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AMERICAN SMELTING AND REFINING COMPANY  
Tucson Arizona

J. E. K.

May 10, 1966

MAY 12 1966

MR. ~~W.E.S., J.E.K.~~  
READ AND RETURN .....  
PREPARE ANSWERS ..... HANDLE .....  
FILE  INITIALS .....

W.E.S.  
MAY 11 1966

TO: J. H. COURTRIGHT  
FROM: R. H. LUNING

BIG SAM (NATIONAL MINE)  
SUNFLOWER MERCURY GROUP  
MAZATZAL MOUNTAINS  
MARICOPA COUNTY, ARIZONA

### Introduction

Following the request of Mr. J. E. Kinnison, I revisited the Big Sam Mine during January and March, 1966, to continue the sampling program. The more complete samples established the trend and locations of vein material, and outlined the "ore" zone at the present pit.

Development at the property has continued intermittantly since my last visit in August, 1965 (File Memorandum, December 20, 1965). Considerable work has been done along the strike of the main cinnabar lode, toward the north - east of the present main pit, and some of the old workings have been cleaned out and re-timbered. Several new access roads have been built.

At present, a Mr. V. Bradley is in charge, who resides at 356 South Hobson Street, Mesa, Arizona. The previous superintendent, Mr. C. P. Keegel, left late last year for California. The operators appear to have financial difficulties as the furnace and all other operations had been shut down, except for some men who were engaged in retreating dust from the furnace to recover the contained mercury and the hand-sorting of high-grade cinnabar bearing quartz veins.

### Conclusions and Recommendations

On the basis of the assay - results, mercury values appear to be confined primarily to cinnabar bearing quartz - carbonate veins with only traces (0.003 - 0.008%) of cinnabar in the Yavapai schist host rock. The property has, therefore, no potential as a low grade disseminated ore body. *mercury!*

*R. H. Luning*  
R. H. LUNING

General Geology and Sampling Methods

Although no attempt was made to do any detailed geological mapping, the following brief description applies to the rocks found at the "Big Sam" Mine.

Quartz - sericite schist, chlorite schist, massive red jasper and rhyolite - porphyry predominate. In addition a reddish-brown slate occurs sporadically. Ransome found that the schists of the region could be subdivided into eight zones, striking roughly N45°E, arranged symmetrically on each side of the jasper as a central axis (U. of A. Bulletin 122, 1927, page 63).

The quartz - sericite schist is the most abundant type of metamorphic rock. It varies in composition from a quartzite containing a little mica to a light colored phyllite in which mica predominates.

The brown slate is a very fine grained rock with a well developed parting along which the rock cleaves readily.

Chlorite schist is well exposed in and adjacent to the main workings. It is of a dark green color and is essentially composed of chlorite and quartz, although sericite, limonite and some magnetite are present.

Jasper occurs in the area as conspicuous outcrops on hillsides and tops of ridges. It usually occurs as bands or stringers with associated quartz in a pale, yellow dolomitic limestone.

Rhyolite - porphyry traverses the district as two broad bands in a north - easterly direction and more or less parallels the schistosity. The rock is of a creamy - yellow color and porphyritic texture with numerous quartz and feldspar phenocrysts.

Wherever possible, continuous chip samples were taken and the number of access roads and bulldozer cuts along the steep hillsides facilitated this type of sampling. Many of the continuous chip samples were taken along a distance of 20' and each sample interval was measured by tape. Some random chip samples were taken at outcrops along hillsides and these locations were plotted on the map by triangulation.

Mr. W. E. Saegart visited the property and suggested that additional work be done by taking channel samples and continuous chip samples immediately adjacent and perpendicular to the main cinnabar lode. Samples were collected over a distance of 50' per sample, each sample weighing between 15-20 lbs. In the smaller, western pit, a 25' interval was chosen.

Attachment A shows the topography and locations of the various claims. The main cinnabar lode is located in the Packover, Go-By, and Sunnyside No. 5 claims. The map also shows the location of the mercury occurrences of other adjacent areas. Note that the average trend of the mineral - bearing zones is about N50°E. The Packover Lode is the widest and most extensive. It averages 50' in width at the Packover claim and is about 1300' long. From an assay map, supplied by Mr. Bradley, the following assay values were copied - (values read from NE to SW for a distance of about 500' along its length):

<u>Assay</u>	<u>Width</u>
0.81%Hg	29'
0.036%	160'
0.036%	75'
0.051%	40'
0.087%	34'
0.62%	17'
0.40%	30'
0.21%	20'
0.33%	29'
0.32%	13'
0.43%	12'
0.23%	36'

The ore occurs in veinlets of quartz and carbonate (either as calcite or ankerite) which vary in size from a fraction of an inch to half a foot or more. Lausen, in the U. of A. Bulletin of Quicksilver Resources in Arizona, 1927, page 69, mentioned that some disseminated cinnabar occurs in the body of schist enclosing the veinlets. He also mentioned native mercury and metacinnabar (in composition like cinnabar but of secondary origin) but these are present in only small amounts.

