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Arizona Geological Survey
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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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file

RECEIVED
APR 26 1976
EXPLORATION DEPARTMENT

AIR MAIL

April 22, 1976

Mr. C. K. Moss
ASARCO Incorporated
Salt Lake Office

Arizona
Superior East Project
Seismic Survey

Dear Mr. Moss:

In reply to your letter of April 19, I think we all agree that Mr. Cockslay has done a competent job and that any problems with his interpretations are a result of the substantial geological complexity. I am inclined to agree with you that further seismic work will be best postponed until we have had some further drill hole confirmation of Cockslay's interpretations. Therefore, unless our Tucson colleagues have caught seismic fever, which I somehow think rather unlikely, we can leave the matter rest for the time being but please remind us all after the next drill information is available. understated

Very truly yours,

Original Signed By
T. C. Osborne

T. C. Osborne

cc: WMKurtz
Fitzgibbon

W. L. Kurtz

GEOPHYSICAL OFFICE - EXPLORATION DEPARTMENT JK → file
3422 South 700 West
Salt Lake City, Utah 84119

RECEIVED
APR 21 1976
EXPLORATION DEPARTMENT

April 19, 1976

Mr. T. C. Osborne, Director of Exploration
New York Office

COOKSLEY SEISMIC SURVEY
SUPERIOR EAST, ARIZONA

Dear Tom:

Attached is Cooksley's interpretation of the seismic profile which he made across the "Whitetail basin" at Superior East. Field work was completed last year.

This survey was made at Collins' request; it was to serve as a test to determine whether seismics might be used the outline the basin in advance of drilling.

Also attached is a structural contour map of the basin. This map is an interpretation based on Jim Sells' drill sections.

There is only one drill hole which has reached the base of the Whitetail that is near enough to Cooksley's profile to provide a check on Cooksley's interpretation. This hole is A-7. The depth to the base of the Whitetail in A-7 shows that Cooksley's interpretation is reasonably good for this location.

One significant feature of the seismic interpretation is the indication that the deeper part of the basin (below minus 1000 ft.) extends farther east than has been interpreted from drilling. A favorable implication from such a condition is that much more of the "native copper section" of the Whitetail will exist under this profile than would have been expected.

I believe everyone would agree that Cooksley's seismics would be valuable elsewhere on the Plateau providing that the results were reliable. Probably, we who have been concerned with Cooksley's work in the past, share the fear that subsequent drilling will show his present interpretation to be in error.

Cooksley has been paid in full for his work. His bill was $16,000.00. The authorization (E.A. 0076-00, New York Office) allowed for an expendi-

ture of $30,000.00, leaving $14,000.00. The Tucson group may have reason to want additional coverage by Cooksley. For my part, I would consider that any additional work should await confirmation (by drilling) of his present interpretation. yes indeed

Yours very truly,

Cal Moss

C. K. MOSS

CKM:am
Enc.

cc: W. L. Kurtz, wo/enc.
F. T. Graybeal, wo/enc.

NOTE TO T. C. O.

The Southwest has previously received a copy of Cooksley's interpretation.

CKM

5/2/75

FROM: W. L. KURTZ

TO: TCO / JJC

J. H. C.

MAY 2 1975

Though we have changed the SEA Request several times the attached cross sections by Mr Sell are still pertinent to the overall Cobalt tail Basset - native copper problem

file

Superior East

cc: JDS w/RPT.
JHC w/RPT.

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

April 22, 1975

TO: W. L. Kurtz

FROM: J. D. Sell

Projected Depth of Drill Holes
Superior East Project
Pinal County, Arizona

I submit the following report with cross-sections as an addendum to the Whitetail Copper Potential report (dated Nov. 8, 1974) and the 1974 Summation Report (dated March 10, 1975).

This report exhibits the expected geology and depths of four primary holes and three subsequent holes planned to further confirm the extent and grade of the native copper and the porphyry copper potential. The location of these holes and their relation to the previous drilling conducted on the project are shown on the Drilling Progress Map of Attachment A. The series of drill holes are shown by cross-sections (Attachments B-1 thru B-5), all with a general east-west orientation, looking north. Table 1 summarizes the projected depth of the drill holes for the expected geologic-mineral units and are listed in the drilling order recommended to provide optimum return on the information secured.

Hole A-3 (Attachment B-1). It is proposed to deepen this hole, from its present depth of 1949 feet, to a bedrock intercept to test for the southward extent of the native copper intersected in discovery hole A-4. It will also test the northeast extension of the Belmont fracture system, which is regarded as having a high potential for massive limestone replacements as have been found at the Magma Mine, Superior.

Hole A-5 (Attachment B-2). This hole is presently cased at a depth of 3145 feet in the middle portion of the Whitetail Conglomerate. Deepening this hole will provide further control on the favorable native copper basin westerly from our hole A-7. Hole A-5 should be carried to a depth sufficient in premineral rock to test for the main favorable limestone replacement horizon presently being developed and mined at Magma.

Proposed hole A (Attachment B-3) is an eastward offset of the original native copper intercept in hole A-4. This hole will provide information on the timing and extent of movement along the Devils Canyon fault and provide data on the potential of native copper east of the fault. The hole will also provide information on the monzonite porphyry found in the bottom of hole A-4. It is within the favorable halo of the porphyry copper target.

Proposed hole B (Attachment B-4). This hole will test the northern extent and grade of the favorable native copper basin north of hole A-7. It is also along the northwest projection of leached capping slide blocks encountered in hole A-2 and should aid greatly in the interpretation of extent and timing of movement of these slide blocks.

Hole A-6 (Attachment B-1). Deepening of this hole from its present depth of 1665 feet will largely be based on the findings in hole A-3 (westward across the Devils Canyon fault) and from proposed hole A northward and on the same side of the fault as A-6.

Proposed hole C (Attachment B-4). This hole is to test the central portion of the porphyry copper target as exhibited in the alteration-mineralization found in hole A-2. The hole should encounter the leached capping slide block as found in holes A-2, AI-1, and DCA-3A, and provide additional control on the extent and movement of this favorable porphyry copper capping. It is in an optimum position within the porphyry copper target area, as integrated from the information of the surrounding holes. As noted above, the bedrock information of proposed holes A and B will be available for further integration into the bedrock configuration and extent of units applicable to this hole C.

Proposed hole D (Attachment B-5) is an alternative site for proposed hole A. It is further east of the Devils Canyon fault and would cut the fault within the dacite unit, which may afford some protection in that the zone would probably be cased off during the rotary drilling. It is also further within the suggested favorable porphyry copper target area. Depending upon the event and extent of native copper occurrence east of the fault, the hole would also provide further data on the timing and movement problem.

The drilling costs applicable to past drilling on the project have been summarized in several reports and also in the Summation Report dated March 10, 1975. In general, the overall costs are around $25.00 per foot with 75-80% of the costs being the direct drilling expenditure. With new drilling contracts presently being submitted, it is expected that costs will be near $36.00 per foot.

Road access to the drill sites of holes A-3 and A-5 are complete and need only minor preparation ($100 each). Proposed hole A will need considerable new construction with a possible cost approaching $25,000. A substantial amount of the expenditure would be for reaching the area of proposed hole D, prior to turning down the access ridge to site A. Proposed site B is around 1200 feet from a present access road that needs some clean-up work and it is estimated the road and site will cost $4,000. Proposed site C is along a previous cat road which needs grade and width modification. A moderate amount of rock work is involved at a cost of $5,000. Site A-6

needs minor clean-up and the sump cleaned out ($300). The main access road from Devils Canyon to serve sites A, C, D, and A-6 has been badly washed in spots and needs to be completely cleaned and revamped where necessary to bring in the bigger diamond drilling machines (estimated cost $5,000).

James D. Sell

James D. Sell

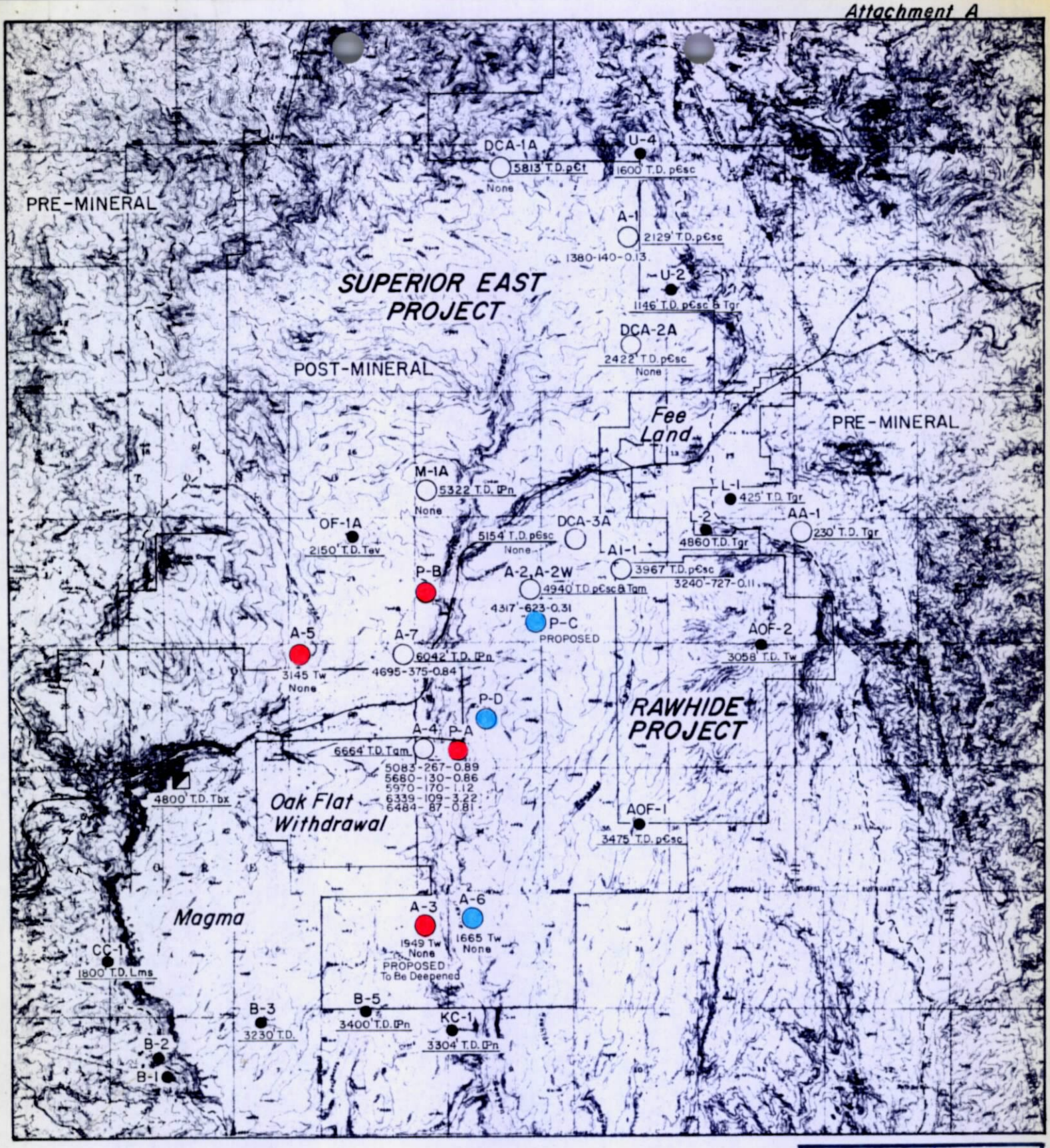
JDS:lb
Atts.

