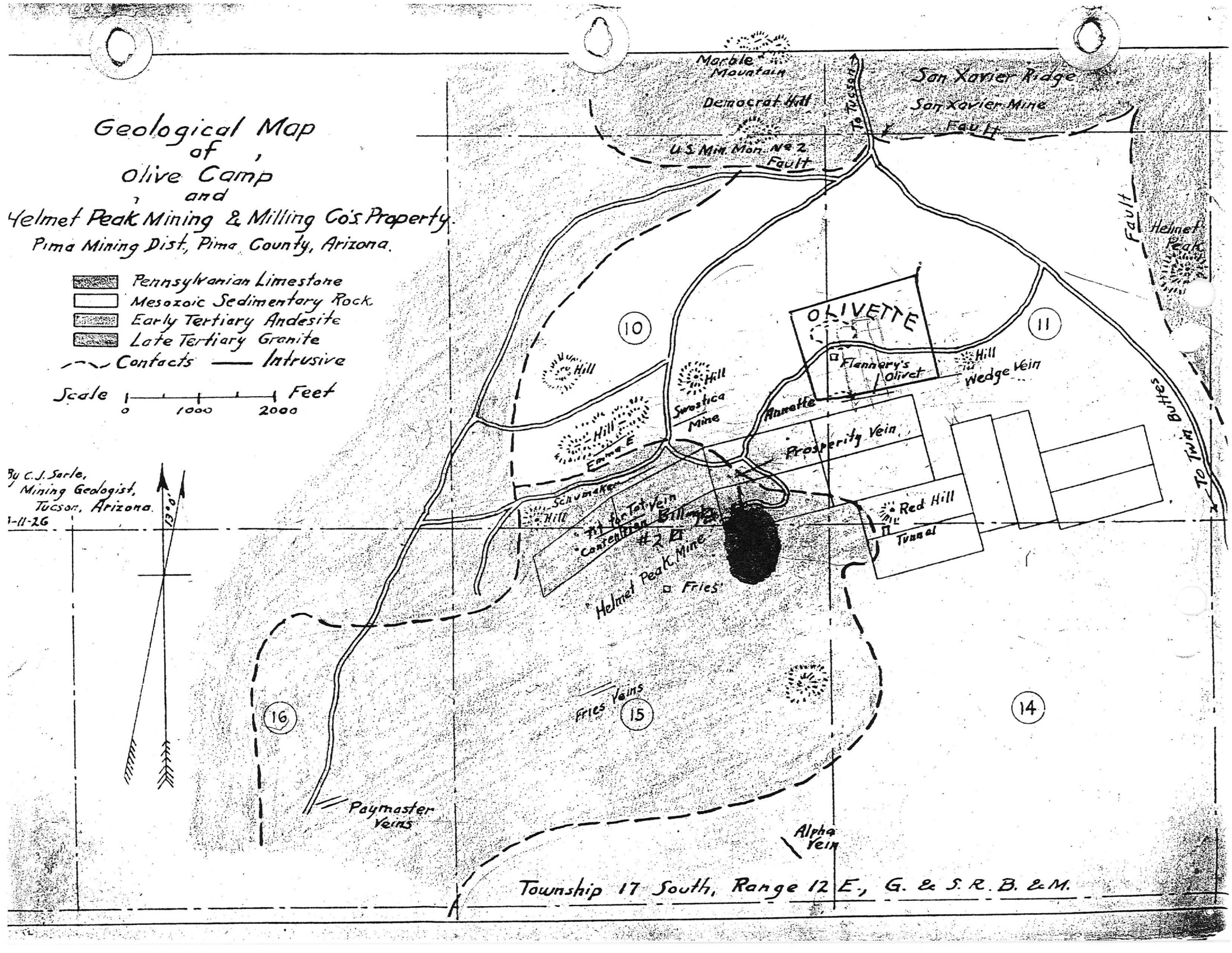


BASE LINE 560 FT.

C. P. Sorrell
Mining Geologist, Tucson, Ariz.

Geological Map of Olive Camp and Helmet Peak Mining & Milling Co's Property.

Pima Mining Dist, Pima County, Arizona.



TABULATION OF ASSAYS

NOTE: The position of these assays is shown on the accompanying geologic sketch map.