Several hundred feet to the northwest of the Packover Lode is the Native or Jasper Lode and similarly to the southeast is the Ione Lode. Both of these are quite narrow and discontinuous and the main development work has been confined to the Packover Lode.

Further occurrences of mercury have been recorded at the Cornucopia Mine, about 1/4 mile northeasterly along Sycamore Creek and also to the northwest of it. I paid a brief visit to this mine and noted some cinnabar bearing quartz fragments on the dump, but took no samples from the area.

Assay Results

Attachment B shows the principal drainage and access roads at the Big Sam Mine. The original twenty-three samples collected are shown in open circles at and adjacent to the main pit. To the northeast lies Sunnyside ridge, where, in addition to surface samples, two samples were collected in the underground workings. A part of the Ione Lode has been extensively developed at this site.

Attachment C is an enlargement of the original sketch map to a scale of 1" = 100' (approx.) and shows the location of samples collected and the approximate pit outlines. A fault has been shown on the map between the two main pits to show that there has been some displacement of the lode.

The results of the original assays by Hawley and Hawley appeared to be encouraging enough to warrant further sampling. However, check assays of some of these showed wide discrepancies in the percentages reported.

<u>Sample No.</u>	<u>Hg% *</u>	<u>Vapor Test</u>	<u>(Re-run) Hg%</u>
1	0.027	0.025	
2	0.030	< 0.10	
3	* 0.010	< 0.025	0.003
4	0.330	< 0.43	
5	0.027	0.025	
6	0.027	0.05	
6-A	0.04	0.05	
7	0.055	0.025	
8	0.06	trace	nil
9	0.05	< 0.025	
10	0.67	> 0.43	0.21
11	0.08	0.10	
12	0.09	< 0.05	
8402	0.035	> 0.025	
8404	0.055	0.10	
8406	0.04	< 0.05	
8408	0.06	> 0.15	
8412	0.045	0.025	nil
8414	0.067	nil	nil
			nil
8416	0.07	0.10	0.010
			0.007
8416-A	0.072	< 0.025	nil
8420	0.045	0.05	0.013
8426	0.05	0.10	0.006
			0.015

\* Original samples--assay by Hawley and Hawley, August, 1965. Please note that samples No: 8414, 8416, & 8426 were re-run twice by Hawley and Hawley.

It may be seen from the above list that sample No. 10, which originally assayed 13.4 lbs/ton, only assayed 4.2 lb/ton on a re-run. Lower grade samples, particularly No's 8 and 8414, showed no evidence of mercury. No's 8420 and 8426, which originally assayed to have about 1 lb/ton only showed about .3 lb/ton. It appears that the original assays, although showing evidence of quicksilver, were erroneously assayed. The vapor test, unfortunately, did not show this as this method is at best semi-quantitative.

Better agreements were subsequently obtained by check-assays with Asarco's El Paso Ore Testing Laboratory. The following is a list of assays with a comparison of Hawley & Hawley.

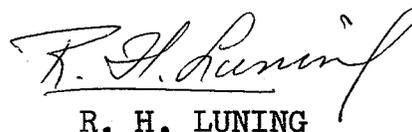
Sample No.	El Paso % Hg	Haw. & Haw. % Hg
L-16	0.27	0.26
C-24	0.037	0.021
C-14	0.16	0.148
C-26	0.033	0.018
L-35	0.001	none
L-28	0.004	0.019
L-29	0.029	0.013
L-12	0.003	0.003
L-36	0.031	0.012

NOTE: Prefix "L" & "C" have been omitted on the sketch-maps.

Averaging each 9 assays results in 0.063 and 0.055% Hg for El Paso and Hawley and Hawley respectively.

Attachment D is a spectrographic analysis of seven samples taken from the higher grade portions of the Packover Lode; Samples No. C-21, 13, 15, 25, 27, and 91, and one small sample derived from a quartz vein showing abundant cinnabar. Of interest is the occurrence of titanium, reported as 0.84%. This presumably is present as ilmenite -  $\text{FeTiO}_3$ .