TABLE 1 — Projected Depths of Drill Holes
(and recommended order of drilling)

Drill Hole Number	Cross Section Number	Present Depth feet	Projected Depth to Unit (feet)							
			Base Dacite	Base Earlier Volcanics	Devils Canyon Fault	Top Cu°	Base Cu°	Base Whitetail	Basement Unit (top of)	Total Depth
A-3	B-1	1949	1430	None	--	4600	4900	4900	Upper Naco (4900)	5300
A-5	B-2	3145	2274	2600	--	3750	3850	3850	Upper Naco (3850) base Naco (5350) top Esc. Repl. (5900)	6500
P-A	B-3	Surface	2000	2200	3700	4300(?)	5000(?)	5200	Porphyry (5200)	6200
P-B	B-4	Surface	1950	2300	--	4800	5200	5700	Upper Naco (5700)	6000
A-6	B-1	1665	1475	None	2900	4300(?)	4600(?)	4600	Schist (4600)	5000
P-C	B-4	Surface	1850	2050	1850	Leached Capping SB* 3850	4300	3850	Porphyry (4300)	5300
P-D	B-5	Surface	1950	2050	2000	3950(?)	4700(?)	4900	Porphyry (4900)	6000

*SB = Slide Block

Attachment A



EXPLANATION

- ASARCO drill hole
- Other drill hole
- Magma's #9 shaft
- DCA-1 (hole designation)
- 4011 Tw — Rock type; Bottom hole depth
- T.D — Total Depth
- Proposed drill site

POST-MINERAL ROCK UNIT

Td - Dacite
Tev - Early volcanics
Tw - Whitetail

PRE-MINERAL ROCK UNIT

Tbx - Breccia
Tqm - Quartz Monzonite
Tgr - Granite
Ps - Supai formation
ℙn - Naco limestone
Me - Escabrosa limestone
Dm - Martin lms
pЄt - Troy qtz
pЄdb - Diabase
pЄsc - Schist