Number of Assay	% Cu.	% Pb.	% Zn.	Oz. Au.	Oz. Ag.	Width Cut	GROSS VALUE Then	Now	Best Bonus Basis
1	1.05	0.2	1.0	Trace	0.5	6.0 ft.	$ 8.09		
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	$13.23	$17.72
5	0.66	1.4	2.5	0.02	3.4	5.3 "	10.55	16.05	20.01
6	0.65	1.4	4.0	0.01	1.8	6.0 "	11.52	17.29	23.29
7	0.41	1.2	2.3	0.01	1.1	5.7 "	7.55	11.53	15.03
8	4.05	0.3	1.0	0.01	2.1	14.5 "	14.88	22.66	28.41
9	1.62	2.0	3.9	0.02	3.8	11.7 "	16.61	25.28	32.23
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	11.44	14.21
13	4.92	0.3	1.8	0.01	2.7	4.5 "	18.87	28.61	36.24
14	2.75	0.2	1.8	0.01	2.0	12.0 "	12.17	18.35	23.66
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		
[illegible]	0.32	0.9	4.0	0.01	0.8	[illegible]	9.08	13.55	[illegible]
							177.91		
						Average	17.79		

A [illegible]
Registered Assayer
Tucson, Arizona

(Values based on quotations for Aug. 25th. 1926, E.& M.J.P., Oct. 14,025, Lo. 4.5¢, Sp. 7.35, Ag. 62 5/8)

— ACCOMPANYING SARLE REPORT and assay map

TABULATION OF ASSAYS — ON SARLE REPORT +

NOTE: The position of these assays is shown on the accompanying geologic sketch map.

Number of Assay	% Cu.	% Pb.	% Zn.	Oz. Au.	Oz. Ag.	Width Cut	GROSS VALUE Then	Now	Best Bonus Basis
1	1.05	0.2	1.0	Trace	0.5	6.0 ft.	$ 8.09		
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	$13.23	$17.72
5	0.66	1.4	2.5	0.02	3.4	5.3 "	10.55	16.05	20.01
6	0.65	1.4	4.0	0.01	1.8	6.0 "	11.52	17.29	23.29
7	0.41	1.2	2.3	0.01	1.1	5.7 "	7.55	11.53	15.0[illegible]
8 ←	4.05	0.3	1.0	0.01	2.1	14.5 "	14.88	22.66	28.[illegible]
9	1.62	2.0	3.9	0.02	3.8	11.7 "	16.61	25.28	32.23
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	11.44	14.21
13	4.92	0.3	1.8	0.01	2.7	4.5 "	18.87	28.61	36.24
14	2.75	0.2	1.8	0.01	2.0	12.0 "	12.17	18.35	23.66
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		
[illegible]	0.32	0.9	4.0	0.01	0.8	26.0 "	9.08	13.55	19.[illegible]
								177.97	229.[illegible]
							Average	17.79	[illegible]

14

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

(Prices based on [illegible]
quotations for Aug. 25th
193[illegible], [illegible] Cu. 14.025,
[illegible] Ag. 62 5/8)

CAMDEN MINE [illegible] CAMP, ARIZONA.

ASSAYS AND ANALYSIS CERTIFICATES ON 250 FT. LEVEL.

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

						TOTAL VALUE Then 1924	TOTAL VALUE Now ABOUT 1945 -
#5 East Drift 26 ft.	.01	.7	.05	2.5	1.4	$ 6.67	$11.61
#6 East Drift 29 ft.	.01	.8	.12	3.6	2.1	9.67	16.79
#7 East Drift 32 ft.	.01	.7	.05	3.6	6.5	15.56	25.64
#8 East Drift 36 ft.	.01	.8	.02	1.2	6.2	11.28	17.77
#9 East Drift 40 ft.	.02	1.2	.02	2.4	7.1	13.27	23.97
#10 East Drift 44 ft.	.02	.9	.02	2.4	5.6	12.60	20.55
#11 East Drift 48 Ft.	.01	1.0	.02	1.1	6.2	11.20	17.65
#12 East Drift 56 ft.	.02	1.2	tr.	1.5	5.2	10.58	17.10
#1 A	.03	1.6	.25	3.1	7.1	17.01	27.77
#13 East Drift 60 ft-4 ft wide	.01	.9	.05	2.6	4.5	11.25	18.62
#14 East 65 ft-4 ft wide	.01	.8	.02	2.5	6.6	12.76	22.51
#15 East 71 ft.	.01	.6	.05	1.7	2.4	6.69	11.24
#16 East 78ft-4ft wide	.02	3.2	1.5	2.5	3.8	15.60	25.51
#1 B Sorted ore	.03	16.1	3.5	9.5		33.70	59.13
#18-C.C.#2East	.03	2.4	.5	5.1	4.6	16.35	30.32
#19-160ft West	.02	1.2	.05	2.9	3.0	9.43	16.99
#19 West 165 to 190 ft	.02	2.2	.05	1.5	3.1	8.03	13.90
#20 West 165 to 190ft.	.02	.6	.05	2.6	2.1	7.58	13.76