Attachment E is a description of the method for assaying of mercury together with a photograph of the apparatus.

  
R. H. LUNING

RHL/mcg  
Attachments: A-E  
cc: WESaegart  
JEKinnison  
NPWhaley

A P P E N D I X

<u>Sample No's</u>	<u>Interval</u>	<u>Remarks</u>
1	20' chip sample @ adit portal	Quartz-sericite schist containing several small (1/4"-1/2") quartz veinlets abundantly stained by li- monite.
2-3	soil samples	Reddish-brown soil con- taining numerous schist fragments
4-9	20' chip samples	Chlorite and quartz-sericite schist. Quartz-carb. vein- lets wk-mod. lim. stain.
10-15	15' chip sample	Chlorite schist, locally some red jasper and quartz vein- lets. Wk. limonite dis- seminated throughout.
16	grab sample from dump, upper adit	Qtz.-sericite and chlorite schist. Visible cinnabar in qtz.
17	8' chip sample	Massive qtz. vein, 8' wide
18	15' chip sample	Qtz-sericite schist moder- ately stained by limonite.
19-20	soil samples	Brown soil containing several schist fragments
21	grab sample from dump	Quartz-sericite and chlorite schist. Numerous quartz fragments on dump.
22-25	20' chip samples	Chlorite schist
26	10' chip sample	Silicified schist containing numerous jasper inclusions
27	20' chip sample	Quartz-sericite schist con- taining calomel (?)
28	15' chip sample from extreme end of drift at lower adit	Quartz-sericite schist stained reddish-brown by iron oxides

**TAB**

A

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# LEGEND

COORDINATE	NORTH	EAST	ELEVATION
MT ORD TOWER	1,059,029.24	123,250.08	
N W CORNER	1,077,665	94,867	5302
MINERS NO 1	1,077,324	95,670	5201
S W CORNER	1,075,29	96,86	5140
POINT K	1,078,182	97,852	4800
POINT G	1,080,540	101,819	4775
POINT D	1,084,070	103,240	5160
MINERS NO 2	1,082,080	102,840	5210
POINT J	1,081,570	104,695	5513
POINT C	1,081,874	105,605	5391
POINT B	1,079,810	110,320	4960
POINT A	1,082,685	111,080	4885

# SYMBOLS

- △ COORDINATE CONTROL POINT
- MINING CLAIM CORNER
- MINING CLAIM BOUNDARY
- - - MINING CLAIM CENTERLINE
- - - WARD MINING CLAIMS



CLAIM MAP

BIG SAM MINE

SCALE: 1"=800'

