CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
520-770-3500
http://www.azgs.az.gov
inquiries@azgs.az.gov

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James Doyle Sell Mining Collection

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JHC

W.E.S.
MAR 17 1969

ASARCO

AMERICAN SMELTING AND REFINING COMPANY
SOUTHWESTERN EXPLORATION DEPARTMENT
P.O. BOX 5795, TUCSON, ARIZONA 85703

J. H. COURTRIGHT
CHIEF GEOLOGIST
L. P. ENTWISTLE
ASSISTANT CHIEF GEOLOGIST
W. E. SAEGART
ASSISTANT CHIEF GEOLOGIST

1150 NORTH 7TH AVENUE
TELEPHONE 602-792-3010

March 12, 1969

Mr. W.T. Hollis,
Manager Mining Division
El Paso Natural Gas Company
El Paso, Texas 79999

Dear Mr. Hollis:

Referring to your letter of March 3, 1969, please find enclosed (1) a copy of the Lakeshore metallurgical report on oxide copper ore, and (2) a map showing the gravity contours.

All other data accumulated, along with interpretations thereof (geologic and drill hole plans, sections, ore estimates, etc.) are contained in our report of January 2, 1969, three copies of which were sent to the El Paso Natural Gas Company.

No geophysical surveys other than gravity were conducted at Lakeshore.

Yours very truly,

J.H. Courtright

J.H. Courtright

JHC:lzb
Encl.

cc: JJCollins
TASnedden
WGBossard
WESaegart (route file copy)

Please copy for RFW

2/7/69 LZB

February 5, 1969
Re: 603

Mr. G. W. Bossard, Milling Engineer
ASARCO - U.S. Mining Dept.
P.O. Box 5795
Tucson, Arizona 85703

J.H.C.

FEB 7 1969

Lakeshore Project

Following up my letter of January 23, I want to pass along to you the complete results of our chemical analysis of the two Lakeshore copper concentrates samples:

	Sample SE-7525	Sample SE-7526
Total Cu	25.7%	25.7%
Pb	0.40	0.40
Zn	0.56	0.55
Fe	25.4	25.4
S	28.0	27.8
As	0.05	0.05
Sb	0.01	0.01
Bi	0.008	0.006
Ni	<0.01	<0.01
Se	0.013	0.012
Te	0.0021	0.0018
Ag	0.008(%)	0.008(%)
Mo	0.17	0.17
SiO_2	10.3	10.1
CaO	1.7	1.3
MgO	3.6	3.8
Al_2O_3	1.06	1.02

ERM:ejs

E. R. Marble, Jr.

CC - JHCourtright, BJDiSanto, KDLoughridge, RMMcGeorge, RBMeen, CENelson, JSSmart, Jr., TASnedden

J. H. C.

JAN 28 1969

January 23, 1969
Re: 603

Mr. G. W. Bossard, Milling Engineer
ASARCO - U.S. Mining Dept.
P.O. Box 5795
Tucson, Arizona 85703

Lakeshore Project

We received two samples of Lakeshore copper concentrates from the Galigher Co. in Salt Lake City, as your letter of January 10 mentioned you had arranged to have done. Many of the chemical analyses on these small samples have now been completed, and the quantitative spectrographic analyses are completed:

Chemical Analyses

	Sample SE-7525	Sample SE-7526
Total Cu	25.7%	25.7%
Pb	0.40	0.40
Zn	0.56	0.55
Fe	25.4	25.4
S	28.0	27.8
SiO_2	10.3	10.1
Al_2O_3	1.06	1.02
CaO	1.7	1.3
MgO	3.6	3.8

Spectrographic Analyses

	Sample SE-7525	Sample SE-7526
Cu	Major const.	Major Const.
Fe	"	"
Si	10% ±	10% ±
Mg	3% ±	3% ±
Al	1% ±	1% ±
Pb	0.5% ±	0.5% ±
Zn	0.5% ±	0.5% ±
Mn	0.05% ±	0.05% ±
As	0.01% ±	0.01% ±
Ca	1.0% ±	1.0% ±

Cont'd.

Spectrographic Analyses, Cont'd

	Sample SE-7525	Sample SE-7526
Sn	0.001% ±	0.001% ±
Bi	0.001% ±	0.001% ±
Ag	0.01% ±	0.01% ±
Ni	0.001% ±	0.001% ±
Co	0.002% ±	0.002% ±
Cr	0.0005% ±	0.0005% ±
Ba	0.05% ±	0.05% ±
Sr	0.01% ±	0.01% ±

Not detected spectrographically were: Cd, Te, Au, B, P, Hg, Sb, Pt, Tl, W, Ge, In, Mo, V, Ti.

We also ran these samples on our Satmagan unit for Fe_3O_4 content: SE-7525 - 0.87% Fe_3O_4, SE-7526 - 0.88% Fe_3O_4.

As soon as the additional chemical analyses are available, they will be forwarded.

E. R. Marble, Jr.

ERM:ejs

CC - BJDiSanto
JHCourtright
KDLoughridge
RMMcGeorge
RBMeen
CENelson
JSSmart,Jr.
TASnedden

AMERICAN SMELTING AND REFINING COMPANY
SOUTHWESTERN EXPLORATION DEPARTMENT
P. O. BOX 5795, TUCSON, ARIZONA 85703

J. H. COURTRIGHT
CHIEF GEOLOGIST
L. P. ENTWISTLE
ASSISTANT CHIEF GEOLOGIST
W. E. SAEGART
ASSISTANT CHIEF GEOLOGIST

1150 NORTH 7TH AVENUE
TELEPHONE 602-792-3010

J. H. C.
JAN 22 1969

January 17, 1969

REGISTERED MAIL
RETURN RECEIPT REQUESTED

Mr. John Reynolds
El Paso Natural Gas Co.
Mining Division
Box 1492
El Paso, Texas

Dear Mr. Reynolds:

In response to your request, I am transmitting herewith two copies each of J. H. Courtright and J. E. A. MacDonald reports which were incorporated in the Asarco Lakeshore Proposal. Please feel free to call again if we can be of any further assistance.

Very truly yours,

W. E. Saegart

W. E. Saegart

WES:lab
cc: RLHennebach
CENelson
TASnedden
JJCollins
JHCourtright
RBMeen

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 16, 1969

J. H. C

JAN 1 6 1969

File Memorandum

Gallgher is forwarding to Central Research Laboratories (c/o E. R. Marble) two 50 gm samples of final copper concentrate from closed-cycle flotation testing of a catch-all composite from Lakeshore. This composite is composed of material from Composites A (DDH-53), B (DDH-55) and C (DDH-41 and DDH-53). The copper assay of the composite is 0.83 percent.

G. W. Bossard
mg

G. W. BOSSARD

GWB/mg
cc: TASnedden
RBMaen
JHCourtright

Misc 15C

MR. W.E.S.
READ AND RETURN
PREPARE ANSWERS ___ HANDLE
FILE ✓ INITIALS

J. H. C.
JAN 17 1969

January 15, 1969

W.E.S.
JAN 17 1969

Mr. Carl E. Williams
Tucson, Arizona.

LAKESHORE, ARIZONA

Dear Carl:

I am glad to acknowledge receipt of your computer output of the statistical analysis of Mr. Courtright's tabulation of the ore reserve blocks for the four ore zones in the Lakeshore deposit.

I note that the oxide zone in its present degree of drilling has a confidence interval ranging from 0.68% to 1.07% copper at the 95% confidence level and that the figure for the mixed sulphide-oxide zone is very similar, being 0.68% to 1.15% copper.

These are wide ranges and reinforce the recommendation that the ore deposit be drilled more intensively.

Many thanks for turning out these calculations.

With best wishes,

Sincerely yours,

John J. Collins

cc: TASnedden
RBMeen
JHCourtright ✓

J. H. C.

JAN 15 1969

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 15, 1969

Mr. J. H. Courtright
Building

Lakeshore Project - Leaching

Dear Sir:

I am enclosing a single copy of the leach test results for Lakeshore drill hole 59-A as received from Mr. Allen of Metcon Laboratory. The acid consumption for this hole is 105 lbs/ton (weighted average) and the weighted copper recovery is 80.4 percent from an average feed assay of 1.49 percent copper (weighted). The equivalent acid consumption is 4.4 pounds acid per pound copper recovered.

Yours truly,

G. W. Bossard

G. W. BOSSARD
Milling Engineer

GWB/mg
encl.
cc: TASnedden - w/encl.
RBMeen - w/ "

Note — Sample is essentially all andesite, according to our logs.

JHC

EL PASO LEACH TEST RESULTS

Hole #P-59-A

INTERCEPTS	% Wt	COPPER TOTAL	COPPER N. S.	%	% RECOVERY		ACCOUNT-ABILITY	Lbs. Cu RECOV.	ACID PER * Lb. COPPER
342-385	10.5	0.77	809 0.61	10.5	73.60	773	88.87	11.33	6.20
385-437	12.7	0.82	104/ 0.63	12.7	59.29	753	86.37	9.72	7.48
437-482	11.0	1.80	1980 1.68	11.0	83.67	920	95.60	30.12	3.91
482-517	8.6	1.56	1342 1.36	8.6	81.88	704	93.93	25.55	4.32
517-555	9.3	2.00	1860 1.84	9.3	87.71	816	94.62	35.08	3.73
555-600	11.0	1.02	1122 0.90	11.0	79.08	869	99.23	16.12	4.98
600-650	12.2	2.64	322/2.48	12.2	92.29	1126	96.85	48.73	2.73
650-703	13.0	1.78	2314 1.67	13.0	85.72	1114	98.30	30.52	4.19
703-750	11.5	1.04	1196 0.92	11.5	83.51	960	101.30	17.37	5.92
			1.49% Cu				80.4%		

Intercepts	#/ton Acid	Interval	% wt	Factor
342 - 385	70.2	43'	10.5	737 ~~452~~
385 - 437	72.7	52'	12.7	923 ~~660~~
437 - 482	117.8	45'	11.0	1296 ~~495~~
482 - 517	100.4	35'	8.6	949
517 - 555	130.8	38'	9.3	1216
555 - 600	80.3	45'	11.0	883
600 - 650	133.0	50'	12.2	1623
650 - 703	127.9	53'	13.0	1663
703 - 750	102.8	47'	11.5	1182
		408'	99.8	105 # Acid Average

APPENDIX IV

DRILL HOLE
P-59-A

T A I L I N G

ACID CONS	Wt.	ASSAY T Cu	ASSAY N.S.	RE-COVERY	Lb Cu EXT.	ACID /Lb Cu	ACCOUNT-ABILITY	Drill Hole P-59-A INTERCEPTS	Hd. ASSA T Cu	Hd. ASSA N.S
28	194.1	0.19	0.11	73.60	11.33	6.20	88.87	(342-385)	0.77	0.6
29	192.2	0.30	0.22	59.29	9.72	7.48	86.37	(385-437)	0.82	0.6
47	187.3	0.30	0.21	83.67	30.12	3.91	95.60	(437-482)	1.80	1.6
44	189.6	0.28	0.16	81.88	25.55	4.32	93.93	(482-517)	1.56	1.3
52	186.0	0.25	0.18	87.71	35.08	3.73	94.62	(517-555)	2.00	1.8
32	192.9	0.22	0.15	79.03	16.12	4.98	99.23	(555-600)	1.02	0.9
53	187.7	0.21	0.14	92.29	48.73	2.73	96.85	(600-650)	2.64	2.4
51	192.2	0.26	0.22	85.72	30.52	4.19	98.30	(650-703)	1.78	1.6
41	193.0	0.18	0.13	83.51	17.37	5.92	101.30	(703-750)	1.04	0.9

APPENDIX IV (A)

24 HOURS

pH	ADDED ACID	Cu ASSAY g/l
2.1	15	0.78
2.2	15	0.62
3.1	24	1.60
2.8	18	1.50
3.2	24	1.60
2.3	15	1.22
3.3	22	2.28
3.0	21	1.66
2.4	18	1.08

48 HOURS

pH	ADDED ACID	Cu ASSAY g/l
1.7	7	0.90
1.7	7	0.72
1.9	13	1.72
2.0	14	2.28
2.0	15	2.80
1.7	7	1.66
2.3	17	4.00
1.9	14	2.52
1.8	11	1.42

	72 HOURS	
pH	ADDED ACID	Cu ASSAY g/l
1.5	3	0.96
1.5	4	0.76
1.6	5	2.84
1.7	9	2.32
1.7	8	3.16
1.6	6	1.60
1.7	10	4.56
1.7	9	2.80
1.6	7	1.60

96 HOURS

pH	ADDED ACID	Cu ASSAY g/l
1.5	3	1.00
1.5	3	0.84
1.55	5	2.88
1.5	3	2.40
1.55	5	3.32
1.5	4	1.60
1.5	4	4.72
1.6	7	3.00
1.55	5	1.76

Aa-16A.22.15
J.H.C.