CONTINUED — CAMDEN MINE — 250 FT LEVEL

#2 A	Gold	Silver	Copper	Lead	Zinc	TOTAL VALUE Then	Now
165 to 190 ft.	.01	.8	tr.	3.2	1.9	$ 7.94	14.66
#21 East 68 ft	.02	1.2	tr	2.7	4.4	10.87	19.12
#22 East 94 ft	.02	1.4	tr.	3.8	4.2	11.56	21.18
#23 West 193 ft.	.01	4.4	.05	2.3		6.23	11.43
#24 West 197 ft.	.01	4.1	.15	3.8		8.60	20.60
#25 Sorted ore	.02	26.4	9.9	3.2		46.25	82.50
#26/26	.02	6.0	2.1	5.5	6.5	26.15	45.29
#27 Tit-for-Tat	.03	26.2		30.6		62.27	116.40
#28 Surface Outcrop		34.1		50.2		95.70	181.39

(COPY)

Tucson, Arizona,
[illegible]

[illegible] GROUP

This group lies about twenty one miles South-West of Tucson, and seven miles North-West of Sahuarita, a station on the Nogales branch of the Southern Pacific Railroad. Either place can be reached over a good automobile road.

now Galveston #2 — Galveston No. 3

This group consists of two claims, the "Chicago" and the "Black Prince". The surface of this ground is mostly covered with detritus, but at a few points shows outcrops of a highly altered eruptive rock, which has the appearance of diabase.

The only development on the property is one twenty foot shaft and one one hundred foot shaft. The one hundred foot shaft is sunk in a West dipping fracture, which is in line with and may be the "Southern Prosperity" fracture, but as it is not traceable on the surface and the distance is about 700 feet, it is not possible to state positively that it is the same fracture.

At a depth of about sixty feet the same formation as shown in the "Southern Prosperity" hill and ore body was encountered, and at the bottom of the shaft a cross-cut was run in the same material, all of which shows a slight dissemination of pyrite and bornite, which, while low grade, may possibly be of high grade enough to pay if concentrated if mined in large quantities. This, however, can only be determined by extensive sampling, which I did not have time to do.

JOHN L. SPLANE
MINING ENGINEER
270 NORTH CHURCH
TUCSON 1, ARIZONA
TELEPHONE 4-2388

January 7, 1956

Mr. Fred W. Fickett
80 North Church Avenue
Tucson 8, Arizona

RE: SUNRISE MINING CO. LEASE

Dear Mr. Fickett:

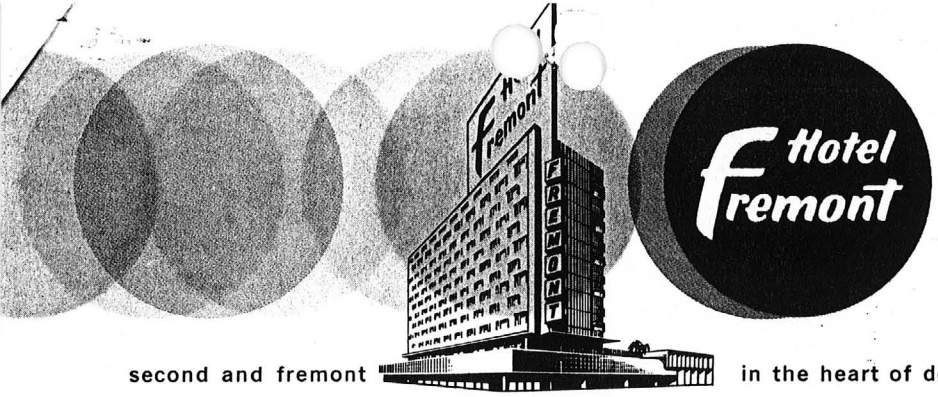
In accordance with paragraph (11) in the agreement between you and the Sunrise Mining Co., dated June 15, 1953, I am enclosing the assay data from the samples taken from the churn drill hole drilled on the "Dan Harper" claim which was finished December 7, 1955.

Am not including a log on the hole as the formation was very consistant, an andesite porphyry with discemin-ated iron pyrite throughout.

Yours Very truly,

John L. Splane

JLS:glc



second and fremont in the heart of downtown las vegas nevada/dudley 4-3333

Aug 28. 1958

Dear Mr Fickett:

Was in your office. Found you gone on Vacation.