ASSAY DATA KEY

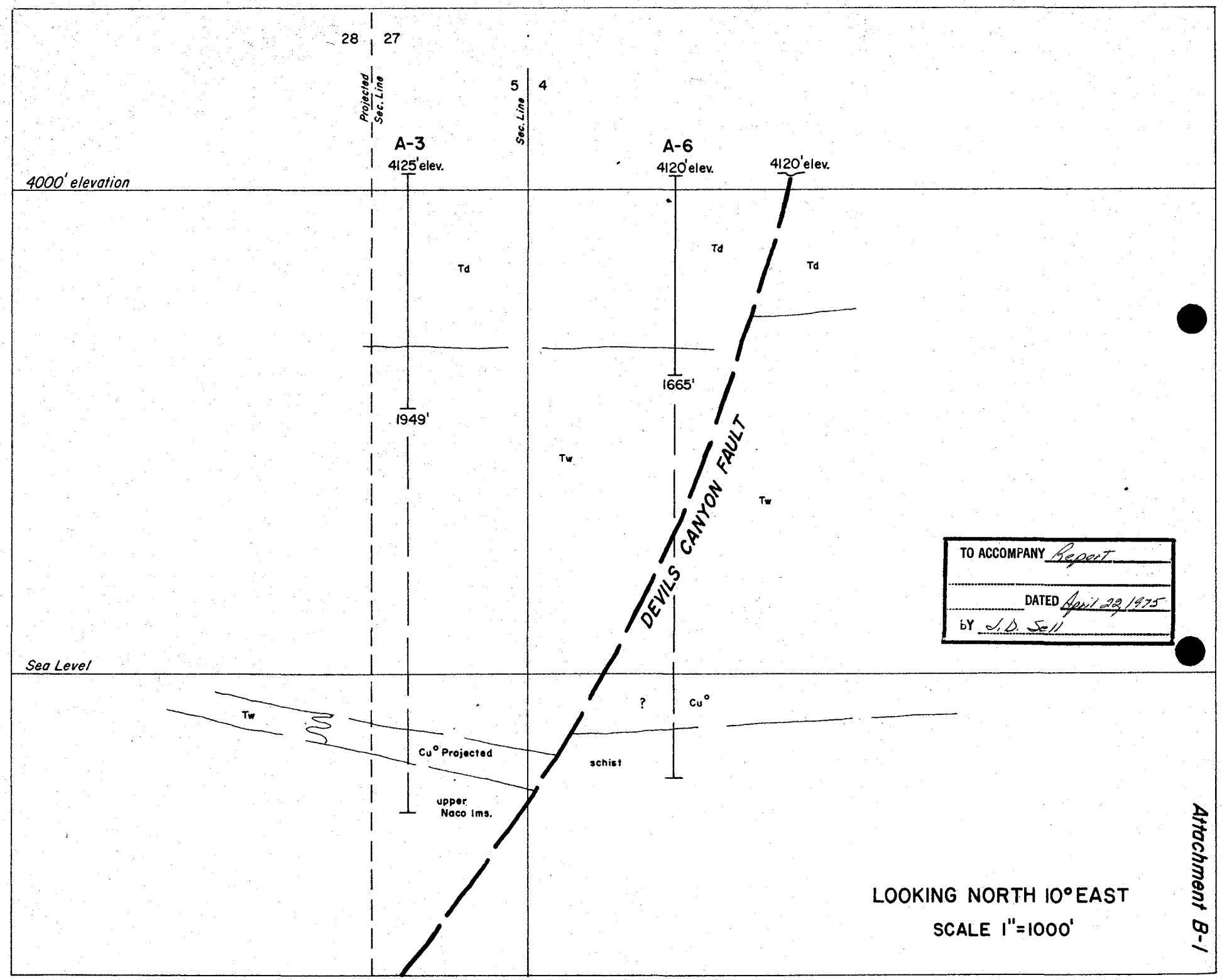
depth-length-%Cu
4317-623-0.31

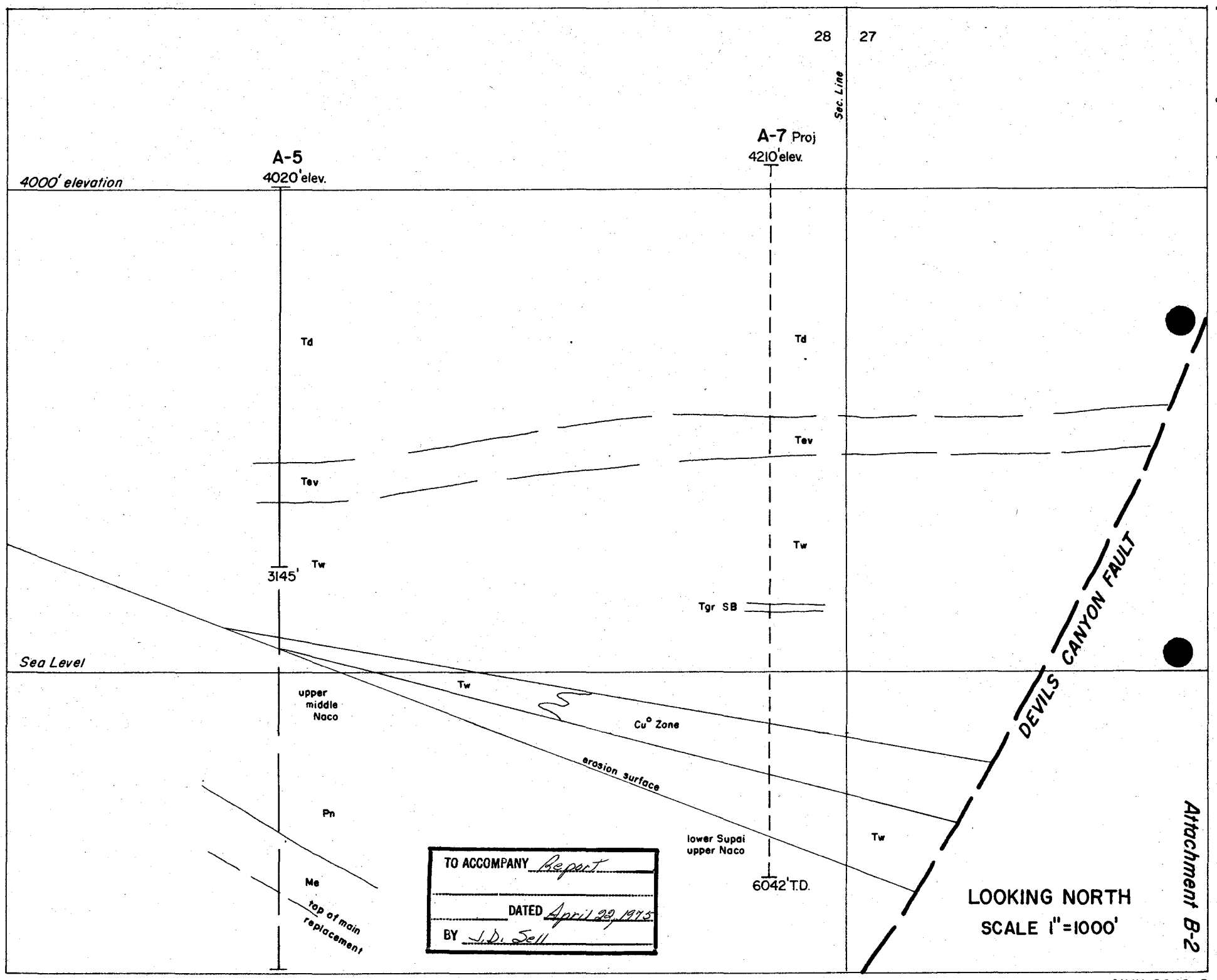
- Primary Holes
- Subsequent Holes

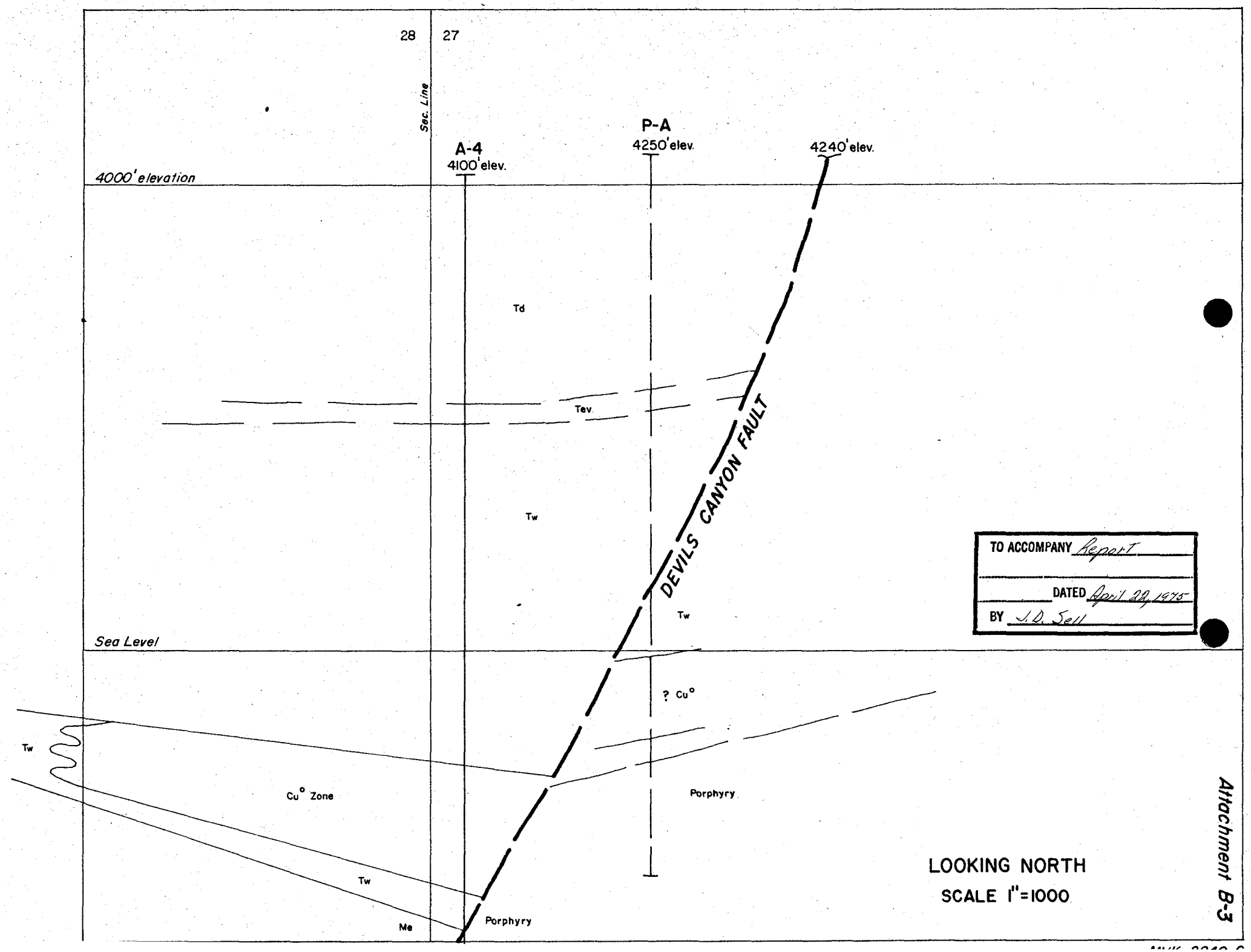
TO ACCOMPANY Report
DATED April 22, 1975
BY J.D. Sell

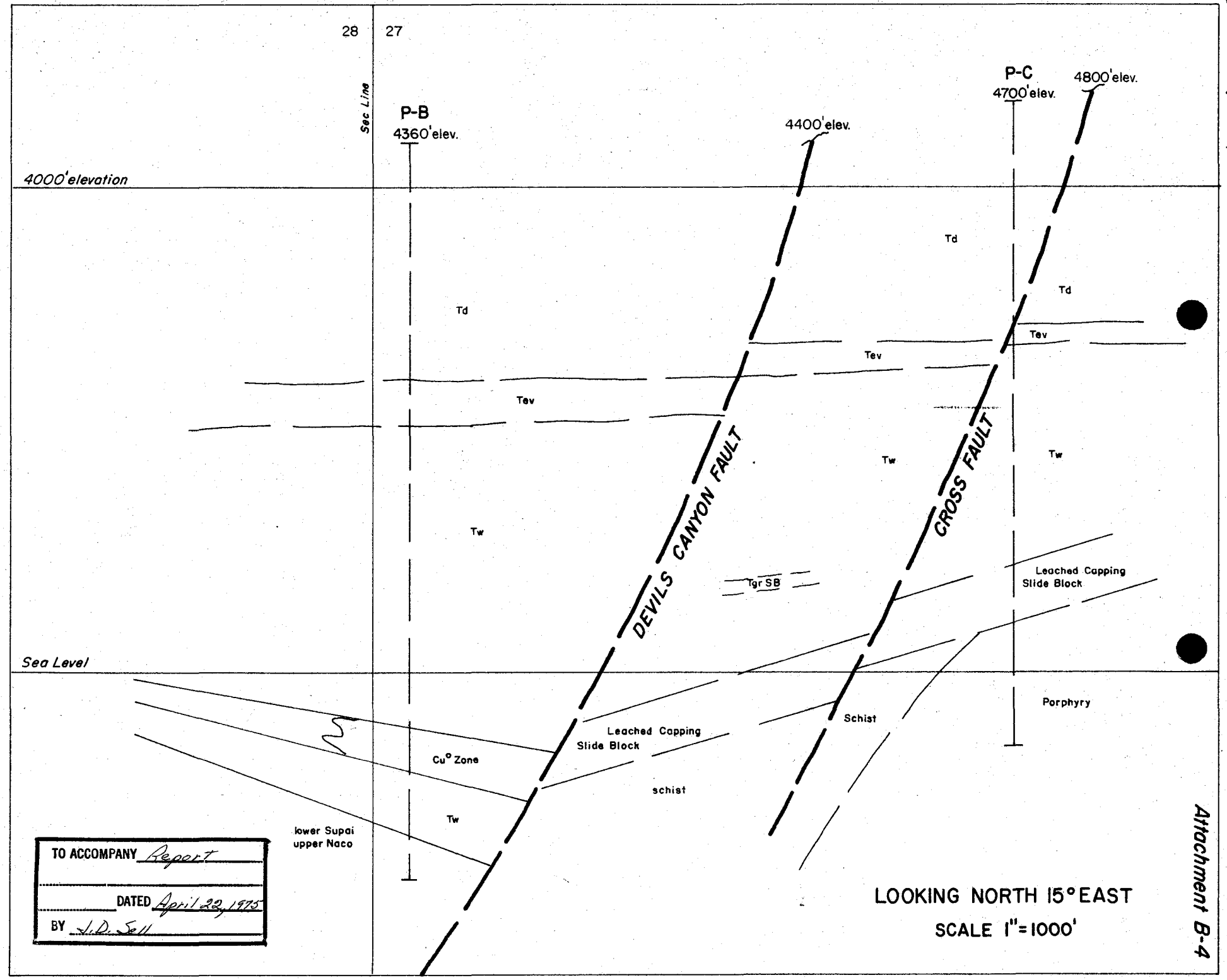
DRILLING PROGRESS MAP
for the month of _____
SUPERIOR EAST
GILA & PINAL COUNTY, ARIZONA
SCALE: 1" = 1 mile J.D.S.

Modified-April 1975-JD
MVK 2463 No. 3

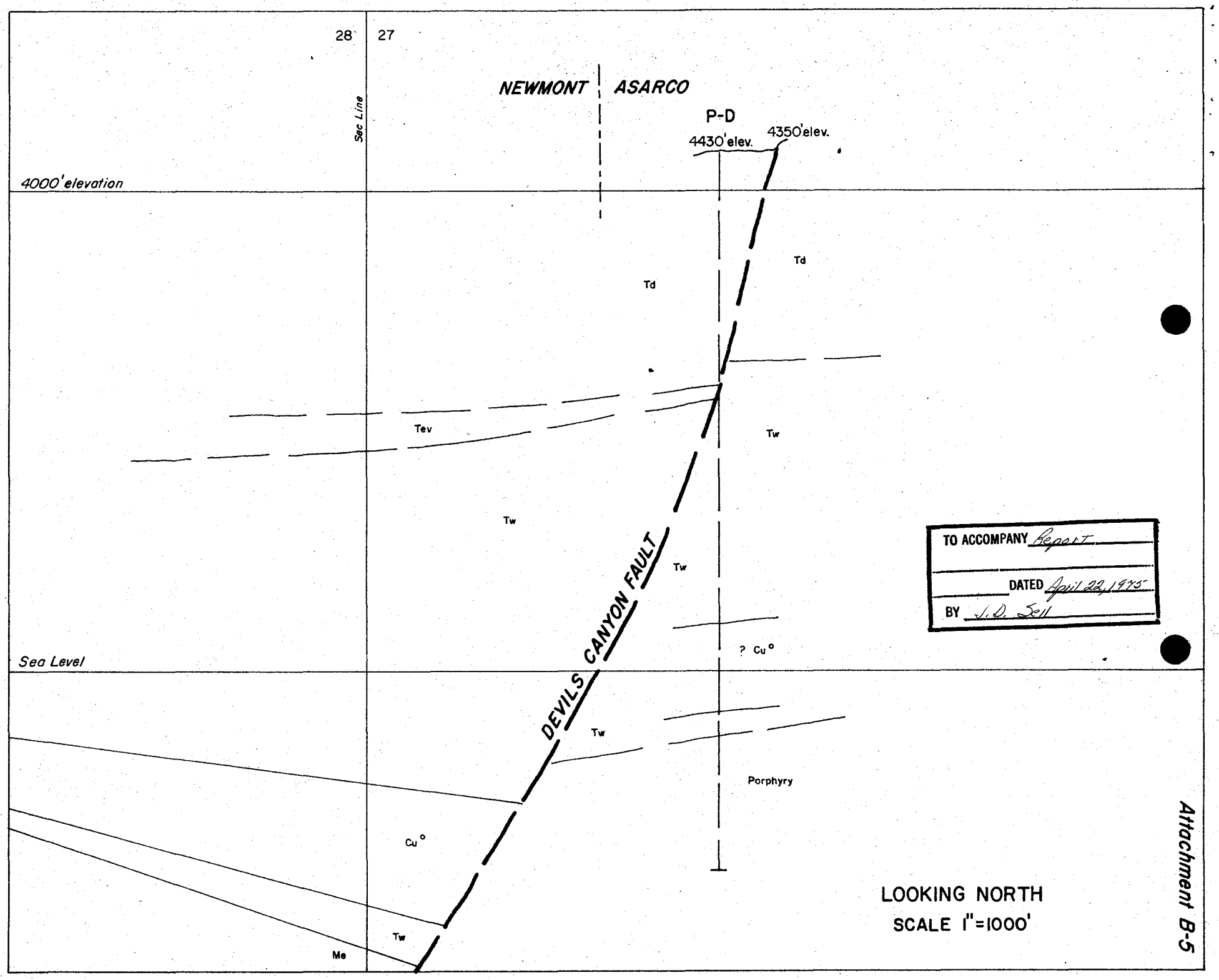

28
27
Projected Sec. Line
5
4
Sec. Line
A-3
4125' elev.
A-6
4120' elev.
4120' elev.
4000' elevation
Td
Td
Td
1665'
1949'
Tw
Tw
DEVILS CANYON FAULT
Sea Level
Tw
?
Cu°
Cu° Projected
schist
upper Naco lms.
TO ACCOMPANY Report
DATED April 22, 1975
BY J. D. Sell
LOOKING NORTH 10° EAST
SCALE 1"=1000'
Attachment B-1


28
27
Sec. Line
A-7 Proj
4210' elev.
A-5
4020' elev.
4000' elevation
Td
Td
Tev
Tev
Tw
Tw
3145'
Tgr SB
Sea Level
Tw
upper
middle
Naco
Cu° Zone
erosion surface
Pn
lower Supai
upper Naco
Tw
Me
top of main
replacement
6042' T.D.
DEVILS CANYON FAULT
LOOKING NORTH
SCALE 1" = 1000'
Attachment B-2
TO ACCOMPANY Report
DATED April 29, 1975
BY J. D. Sell


28
27
Sec. Line
A-4
4100' elev.
P-A
4250' elev.
4240' elev.
4000' elevation
Td
Tev
Tw
DEVILS CANYON FAULT
Tw
Sea Level
? Cu°
Tw
Cu° Zone
Porphyry
Tw
Me
Porphyry
TO ACCOMPANY Report
DATED April 22, 1975
BY J. D. Sell
LOOKING NORTH
SCALE 1"=1000
Attachment B-3



Attachment B-4


28
27
Sec Line
NEWMONT
ASARCO
P-D
4430'elev.
4350'elev.
4000'elevation
Td
Td
Tev
Tw
Tw
Tw
DEVILS CANYON FAULT
? Cu°
Sea Level
Tw
Porphyry
Cu°
Tw
Me
LOOKING NORTH
SCALE 1"=1000'
TO ACCOMPANY Report
DATED April 22, 1975
BY J.D. Sell
Attachment B-5

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

April 30, 1975

J. H. C.
MAY 1 1975

Mr. T. C. Osborne
Assistant Director of Exploration
New York Office

Supplemental Exploration
Authorization Request
Superior East Project
Pinal County, Arizona

Dear Sir:

On April 25, 1975 I submitted a Supplemental Exploration Authorization Request for Superior East totaling $450,000. You have asked that request to be modified to a more limited program. I therefore propose that work items 1 and 2 of that request be done at this time.