JAN 15 1969

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 14, 1969

MR. WES
READ AND RETURN
PREPARE ANSWERS HANDLE
FILE INITIALS

W.E.S.
JAN 22 1969

Mr. J. H. Courtright
Building

Lakeshore Project Leaching

Dear Sir:

As a matter of interest I have tabulated the leach test results from Lakeshore Project samples, of test work undertaken by El Paso Natural Gas (Metcon, Canadian Exploration Limited and Hawley and Hawley), Bear Creek, Placer Development (Canadian Exploration Limited), American Metals-Climax (Hawley and Hawley) and Asarco. It is impossible to make a direct comparison between results obtained by Asarco and the other competing companies since the origin and treatment of samples was not standardized, but several points are interesting.

Copper Recovery - If we neglect the manner in which the samples were prepared and the laboratory process used, the following tabulation can be made (+ 0.4 percent cut-off only):

Company	Number of Samples	Average Copper Assay	Copper Recovery
Bear Creek	7	0.80	73
Asarco	11	0.79	72
American Metals-Climax	4	0.83	61
El Paso Natural Gas	17	0.82	59
Placer Development	2	0.71	59
Average (Weighted)	41	0.80	65

Total recoveries range from a low of 59 percent (EPNG and Placer Development) to a high of 73 percent (Bear Creek). It is interesting to note that the highest recoveries (73 and 72 percent) were obtained by Kennecott and Asarco, both of which have precipitation plant operations and have done considerable leaching test work. This merely strengthens my point that laboratory leach procedures can influence the test results, and experience in this type of test work is very important in attempting to evaluate a property like Lakeshore.

Acid Consumption - A similar comparison as above can be made with acid consumption.

Company	Number of Samples	Acid Consumption Pounds Per Ton
Bear Creek	7	83
Asarco	11	124
American Metals-Climax	4	63
El Paso Natural Gas	17	84
Placer Development	2	39
Average (Weighted)	41	94

Later Asarco test results have indicated that the acid consumption with the same samples listed above should be less than 80 pounds per ton. If we use the lower figure (80 lb) for Asarco in the above calculation then the average consumption figure decreases to 83 pounds per ton.

Yours truly,

G. W. Bossard

G. W. BOSSARD
Milling Engineer

GWB/mg
cc: TASnedden
RBMeen

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona
January 7, 1969

FILE MEMORANDUM

LAKESHORE LEACH TEST WORK

Listed below are the final solution assays for the six 72-hour leach tests run on the Lakeshore composites.

Test No.	Composite	Sulfuric Acid Strength	Assays GPL Cu	Total Fe	Fe +++	Al_2O_3
LS 30	A	10 gpl	1.24	1.1	0	5.2
31	A	20 gpl	1.46	2.2	0	3.1
32	B	10 gpl	2.98	.65	.21	7.6
33	B	20 gpl	3.05	1.0	.42	3.4
34	C	10 gpl	3.32	1.0	0.1	4.9
35	C	20 gpl	3.70	1.8	0.3	6.4

D. E. Crowell (c.w.s)
D. E. CROWELL

DEC:js

Misc - 15C

J.H.C.
JAN 6 1969

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 6, 1969

MEMORANDUM

LAKESHORE

Subject: +0.40 Cu Ox zone (46 holes investigated)

6 had no + .4 Cu (8,36,41,46,50,60)

9 were 100% rotary thru ox zone

15 were 100 % cored thru ox zone

16 mixed rotary & core

Total footage + .4 Cu ox zone = 11,772 - 100 %

Total footage rotary = 6,329 - .54 %

Total footage cored = 5,443 - .46 %

of mixed rotary - core intercepts (16 holes)

rotary footage = 3683 = .67%

core footage $= \frac{1790}{5473} = \frac{.33\%}{100\%}$

Note: From hole No. P-63 on, coring commenced at first sign of Cu values.

R.D. Karvinen

RDK:lzb

El Paso Natural Gas Company

J. H. C.
JAN 8 1969

El Paso, Texas 79999
January 6, 1969

Mr. J. H. Courtright
Chief Geologist
Southwestern Exploration Dept.
American Smelting & Refining Company
1150 North 7th Avenue
Tucson, Arizona

Dear Mr. Courtright:

We are enclosing some data on our recently completed hole P-59A which I am sure you will find to be of interest.

Very truly yours,

John R. Reynolds
Supt. of Exploration
Mining Division

JRR:mp
Enclosure

Hole P-59A was collared approximately 10 feet NW of hole P-59. It was cored through the 710 foot interval that was drilled with a rotary drill in P-59. A comparison of the assay results from these two holes follows:

P-59				P-59A			
Interval	Thickness	Type of Sample	%Cu	Interval	Thickness	Type of Sample	%Cu
340 - 710	370	Rotary	0.82	342 - 708	366	Core	1.45
710 - 810	100	Core	1.56	708 - 810	102	Core	1.25

Acid leach tests are currently being run in Tucson by Metcon on split core sampled from P-59A. The head samples for the tests assayed as follows:

P-59A	Interval	Total Copper	Acid Sol. Copper
	342 - 385	.77	.61
	385 - 437	.82	.63
	437 - 482	1.80	1.68
	482 - 517	1.56	1.36
	517 - 555	2.00	1.84
	555 - 600	1.02	.90
	600 - 650	2.64	2.48
	650 - 703	1.78	1.67
	703 - 750	1.04	.92

1/6/69

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. H. C.
JAN 4 1969

January 3, 1969

MEMORANDUM

LAKESHORE

Supergene enrichment.

Of 47 holes investigated, 13 exhibited zones of possible supergene enrichment. Following is a tabulation of these drill holes:

Hole No.	% Cu Ox zone	% Cu (mix zone)	Thickness
4	.34	.55	57'
10	.30	.68	16'
27	.46	.51	24'
29	.31	.55	65'
30	.37	.59	30'
40	.56	.81	25'
45	.56	.69	139'
46	.33	.63	40'
47	.44	.64	57'
57	.49	.56	60'
64	1.33	1.85	60'
69	1.13	1.32	145'
73	.80	2.09	(+)111'

A probable insufficiency of pyrite and poor water table conditions preclude a zone of supergene enrichment east of the north-south fault. Hole 73 is west of this fault and may represent a zone warranting extensive exploration.

R.D. Karvinen

RDK:lzb

EL PASO LAKESHORE PROPERTY
SPECIAL REPORT
ON
HOLE 59 A (CORE)

For Clients

of

CompuTech Research Ltd.

January 1969

Because rotary drilling could produce biased assay results in the oxide zone, El Paso Natural Gas decided to drill a core hole on about a 10 foot off-set to hole P -59. In summary, the results were as follows:

Type of Drilling	Elevation Interval	Average Grade
Core (59A)	1450 - 1080	1.448
Rotary 59	1450 - 1080	0.814
Core (50A)	1080 - 970	1.316
Core (59)	1080 - 970	1.578

DISCUSSION OF RESULTS

The comparison of holes 59 and 59A for 10 foot composites are shown in table 1. Notice that little correlation exists between each 10-foot interval and that the core assays are significantly higher than the rotary assays.

Figure 1 presents a plot of the rotary vs. core comparison and a computed second degree equation.

Figure 2 presents the larger scale plot of Figure 1.

Figure 3 presents the core-rotary plots on reversed axes.

Figures 4 and 5 present the second and third degree equation plots for the core vs. core comparison, pointing out little correlation exists.

CONCLUSIONS

1. There are to few samples in the core of 59 and 59A to compare the results with any certainty. That is to say that there exists an expected amount of variability between core 59 and core 59A. Statistically, the samples could be from the same population. Therefore, more testing must be done before any conclusive decisions can be made concerning reliability of certain drilling -- as 59.

2. The core-rotary comparisons point out a difference between the core and rotary assays. These results indicate that the rotary drilling underestimates the oxide grade significantly. However, about 5 - 15 core holes must be drilled in the oxide zone to produce enough data for a reliable correction graph (like figure 1) to be computed.

TABLE 1.

COMPARISON OF LAKE SHORE ROTARY AND CORE SAMPLES, JAN. 3, 1969.

	X	Y	Z	AI	59A CORE	59 ROTARY
1059	52104.0	51181.9	1440.0	7.0	0.433	.225
1059	52104.0	51181.9	1430.0	10.0	0.826	.306
1059	52104.0	51181.9	1420.0	10.0	0.890	.367
1059	52104.0	51181.9	1410.0	10.0	0.695	.323
1059	52104.0	51181.9	1400.0	10.0	0.737	.311
1059	52104.0	51181.9	1390.0	10.0	0.739	.376
1059	52104.0	51181.9	1380.0	10.0	0.851	.730
1059	52104.0	51181.9	1370.0	10.0	0.845	.636
1059	52104.0	51181.9	1360.0	10.0	0.674	.564
1059	52104.0	51181.9	1350.0	10.0	1.044	.494
1059	52104.0	51181.9	1340.0	10.0	1.621	.499
1059	52104.0	51181.9	1330.0	10.0	1.078	.651
1059	52104.0	51181.9	1320.0	10.0	2.077	.688
1059	52104.0	51181.9	1310.0	10.0	2.325	.870
1059	52104.0	51181.9	1300.0	10.0	1.776	.918
1059	52104.0	51181.9	1290.0	10.0	1.310	1.034
1059	52104.0	51181.9	1280.0	10.0	1.381	.889
1059	52104.0	51181.9	1270.0	10.0	2.326	.918
1059	52104.0	51181.9	1260.0	10.0	2.575	.986
1059	52104.0	51181.9	1250.0	10.0	1.189	.876
1059	52104.0	51181.9	1240.0	10.0	1.152	.690
1059	52104.0	51181.9	1230.0	10.0	0.969	.765
1059	52104.0	51181.9	1220.0	10.0	0.975	.723
1059	52104.0	51181.9	1210.0	10.0	0.987	.929
1059	52104.0	51181.9	1200.0	10.0	0.935	.949
1059	52104.0	51181.9	1190.0	10.0	1.018	.864
1059	52104.0	51181.9	1180.0	10.0	1.583	.765
1059	52104.0	51181.9	1170.0	10.0	2.455	.893
1059	52104.0	51181.9	1160.0	10.0	2.307	.729
1059	52104.0	51181.9	1150.0	10.0	4.420	.806
1059	52104.0	51181.9	1140.0	10.0	1.697	1.153
1059	52104.0	51181.9	1130.0	10.0	1.412	1.218
1059	52104.0	51181.9	1120.0	10.0	1.759	1.153
1059	52104.0	51181.9	1110.0	10.0	1.903	1.140
1059	52104.0	51181.9	1100.0	10.0	1.540	1.408
1059	52104.0	51181.9	1090.0	10.0	1.605	1.726
1059	52104.0	51181.9	1080.0	10.0	1.455	1.567

AVERAGES

59A	59
1.448	0.814

	X	Y	Z	AI	59A CORE	59 CORE
1059	52104.0	51181.9	1070.0	10.0	1.615	1.626
1059	52104.0	51181.9	1060.0	10.0	1.104	2.192
1059	52104.0	51181.9	1050.0	10.0	0.594	1.458
1059	52104.0	51181.9	1040.0	10.0	0.744	1.765
1059	52104.0	51181.9	1030.0	10.0	0.444	1.399
1059	52104.0	51181.9	1020.0	10.0	0.531	1.479
1059	52104.0	51181.9	1010.0	10.0	2.351	1.199
1059	52104.0	51181.9	1000.0	10.0	1.941	1.360
1059	52104.0	51181.9	990.0	10.0	1.646	1.422
1059	52104.0	51181.9	980.0	10.0	1.840	1.693
1059	52104.0	51181.9	970.0	0.9	1.670	1.766

AVERAGES

59A	59
1.316	1.578

FIGURE 1.

