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James Doyle Sell Mining Collection

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AMERICAN SMELTING AND REFINING COMPANY  
Tucson Arizona

January 21, 1959

MEMORANDUM FOR T. A. SNEDDEN

T. A. S.  
JAN 22 1959

MISSION PROJECT  
Sampling Program

Mr. Richard and I have discussed Mr. Vincent's sampling procedure, transmitted by letter of January 5 to Mr. Hall, and it occurs to us that the treatment of the 200 lb. cut entails more work than really may be necessary. Also, our present laboratory facilities are inadequate to cope with the volume of material which would have to be treated.

The running of various rejects at the check points suggested by Mr. Vincent would determine the degree of accuracy of the method; but, if the sample he proposes is larger than necessary, and more grinding than necessary is being done, these check data will not indicate it. Therefore it is recommended that at the beginning a procedure should be employed which would enable us to determine the minimum size of sample and the minimum grinding necessary to produce results of acceptable accuracy. It is suggested that this could be accomplished by starting with two 50 lb. cuts of the 400 to 600 lb. product of the automatic sampler which would be processed in parallel (see flow sheet attached) and the assay results compared. This procedure would be used to sample 3 existing ore lots ranging in assay from 1.0% Cu to 6.0% Cu.

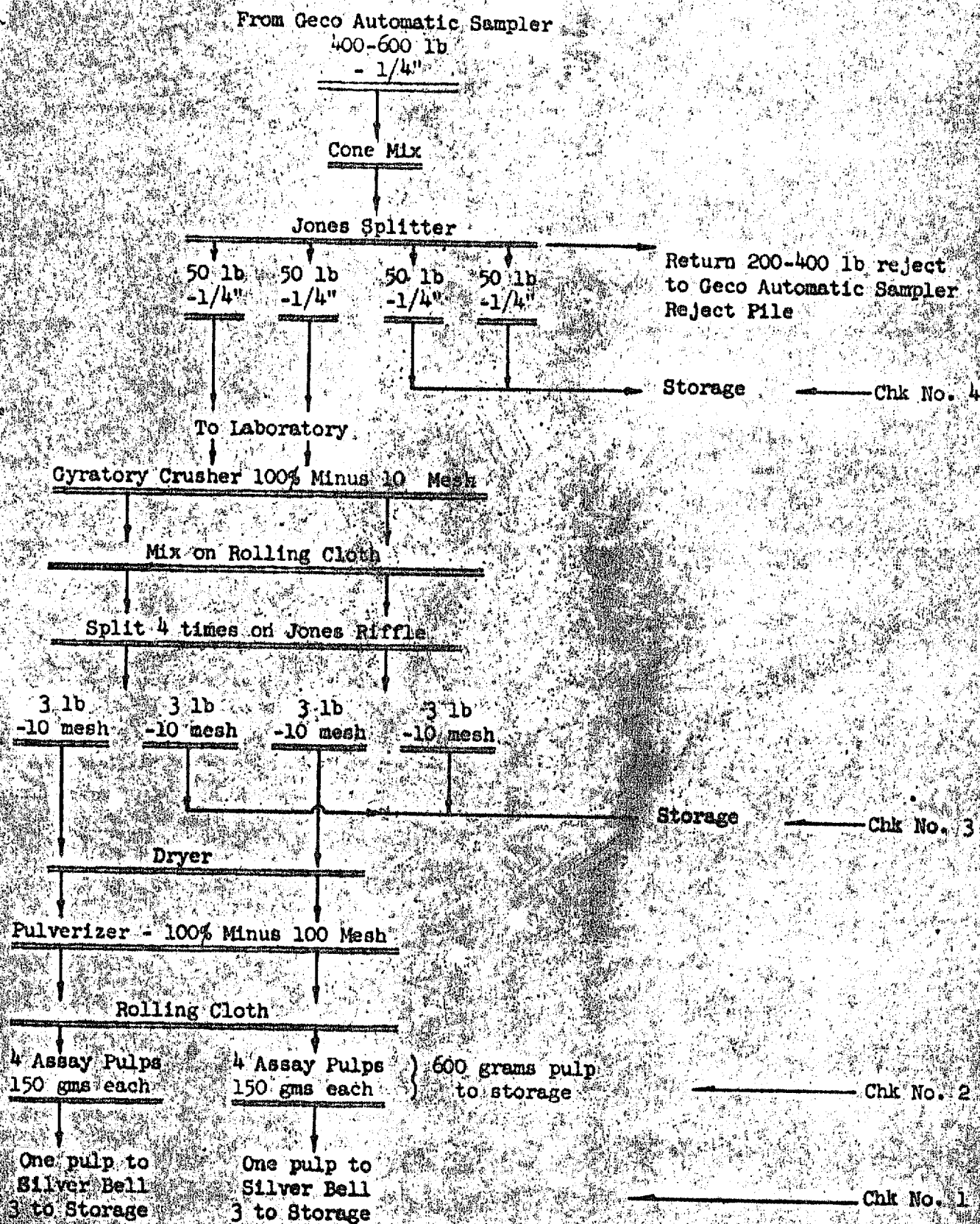
If the assays of the 50 lb. sample pairs in each of the 3 different lots vary no more than 5%, the size of the sample and its treatment should be considered satisfactory, and this procedure should then be substituted for Mr. Vincent's more refined and lengthy process. However, if a greater variance occurs, checking of rejects at various steps would be made. This checking should logically start with a check of (1) the assays by another laboratory, then progress to (2) the 600 gm pulp reject, (3) the -10 mesh storage samples, and (4) the -1/4 inch 50 lb. cuts in storage.