Work	Est. Total Project Cost
1) Deepen rotary hole A-5 from 3145 feet to 4645 feet by diamond drilling	$ 40,000
2) Clean out, case, and deepen rotary hole A-3 from 1949 feet to 4950 feet by diamond drilling	120,000
Estimated Total	$160,000
Less Balance SEA #0010-08	(50,000)
Amount requested	$110,000

If you approve, please request a Supplemental Exploration Authorization in this amount. Forms 302-EA and 302-EB are attached.

Respectfully submitted,

W. L. Kurtz

W. L. Kurtz

WLK:lb
Atts.

cc: JHCourtright - w/o atts.
RBCrist " "
JDSell " "
NPWhaley " "
WGKellogg - w/atts.

J.H.C.

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

April 25, 1975

J. H C.
APR 29 1975

Mr. T. C. Osborne
Assistant Director of Exploration
New York Office

Supplemental Exploration
Authorization Request
Superior East Project
Pinal County, Arizona

Dear Sir:

I have previously forwarded to you Mr. Sell's excellent reports on the Superior East Project entitled "1974 Summary Report with Recommendations for Additional Exploration" dated March 10, 1975 and "Whitetail Copper Potential" dated November 8, 1974.

These reports summarize all our work to date. The work approved in SEA #0010-08 has been partially completed (i.e., State PP work completed and drill hole DCA-3 cleaned out, cased, and completed by diamond drilling). The proposed hole south of A-2 was not drilled, but rather old hole DCA-2 was reentered, cased, and cored from 1352 feet to 2080 feet to check the mineralization previously reported in the rotary cuttings. No mineralization of economic importance was encountered.

After discussing these reports with you and Mr. Collins, general agreement was reached that present exploration should be directed at the native copper in Whitetail rather than the porphyry copper target area. The two holes, A-4 and A-7, completed in the native copper zone both contained plus 300-foot intercepts averaging greater than 0.8% copper.

We propose the following program to test the Whitetail basin and the native copper zone contained within the Whitetail conglomerate:

1) Deepen rotary hole A-5 from 3145 feet to 4645 feet by diamond drilling.

2) Deepen rotary hole A-3 from 1949 feet to 4950 feet by diamond drilling.

3) Obtain an intercept 1,000 feet east of A-4 by drilling a wedged hole from within A-4. Requires 2,000-3,000 feet of diamond drilling.

4) Collar a new hole based upon above drill results. Tentative site: 3,000 feet north-northeast of A-7 or 3,000 feet south of A-4. Requires a 5,000-6,000 foot hole.

I estimate total project expenditures to complete this work at $500,000.

If you approve, please request a Supplemental Exploration Authorization in the amount of $450,000 ($500,000 less $50,000 balance in SEA #0010-08). Forms 302-EA and 302-EB are attached.

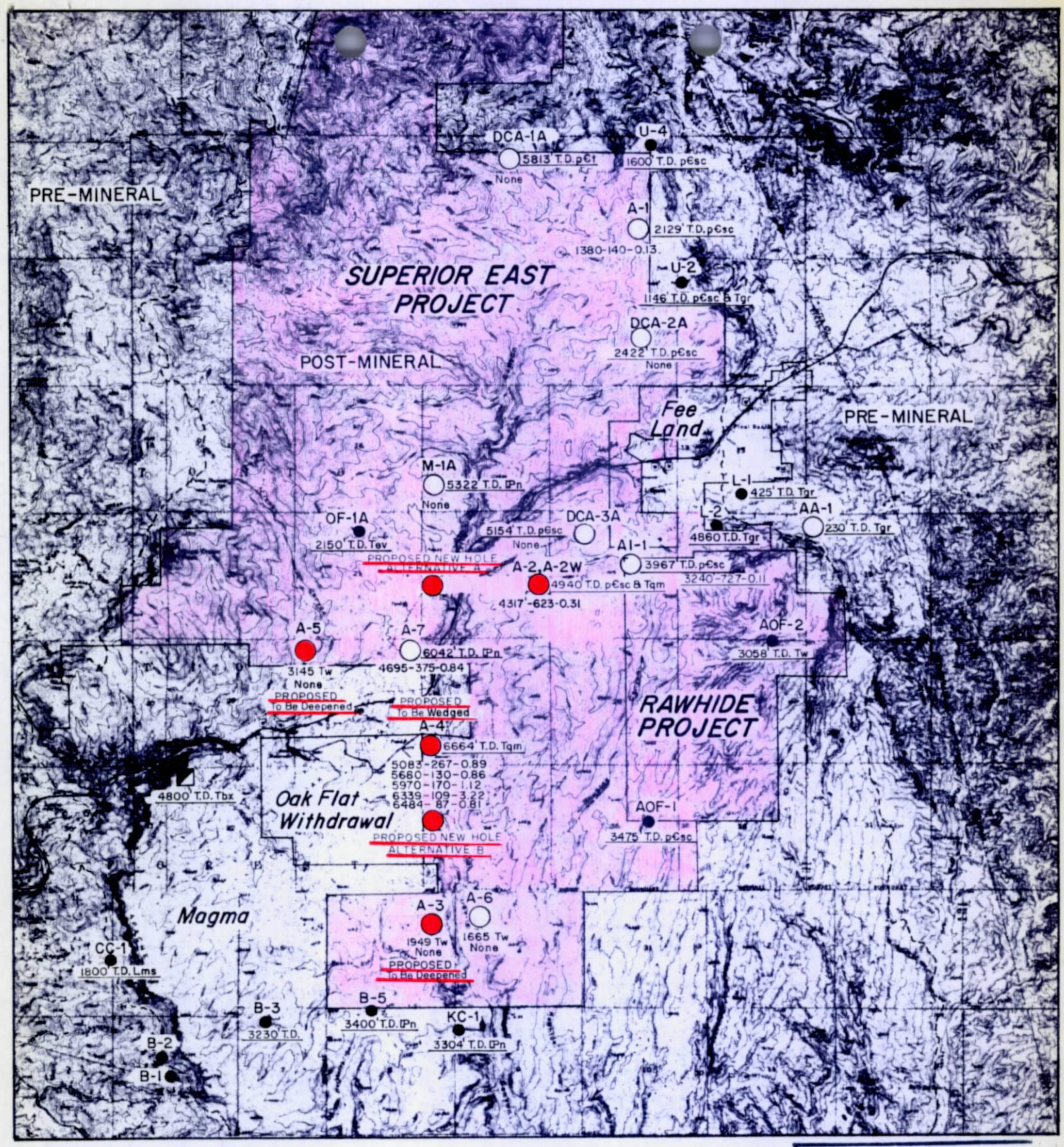
Respectfully submitted,

W. L. Kurtz

W. L. Kurtz

WLK:lb
Atts: Map
Forms 302-EA & 302-EB

cc: JHCourtright - w/atts.
RBCrist - w/o atts.
JDSell - w/o atts.
NPWhaley - w/o atts.
WGKellogg - w/forms only



EXPLANATION

- ASARCO drill hole
- Other drill hole
- Magma's #9 shaft
- DCA-1 (hole designation)
- 4011 Tw — Rock type; Bottom hole depth
- T.D — Total Depth
- Proposed drill site

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Tev - Early volcanics
Tw - Whitetail

PRE-MINERAL ROCK UNIT

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Tqm - Quartz Monzonite
Tgr - Granite
Ps - Supai formation
Pn - Naco limestone
Me - Escabrosa limestone
Dm - Martin lms
p€t - Troy qtz
p€db - Diabase
p€sc - Schist

ASSAY DATA KEY

depth-length-%Cu
4317-623-0.31

Primary Holes

TO ACCOMPANY Supplemental Exploration Authorization Request
DATED April 25, 1975
BY W. L. Kurta

DRILLING PROGRESS MAP
for the month of _____
SUPERIOR EAST
GILA & PINAL COUNTY, ARIZONA
SCALE: 1" = 1 mile J.D.S.

Modified-April 1973-WL
MVK 2463 No. 3

PRINTED IN USA 9/69

FORM 302-EB

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION AUTHORIZATION

....April 25,.....19.75.

Originating Office ...SWED - Tucson.....

Application is hereby made for supplemental Authorization to cover cost, in excess of original estimate, of work authorized by New York.

SUPERIOR EAST PROJECT

No..Pinal County, Arizona.. #0010-00 thru #0010-09*

Present total Estimated Cost (Form 302-EA attached)	$2,235,000.
Amount previously authorized (date 6/70 thru 6/74.)	$1,785,000.
*#0010-07 & 09 - JI Ranch purchase ($520,000)	
Balance for which Authorization is now requested	$..450,000.

ADDITIONAL WORK CONTEMPLATED:

1) Deepen rotary hole A-5 1500 feet by diamond drilling.
2) Deepen rotary hole A-3 3000 feet by diamond drilling.
3) Diamond drill 2,000 to 3,000 feet in a hole wedged from A-4.
4) Rotary and diamond drill a new hole to a final depth between 5,000 feet and 6,000 feet.

EXPLANATION OF INCREASED COST:

Substantial native copper intercepts in drill holes A-4 and A-7 justify additional drilling.

Reviewed by ..[signature]..... Approved by .....
Acct. Mgr. or Chief Acct. Vice President

Recommended by ..[signature]..... Approved by .....
Supervisor Comptroller

Account Chargeable to .....
To be designated by Comptroller

Approved by Advisory Committee Approved by Board of Directors

.....19..... .....19.....