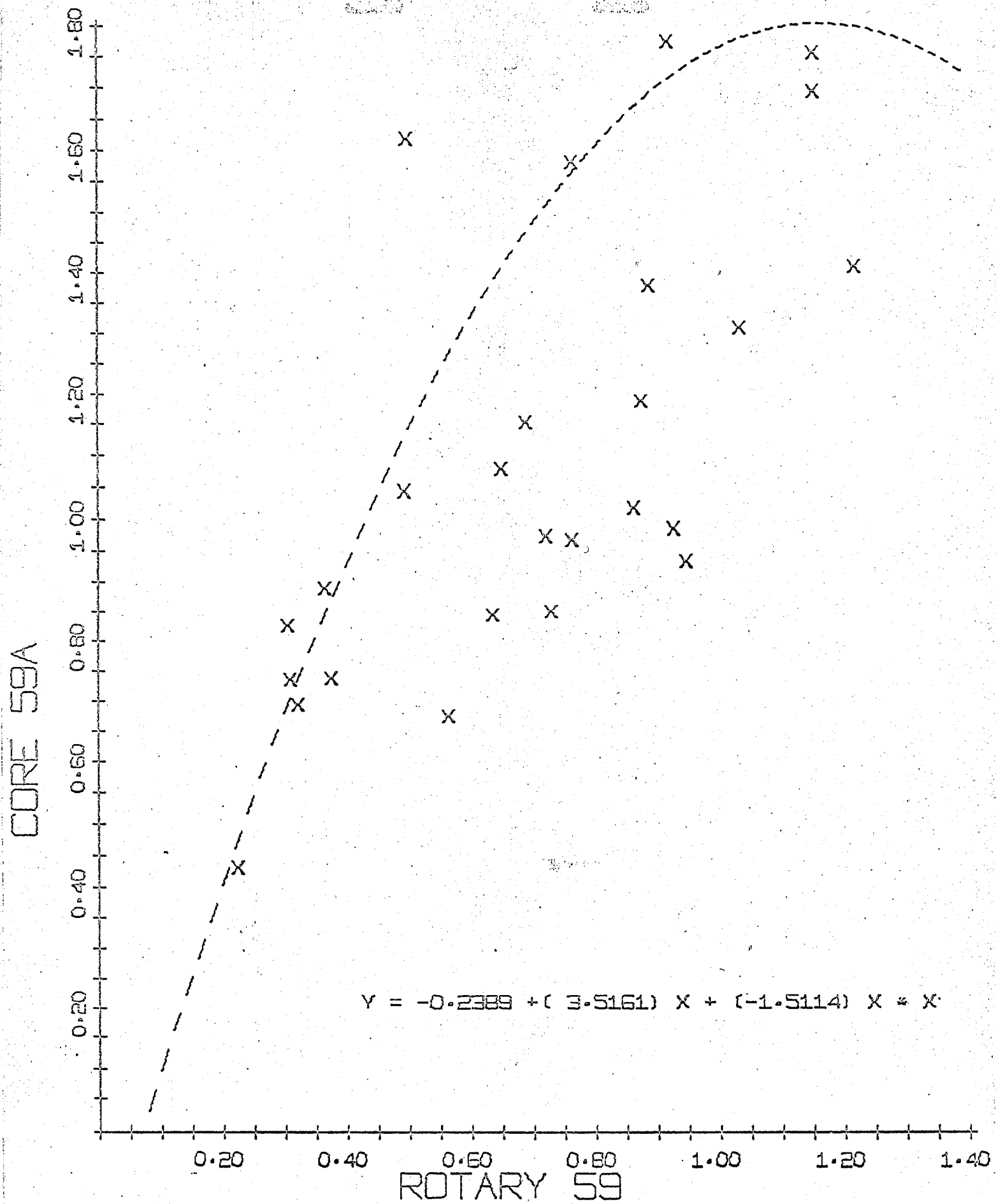

CORE 59A
ROTARY 59
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
Y = -0.2389 +(3.5161) X + (-1.5114) X * X

FIGURE 2.

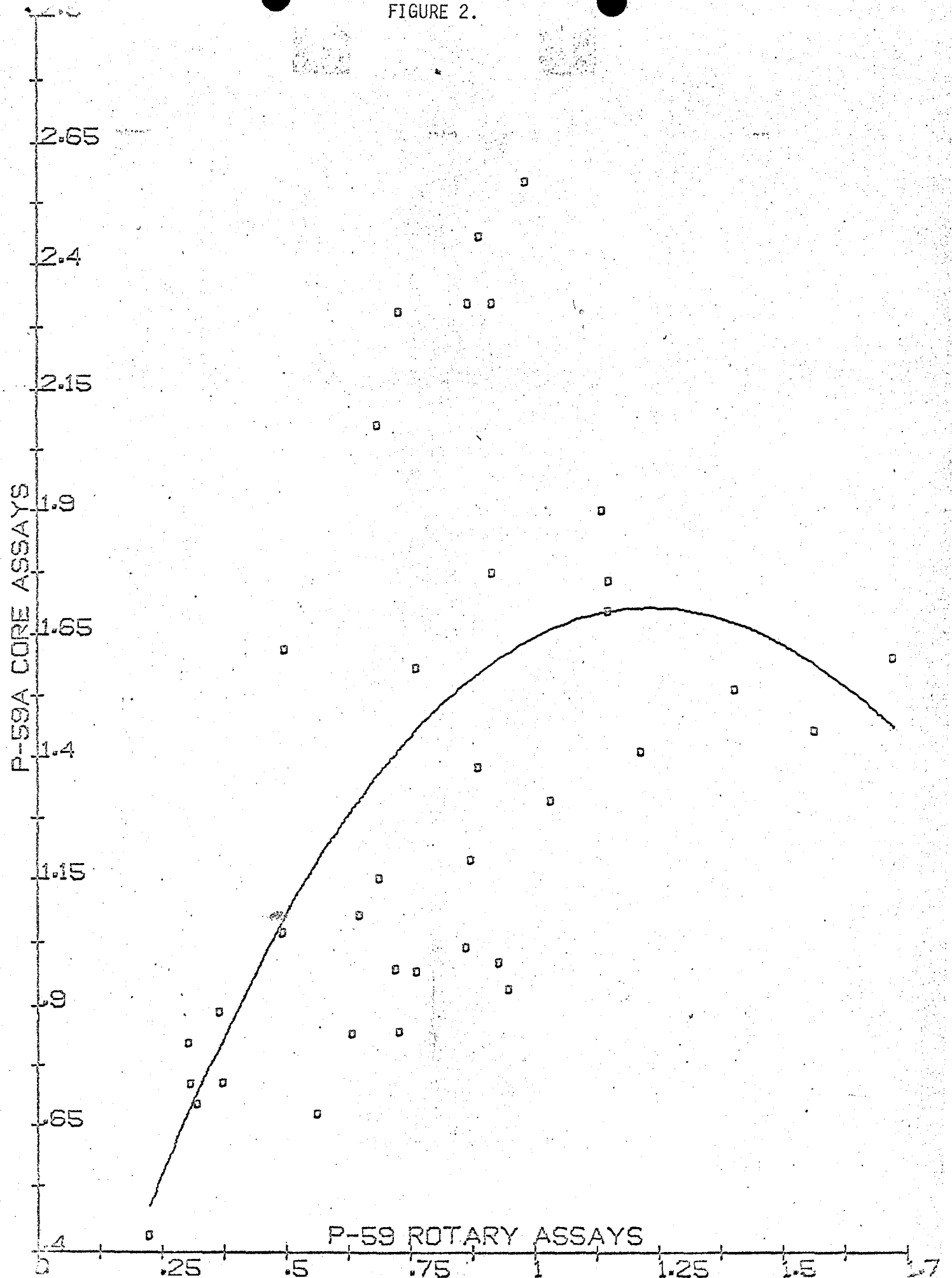

2.65
2.4
2.15
1.9
1.65
1.4
1.15
.9
.65
.4
P-59A CORE ASSAYS
0
.25
.5
.75
1
1.25
1.5
1.7
P-59 ROTARY ASSAYS

FIGURE 3.

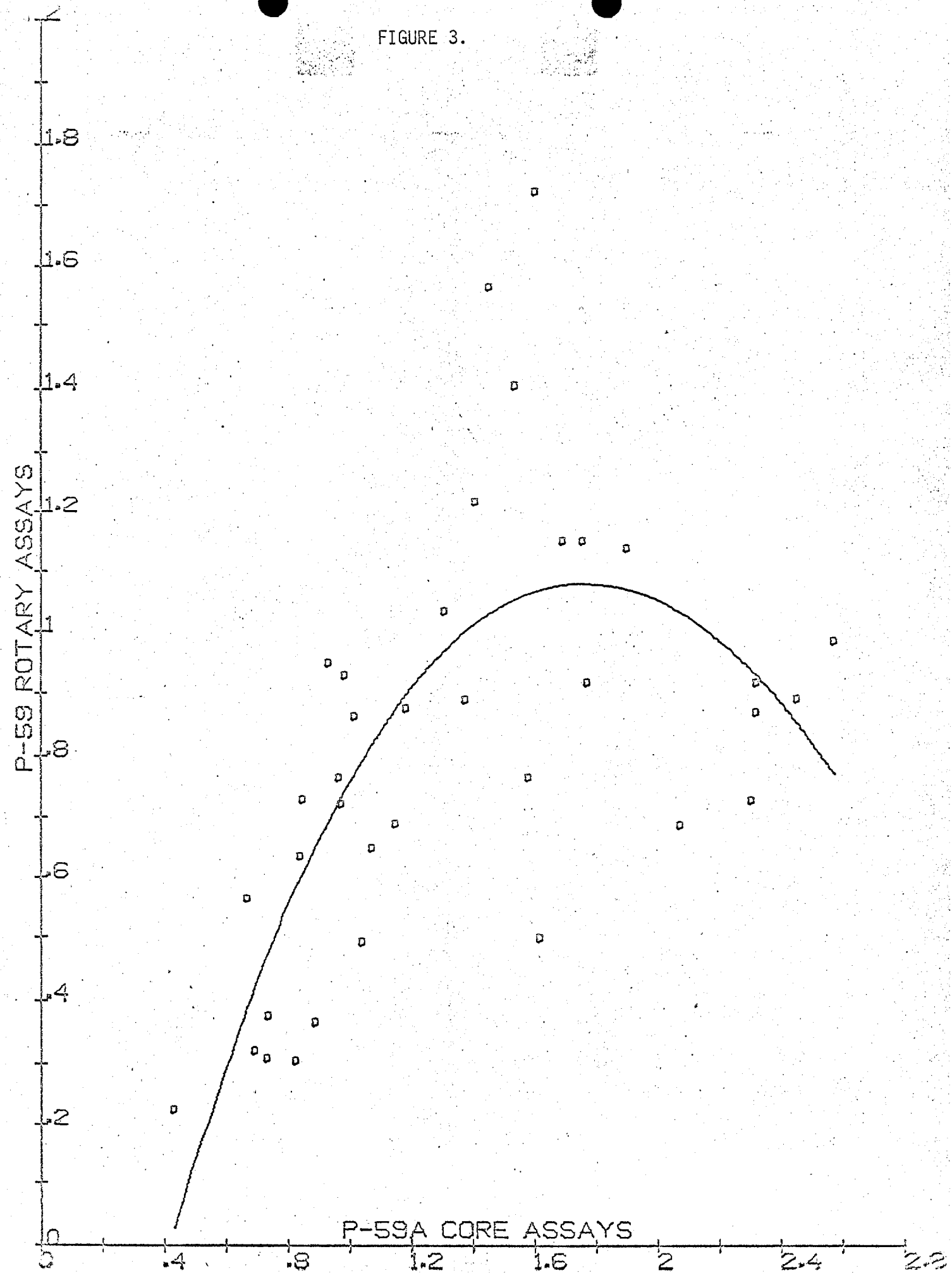

P-59 ROTARY ASSAYS
P-59A CORE ASSAYS
0
.2
.4
.6
.8
1
1.2
1.4
1.6
1.8
0
.4
.8
1.2
1.6
2
2.4

FIGURE 4.