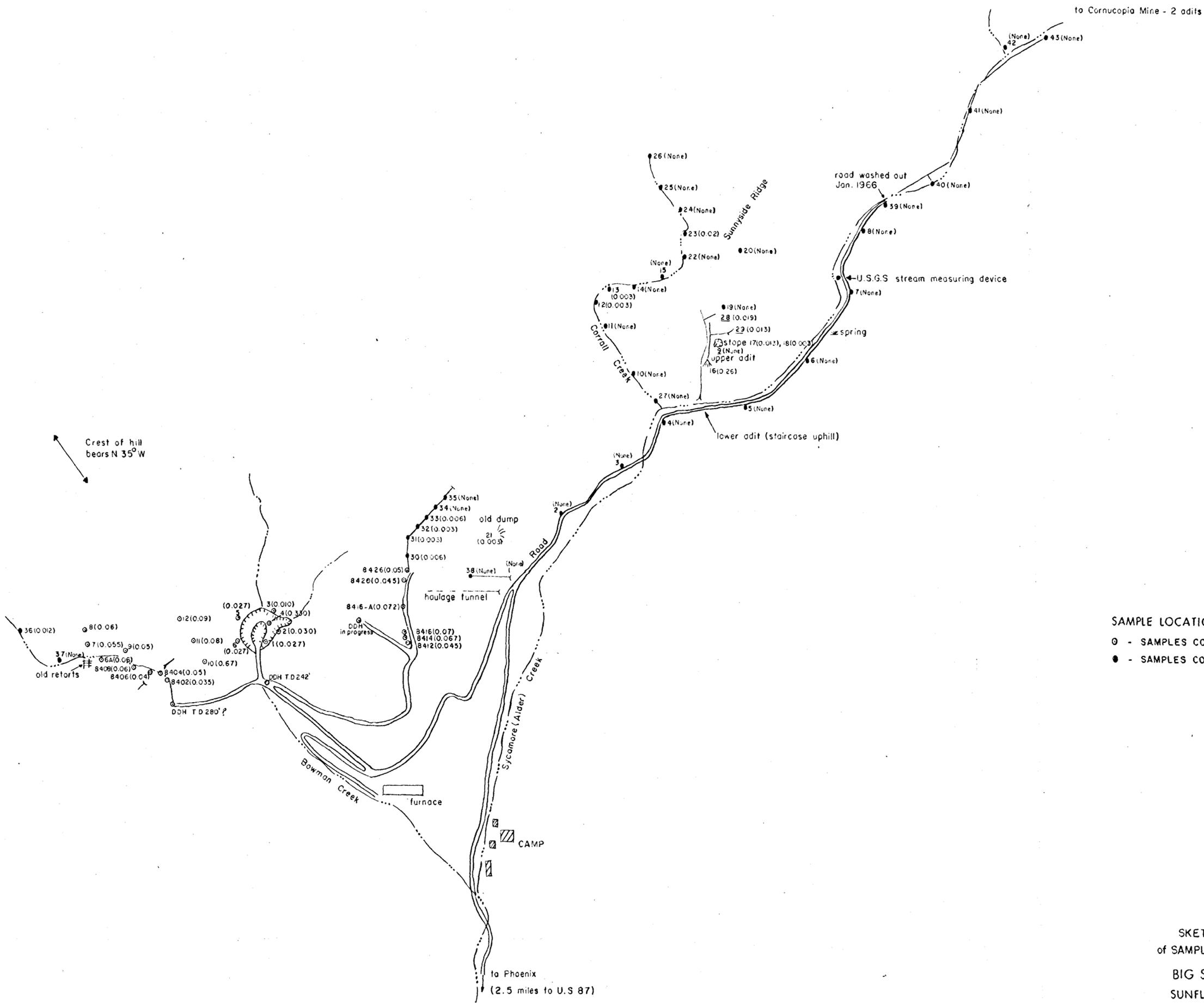
April, 1966

Mercury Occurrences

**TAB**

*B*

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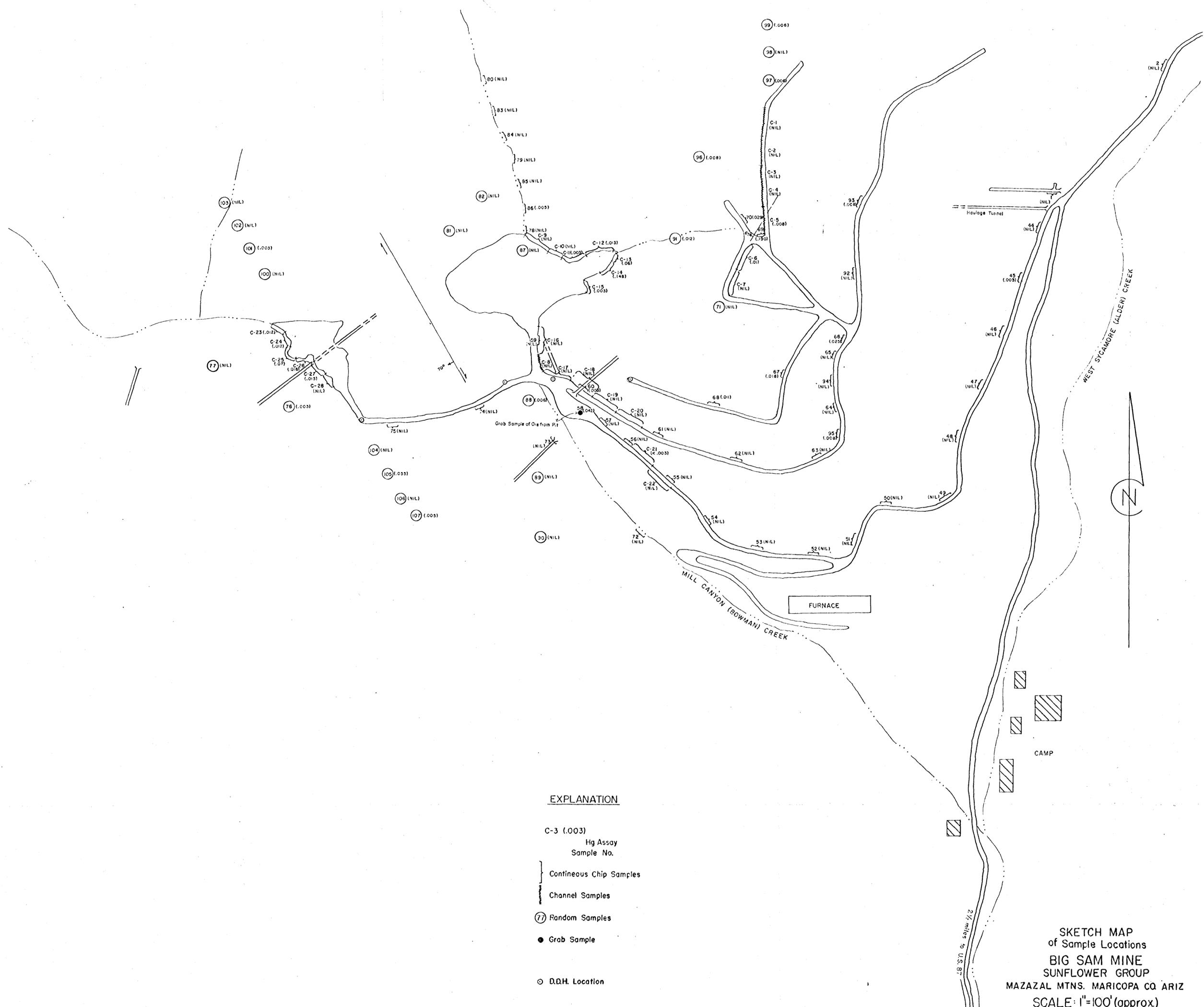
SAMPLE LOCATIONS  
 ○ - SAMPLES COLLECTED, AUG. 1965  
 ● - SAMPLES COLLECTED, JAN. 1966