.....
Secretary

PROSPECT SUPERIOR EAST PROJECT

LOCATION Pinal County, Arizona

COST ESTIMATE, MINERAL EXPLORATION

OFFICE SWED - Tucson

W. L. Kurtz

No.	Type of Work	Salaries/Wages Days	Salaries/Wages Amount	Material	Fees, Rent, Services	Traveling	Taxes	Other	Total Estimate Cost
501	Outright Purchase							519,000	519,000
502	Option Payments								
503	Bonus Payments								
504	Minimum Royalties-								
	Deductible from								
	Future Production								
505	Minimum Royalties-Not								
	Deductible from								
	Future Production								
506	Rental Payments							2,500	2,500
507	Staking Claims		4,000		45,000				49,000
511	Surface Excavating								
512	Underground "								
521	Surface Drilling				1,325,000				1,325,000
522	Underground "								
530	Geologic								
540	Sampling, Assaying, Lab.		4,000		21,000	2,000			27,000
550	Geophysics								
560	Geochem				3,000				3,000
570	Engineering								
580	Construction (temp.)				101,000				101,000
590	Construction (perm.)								
610	Administration, Field		136,000			50,500			186,500
	Offices and Camps								
620	Administration, General		5,000		4,000				9,000
641	Autos and Vehicles					13,000			13,000
642	Aircraft and Boats								
650	Partner's Share								
	ASARCO'S SHARE		149,000		1,499,000	65,500		521,500	2,235,000
661	Commission or Fees								
663	Exchange								
	TOTAL		149,000		1,499,000	65,500		521,500	2,235,000

J. H. C.

MAR 12 1975

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

February 26, 1975

Mr. T. C. Osborne
Assistant Director of Exploration
New York Office

Appropriation Request
J-I Ranch

Dear Sir:

Attached is an appropriation request for $6,100 to cover the following for the J-I Ranch.

One 16' Combination Stock Trailer $1,300

A trailer of this type is needed in the ranch operation to move horses and cattle to and from remote portions of the ranch. Horses may be hauled and unloaded at points saving hours of riding time. Sick or crippled cattle can be loaded and brought to the headquarters for treatment within hours where driving might take two to three days or even impossible. Also, in moving stock to market the trailer would nearly double the capacity of the truck, saving mileage and time.

Develop A-7 Drill Hole for Stock Water $4,800

With the development of this water source, we will be able to furnish permanent water for the southwest corner of the north unit. There is approximately 1,200 acres which are without water during the dry seasons of the year, thus preventing proper utilization of forage and distribution of livestock.

The ranch at one time had an additional 45 head temporary permit for livestock. Through the development of this permanent water and other water where available, we should regain the 45 head on a term permit from the Forest Service. This would bring our total to 400 head of cattle year-long plus the natural increase through May.

Respectfully submitted,

Wm L. Kurtz

W.L. Kurtz

RLH:WLK:vmh
Attachments
cc: J.H. Courtright w/o attach.
R.B. Crist w/o attach.
J.D. Sell w/o attach.
J.J. Tornatore w/attach.

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

December 11, 1974

DEC 11 1974

Mr. T. C. Osborne
ASARCO
New York Office

Seismics
Superior East Project
Pinal County, Arizona

Enclosed are two reports by Cooksley, one dated June 1970 done for Continental Copper and one dated February 1972 done for Asarco.

The two critical items are the selection of the "correct" velocity and the selection of the "correct" reflecting surfaces. An inspection of Appendix C and Appendix B casts serious doubt on accurate selections (Moss, March 27, 1972, sums this subject up quite well).

W. L. Kurtz

W. L. Kurtz

WLK:lb
Encs.

cc: JHCourtright
JDSell
CKMoss

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

November 8, 1974

W. L. K
DEC 10 1974

J. H. C.

DEC 11 1974

TO: W. L. Kurtz

FROM: J. D. Sell

file → Whitetail Copper Potential
Superior East Project
Pinal County, Arizona

SUMMARY

At your request I am submitting this report on the potential of the copper zone found in the lower portion of the Whitetail Conglomerate.

As previously recorded, two ASARCO drill holes have cored substantial cuprite-native copper intervals. Drill hole A-4 encountered the following consecutive intervals: 267 feet of 0.89% copper, 330 feet of 0.08%, 130 feet of 0.86%, 160 feet of 0.16%, and 170 feet of 1.12% copper. Drill hole A-7 encountered 55 feet of 1.17% copper, 50 feet of 0.10%, 110 feet of 1.46%, 50 feet of 0.16%, and 110 feet of 0.70% copper (or 375 feet of 0.84% copper).

The collar-to-collar surface distance from A-4 to A-7 is 3,900 feet with slightly over that amount, due to hole deviation, at the level of the mineralized copper zone. The continuity of copper values between the holes is supported by sedimentation parameters and type of mineralization.

East-west cross-sections and a north-south section have been constructed through known geologic data. An inferred reserve of 431 million tons has been calculated using the data and restricted block parameters discussed in the text. Ownership breakdown of the tonnage is shown below.

Owner	Tons	
ASARCO, north	87,500,000	
ASARCO, east	49,200,000	
ASARCO subtotal		136,700,000
Newmont, north		174,800,000
Oak Flat Recreation (USFS closed to mineral entry)		119,700,000
Total		431,200,000 tons

area: 7000' x 2500'

Based on the grade of the two drill holes, an average of +0.80% copper is assignable to the above tonnage.

was established of assigning half the overall zone to equal the thickness for the mineralized intercept calculations. This half value was used in the paramarginal resource calculations for blocks C through G.

Attachment F-series are plans of the various ownership blocks using the above parameters of diminishing thickness. The geological paramarginal resource blocks are summarized in Table 2.

TABLE 2 - Paramarginal Resource Block Summary

Block	Owner	Tons	
A	ASARCO, North	196,000,000	
E	ASARCO, East	197,300,000	
G	ASARCO, South	164,200,000	
	ASARCO Subtotal		557,500,000
B & C	Newmont, North	347,900,000	
F	Newmont, South	44,400,000	
	Newmont Subtotal		392,300,000
D	Oak Flat Recreation (USFS)		445,400,000
	Total		1,395,200,000 tons paramarginal resources, total basin

With the foregoing information, the following conclusions are evident.

1) The mineral zones intercepted in ASARCO drill holes A-4 and A-7 are significant and substantial as a mineral reserve.

2) The lateral extent between A-4 and A-7 and the similarity of values and distribution established a continuity of a host mineral zone.

3) The westward distance of A-7 away from the probable bounding structure of the Devils Canyon fault established a strong continuation of the host zone at right angles to the north-south A-4 to A-7 trend.

4) The logging of a marker bed at the top of the mineral zone and the sedimentation characteristics within the zone strongly support a defineable but widespread unit within the lower portion of the large Whitetail basin.

5) The amount of inferred copper is compatible to known deposits in the vicinity (Miami and Ray districts).

6) Further studies:

   a) A study is presently under way to redefine the various source areas and levels of clast material within the total Whitetail

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

November 5, 1974

I. H. C.

NOV 8 1974

Mr. J. J. Collins
Director of Exploration
New York Office

Seismics
Superior East Project
Arizona

Dear Mr. Collins:

In a letter of June 6, 1974 from Mr. Moss to you, I am quoted: "Mr. Kurtz feels that our drilling to date has fairly well established the general overall configuration of the Whitetail basin and general distribution of the rock types. He feels that additional seismic work would be more of a research project and not directly applicable to guiding further exploration at Superior East."

In a letter of October 24, 1974 from Moss to you, Mr. Moss states: "My personal evaluation of Cooksley's capabilities in the area would limit his probable contribution to the determination of coarse aspects of the structural picture. I doubt that he would be able to identify slide blocks, or detail structural breaks. Resolution of features near fault planes would be difficult to accomplish."

My conclusion of the recent discussions between Kurtz and Moss, Moss and Cooksley, Sell and Cooksley, and Sell and Kurtz is that additional seismic work at Superior East will not materially affect or change our exploration plans at Superior East. The Whitetail conglomerate, with its greatly varying composition and specific gravity, has not yet allowed a constant velocity to be assigned to it and therefore does not allow an accurate calculation of thickness.

In my mind there is no justification of spending 10-20-30,000 dollars on seismic work at this time. The limits of the 0.5% to plus 1.0% native copper have to be defined and this can only be done by drilling. I believe the next exploration step is drilling a hole south of A-4. This could be a new hole 3500' south of A-4 or deepening A-3 (7500' south of A-4).

Very truly yours,

W. L. Kurtz

W. L. Kurtz

WLK:lb

cc: JHCourtright
CKMoss
JDSell

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

September 11, 1974

J. H. C.
SEP 11 1974

Superior East

Mr. D. E. Crowell
Building

Native Copper

As discussed with you last week, Mr. Sell will provide you with about 20 pounds of assay reject material averaging about 0.9% copper. The copper primarily occurs as native copper in conglomerate. The native copper occurs as thin plates and foils around the pebbles*, as fine disseminations in the fine sand and clay matrix, and a small percentage within the pebbles.

I should like you to determine whether this native copper can be recovered easily and in what quantity.

W. L. Kurtz
W. L. Kurtz/lb

WLK:lb

cc: JHCourtright
JDSell

*In splitting the core and crushing for assay, the plates and foils have fallen away from the pebbles.

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

June 17, 1974

W. L. K.
JUN 21 1974

J. H. C.
AUG 5 1974

Memorandum to: J. D. Sell

From: F. T. Graybeal

Hydrothermal alteration in
A-1 and A-2 samples
Superior East Project

Fourteen thin sections were examined in detail from two drill holes in the Superior East area. All sections examined in this phase were from below "fault 2". Data sheets for both the alteration and fluid inclusion studies are appended.

Hole A-1

The six samples studied are schistose and all contain variable amounts of quartz, orthoclase, biotite, sericite-muscovite, and sulfide. The schistosity is accentuated by the formation of alternating layers of quartz-orthoclase and biotite-sericite. The schist is cut by quartz-orthoclase veins of uncertain origin, either metamorphic or hydrothermal, which generally parallel the foliation. The vein orthoclase usually contains some extremely fine-grained reddish inclusions which probably account for its pinkish color. Some of the matrix orthoclase has a similar appearance suggesting a similar origin.

The biotite is generally elongate parallel to the foliation rather than in random orientation, suggesting metamorphic origin. However, in several samples lenses of biotite are notably coarser grained and more abundant where they are coincident with lenses of red inclusion-rich orthoclase. This latter occurrence, perhaps 5-10% of the total biotite + orthoclase, may be hydrothermal. In several places, biotite is more abundant where sulfides are more abundant.

Sericite is often medium-grained (muscovite), is concentrated along the foliation planes, and often cuts across biotite flakes.

Anhydrite (2-10%) and calcite (tr-1%) occur in four of the samples. Anhydrite is both disseminated and in the quartz veins and, in the sections examined, appears to decrease in abundance with increasing depth. Traces of chlorite were noted in A-1-20. In addition kaolinite, possibly with mixed very fine-grained quartz, is present in A-1-20. The presence of moderate cataclastic deformation features makes it unclear whether the kaolinite is an alteration mineral or simply part of a mylonite.

Fluid inclusions were examined in detail in four of the samples. In all cases they were found to be very small, rare, and of the two-phase type with liquid and a small gas bubble. A brief reconnaissance of the other two samples revealed a similar population. No daughter minerals or gas-rich inclusions were seen.

In summary, hole A-1 appears to contain some potassic alteration. The strongest evidence for this is the presence of locally abundant anhydrite. The near absence of fluid inclusions of any type suggests that alteration was not pervasive. Veins which crosscut the foliation are rare.