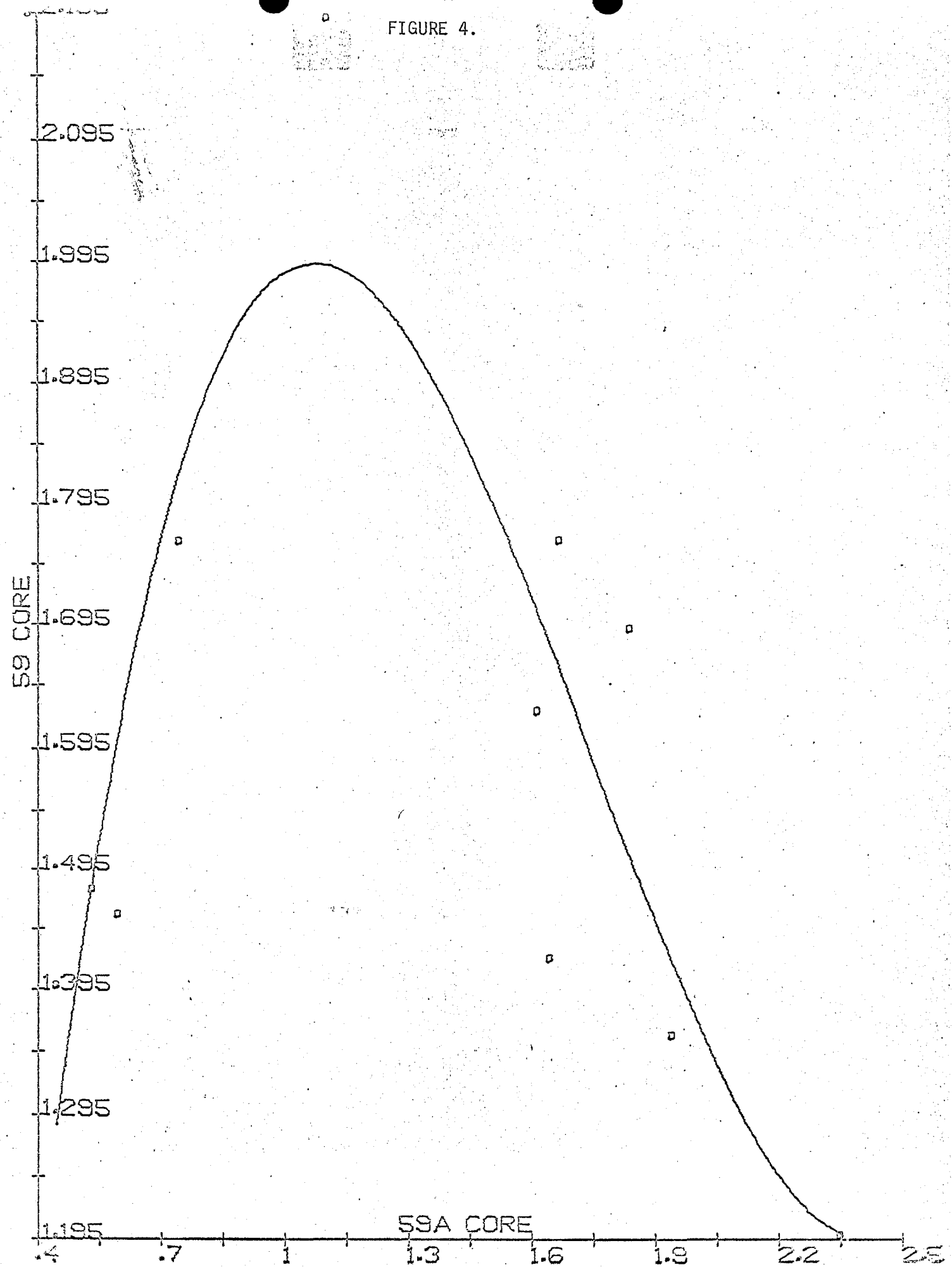
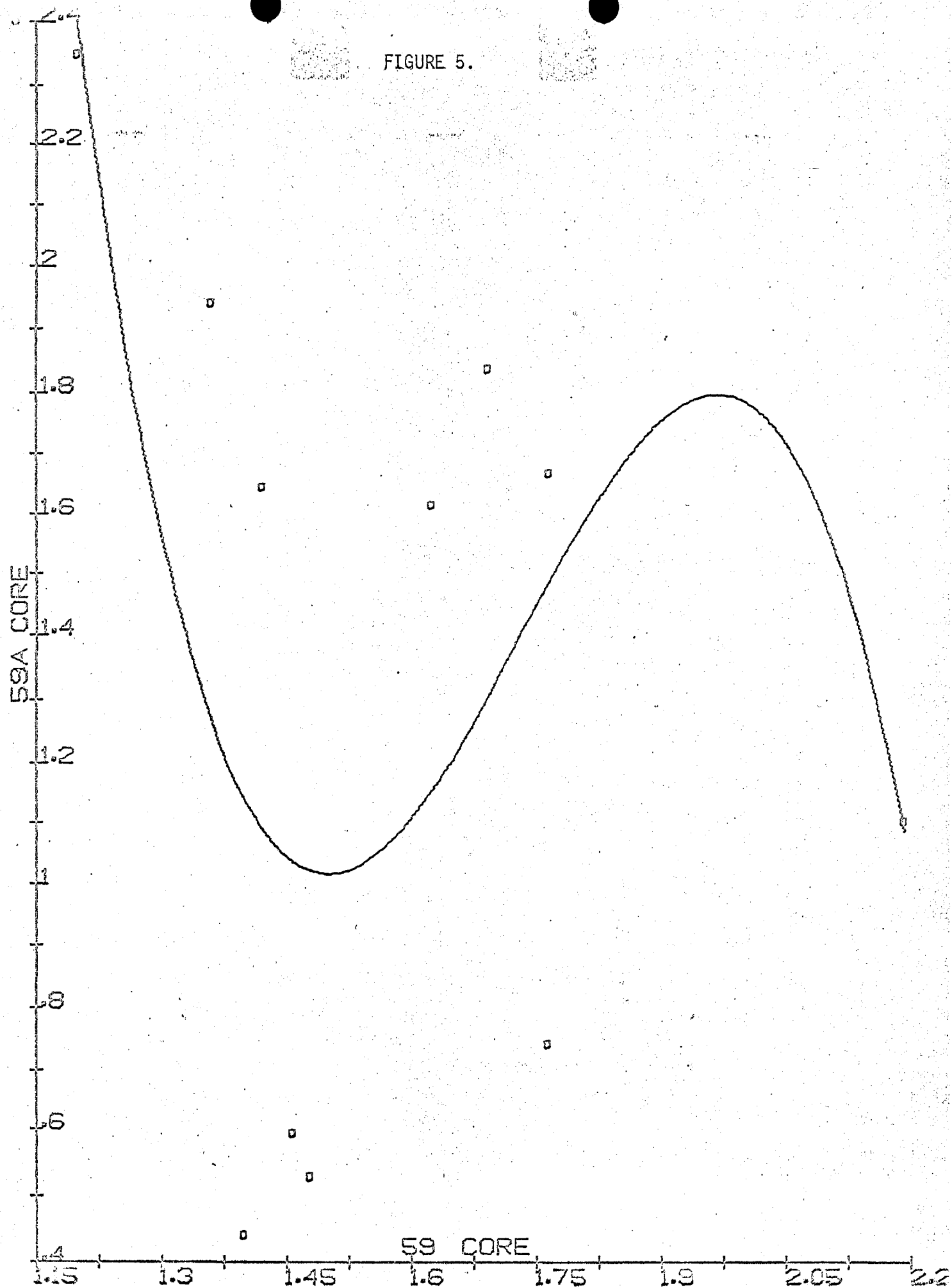

2.095
1.995
1.895
1.795
1.695
1.595
1.495
1.395
1.295
1.195
59 CORE
59A CORE
.4
.7
1
1.3
1.6
1.9
2.2
2.5

FIGURE 5.


59A CORE
2.4
2.2
2
1.8
1.6
1.4
1.2
1
.8
.6
.4
59 CORE
1.15
1.3
1.45
1.6
1.75
1.9
2.05
2.2

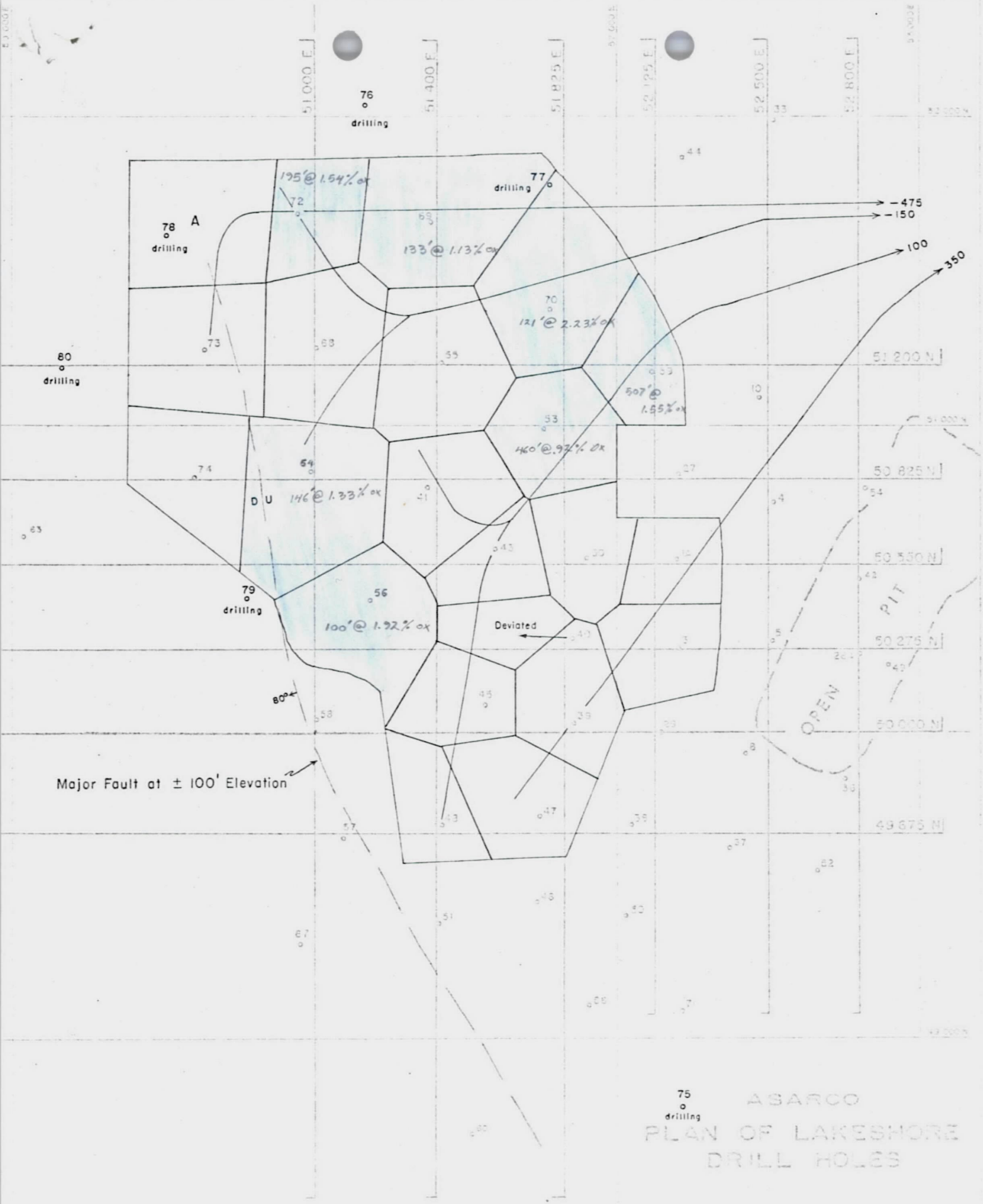
Dec '68

LAKESHORE

Oxide Intercepts with Rotary Assays increased by 25%

Polygon	Area	Thickness	Ft^3	Tons	+.90 %Cu	Interval
P-1A	86,000	496	42,656,000	3,412,480		150-646
P-3	113,200	336	38,035,200	3,042,816		200-536
P-30	116,800	535	62,488,000	4,999,040		300-835
P-39	129,600	712	92,275,200	7,382,016		370-1082
P-40	78,000	700	54,600,000	4,368,000		310-1010
P-41	------	---	----------	---------		--------
P-43	83,600	514	42,970,400	3,437,632		420-934
P-45	100,800	504	50,803,200	4,064,256		430-934
P-47	142,000	80	11,360,000	908,800		460-540
P-48	83,600	41	3,427,600	274,208		1044-1085
P-53	141,200	460	64,952,000	5,196,160	0.92	350-810
P-55	182,000	272	49,504,000	3,960,320		690-962
P-56	176,400	100	17,640,000	1,411,200	1.92	550-650
P-59	102,800	507	52,119,600	4,169,568	1.55	400-907
P-64	224,800	146	32,820,800	2,625,664	1.33	730-876
P-68	186,800	218	40,722,400	3,257,792		850-1068
P-69	225,200	133	29,951,600	2,396,128	1.13	989-1122
P-70	218,000	121	26,378,000	2,110,240	2.23	810-931
P-72	120,800	195	23,556,000	1,884,480	1.54	970-1165
P-73	182-800	670	122,476,000	9,798,080		968-1638
P-74	145,600	524	76,294,400	6,103,552		870-1394
Assigned	201,600 A	481 A	96,969,600 A	7,757,568 A		970-1451 A

Total = 19,793,440 Tons
Ave. thickness = 301.6 feet
Wt. Ave. Grade = 1.41% Cu



ASARCO

PLAN OF LAKESHORE DRILL HOLES

Scale 1" = 400'

DECEMBER, 1960

Dec '68

Comparison Assay Results

Coring vs Rotary Sludge

Hole #P-59 & P-59A (offset 9.5' N.74° W.)

Depth	Interval	Rotary Assay	Core Assay	Percent change
0 - 60'	60'	No assay		
270'	210'	0.1035 %	0.1307 %	+ 26 %
340'	70'	No assay		
370'	30'	0.3033 %	0.7177 %	+137 %
400'	30'	0.3367 %	0.7250 %	+115 %
430'	30'	0.6467 %	0.7893 %	+ 22 %
460'	30'	0.5500 %	1.2643 %	+130 %
490'	30'	0.8300 %	2.0718 %	+150 %
520'	30'	0.9467 %	1.7677 %	+ 87 %
550'	30'	0.8467 %	1.5280 %	+ 80 %
580'	30'	0.8100 %	0.9770 %	+ 21 %
610'	30'	0.8567 %	1.2167 %	+ 42 %
640'	30'	0.8100 %	3.0783 %	+280 %
670'	30'	1.1800 %	1.6057 %	+ 36 %
700'	30'	1.4333 %	1.6610 %	+ 16 %
710'	10'	1.5640 %	1.3930 %	- 12 %
340-710'	370'	0.815 %	1.454 %	+ 78 %

Dec '68

Comparison Assay Results

Coring vs Rotary Sludge

Hole #P-59 & P-59A (offset 9.5' N.74° W.)