SKETCH MAP  
 of SAMPLE LOCATIONS  
 BIG SAM MINE  
 SUNFLOWER GROUP  
 MAZATZAL MTNS. MARICOPA CO., ARIZ.  
 Scale 1" = 300' (approx) RHL

**TAB**

*C*

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EXPLANATION

- C-3 (.003)  
Hg Assay  
Sample No.
- } Contineous Chip Samples
- } Channel Samples
- ⑦ Random Samples
- Grab Sample
- D.D.H. Location

SKETCH MAP  
of Sample Locations  
BIG SAM MINE  
SUNFLOWER GROUP  
MAZAZAL MTNS. MARICOPA CO. ARIZ  
SCALE: 1"=100' (approx.)

**TAB**

*D*

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# PACIFIC SPECTROCHEMICAL LABORATORY, INC.

## CHEMICAL AND SPECTROGRAPHIC ANALYSIS

### RESEARCH

2558 Overland Avenue

Los Angeles, California 90064

April 22, 1966

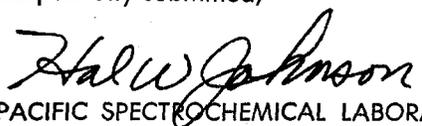
Report of semiquantitative spectrographic analysis of sample submitted by

Hawley & Hawley  
Assayers and Chemists, Inc.  
Tucson, Arizona 85703

330577

Silicon-	15. %
Iron-	6.1
Calcium-	12.
Aluminum-	8.9
Magnesium-	2.3
Titanium-	0.84
Boron-	0.0047
Manganese-	0.059
Gallium-	0.0037
Copper-	0.0067
Chromium-	0.023
Nickel-	0.0071
Vanadium-	0.046
Sodium-	0.54
Cobalt-	0.0072
Potassium-	2.1
Strontium-	0.012
Antimony-	not detected - less than 0.005
Barium-	" " 0.05
Lead-	" " 0.01
Bismuth-	" " 0.001
Molybdenum-	" " 0.002
Zinc-	" " 0.03
Silver-	" " 0.0001
Beryllium-	" " 0.0003
Gold-	" " 0.001
Tungsten-	" " 0.05
Zirconium-	" " 0.003
Rare earths-	nil

Respectfully submitted,

  
PACIFIC SPECTROCHEMICAL LABORATORY, INC.

**TAB**

*E*

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**INSTRUCTIONS FOR MAKING ASSAYS FOR MERCURY WITH****WHITTON'S APPARATUS****DESCRIPTION OF THE APPARATUS**

The Whitton Mercury Determination Apparatus for assaying mercury in ores possesses novel features which render the assay more accurate and reliable without lengthening the time required, while the manipulation is at the same time easy and simple.