Hole A-2

The seven samples studied are mixed schist and granite porphyry. The matrix and phenocryst textures of the granite porphyry, particularly the quartz eyes, were rather distinctive and indicate that the aplite and feldspar veins noted on the logs are probably all granite porphyry. The orthoclase in the granite porphyry often contains abundant reddish inclusions which I have found to be typically a hydrothermal alteration phenomenon. The amount which is hydrothermal is unclear, but it could be 50 percent of the total orthoclase in the rock.

The sericite in the granite porphyry is clearly an alteration product of plagioclase. The abundant kaolinite in A-2-6 may be a result of the moderate cataclastic deformation of this sample, similar to that seen in sample A-1-20. Minor calcite is present in most of the granite porphyry samples.

The two samples of schist in this hole both contain calcite and sample A-2-7 also contains minor anhydrite and apatite. Both these latter two accessory minerals are characteristic of potassic alteration assemblages in other porphyry copper deposits.

Fluid inclusions are mostly small to medium size and are rare to common. Two-phase inclusions (water with a gas bubble forming 10-40 percent of the inclusion) generally form about 99 percent of the total inclusions present. The remainder are three-phase inclusions containing small but recognizable daughter minerals particularly a small birefringent, blocky species. Several inclusions contain an opaque mineral and several other anisotropic species may be present. The overall abundance and type of fluid inclusions indicate the presence of a hydrothermal fluid of low to moderate salinity.

In summary, hole A-2 appears to contain an uncertain but possibly substantial amount of hydrothermal alteration minerals. This is probably a function of the abundance of granite porphyry encountered in the hole. Circulation of a hydrothermal fluid of low to moderate salinity is also indicated. No obvious vertical changes are present.

Comparison of holes A-1 and A-2

The comparison of alteration in the two holes is admittedly difficult due to significant differences in rock type which tend to influence alteration mineralogy. Both holes contain probable potassic alteration minerals; however, in A-2 these minerals are more abundant and varied than in A-1. In addition fluid inclusions in A-2 are larger, more abundant, and contain a more saline hydrothermal solution than in A-1. Although the fluid inclusions are more abundant and varied in the granite porphyry as compared to the schist in A-2, a comparison of schist samples in holes A-1 and A-2 strongly suggests that alteration was more pervasive in A-2.

The apparent stronger alteration in A-2 may be related to the abundance of granite porphyry, the probable source rock. Nothing can be said about the relative depth of the two holes in the hydrothermal system. The fluid inclusions in the granite porphyry in A-2 are similar to but not as abundant or saline as fluid inclusions examined from a single granite porphyry sample collected from the OxHide deposit. Thus it is possible that the center, or most intense zone of alteration-mineralization has not yet been intersected in the Superior East area, if indeed one was or is still present.

F. T. Graybeal

F. T. Graybeal

FTG:lb
Attachs. - in General File

cc: WLKurtz

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

I. C.

May 10, 1974

MAY 13 1974

Mr. T. C. Osborne
Asst. Director of Exploration
New York Office

Supplemental Exploration
Authorization Request
Superior East Project
Pinal County, Arizona

Dear Sir:

In the initial request of $500,000 for purchase of the JI Ranch from D Land and Cattle Company, I inadvertently neglected to include our obligation of a mortgage in the amount of $19,280.79 on the 116.5 fee acres north of the highway. I request $20,000 to cover this mortgage and legal fees.

Forms 302-EA and 302-EB are attached.

Respectfully submitted,

W. L. Kurtz

W. L. Kurtz

WLK:lb
Attachs.

cc: JHCourtright - w/o attachs.
RBCrist - " "
JDSell - " "
ADCoumides - w/attachs.

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

April 4, 1974

J. H. C.

APR 8 1974

FILE MEMORANDUM

Oak Flat
Pinal County, Arizona

Today I talked with Byron Hardie of Newmont and told him of my discussions with T. Brown.

Hardie indicated he would try and avoid Brown.

I told Hardie that I didn't think any one party would be able to obtain mineral rights at Oak Flat because the government would not show partiality towards one party or one company. I told him he ought to think about the area and how it might be effectively explored considering the land positions of Newmont and Asarco.

W. L. Kurtz

WLK:lb

cc: TCOsborne
JHCourtright
RBCrist
JDSell
NVisnes

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

April 3, 1974

J. H. C.
APR 8 1974

FILE MEMORANDUM

Oak Flat
Pinal County, Arizona

I met with T. Brown again this morning and informed him that Asarco did not want to proceed any further with him concerning a land exchange (his 390 acres of patented mining claims in the Buffalo National River, Arkansas for an undisclosed property in Arizona).

T. Brown's terms were $500 thousand immediately, an additional $500 thousand if he completed the land exchange, and 10% net profits on any production.

Mr. Desvaux and I had established that surface value of hilly, rocky land in the Buffalo River area brings between $100 and $250 per acre. The government has paid as high as $400 per acre for prime bottom land.

Mr. Brown inquired if he obtained documentation from the government that an exchange could be made, would Asarco then be interested. I said we might be.

Brown left by saying he was going to contact Byron Hardie at Newmont.

W. L. Kurtz

WLK:lb

cc: TCOsborne
JHCourtright
NVisnes
RBCrist

N.C.

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

March 15, 1974

J. H. C.

MAR 18 1974

Mr. T. C. Osborne
Asst. Director of Exploration
New York Office

Supplemental Exploration
Authorization Request
Superior East Project
Pinal County, Arizona

Recently completed drill hole A-7 indicates that the native copper in conglomerate intersected in hole A-4 extends northerly for at least 4,000 feet. Hole A-7 intersected one native copper-cuprite zone with the 375' interval between 4695'-5070' assaying 0.84% copper including two 50' zones assaying 0.10 and 0.16 copper (see attached Plan Map).

Drill hole AI-1 on the adjacent Rawhide Project Area was located 4,000' east of A-2 to test for the eastward extension of the porphyry copper-type mineralization intersected in drill hole A-2. Significant assays in A-2 are: 4317-4610 293' 0.35% Cu; 4610-4940 150' 0.42% Cu as chalcopyrite and bornite. The 727' interval between 3240' and 3967' in AI-1 averages 0.11% Cu as chalcopyrite in Pinal Schist. This demonstrates that the porphyry copper zone discovered in A-2 is of major size and that additional drilling is required to test for ore grade copper (both secondarily enriched and primary).

I recommend drilling two holes in the porphyry copper zone. The first would entail cleaning out old drill hole DCA-3 to 3,000 feet, casing and diamond drilling 1500-2000 feet. The other hole would be drilled at a site selected after completion of DCA-3. Additional drilling in the native copper zone is not recommended at this time because of Magma's claims and the Oak Flat Withdrawal.

$23,000 worth of work needs to be completed on State sections 4 and 5 to hold our prospecting permits for another year. This would be fulfilled by deepening holes A-3 and A-6.

I estimate total project costs to complete this work as follows:

Clean out, case and diamond drill DCA-3	$ 65,000
Drill additional hole	130,000
State PP work	25,000

If you approve, please request a Supplemental Exploration Authorization in the amount of $220,000. Forms 302-EA and 302-EB are attached.

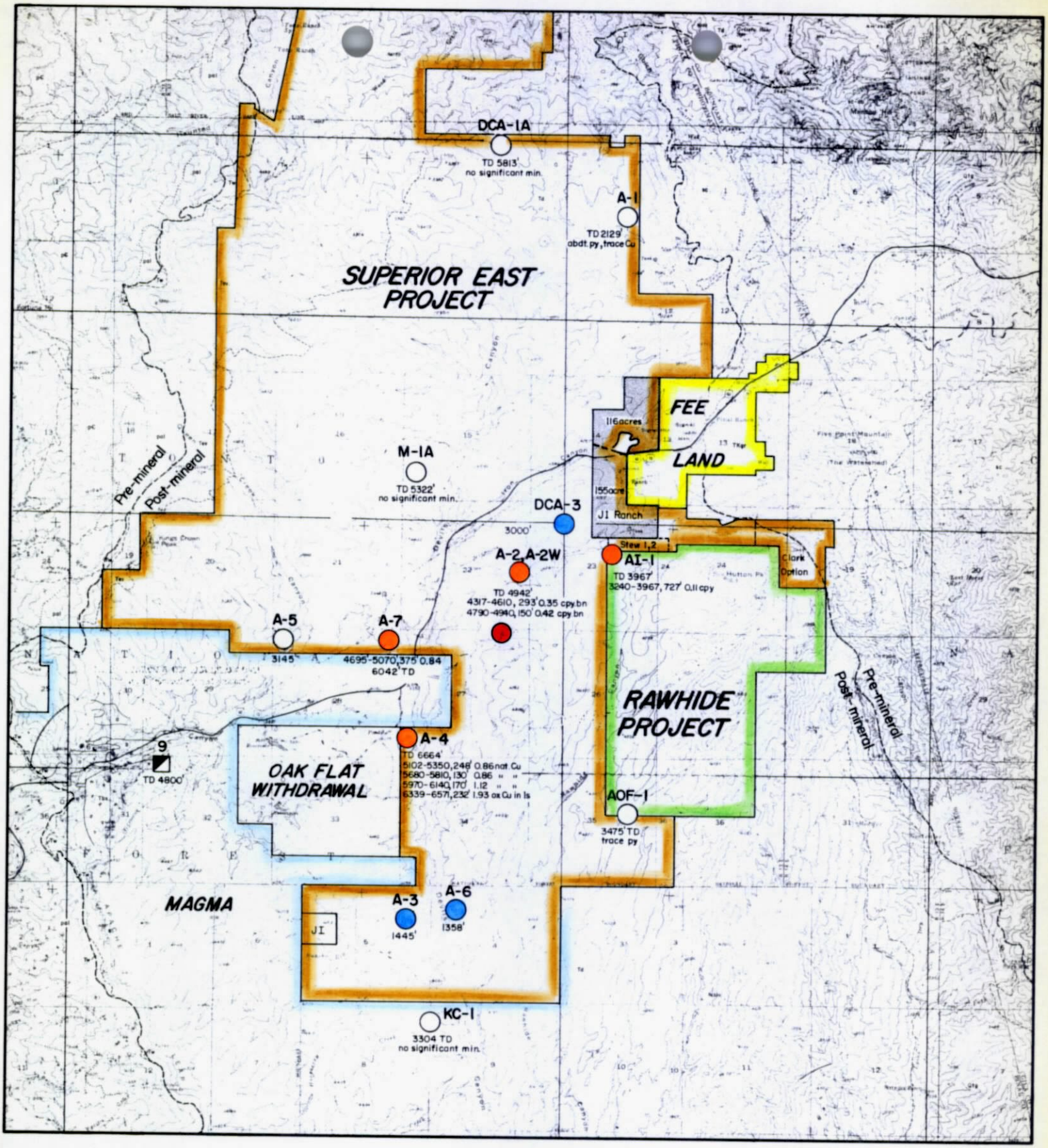
Respectfully submitted,

W. L. Kurtz

W. L. Kurtz

WLK:lb
Attachs.

cc: JHCourtright - w/attachs.
RBCrist - w/o attachs.
JDSell - w/o attachs.
ADCoumides - w/forms only



EXPLANATION

- Significant copper intercept
- To be deepened in 1974
- Proposed hole, tentative location

ASARCO

SUPERIOR EAST · RAWHIDE PROJECT AREA

PINAL & GILA CO. ARIZONA

W.L.K. 1:62,500 Jan. 1974 rev. Mar. 1974

To accompany Supplemental Exploration Authorization Request

Dated 3-15-74

By W. L. Kurtz

mn 2701 DAM

PRINTED IN USA 9/69

FORM 302-EB

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION AUTHORIZATION

March 15, 1974

Originating Office SWED - Tucson

Application is hereby made for supplemental Authorization to cover cost, in excess of original estimate, of work authorized by New York.