Depth	Interval	Rotary Assay	Core Assay	Percent change
0 - 60'	60'	No assay		
270'	210'	0.1035 %	0.1307 %	+ 26 %
340'	70'	No assay		
370'	30'	0.3033 %	0.7177 %	+137 %
400'	30'	0.3367 %	0.7250 %	+115 %
430'	30'	0.6467 %	0.7893 %	+ 22 %
460'	30'	0.5500 %	1.2643 %	+130 %
490'	30'	0.8300 %	2.0718 %	+150 %
520'	30'	0.9467 %	1.7677 %	+ 87 %
550'	30'	0.8467 %	1.5280 %	+ 80 %
580'	30'	0.8100 %	0.9770 %	+ 21 %
610'	30'	0.8567 %	1.2167 %	+ 42 %
640'	30'	0.8100 %	3.0783 %	+280 %
670'	30'	1.1800 %	1.6057 %	+ 36 %
700'	30'	1.4333 %	1.6610 %	+ 16 %
710'	10'	1.5640 %	1.3930 %	- 12 %
400 - 710	310	0.945 %	1.660 %	+ 76 %
340-710'	370'	0.815 %	1.454 %	+ 78 %

LAKESHORE

% CU ASSAY

Hole Nº	LAST ASSAY ROTARY	FIRST ASSAY CORE		CHANGE OVER POINT
P-1	Not sampled	0.30		140
P-1A	Not sampled	0.35		802.5
P-2	Not sampled	tR		100
P-3	0.45	.71	+	210
P-4	0.43	0.15	−	150
P-5	0.34	0.43	+	200
P-6	0.22	0.27	+	180
P-8	0.13	0.66	+	185
P-10	0.28	0.29	0	805.3
P-27	0.58	0.60	0	753.0
P-28	0.86	2.81	++ ✓	80.0
P-28A	0.16	0.15	0	720
P-29	0.25	0.52	+	800
P-30	0.48	0.62	+	900
P-33	0.46	0.49	0	900
P-36	0.12	0.17	+	800
P-37	0.21	0.34	+	800
P-38	0.19	0.16	0	785
P-39	0.44	0.41	0	919
P-40	0.62	0.41	−	770
P-41	0.24	0.51	+	940
P-42	0.31	0.39	0	600
P-43	0.46	0.69	+	890
P-44	0.48	0.40	0	1000
P-45	0.53	0.36	−	875
P-46	0.36	0.33	0	1000
P-47	0.44	0.29	−	918

LAKESHORE

% Cu Assay

No. of Hole	Last Assay Rotary	First Assay Core		Change over Point
P-48	0.19	0.85	++	1040
P-49	0.19	None	–	820
P-50	0.31	0.18	–	1000
P-51	0.31	0.22	–	1146
P-52	0.15	0.15	0	800
P-53	0.95	0.46	–	800
P-54	0.32	0.89	++	813
P-55	0.44	0.43	0	700
P-56	1.81	4.42	+++	570
P-57	0.37	1.31	+++	1050
P-58	0.20	0.12	–	970
P-59	1.56	1.60	+	710
P-60	0.16	0.17	0	620
P-62	0.42	0.77	+	770
P-63	0.28	0.53	+	950
P-64	2.14	2.13	0	830
P-67	0.16	0.64	++	1365
P-68	1.22	0.70	–	870
P-69	0.10	0.15	0	900
P-70	0.33	1.71	++	810
P-71	0.19	0.20	0	908
P-73	TR	0.35	+	870

DOODLER PAD

ARIZONA MOVING & STORAGE CO.
1039 N. Alamo Street
Tucson, Arizona
Phone 298-3393

Assume: 0.60% oxide

Acid consumption 80 #/ton
Acid cost #14/ton
Recovery 74%
$3.55/ton

80% after smelting

$2.84

.56 cost Acid
.36 operating Mining costs

$1.92/ton Net

1.60/ton Vat leaching costs

0.32/ton Profit

AGENT FOR

NATIONAL VAN LINES, INC.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona
December 11, 1968

Memorandum To: Mr. G. W. Bossard

Results of Leaching Tests on Lakeshore Oxide Ore Samples

This memorandum outlines the results of the metallurgical test program on the 18 Lakeshore oxide ore samples collected November 15-16 at the Lakeshore property. The complete analysis of each sample is given in Table No. 1.

The first results indicated that this ore would require strong acid solutions and/or long leaching times in order to obtain reasonable recoveries. It was decided, therefore, to test each of the samples under strong leaching conditions (minus 10 mesh ore and leach solution strength of 57.5 gram per liter H_2SO_4) in order to quickly determine the amount of leachable copper present and to obtain an approximate idea of the acid consumption. The results of this phase of the test program are given in Table No. 2.

Three composite samples, A, B and C were then made up from the 18 samples on the basis of rock type and amount of leachable copper present. The composition of these samples is discussed in a memorandum from Mr. R. D. Karvinen dated November 29, 1968. Composite A represents andesitic rock, Composite C represents porphyritic rock, and Composite B represents a mixture of the two types. The composition and assays of the three composite samples are given in Table No. 3.

The three composite samples were then tested under conditions approximating vat leach conditions. Each composite was leached for seven days with leach solution strengths maintained at 10 and 20 gram per liter sulfuric acid for the first three days and then without further acid addition. The size of the material was minus one-quarter inch. The tests were run in open-mouth bottles rotated on laboratory rolls since sufficient sample for column leach tests was not available. The results of the six leach tests are given in Table No. 4. Complete results of each test are given in the attached sheets in the form of curves showing copper recovery and acid consumption plotted against leaching time.

In general, these tests indicate from the samples tested that reasonable recoveries (70% plus or minus 3%) can be obtained by vat leaching this ore using sufficient time (approximately six days leaching) with moderately strong leaching solutions. In actual practice, varying strength leaching

solutions would be applied to the ore at different times during the leaching cycle; the 10 and 20 gram per liter acid strengths used in the test work are only rough approximations of actual conditions. The tests indicate that the data obtained with the 10 gram per liter solutions should approach actual results more closely than data obtained from the 20 gram per liter solutions.

Previous experience has shown that actual copper recoveries from vat leach operations will be lower than recoveries obtained in laboratory bottle leach tests, so the recoveries listed in the table should be reduced somewhat. The following paragraphs present a short discussion of the test results from each ore type tested.

Andesite (Composite A) This sample was of low grade and contained more sulfide copper than the other samples. Also, the copper in this sample went into solution more slowly than with the other ore types. If this sample is typical of the andesite ore, only 65 to 67 percent recovery can be expected with this ore type with acid consumption of about 80 pounds of sulfuric acid per ton of ore.

Mixed Type (Composite B) This sample gave better results than either of the other samples but since only two drill holes are represented these results may not be too significant. Copper recovery should be 71 to 74 percent and acid consumption about 65 pounds of sulfuric acid per ton of ore.

Porphyritic (Composite C) The grade of this sample is considerably higher than that indicated for the orebody so the copper recoveries obtained from these tests are probably higher than could be expected in practice. Copper recovery should be 70 to 73 percent and acid consumption approximately 80 pounds sulfuric acid per ton of ore. The acid consumption seems high considering that this sample contains less than one-half as much acid-soluble CaO as Composite A, but all of the tests confirm this high acid consumption. This consumption would be less if the copper assay of the feed was lower but would not change the acid consumption figure by more than 10 percent. The acid is apparently being consumed by some other constituent in the ore besides CaO, possibly by the dissolution of alumina. The cause of this acid consumption can be determined by further test work if this information is desired.

The results that could be expected from heap leaching this ore are estimated as follows: 40 percent copper recovery over 10-15 years and an acid consumption of at least 75 pounds H_2SO_4 per ton of ore.

The above estimates of copper recovery and acid consumption are the most accurate that we can make based on the samples tested. These estimates should be accurate to within plus or minus 10 percent assuming that the samples accurately represent the orebody. If more detailed and accurate information is desired we would need enough coarse (plus 1/2 inch) sample to permit column leach tests. This would require a minimum of 500 pounds and we should have two or three times that quantity to permit several tests.

D. E. Crowell

D. E. CROWELL

DEC/mg

Table No. 1

Lake Shore Sample Assays

Lake Shore Hole No.	Total Cu	N.S. Cu	Total CaO	Acid Soluble CaO	Total MgO	SiO_2	Fe	S	Al_2O_3
P- 3	.61	.23	7.6	2.0	1.95	62.3	3.4	.40	3.63
P- 4	.32	.28	6.2	1.6	0.68	62.0	2.5	.04	3.80
P-27	.47	.40	7.2	1.7	1.01	63.3	2.9	.25	3.38
P-33	.57	.03	7.6	2.8	1.73	62.8	3.1	.90	2.14
P-39	.52	.35	6.2	2.3	0.94	62.8	3.2	Nil	3.80
P-40	.27	.24	5.0	1.2	1.73	62.0	2.9	.80	3.80
P-43	.48	.39	3.5	2.0	1.23	62.1	2.9	.25	3.46
P-45	.34	.30	4.5	2.0	1.01	61.8	3.0	Nil	3.23
P-51	.27	.19	2.4	0.9	0.65	62.8	4.1	.05	3.82
P-55	.68	.60	2.2	0.9	0.21	63.4	4.5	.20	3.82
P-56	1.80	1.58	1.0	0.5	0.21	66.6	3.1	.02	2.72
P-59	.70	.63	2.3	0.6	1.12	64.0	3.0	.47	3.78
P-62	.79	.74	1.1	0.9	0.29	64.2	2.6	.03	3.84
P-64	.95	.87	0.9	0.6	0.40	64.3	2.4	.09	2.97
P-68	.69	.62	0.8	0.6	0.43	64.6	3.9	.07	2.83
P-69	.70	.60	1.4	1.1	0.65	62.8	3.6	.09	3.84
P-70	.95	.81	1.3	1.1	0.86	63.4	3.4	.28	3.63
P-73	.34	.22	0.9	0.8	0.86	63.0	5.1	tr	3.38

Table No. 2

Lake Shore Test Results - Strong Leaching Conditions

Lake Shore Hole No.	Head Assay Total Cu	Head Assay N.S. Cu	Cu Recovery	Acid Consumption - Pounds of H_2SO_4					
P - 3	.61	.23	36%	143#/ton ore	-	32#/# Cu recovered			
4	~~.32~~	.28	75	170	"	"	36	"	"
27	.47	.40	*77	155	"	"	21	"	"
33	.57	.03	NO TEST - ALL SULFIDE						
39	.52	.35	59	142	"	"	23	"	"
40	~~.27~~	.24	84	132	"	"	29	"	"
43	.48	.39	77	87	"	"	12	"	"
45	~~.34~~	.30	82	113	"	"	20	"	"
51	~~.27~~	.19	34	122	"	"	67	"	"
55	.68	.60	*67	125	"	"	14	"	"
56	1.80	1.58	78	119	"	"	4	"	"
59	.70	.63	77	132	"	"	12	"	"
62	.79	.74	77	129	"	"	11	"	"
64	.95	.87	84	78	"	"	5	"	"
68	.69	.62	78	121	"	"	11	"	"
69	.70	.60	*72	132	"	"	13	"	"
70	.95	.81	75	-			-		
73	~~.34~~	.22	37%	107	"	"	42	"	"

12 34 .78% Cu

71%

12 757

* - 40 hour leach only

Leach Conditions: 200 gm - 10 mesh ore leached 48 hours in 57.5 gpl acid solution at 20% solids. Leaching done in one gallon bottles rotated on rolls.

Table No. 3

Composition and Assays of Lake Shore Composite Samples

Composite	Rock Type	Lake Shore DDH Hole Nos.	Total Cu	Assay N.S. Cu	Assay Fe	Acid Soluble CaO
A	Andesitic	P-4, P-27, P-39 P-43, P-45	0.49	0.33	3.10	1.80
B	Mixed Rock Types	P-64, P-69	0.81	0.72	3.50	0.70
C	Porphyritic	P-55, P-56, P-62 P-68, P-70	1.04	0.92	4.00	0.70

Composites were made up of equal amounts of sample from the holes listed except that hole P-45 is represented by only one-half the weight of the other samples in this composite. This is because we did not have a sufficient amount of this sample to make an equally weighted composite.

Hole No. P-59 was listed by Mr. Karvinen as belonging to the B Composite but it was decided to leave this sample out as it consists wholly of hammer cuttings while all of the other samples in the composites are diamond drill core crushed to minus one-quarter inch.