According to all figures. The Copper Water — Would run about 1 lb of — Copper Per Ton. This would not Warrant the installation of Pumps and Vats - We could get some Sponge Copper. it would not pay.

I am enclosing the Results of the assay.

Will be down that way soon.

(15)

With all Best Wishes.

Henriette Miller.

University of Arizona
TUCSON 25, ARIZONA

COLLEGE OF MINES
ARIZONA BUREAU OF MINES

August 8, 1958

Miss Henriette Miller
6708 E; Cooper St.,
Tucson, Arizona

Dear Miss Miller:

Below are the results of an assay for copper performed on the sample of water brought to our office.

	Percent
Copper	0.044

or

Copper	0.88 lbs./ton

Yours very truly,

H. Wesley Peirce

H. Wesley Peirce
Asst. Mineralogist

15

Note [illegible]s property adjoins the Mineral Belt Mines, Inc., on the south.

REPORT

On the property of the

HELMET PEAK MINING AND MILLING COMPANY

Pima Mining District,

Pima County, Arizona.

****

by

*O. J. Sarle, - Mining Geologist,

Tucson, Arizona

August 25th, 1926

*For eight years Professor of Geology, University of Arizona

(4)

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 12 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.

Suhuarita, 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 collectively known as the "Harper-Martines Group" and are named: South Camden, South Camden Nos. 1 and 2, Refufia, Refufia 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 contigious and have an area of nearly 240 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 faultblock 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 parallelling 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 snad-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 much 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 Permo-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 limestones. This is mainly a fresh water continental deposit, as shown by its lithological character and fossils. Marine, Commanchean, Cretaceous fossils, found in this series in the Patagonia Mountains, some fifty miles to the southeastward, however, establish the age of the series.

Mantling 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. UUpon these, but more localized, were early Quarternary 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 state in closing Tertiary and early Pleistocene times, -- a very long period, though short geologically considered.
Th
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 state of final minor adjustment. It wasnot so rapid but that many antecedent streams in Southern Arizona were able to maintain their uninterrupted way, erosional downcutting 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 ORE 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 occured in successive states, the intervals between permitting a certain amount of magmatic differentiation.

The batholith imparted a dome shape to the Sierrita uplit. 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 upfault massife 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 mashed and sheared, and in places converted into slates and veen 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 recrystalized into sericite, until it is often difficult to distinguish them in the field from altered quartz-porphyry, or a mashed and reconstructed rhyolite; shales extensively hornfelsitized, porcelainized 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 occurance 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 wall-like 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 limestone 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 inless 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 Schwmacher, located just north of the Company's holdings; the Tit-for-Tat, Contention and Prosperity veins on their ground; the Freis 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 occurance, though 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 occuring 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, the 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 relatively 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 quanity.

The fissure veins of the OLIVE CAMP, essentially lead-silver and tetrahedirte-silver-lead ores, which were worked between 1886 and 1893, should be regarded as upper, attenuated ends of ore bodies, grading downward through zinc-copper ores to copper-iron 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 Permo-Pennsylvnian 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 strataform 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, grey sandstone or quartzite, interbedded with purple shale. There are also some thin beds, of grey 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 reentrant 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 occurances, 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 andesite. 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 phenochrysts. 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 phenochrysts absent.

Half a mile northeast of the Helmet Peak Mines, a small area of outcropping granite occurs in the midst of the upedged 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 occurence 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 roof 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 Twin Butte 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 occurances 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 occurance of the common mineralizer, the granite, implies a high degree of probability that large ore bodies will be discovered in the OLIVE CAMP once 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 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 argillocarenaceous 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 5 of this report. Some lie north of the Helmet Peak Co.'s property, 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 tthe andesite and stands vertical and trends N. 65° E., and was developed for about five hundred feet and to a depth of perhaps *two hundred feet. The Prosperity workings like 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 the same amount of development.

The Annette vein, about 1200 feet northeast of the Prosperity vein, strikes N. 80° E., dipping 55° N.,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 1886 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 huge 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 occurence of zones of close fracturing and bressiation 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 bresciated 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 ofthis 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 cut 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 such higher grade ore than this average: for example, assay No. 8, cut across 14.5 feet, runs $14.88: No. 9, across 11.7 feet, $16.61; 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 crosscut should be driven to a point beneath the Billings (the 52 foot) 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 ore.

This program carried out, besides greatly increasing ore output, should raise the grade of ore, facilitate selective mining and mining 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 shortestpossible time. This will require experienced, competent mine operators, eager for results.

Much credit is due the present Superintendent, 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 water level 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 bodywidening 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 this 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 mind 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 25, 1926