When the degree of accuracy of the laboratory treatment is established the accuracy of the sample plant itself may then be tested by one or more re-runs of an entire ore lot.

*J. H. Courtright*  
J. H. COURTRIGHT

Attachment: Flow Sheet  
JHC/ds  
cc: ACHall  
KRichard

**PRELIMINARY FLOW SHEET FOR EVALUATION OF SAMPLE TREATMENT  
MISSION PROJECT**



By Kenyon Richard and J. H. Courtright

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Tucson Arizona

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*J. H. Courtright*  
J. H. COURTRIGHT

Attachment: Flow Sheet  
JHC/ds  
cc: ACHall  
KRichard

PRELIMINARY FLOW SHEET FOR EVALUATION OF SAMPLE TREATMENT  
MISSION PROJECT

From Geco Automatic Sampler

400-600 lb

- 1/4"

Cone Mix

Jones Splitter

50 lb

- 1/4"

50 lb

- 1/4"

50 lb

- 1/4"

50 lb

- 1/4"

Return 200-400 lb reject  
to Geco Automatic Sampler  
Reject Pile

Storage ← Chk No. 4

To Laboratory

Gyratory Crusher 100% Minus 10 Mesh

Mix on Rolling Cloth

Split 4 times on Jones Riffle

3 lb  
-10 mesh

3 lb  
-10 mesh

3 lb  
-10 mesh

3 lb  
-10 mesh

Storage ← Chk No. 3

Dryer

Pulverizer - 100% Minus 100 Mesh

Rolling Cloth

4 Assay Pulps  
150 gms each

4 Assay Pulps  
150 gms each

600 grams pulp  
to storage ← Chk No. 2

One pulp to  
Silver Bell  
3 to storage

One pulp to  
Silver Bell  
3 to storage

← Chk No. 1

By Kenyon Richard and J. H. Courtright

WESTERN MINING DEPARTMENT  
Salt Lake City, Utah

January 3, 1959

Mr. A. C. Hall, Assistant Manager  
Southwestern Department  
American Smelting and Refining Company  
813 Valley National Building  
Tucson, Arizona

MISSION PROJECT  
SAMPLING PROGRAM

Dear Sir:

In reply to your letter of December 31, as long as there is 110 volt AC available, there is no necessity for a separate step down transformer. In a mill it is usually cheaper and more convenient to use a small 25 watt 440 volt - 110 volt single phase transformer than install separate conduit and wire to the sampler. Denning or Silver Bell probably have them.