Table No. 4

Summary of Leach Test Results

With 10 and 20 gpl Acid Leach Solutions

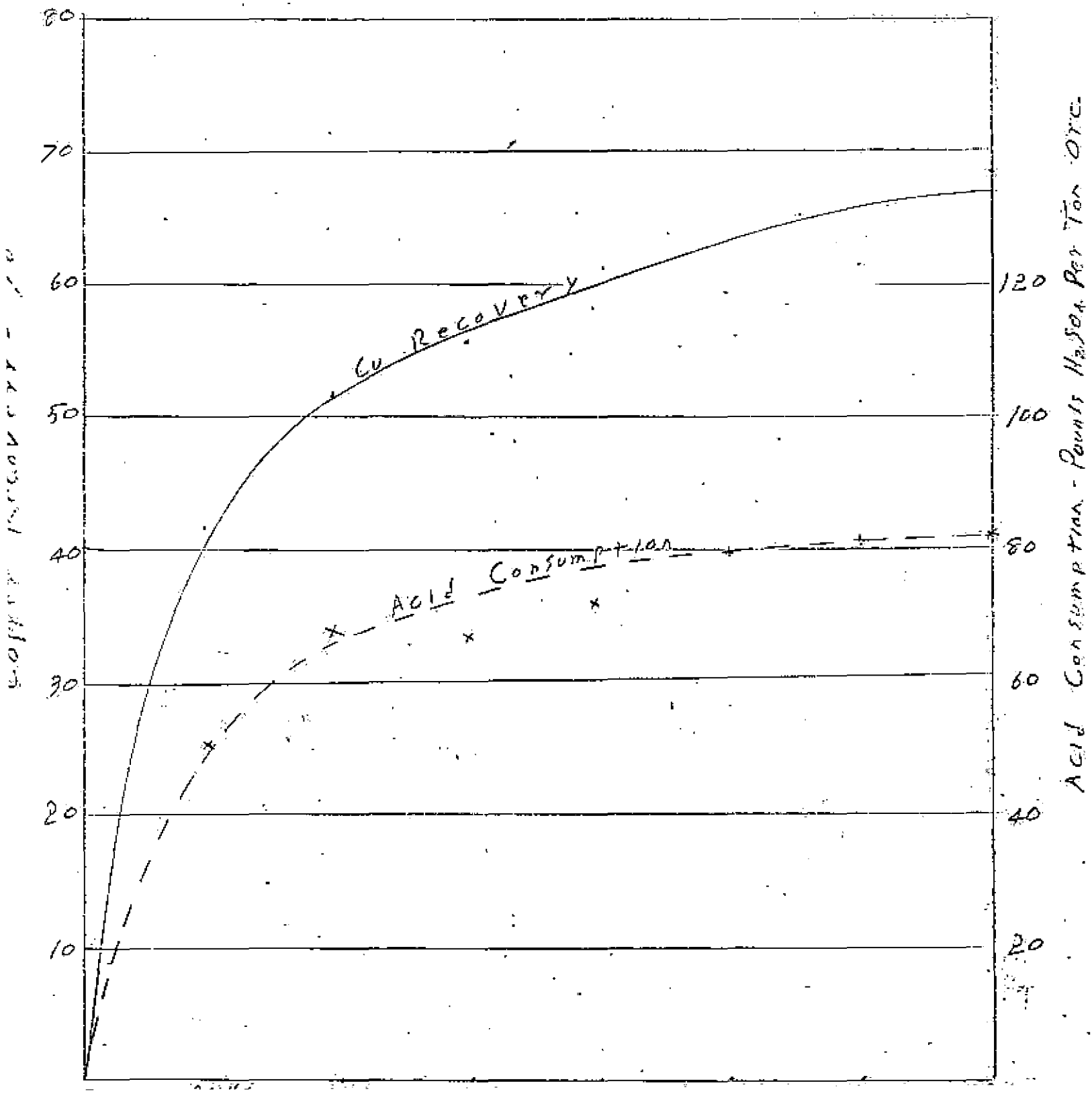
Test No.	Sample	Solution Strength gpl H_2SO_4	Third Day Total Cu Recovery	Third Day Acid Consumption lbs/ton	Third Day Acid Consumption lbs/lb Cu	Seventh Day Total Cu Recovery	Seventh Day Acid Consumption lbs/ton	Seventh Day Acid Consumption lbs/lb Cu
30	A (Andesite)	10	56%	64.9	13.6	68.8%	83.1	14.1
31	A (Andesite)	20	63%	78.9	14.6	71.9%	110.8	17.9
32	B (Mixed)	10	72%	58.4	4.9	77.4%	66.6	5.2
33	B (Mixed)	20	76%	64.7	5.1	77.7%	80.6	6.2
34	C (Porphyry)	10	68%	65.0	5.0	75.8%	83.1	5.7
35	C (Porphyry)	20	74%	73.6	5.0	78.8%	101.5	6.5

These tests were done in one-gallon bottles rotated on rolls. Leach solution strengths were held at the indicated value (10 or 20 gpl H_2SO_4) for 72 hours then allowed to fall as the acid was consumed. The sample was all minus one-quarter inch in size. The ratio of solution to solids was held at 2:1 by weight. All leaching was done at room temperature.

Daily copper recovery and acid consumption figures are given on the following pages along with final solution assays for H_2SO_4 and copper.

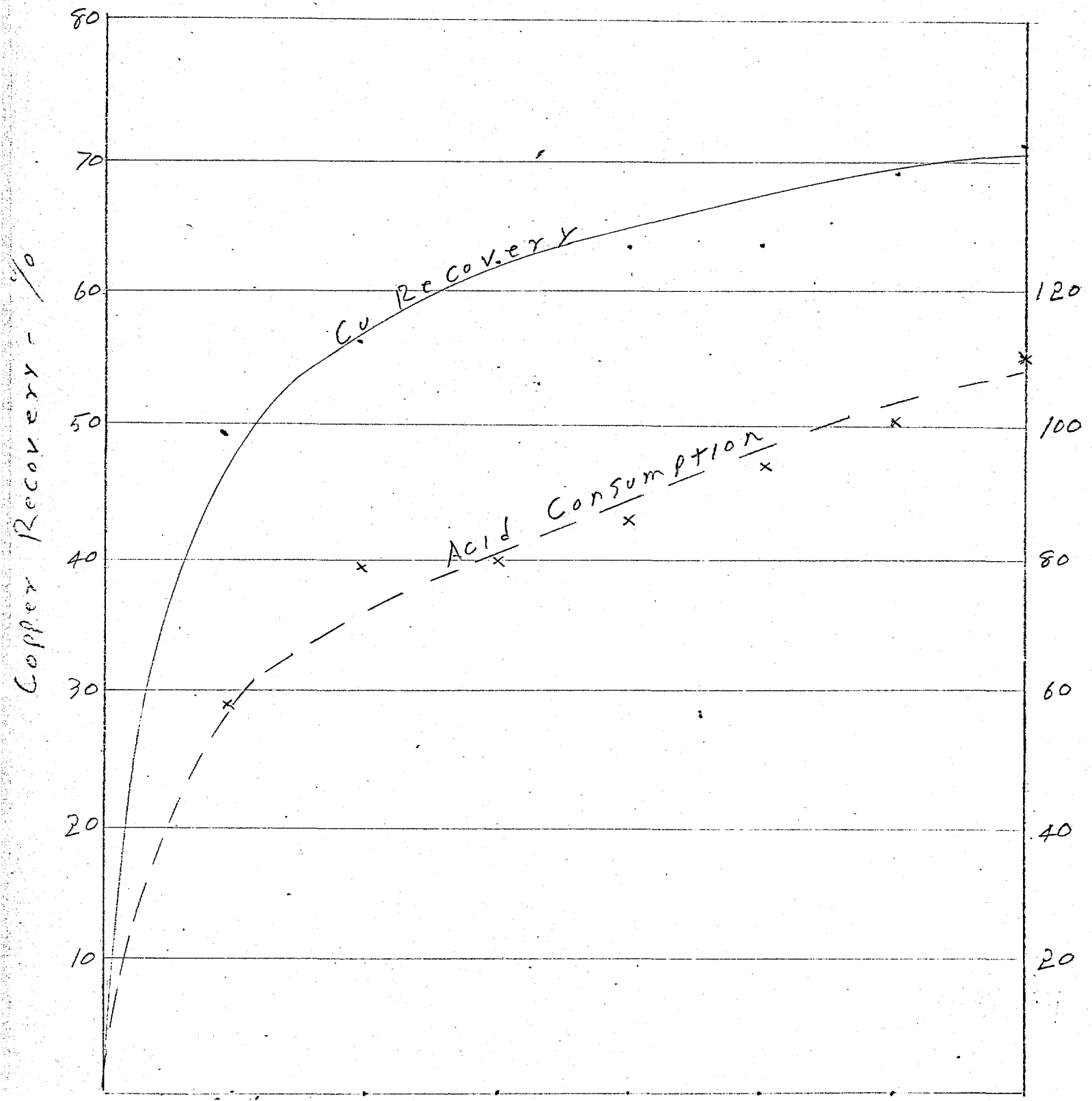
Test No. 30 - Sample A

Leach solution maintained at 10 gpl H_2SO_4 for three days then allowed to drop as acid was consumed. Final solution strength was 5.5 gpl H_2SO_4 and 1.3 gpl Cu.



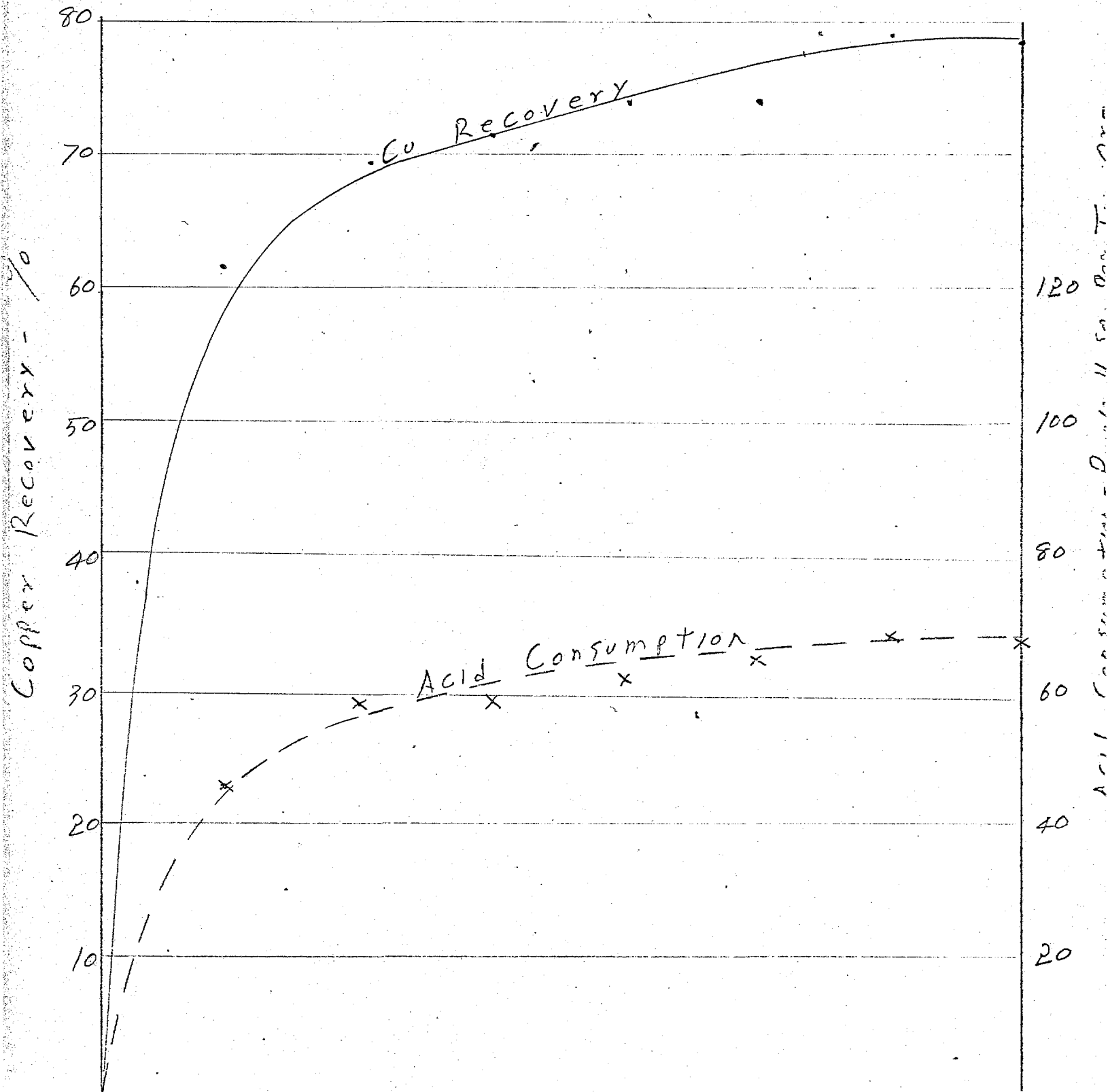
Test No. 31 - Sample A

Leach solution maintained at 20 gpl H_2SO_4 for three days then allowed to drop as acid was consumed. Final solution strength was 11.3 gpl H_2SO_4 and 1.4 gpl Cu.