The Apparatus proper consists of a steel retort with a cover of sheet silver. Above these is a cooling dish of brass which clamps tightly over the retort. This provides a tightly closed chamber from which no mercury vapor can escape-- a feature which renders close and careful regulation of the heat unnecessary.

**PRINCIPLE OF OPERATION**

Since mercury vapors will condense upon any surface below the boiling point of Mercury (357.82° C), use is made of a steel retort which can be readily kept above that temperature, and a silver cover which is kept below the condensation temperature by means of a cooling dish filled with water directly above it. Thus the vapor must condense upon the silver foil cover, with which it forms an amalgam, and not upon any other portion of the exposed inner surfaces of the retort. On the condensing surface exposed as much as 0.15 grams of mercury may be deposited, though it is preferable that such quantities of ore be used that not over 0.05 grams will be deposited, when the amalgam formed adheres closely to the foil. The silver foil is replaceable at small expense. One piece will last for from 5 to 10 assays.

The time required for an assay is about 30 minutes. By using two sets of apparatus and four pieces of foil and weighing up the first pair while the second pair is collecting the mercury, the assay may be made in 15 minutes. By working with three sets the time can still be further reduced to 12 minutes, for continuous work.

The results obtained with this apparatus have been checked repeatedly against those obtained by other and slower methods, and have been found to be consistently in close agreement.

**METHOD OF PERFORMING ASSAY**

1: Take from 0.15 to <sup>3</sup>/<sub>2</sub> grams of ore, according to richness, place in the retort, and mix very thoroughly with about 6 grams of prepared iron filings, adding 3 grams more as a cover. The preparation of these iron filings, which are used as a desulphurizer or flux, is very important. They should be put through a 50 mesh sieve, washed very thoroughly with alcohol or carbon disulphide to remove grease and heated for an hour or more in the muffle or upon a hot plate. It is not advisable to have them too fine, and all that will go through an 80 mesh sieve should be discarded for best results. A blank test with the prepared filings should not increase the weight of a new foil nor discolor it.

2: Weigh a square of foil, assemble the apparatus and screw clamp down firmly.

3: Fill the cooling dish with water, and heat for 17 minutes. If a bunsen

burner is used, regulate the heat as follows: Have the bottom of the retort about 1 1/4 inches above the top of the burner. The gas flame should be turned quite low, and the blue cone of the flame should just strike the bottom of the retort, while the flame runs up the sides for about 1/2 inch. The tendency of beginners seems to be to use too much heat. The water in the cooling dish should come to a boil in 6 or 7 minutes, and should be allowed to boil throughout the assay, being replaced only once or twice as it boils away. This keeps the foil above the boiling point of water, while below that of mercury. Thus no water remains upon the foil at the conclusion of the assay so that desiccation of the foil is unnecessary. Cooling is very rapid, and no evidence of overheating has appeared in many assays, so that the close attention of the operator is not necessary during the heating.

3: At the expiration of the 17 minute heating period allow the assay to cool until it can be handled, which takes about 5 minutes. Dismount the apparatus carefully. Convey the foil, under cover to avoid dust, to the balance and weigh.

ESTIMATION OF RESULTS

The increase in the weight of the foil is due to mercury, and the percentage is readily calculated. EXAMPLE: Using 1 1/2 grams of ore, the weight of the silver increase 0.05 gram, the percentage of mercury to ore by weight is 3.33%.

The deposit upon the foil should be white in color. If the heat is too high or has been applied too long the deposit will assume a dark color. This dark deposit is volatile, and is apparently due to oxidation of the mercury. Assays in which the coloring appears are not generally very reliable. They may vary either way from the correct result, but are generally high.

In the case of ores containing much water, on removing the foil it is occasionally found to have filings upon the deposit, and it is also stained a dark color in spots. This due to a drop of water condensing on the foil and falling back on the hot charge in the retort, where it boils violently and throws up the charge on the foil. This may be avoided by heating up the charge slowly; or, if very persistent, by the use of a shield above the charge. Probably asbestos wool would be good to use for this purpose.

\*\*\*\*\*

REPLACEMENTS

369-96-WHITTON MERCURY DETERMINATION APPARATUS, complete with support, support ring, support ring clamp holder and one foil- - - - -

369-97-EXTRA SILVER FOIL, 1 3/4 inches square - - - - -

369-98-IRON FILINGS, specially prepared, free from grease, per lb.- -

MANUFACTURED BY

B I C O , I N C .

3116 Valhalla Drive, Burbank, Calif.

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