A mixing barrel for splitting the 500 lb. sample to 250 lbs. is not essential, in our opinion, if the sample is carefully coned and mixed before taking random shovels of ore to a Jones splitter. A mixing barrel to handle a 500 lb. sample is rather cumbersome and quite expensive to make. Its sole advantage is in eliminating the human equation--which is a very important factor on very high grade products but not so critical on low grade ores crushed to all  $-1/4"$ .

We have drawn up a flow sheet for sampling, crushing, and pulverizing the 500 lb. sample and have pointed out the stages in the process where checks may be made to determine the validity of the sample at those points. The flow sheet is attached. These are the check points:

1. At a crushing rate of 3-5 tons per hour, our only real variable that will influence accuracy of sampling is the number of cuts taken. If the individual cuts show too great a variance from the true assay, then the frequency of cut must be increased. This can be determined by weighing and assaying all of the cuts and calculating the true assay on a weight basis. A tabulation of the individual assays will determine whether the individual variations are too far out from the average and true values.

We are attaching an ovalid copy of Mr. Sigmond Smith's and Bruce Irvin's paper on sampling that sets up formulas for calculating the proper frequency, feed rate, etc.

2. The whole sample lot reject can, of course, be run through the plant again at the same feed rate to cut another  $1/4"$  sample.

A.C.Hall

-2-

1/5/39

According to the formulas and sampling monograph of Pierre Gy this sample should have an accuracy of  $\pm 1\%$ .

3. The reject after splitting to 200 lbs. can be treated in a similar manner to the sample and checked.

4. The 200 lb. sample after it is crushed to 10 or 20 mesh can be mixed and split to 25 lbs. with an accuracy of  $\pm 0.7\%$  for 10 mesh and  $\pm 0.2\%$  for 20 mesh according to the formulas of Pierre Gy. Any or all of the three reject splits obtained in reducing the 200 lb. sample to 25 lbs. can be checked but the final 25 lb. reject is the most significant.

5. The 25 lbs. at 10 or 20 mesh is dried in an oven, then reduced to all -40 mesh in a McCool or other vertical disk pulverizer and then split 4 times, after mixing on a large cloth each time, to approximately 600 grams or 1.36 lbs. A significant check is the final 1.36 lb. reject. According to Pierre Gy's formulas the accuracy of this operation should be  $\pm 0.3\%$ .

6. The final 600 gram or 1-1/2 lb. sample can then be pulverized to 100-150 mesh, mixed, rolled and split into assay pulps. If the 600 gram sample is split into four 150 gram samples, they should theoretically be within  $\pm 0.15\%$ . These splits can be checked.

The final word in all of this is to take care that the mixing and splitting of the samples is done with utmost attention to correct procedure and cleanliness.

Very truly yours,

J. D. Vincent

JW:lh

cc: Education-w/attach.  
HFW:ls- "  
Richard- "

MP 83

SAMPLE PREPARATION FLOW SHEET

Feed from Universal Crushing Plant  
3-5 Tons/hr.  
-1/4" Ore

6000 Automatic Sampler

400-600 lb.\*  
-1/4" Sample

Reject\*

Trucks to stockpile

Mixing Floor

(Sample is dumped and formed into a cone and then shoveled at random into Jones splitter pans)

*prepared at crushing plant*

*Deliv. to Lab*

Jones Riffle

200 lb. Sample

200-400 lb. Reject\*

*Split to four  
50 lb samples*

Marcy Cycl Crusher

to -10 or 20 mesh (Screened and oversize closed circuited)

Mixing Floor

Sample is dumped and formed into a cone and shoveled at random into Jones splitter pans for each split

Split 3 times with a Jones Riffle

Sample 25 lbs. of  
-10 or -20 mesh ore

Reject "A" - 100 lbs.

Reject "B" - 50 lbs.

Reject "C" - 25 lbs.\*

Dryer

McCool or Vertical Disk Pulverizer

-10 Mesh (Screened and oversize returned)

Large Rolling Cloth for Mixing (then dumped into Jones Riffle Pans)

Split 4 times on a small Jones Riffle

Sample  
1.56 lbs. or  
600 grams

Reject 1-12.5 lbs.

Reject 2 - 6.25 lbs.

Reject 3 - 3.175 lbs.