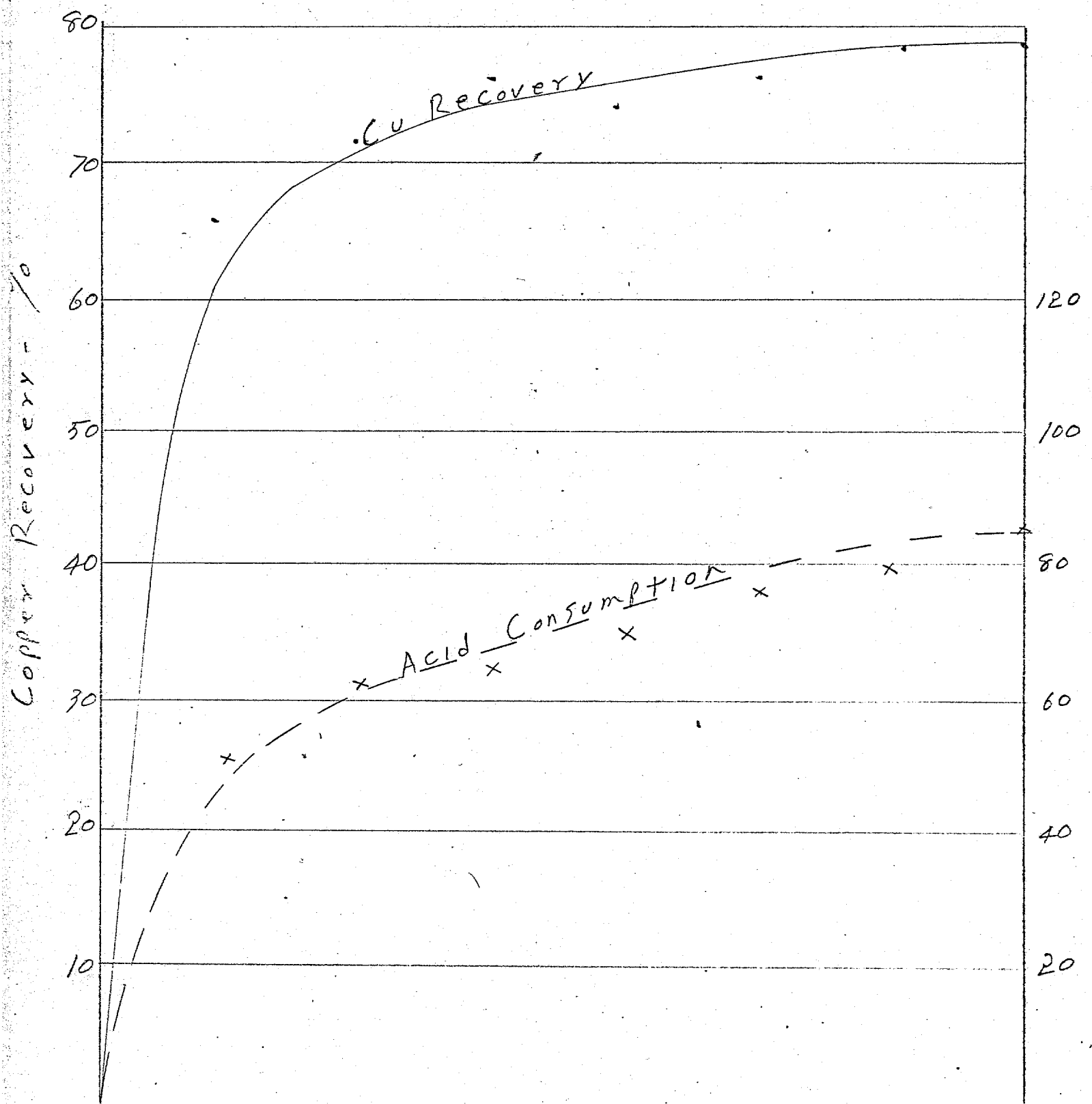
Test No. 32 - Sample B

Leach solution maintained at 10 gpl H_2SO_4 for three days then allowed to drop as acid was consumed. Final solution strength was 7.5 gpl H_2SO_4 and 2.8 gpl Cu.



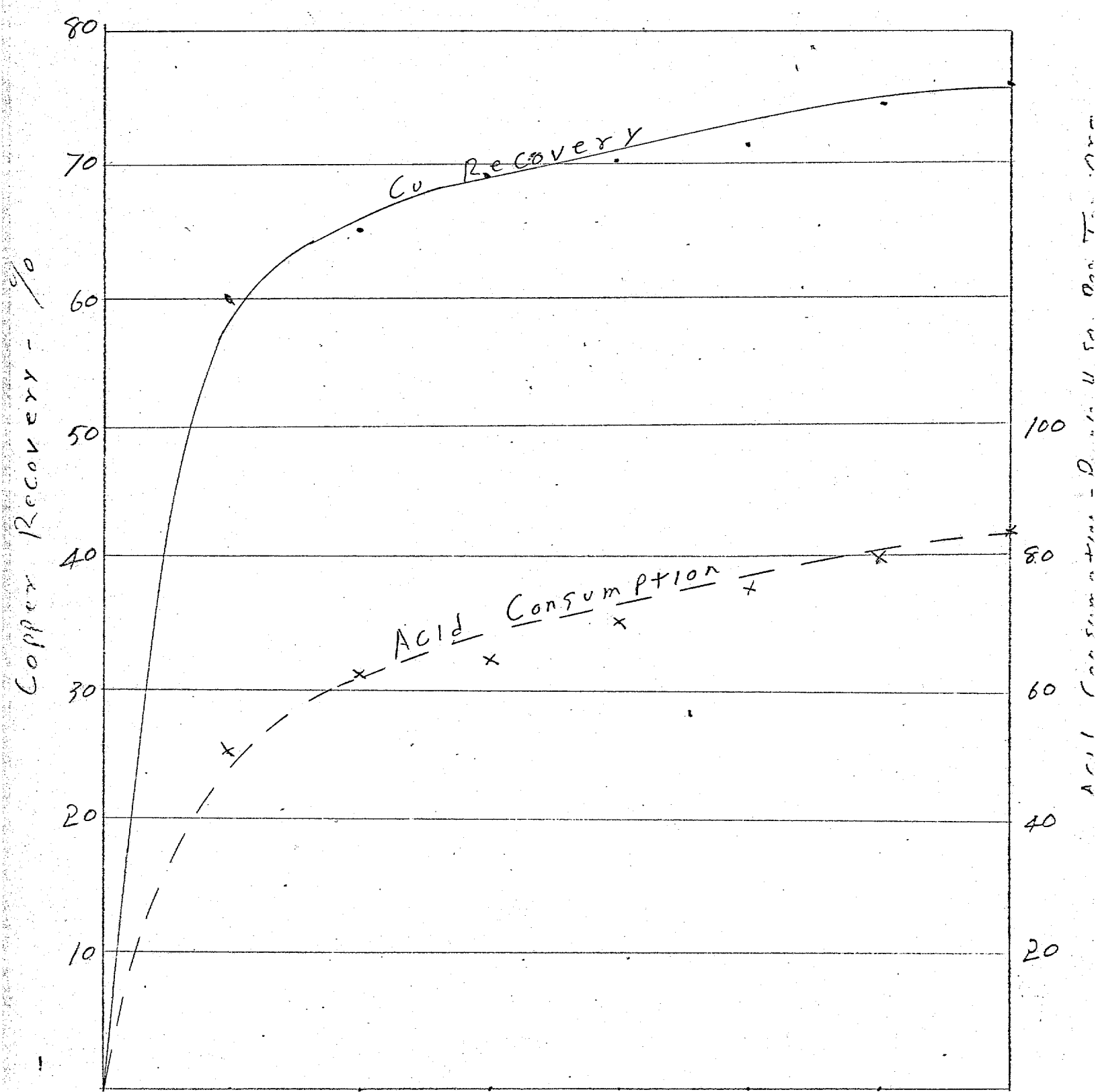
Test No. 33 - Sample B

Leach solution maintained at 20 gpl H_2SO_4 for three days then allowed to drop as acid was consumed. Final solution strength was 15.8 gpl H_2SO_4 and 3.0 gpl Cu.



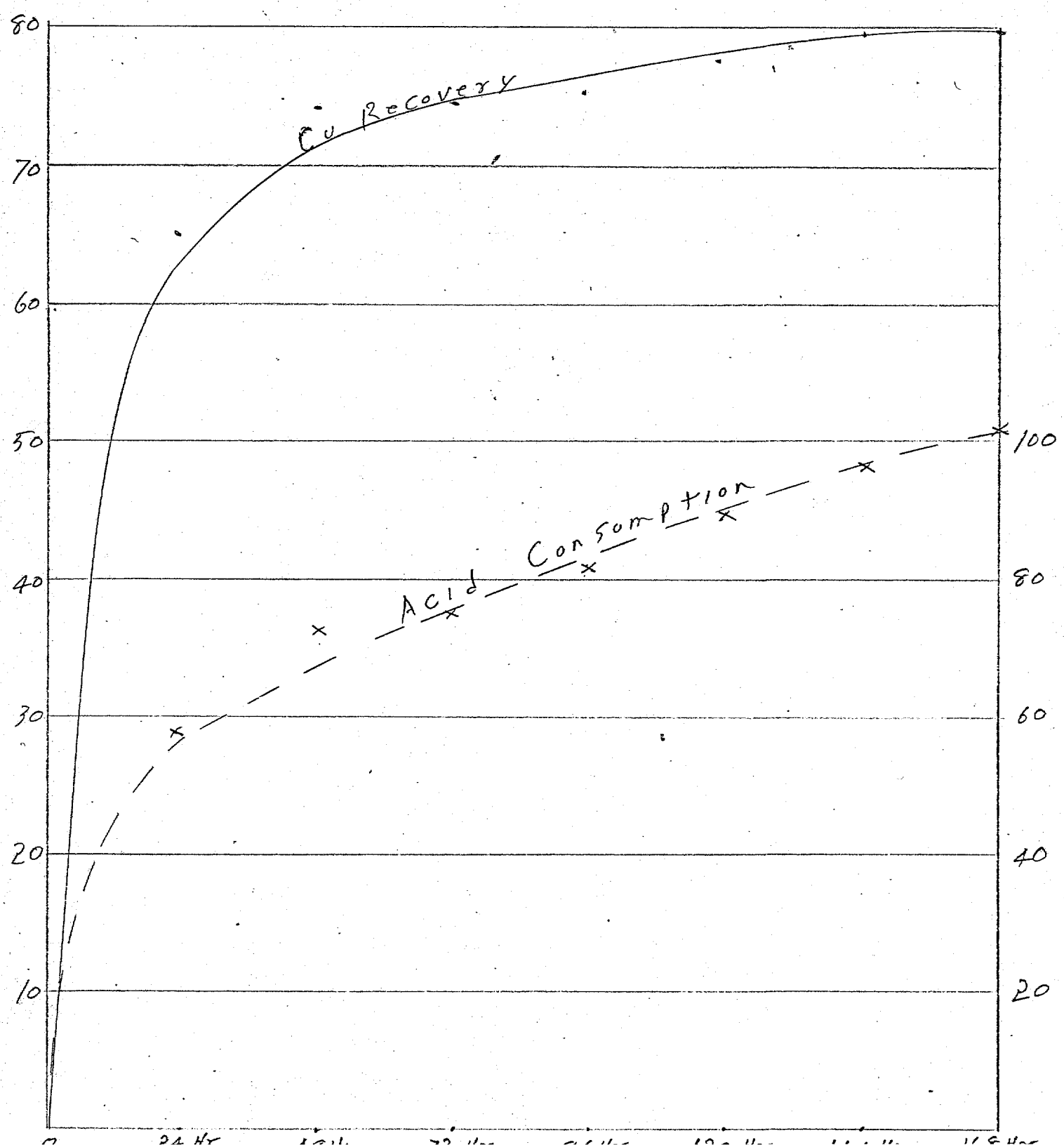
Test No. 34 - Sample C

Leach solution maintained at 10 gpl H_2SO_4 for three days then allowed to drop as acid was consumed. Final solution strength was 6.1 gpl H_2SO_4 and 3.2 gpl Cu.



Test No. 35 - Sample C

Leach solution maintained at 20 gpl H_2SO_4 for three days then allowed to drop as acid was consumed. Final solution strength was 12.8 gpl H_2SO_4 and 3.5 gpl Cu.



HAWLEY & HAWLEY

ASSAYERS AND CHEMISTS, INC.