No. Superior East Project #0010-00 thru #0010-07*
Pinal County, Arizona

Present total Estimated Cost (Form 302-EA attached)	$1,765,000
Amount previously authorized (date 6/70 thru 2/74)	$1,545,000
Balance for which Authorization is now requested	$220,000

*#0010-07 - JI Ranch purchase ($500,000)

ADDITIONAL WORK CONTEMPLATED:

Clean out, case, and then deepen DCA-3 from 3000 feet to 5000 feet by diamond drilling.

Drill new rotary-diamond drill hole to 5000 feet in the porphyry copper target area.

Deepen two holes to fulfill work obligations on State Prospecting Permits.

EXPLANATION OF INCREASED COST:

Drilling has located a large zone containing porphyry copper mineralization. Additional exploration drilling will search for ore grade mineralization in this zone.

Reviewed by ..... Acct. Mgr. or Chief Acct.

Approved by ..... Vice President

Recommended by ..... Supervisor

Approved by ..... Comptroller

Account Chargeable to .....
To be designated by Comptroller

Approved by Advisory Committee

.....19.....

Approved by Board of Directors

.....19.....

.....
Secretary

PROSPECT SUPERIOR EAST PROJECT

LOCATION Pinal County, Arizona

COST ESTIMATE, MINERAL EXPLORATION

OFFICE SWED - Tucson

W. L. Kurtz

	Type of Work	Salaries/Wages Days	Salaries/Wages Amount	Material	Fees, Rent, Services	Traveling	Taxes	Other	Total Estimate Cost
1	Outright Purchase								
2	Option Payments								
3	Bonus Payments								
4	Minimum Royalties-								
	Deductible from								
	Future Production								
5	Minimum Royalties-Not								
	Deductible from								
	Future Production								
6	Rental Payments				2,500				2,500
7	Staking Claims		4,000		45,000				49,000
1	Surface Excavating								
2	Underground "								
1	Surface Drilling				1,435,000				1,435,000
2	Underground "								
0	Geologic								
0	Sampling, Assaying, Lab.		4,000		16,000	2,000			22,000
0	Geophysics								
0	Geochem				3,000				3,000
0	Engineering								
0	Construction (temp.)				81,100				81,100
0	Construction (perm.)								
0	Administration, Field		116,000			40,400			156,400
	Offices and Camps								
0	Administration, General				3,000				3,000
1	Autos and Vehicles					13,000			13,000
2	Aircraft and Boats								
50	Partner's Share								
	ASARCO'S SHARE		124,000		1,585,600	55,400			1,765,000
51	Commission or Fees								
53	Exchange								
	TOTAL		124,000		1,585,600	55,400			1,765,000

RECEIVED
FEB 18 1974
EXPLORATION DEPT.

OFFICE OF THE SECRETARY

New York, N.Y., February 6, 1974

J. H. C.

Mr. J. J. Collins

MAR 15 1974

The following is an extract from the minutes of the Advisory Committee Meeting held January 30, 1974:

Exploration Authorization #0610-07
Superior East Project
Final County, Arizona (Cu)

It was reported by Company Geologists that $1,045,000 had been previously authorized for work at this project and they now propose a supplemental exploration authorization in the amount of $500,000 for the purchase of the 355-cattle unit JX Ranch plus an additional 116 fee acres from the D Land and Cattle Company.

There was approved a supplemental exploration authorization in the amount of $500,000 for the purchase of the 355-cattle unit JX Ranch plus an additional 116 fee acres from the D Land and Cattle Company in connection with the Superior East Project, Final County, Arizona.

F. J. Goldthwait
Administrative Assistant

FJG:lm
Enc.
FGHamrick w/enc.
HGStringham (2) w/enc.
KVignes
JHCourtright
RBCrist
JDSell
ADCoumides
WLKurtz w/enc.

J.H.C.

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

J. H. C.

JAN 24 1974

January 24, 1974

Mr. T. C. Osborne
Asst. Director of Exploration
New York Office

Supplemental Exploration
Authorization Request
Land Purchase; JI Ranch
Superior East Project
Pinal County, Arizona

Dear Sir:

Shortly after the start of the Superior East Project in 1970, the JI Ranch was offered for sale to Asarco. At that time we had no positive drill information to justify purchase. The ranch consists of 316 fee acres plus Forest and State grazing leases which allow 355 cattle yearlong. The grazing leases cover all of our mining claims. The ranch was sold in April 1972 and is currently owned by D Land & Cattle Company, a limited partnership. Since the acquisition of the JI Ranch by D Land, the general partner has continually harassed our exploration effort and has overstaked our claims.

Our exploration near the JI Ranch fee land has been encouraging and indicates that additional deep exploration drilling is necessary. Drill holes A-2 and AI-1 have substantiated the existence of a porphyry copper system and have demonstrated that a chalcocite blanket, with its enriched ore, can exist beneath the cover rocks. Neither hole intersected ore grade copper, but did intersect significant amounts of primary copper mineralization (A-2: at 4317' 293' of 0.35% copper; at 4790' 150' of 0.42% copper and AI-1: at 3240' 727' of 0.11% copper). Though the AI-1 intercept contained low copper values, it is of particular interest because it contained a very high chalcopyrite to pyrite ratio suggestive of a porphyry copper core zone rather than a peripheral fringe zone. At this point in exploration the geometry of the porphyry copper system is imperfectly known and it is now conceivable that ore grade copper mineralization could occur on the JI Ranch fee land (a possibility thought quite remote upon completion of drill hole A-2).

The Limited Partners have refused our offer of $100,000 front money for a 3-year purchase option, but have indicated that they would sell the ranch with all improvements, land, and cattle (they would retain the right to sell last year's calf crop), plus an additional 116 acres of fee land immediately north of the ranch headquarters at the current market price. They would retain a 4% NSR on any minerals produced from the fee land and unpatented mining claims Stew 1 and 2.

The current market price of the ranch with cattle has been appraised by Hebbard & Webb Company at $385,000 and the excess fee land by Sun Valley Land at $94,000, for a total current market value of $479,000.

Hebbard & Webb state they could provide a party to manage the ranch, which should net about $20,000 per year before depreciation and taxes. Also, Hebbard & Webb state they could find another buyer within 8 to 10 months time.

Because of the encouragement obtained in our drilling, the opportunity to clear up the claim controversies, and the opportunity to purchase at current market price, I recommend we offer the Limited Partners $500,000 for the ranch, cattle, improvements, land, and any mining rights they may have, and reserve them a 4% NSR for production of any minerals from the fee land and lode claims Stew 1 and 2.

If you agree, please obtain approval to make D Land a firm offer. Forms 302EA and 302EB are enclosed.

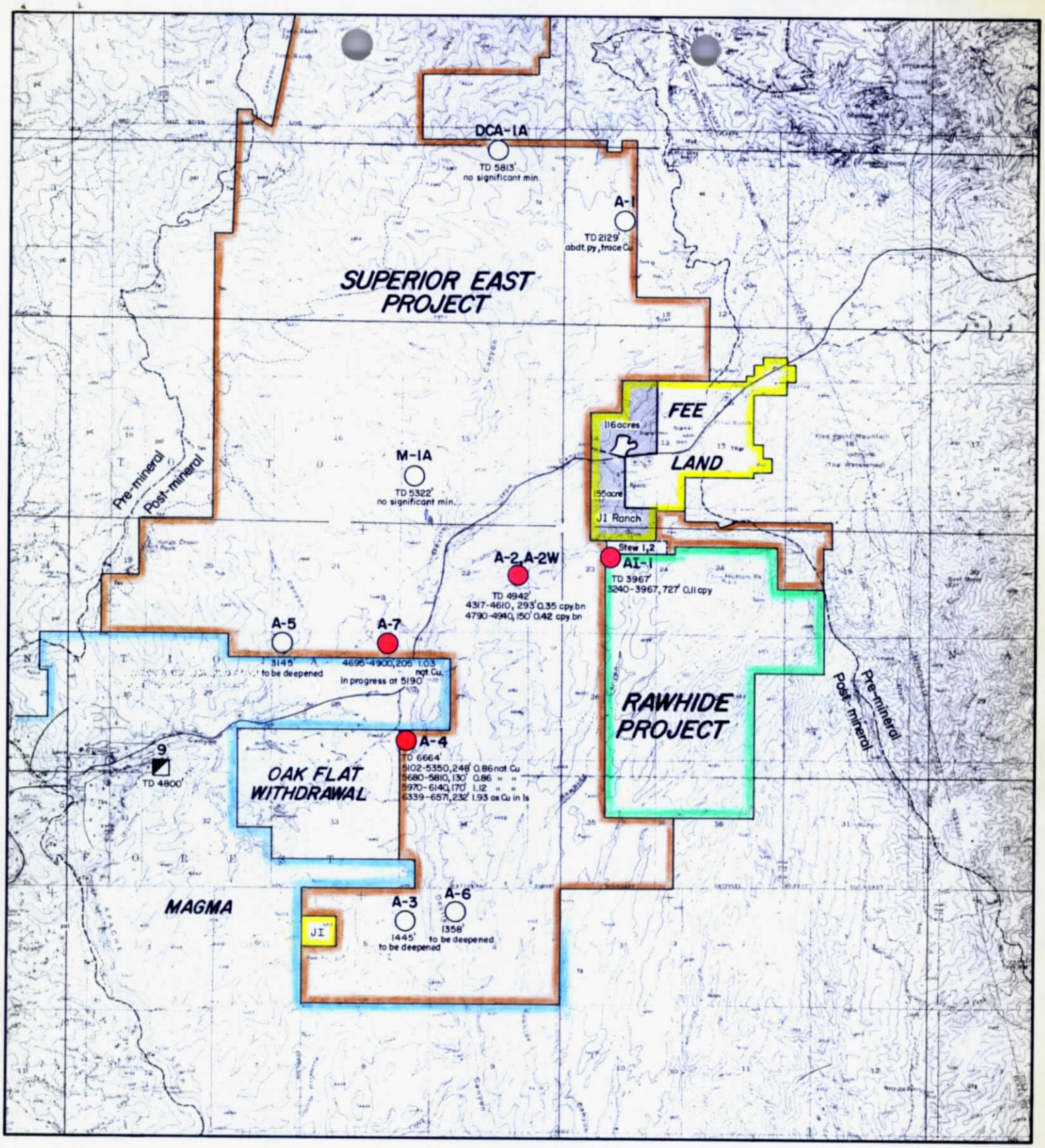
Respectfully submitted,

W. L. Kurtz

W. L. Kurtz

WLK:lb
Attach: Map
Encs: Forms 302EA & 302EB

cc: NVisnes - w/o Attach. & Encs.
JHCourtright - w/Attach. only
RBCrist - w/o Attach. & Encs.
JDSell - w/o Attach. & Encs.
ADCoumides - w/forms only



EXPLANATION

significant copper intercept

ASARCO drill hole

ASARCO

SUPERIOR EAST · RAWHIDE PROJECT AREA

PINAL & GILA CO. ARIZONA

W.L.K. 1:62,500 Jan. 1974

To accompany Supplemental Exploration Authorization Request

Dated January 24, 1974

By W. L. Kurtz

mn 2701 DAM

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

November 16, 1973

J. H. C.
NOV 30 1973

file Superior East

FILE MEMORANDUM

J.I. Ranch
D Land & Cattle Company

Leonard Lewis phoned today to state that they were still interested in negotiating a sale of the ranch to ASARCO and would like to meet with ASARCO in Tucson December 4th and 5th.