Reject 4 - 1.56 lbs.\*

Braun Pulverizer

150 Mesh (Screened and oversize returned)

Rolling Cloth

4 assay pulps of 150 grams each\*

Assay Laboratories

*Split to  
1 1/2 lbs  
8 pairs assay pulps  
GB + Jacobs.*

\*Indicates points where checks can be made on accuracy of sampling operations.



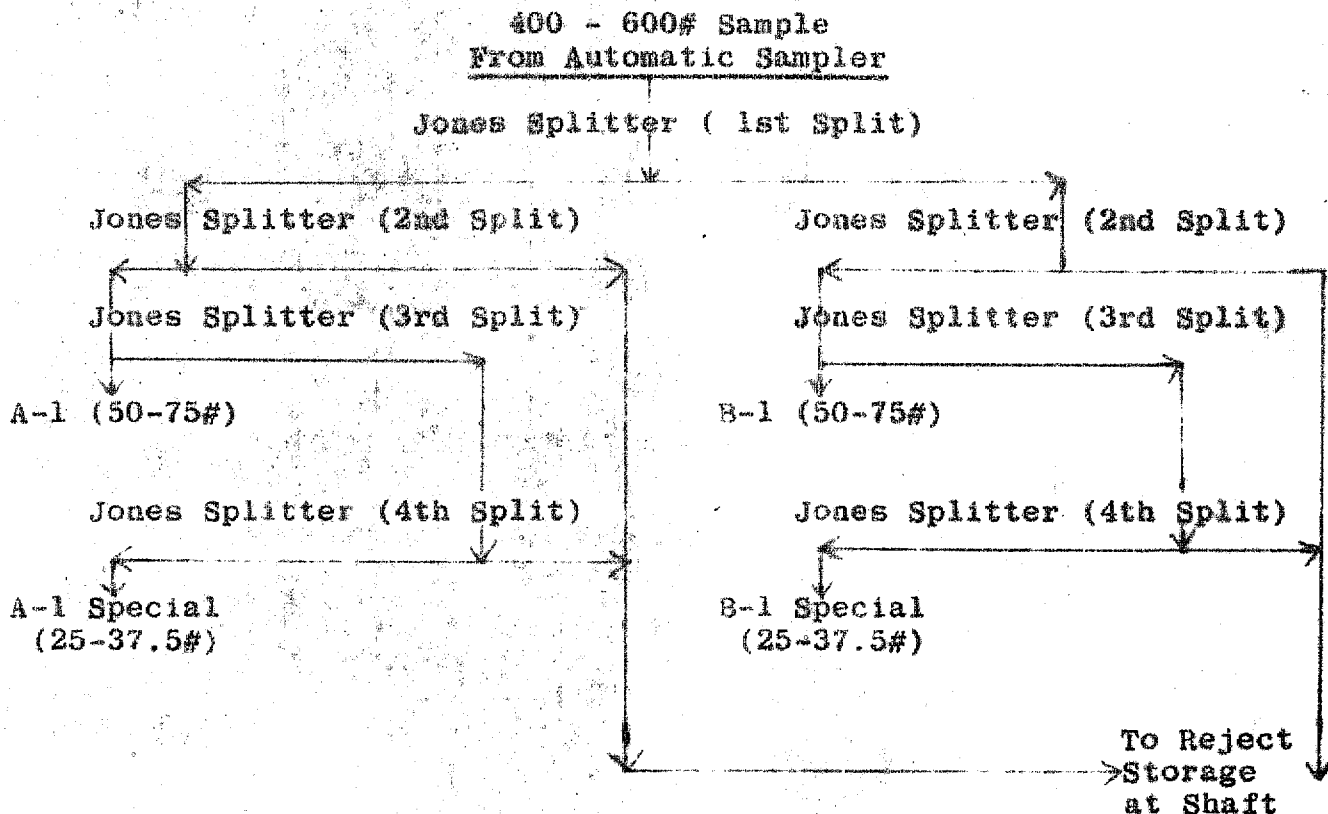
Mem to TAS from ACH May 18, 1959  
Mission Project  
Supplemental Rept. on Underg. work

The core and sludge samples from the underground drilling were processed in nearly the same manner. The average run of core weighed between 2 and 4 lbs. After being logged it all was crushed to -1/2" and split once. One half was stored and the other was reduced to -10 mesh in the gyratory crusher and split to about 500 grams by a Jones splitter. The pulps were then prepared by following the same procedures outlined for the grab and channel samples.