Registered Assayers

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

K.V.D.S. DEC 9 1968

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %	Non-sulfide Cu%	
P-1 A - 846 - 1081				0.48			0.11	
P-30 - 850 - 968				0.35			0.23	
P-30 - 968 - 1064				0.67			0.22	
P-55 - 962 - 1038				0.65			0.10	
P-55 - 1038 - 1145				0.66			0.05	
P-56 - 650 - 758				1.36			0.16	
P-56 - 758 - 940				0.53			0.05	
P-64 - 876 - 930				1.60			0.63	
P-68 - 1058 - 1158				0.37			0.04	
P-68 - 1158 - 1399				0.49			0.04	
P-69 - 1124 - 1290				1.22			0.08	
	11 Cu, singles @ $1.75							$ 19.25
	11 CuO, singles @ $2.25							24.75
	11 samples prepared @ $.85							9.35

CC: American Smelting & Refining Company
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
ADD: Attn: Mr. Ron Karvinen
CITY:

REMARKS:

Analysis Cert. By

Preparation $ 9.35
Analysis $ 44.00

ACC: AMERICAN SMELTING & REFINING CO. | Date Spl. Received 11/29/68 | Date Compl. 12/5/68 | TUC 341564 | $ 53.35

Table No. 1

~~Nov 26, 1968~~

Summary of Lake Shore Test Results

Lake Shore Hole No.	Head Assay Total Cu	Head Assay N.S. Cu	Strong Leach Results Cu Recovery	Acid Consumption - Pounds of H_2SO_4	
~~P-3~~	~~.61~~	~~.23~~	~~36 %~~	~~143 #/ton ore~~	~~32 #/# Cu recovered~~
X 4	.32	.28	75	170 "	36 "
27	.47	.40	*77	155 "	21 "
~~33~~	~~.57~~	~~.03~~	~~No Test - All Sulfide~~		
39	.52	.35	59	142 "	23 "
~~40~~	~~.27~~	~~.24~~	~~84~~	~~132 "~~	~~29 "~~
43	.48	.39	77	87 "	12 "
45	.34	.30	82	113 "	20 "
~~31~~	~~.27~~	~~.19~~	~~34~~	~~122 "~~	~~67 "~~
55	.68	.60	*67	125 "	14 "
56	1.80	1.58	78	119 "	4 "
59	.70	.63	77	132 "	12 "
62	.79	.74	77	129 "	11 "
64	.95	.87	84	78 "	5 "
68	.69	.62	78	121 "	11 "
69	.70	.60	*72	132 "	13 "
70	.95	.81	75	—	—
~~73~~	~~.34~~	~~.22~~	~~37~~	~~107 "~~	~~42 "~~

Leach Conditions: 200 gm - 10 mesh ore leached 48 hours in 57.5 gpl acid soln at 20% solids

* 40 hours leach only

J. E. K.

NOV 27 1968

Table No. 2

Chemical Analyses of Lakeshore Samples

Lake Shore Hole No.	Intercept Footage	Total Cu	N.S. Cu	Total $CaCO_3$	SiO_2	Fe	Sulfur
		Assays					
P-3	831-907	.61	.23	13.6	62.3	3.4	.40
4	150-871	.32	.28	10.1	62.0	2.5	.04
27	630-959	.47	.40	12.9	63.3	2.9	.25
33	905-992	.57	.03	13.6	62.8	3.1	.90
39	917-1073	.52	.35	11.1	62.8	3.2	nil
40	310-1010	.27	.24	9.0	62.0	2.9	.80
43	890-982	.48	.39	6.2	62.1	2.9	.25
45	875-934	.34	.30	8.1	61.8	3.0	nil
51	580-1110	.27	.19	4.3	62.8	4.1	.05
55	700-972	.68	.60	3.9	63.4	4.5	.20
56	570-650	1.80	1.58	1.8	66.6	3.1	.02
59	340-710	.70	.63	4.1	64.0	3.0	.47
62	770-827	.79	.74			2.6	.03
64	680-876	.95	.87			2.4	.09
68	870-1067	.69	.62			3.9	.07
69	900-1124	.70	.60			3.6	.09
70	810-930	.95	.81			3.4	.28
73	870-1124	.34	.22			5.1	tr

Assay columns left blank not received yet.

P 45 - An hem frac. slight bleaching. Tr Cpy No Green Cu

P 70 Gr? hem st. clay. Plenty green Cu. No sulphides

P 40 An hem spots. 2/3 Limonite stained. 1/3 bleached (st. clay?)
Tr green Cu. No Sul. Some fines.

P 39 An 90% / Mzp 10% | St. hem. generally st. clay. Tr green Cu. No sul.

P 68 Gr? St. hem. Some bleaching. Mod green Cu. No sul.

P 62 Mzp. Generally st clay & bleaching. Mod lim. Mod green Cu. No Suls. Some fines.

Rotary cuttings.
P 51 1 Mzp and bleached An. Mag diss in 20% of sample. limonite mod. 30% fines, largely limonite stained. No green copper. About 1/3 Non sulphide Cu but only .05% S assay. Something wrong here -- (native Cu?).

P 43 An (10% hard vol, 90% tuff or grit) plus little Mzp. Hem st, clay mod. Vy little green Cu. Tr py.

J. E. K.

NOV 27 1968

P-55 ~~Gr~~ Por. Cu absorbed in feldspar & as ~~[illegible]~~ vnlts chrysocolla
No sulphides, mod FeOx, mostly lim
Sericite & clay alt

P-69 30% And Cu as CuSi, w/ mod hem, clay
30% And Bx No sulphids
40% Gr

P-56 80% Mp Cu mostly as CuSi, minor suls
20% An mod to Hvy FeOx as lim
Clay & ser alt.

P-59 And ±70% Cu as CuSi - No sulphides
+
meta sediments? ±30% minor FeOx
Sample - 10 mesh

P-1 And No vis Cu
Some ser, some clay

P-64 Qtzt 80% Cu as CuSi. No Sul
And 20% minor ser, some clay

P-27 And 80% Cu as CuSi - No sul
MP 15% mod FeOx
Qtzt 5% mod alt

An = Andesite and/or sediments

J. E. K.
NOV 15 1968

INTERVALS PREPARED BY EL PASO

✓ ~~P-3~~	831-907	crushed core	An
✓ P-4	150-871	crushed core	— An ✓
✓ ~~P-40~~	310-770	rotary cuttings	— An-20 qtz 80
✓ P-64	680-830	rotary cuttings	— An
11/6 ✓ P-68	870-1067	crushed core	— mp ✓

INTERVALS PREPARED BY EL PASO 11/8/68 A.M.

✓ P-27	630-959	crushed core	— An ✓
✓ P-39	917-1073	crushed core	— An ✓
4/6 ✓ P-56	570-650	crushed core	mp ✓
✓ P-62	770-827	crushed core	mp ✓

INTERVALS PREPARED BY ASARCO 11/8/68 PM

✓ ~~P-40~~	770-1010	crushed core	An + ~~mp~~ ✓
5/13 ✓ P-64	830-876	crushed core	An
✓ ~~P-33~~	905-992	crushed core	An por, seers ?
1/2 ✓ P-43	~~902~~ 901.8-982	crushed core	— An ✓
✓ P-45	875-934	crushed core	— An ✓
14 ✓ P-55	700-972	crushed core	— mp ✓ ~~mixed~~
13 ✓ P-69	901-1124.5	crushed core.	mp ✓ mixed
✓ P-70	810-930	crushed core	— mp ✓
? ✓ P-70	? (700-810 rotary cuttings)		?
✓ P-59	(340-~~710~~ 710) rotary cuttings)		(340-530 & 530-709) An ✓

✓ P-68 870 - 1067 crushed core

INTERVALS PREPARED BY EL PASO 11/8/68 A.M.

✓ P-27 630 - 959 crushed core
✓ P-39 917 - 1073 crushed core
✓ P-56 570 - 650 crushed core
✓ P-62 770 - 827 crushed core

INTERVALS PREPARED BY ASARCO 11/8/68 PM

✓ P-40 770 - 1010 crushed core
✓ P-64 830 - 876 crushed core
✓ P-33 905 - 992 crushed core
✓ P-43 ~~902~~ 901.8 982 crushed core
✓ P-45 875 - 934 crushed core
✓ P-55 700 - 972 crushed core
✓ P-69 901 - 1124.5 crushed core
✓ P-70 810 - 930 crushed core
✓ P-76 (700 - 810 rotary cuttings)
✓ P-59 (340 - ~~530~~ 710) rotary cuttings) (340-530 & 530-709)
✓ P-51 (580 - 1110) rotary cuttings) (580-770, 770-960 & 960-1110)
~~P-73~~ 870 - 1124 — crushed core - porphyry

Samples full EP scoop

All EP prepared samples

All ASARCO prepared samples except

P-40 770-1010 } 1/2 EP scoop
P-64 830-876

P-59 } full ASARCO scoop.
P-51

1 ASARCO scoop = 2 EP scoops

11/9/68

Try to get some samples from P-73

El Paso Natural Gas Company

El Paso, Texas 79999

November 7, 1968

J. H. C.
NOV 15 1968

Mr. J. H. Courtright
Chief Geologist
Southwestern Exploration Dept.
American Smelting & Refining Co.
1150 North 7th Avenue
Tucson, Arizona

Dear Mr. Courtright:

We are happy to furnish you a copy of the revised ore reserves as of October 30, 1968 for our Lakeshore property. We hope that this data will be helpful to you in your evaluation of our property.

Yours truly,

W. T. Hollis

W. T. Hollis
Manager
Mining Division

WTH:dg
Enclosures

COMPUTECH RESEARCH, LTD.
Subsidiary of GFI Computer Industries
1019 WEST PRINCE ROAD
TUCSON, ARIZONA 85705
887-2220, AREA CODE 602

November 5, 1968

Mr. John Reynolds
Mining Division
El Paso Natural Gas Company
El Paso, Texas 79999

Dear John:

Enclosed are six copies of the updated ore reserve figures through October 30, 1968 for the Lake Shore Project. Dick Hewlett said that he wanted to do the +0.4 and +0.3 reserves, which I have not yet received.

Note that drill holes P-70 and P-71 are not included in the present figures.

Sincerely,

William L. Meyer
Director
Systems Development Division

WLM/rcm
Enclosures

LAKE SHORE PROJECT SUMMARY OF ORE RESERVES AS OF OCT. 30, 1968.

1. PORPHYRY RESERVES FOR ORE GREATER THAN 200 FEET THICK
   CUT-OFF GRADE FOR PORPHYRY = 0.50

ORE CLASS	GRADE	TONNAGE
PROVEN ORE	0.802	107,934,500
PROBABLE ORE	0.816	24,161,250
TOTAL ORE	0.805	132,095,750

NOTE--TOTAL PORPHYRY RESERVES INCLUDES 9,258,700 TONS OF TACTITE WHICH LIES UNDER THE PORPHYRY.

2. TACTITE RESERVES FOR THE ENTIRE ORE BODY
   CUT-OFF GRADE = 1.00

ORE CLASS	GRADE	TONNAGE
PROVEN ORE	1.752	16,675,000
PROBABLE ORE	1.967	2,606,400
TOTAL ORE	1.781	19,281,400

3. TACTITE RESERVES OUTSIDE THE PORPHYRY AREA
   CUT-OFF GRADE = 1.00

ORE CLASS	GRADE	TONNAGE
PROVEN ORE	1.663	7,894,100
PROBABLE ORE	1.967	2,128,600
TOTAL ORE	1.728	10,022,700

4. OXIDE RESERVES

CUT-OFF GRADE	GRADE	TONNAGE
0.20	0.476	206,271,000
0.75	1.085	21,182,900
1.00	1.400	10,826,700

NOTE--TO OBTAIN THE TOTAL SULPHIDE TONNAGE, ADD THE PORPHYRY RESERVES TO THE TACTITE RESERVES OUTSIDE THE PORPHYRY.
TOTAL SULPHIDE = 132,095,750 + 10,022,700 = 142,118,450
AVERAGE GRADE = 0.870

LAKE SHORE PROJECT ORE RESERVES AT +0.50 PORPHYRY --

PROVEN RESERVES

	9/20/68				10/30/68		
I	NO.	AVERAGE	TONNAGE	THICKNESS CUT-OFF	NO.	AVERAGE	TONNAGE
1	1159	0.860	83948128.	50.	1396	0.832	119897072.
2	1077	0.858	82648752.	100.	1323	0.830	118729792.
3	866	0.834	77033952.	150.	1116	0.813	113230832.
4	706	0.819	71231248.	200.	969	0.802	107934576.
5	609	0.811	66770416.	250.	869	0.796	103335824.
6	548	0.803	63310208.	300.	813	0.793	100143328.
7	472	0.793	58181872.	350.	759	0.791	96535200.
8	417	0.782	53907288.	400.	696	0.790	91645424.
9	352	0.768	48180416.	450.	626	0.790	85443744.
10	310	0.766	44042504.	500.	557	0.790	78611040.