A sludge sample was dried and the cake broken up by mortar and pestle. The small (1 to 1-1/2 lb.) sample was then mixed by rolling it and split to about 250 grams. The reject was stored while the sample was reduced to -100 mesh in the pulverizer and sent for assay.

The bulk samples obtained from the sampling plant at the shaft site were processed in a different manner from those discussed above. The procedures for handling these samples were suggested by Mr. Courtright (memorandum for T. A. Snedden on January 21, 1959) as a substitute for the more refined and lengthy procedure recommended in Mr. Vincent's letter of January 5, 1959. Subsequent check samples of three test lots proved a 35 to 50 lb. cut from the 400-600 lb. product of the automatic sampler would be within the required accuracy.

The test lot samples were obtained by running the much piles from three drift rounds through the bulk sampling plant. The 400 to 600 lb. sample cut out by the automatic sampler was then reduced by a Jones splitter at the shaft site. The following diagram shows how the A-1, A-1 Special, B-1 and B-1 Special samples were split out:



The A-1, A-1 Special, B-1 and B-1 Special samples were then sent to the laboratory in 5-gallon milk cans and processed for assaying.

The following table compares assays obtained from the test lot samples and includes assays of the grab samples from the drift rounds:

Test Lot Number	A S S A Y S				
	Grab Sample	A-1 Sample (50-75#)	A-1 Special (25-37.5#)	B-1 Sample (50-75#)	B-1 Special (25-37.5#)
94-D	0.94	1.08	1.10	1.09	1.11
165-D	6.78	5.35	5.52	5.31	5.43
193-D	2.19	2.87	2.96	2.89	2.93

The four samples representing the various splits from the three test lots all were within very close correspondence, and the amount of A-1 special sample was considered to be sufficiently representative for the purposes of the raise bulk sampling program. The procedures used at the laboratory for preparing the above and other samples from the bulk sampling plant are described below.

The sample was first weighed, dried 16-24 hours at 230° F, weighed again, and screened for + and -10 mesh. The +10 mesh was reduced to -10 mesh in the gyratory crusher and recombined with the other -10 mesh material. The sample was then thoroughly mixed on a rolling cloth and split down to two 3 lb. (approximately) portions by a Jones splitter (split four times). One 3 lb. portion was placed in storage while the other was reduced to -100 mesh in the pulverizer. This 3 lb. -100 mesh sample was then mixed, coned and reduced by a spatula to 150 grams. The 150 gram pulp was sent for assay, while the reject was placed in storage.

As a check on the accuracy of the bulk sampling plant itself, one sample (R8SP Repeat A1, from Raise 4350-1250W, interval 17.7 to 21.5') was run back through the plant. The two runs assayed 3.96 and 3.97% Cu, a flat check.

A total of 73 samples have been run to check (a) the accuracy of sample preparation and (b) the assaying of underground samples. These check samples compared duplicate pulps and new pulps from crushed reject samples with the original pulp assays. The check assays were high in 28 cases with an average difference of 0.035% Cu; low in 37 cases with an average difference of 0.064% Cu; and the same in 8 cases. The total average difference in the 73 assays is 0.019% Cu.

The following is a tabulation of the check assays, included here as a matter of record:

WESTERN MINING DEPARTMENT  
Salt Lake City, Utah

January 5, 1959

Mr. A. C. Hall, Assistant Manager  
Southwestern Department  
American Smelting and Refining Company  
813 Valley National Building  
Tucson, Arizona

MISSION PROJECT  
SAMPLING PROGRAM

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2. The whole sample lot reject can, of course, be run through the plant again at the same feed rate to cut another 1/4" sample.

1/5/59

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JDV:lh

cc: TASnedden-w/attach.  
DRPurvis- "  
KRichard- "

MP 83