I informed him we would meet with him, but were only interested in purchasing the ranch, without cattle, for the present fair market price ($355,000) with a provision for royalty on any production of minerals from the fee land. I indicated to him that our position had changed somewhat since we first contacted them and that results from the drill hole have somewhat influenced our position.

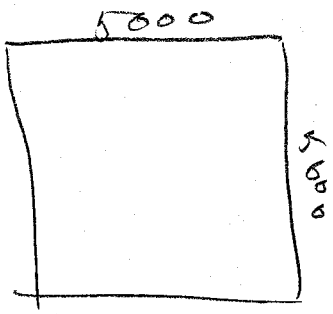
W. L. Kurtz

W. L. Kurtz

WLK:lb

cc: TCOsborne
JHCourtright
RBCrist
JDSell

A-4 — Sump East



5000 x 5000 x (600') 50

25000 000
50

1,250,000,000 tons @ +.80 % ce

248 - .86
130 - .86
170 - 1.12
548 ± .93

860 - .81 - 5680' to 6540'
1460 .66 - 5080 to 6540

RECEIVED
OCT 1 1973
EXPLORATION DEPT.

OFFICE OF THE SECRETARY

New York, N.Y., September 25, 1973

J. H. C.
OCT 1 - 1973

Mr. J. J. Collins

The following is an extract from the minutes of the Advisory Committee meeting held September 19, 1973:

Exploration Authorization #0010-06
Superior East Project
Pinal County, Arizona (Cu)

It was reported by Company Geologists that $930,000 has previously been authorized for work at this project and they now propose a supplemental exploration authorization in the amount of $115,000 mainly to case the current hole, A7, to a depth of about 4,000 feet and to continue it by diamond drilling to approximately 6,000 feet so as to complete at least one test this year and to avoid the possible problems which might arise in reoccupying A7 later. This additional expenditure required to complete the hole will actually be $95,000 plus a contingency allowance of $20,000 for wedging and additional sampling in case limestone replacement ore is found.

There was approved a supplemental exploration authorization in the amount of $115,000 for additional drilling wedging and additional sampling at the Superior East Project, Pinal County, Arizona.

J. F. Hornbostel, Jr.
Assistant Secretary

JFH:lm
Enc.
FGHamrick
HQStringham - 2 w/enc.
WLKurtz w/enc.
JECourtright
ADCoumides w/enc.
RBCrist

J.H.C.

J. H. C.

SEP 6 1973

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

September 5, 1973

Mr. T. C. Osborne
Asst. Director of Exploration
New York Office

Superior East Project
Pinal County, Arizona

Dear Sir:

Enclosed is a Supplemental Exploration Authorization Request for the Superior East Project, which we discussed by phone today.

I have enclosed two sets of Forms 302-EA and 302-EB; one set pertains only to the $15,000 necessary to complete the rotary portion of drill hole A-7, and the other set pertains to the $95,000 necessary to complete both the rotary and diamond drill portions of A-7.

Very truly yours,

W. L. Kurtz

WLK:lb
Enc.

P.S.: Details of drill hole A-4, which contains the native copper discovery and the limestone replacement discovery, and details of drill hole A-2, which contains the porphyry copper discovery, are included with my February 28, 1973 Supplemental Exploration Authorization Request.

WLK

J. H. C.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

SEP 6 1973

September 5, 1973

Mr. T. C. Osborne
Asst. Director of Exploration
New York Office

Supplemental Exploration
Authorization Request
Superior East Project
Pinal County, Arizona

Dear Sir:

Road construction, drill site preparation, and drilling have been completed at the Superior East Project to fulfill requirements for the assessment year 1 Sept. 72-31 Aug. 73 on our 710 Federal Lode Claims and two State Prospecting Permits (see attached map).

Due to higher than anticipated road construction costs on the rugged, rocky dacite plateau, the rotary drill hole A-7 (still in progress) will not be completed and cased to the programed core point at 4,000 feet with available funds. It is planned to deepen this hole by diamond drilling to ±6,000 feet. To help in insuring the completion of deep diamond drill holes in the geologic environment of the dacite plateau, it is very advantageous to set the rotary drill casing as deep as possible. To accomplish this, I estimate an additional $15,000 is necessary.

Drill hole A-7 was collared to test for continuity of the three separate native copper horizons (248' @ 0.86 Cu; 130' @ 0.86 Cu; 170' @ 1.12 Cu) intersected below the 5,000 foot depth in A-4. Also, drill hole A-7 will test for high grade (5-6% Cu) limestone replacements. I estimate will be necessary to complete the diamond drilling.

If you approve, please request funds for this additional work. These additional expenditures will apply for part of 1973-74 assessment work requirements. Forms 302-EA and 302-EB are attached.

Respectfully submitted,

W. L. Kurtz

WLK:lb
Attachs.

cc: JHCourtright - w/attachs.
ADCoumides - w/forms only
JDSell - w/attachs.

PROSPECT Superior East Project

LOCATION Pinal County, Arizona

COST ESTIMATE, MINERAL EXPLORATION

OFFICE SWED - Tucson

W. L. Kurtz

o.	Type of Work	Salaries/Wages Days	Salaries/Wages Amount	Material	Fees, Rent, Services	Traveling	Taxes	Other	Total Estimate Cost
01	Outright Purchase								
02	Option Payments								
03	Bonus Payments								
04	Minimum Royalties-								
	Deductible from								
	Future Production								
05	Minimum Royalties-Not								
	Deductible from								
	Future Production								
06	Rental Payments				2,500				2,500
07	Staking Claims		4,000		45,000				49,000
11	Surface Excavating								
12	Underground "								
21	Surface Drilling				641,400				641,400
22	Underground "								
30	Geologic								
40	Sampling, Assaying, Lab.		4,000		11,000	2,000			17,000
50	Geophysics								
60	Geochem				3,000				3,000
570	Engineering								
580	Construction (temp.)				81,100				81,100
590	Construction (perm.)								
610	Administration, Field		101,000			34,000			135,000
	Offices and Camps								
620	Administration, General				3,000				3,000
641	Autos and Vehicles					13,000			13,000
642	Aircraft and Boats								
650	Partner's Share								
	ASARCO'S SHARE		109,000		787,000	49,000			945,000
661	Commiasion or Fees								
663	Exchange								
	TOTAL		109,000		787,000	49,000			945,000

PRINTED IN USA 9/69

FORM 302-EB

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION AUTHORIZATION

September 5, 1973

Originating Office SWED - Tucson

Application is hereby made for supplemental Authorization to cover cost, in excess of original estimate, of work authorized by New York.

No. Superior East Project, Pinal County, Arizona

Present total Estimated Cost (Form 302-EA attached)	$945,000
Amount previously authorized (date.....) 0010-00 $45,000, 6/70; 0010-01 $31,000, 8/70; 0010-02 $55,000, 12/70; 0010-03 $260,000, 3/71; 0010-04 $409,000, 7/71; 0010-05 $130,000, 3/73.	$930,000
Balance for which Authorization is now requested	$15,000

ADDITIONAL WORK CONTEMPLATED:

Deepen drill hole A-7 (currently being rotary drilled) from 2300 feet to 4,000 feet and set casing to prepare hole for diamond drilling to test for continuity of native copper horizons intersected in drill hole A-4 and to test for high grade (5-6% Cu) limestone replacements.

EXPLANATION OF INCREASED COST:

Higher road construction and drill site preparation costs used funds scheduled for rotary drilling and casing hole A-7 to the programed core point at 4,000 feet.

Reviewed by ..... Acct. Mgr. or Chief Acct.

Approved by ..... Vice President

Recommended by ..... Supervisor

Approved by ..... Comptroller

Account Chargeable to .....
To be designated by Comptroller

Approved by Advisory Committee

.....19.....

Approved by Board of Directors

.....19.....

.....
Secretary

PROSPECT Superior East Project

LOCATION Pinal County, Arizona

COST ESTIMATE, MINERAL EXPLORATION

OFFICE SWED - Tucson

W. L. Kurtz

o.	Type of Work	Salaries/Wages Days	Salaries/Wages Amount	Material	Fees, Rent, Services	Traveling	Taxes	Other	Total Estimate Cost
01	Outright Purchase								
02	Option Payments								
03	Bonus Payments								
04	Minimum Royalties-								
	Deductible from								
	Future Production								
05	Minimum Royalties-Not								
	Deductible from								
	Future Production								
06	Rental Payments				2,500				2,500
07	Staking Claims		4,000		45,000				49,000
11	Surface Excavating				715,000				715,000
12	Underground "								
21	Surface Drilling								
22	Underground "								
30	Geologic								
40	Sampling, Assaying, Lab.		4,000		11,000	2,000			17,000
50	Geophysics								
60	Geochem				3,000				3,000
70	Engineering								
80	Construction (temp.)				81,100				81,100
90	Construction (perm.)								
510	Administration, Field		106,000			35,400			141,400
	Offices and Camps								
520	Administration, General				3,000				3,000
541	Autos and Vehicles					13,000			13,000
542	Aircraft and Boats								
550	Partner's Share								
	ASARCO'S SHARE		114,000		860,600	50,400			1,025,000
561	Commission or Fees								
563	Exchange								
	TOTAL		114,000		860,600	50,400			1,025,000

PRINTED IN USA 9/69

FORM 302-EB

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION AUTHORIZATION

....September 5,.....1973..

Originating Office ...SWED - Tucson.....

Application is hereby made for supplemental Authorization to cover cost, in excess of original estimate, of work authorized by New York.

No....Superior East Project, Pinal County, Arizona

Present total Estimated Cost (Form 302-EA attached) $.1,025,000.

Amount previously authorized (date.....) $..930,000.
0010-00 $45,000, 6/70; 0010-01 $31,000, 8/70; 0010-02 $55,000, 12/70;
0010-03 $260,000, 3/71; 0010-04 $409,000, 7/71; 0010-05 $130,000, 3/73.
Balance for which Authorization is now requested $...95,000.

ADDITIONAL WORK CONTEMPLATED:

Deepen rotary drill hole A-7 (currently being drilled) from 2300 feet to 4,000 feet, set casing and continue by diamond drilling to ±6,000 feet to test for continuity of native copper horizons intersected in drill hole A-4 and to test for high grade (5-6% Cu) limestone replacements.

EXPLANATION OF INCREASED COST:

Complete test of native copper horizons and limestone replacements started by 1972-73 assessment hole A-7.

Reviewed by .....
Acct. Mgr. or Chief Acct.

Approved by .....
Vice President

Recommended by .....
Supervisor

Approved by .....
Comptroller

Account Chargeable to .....
To be designated by Comptroller

Approved by Advisory Committee

.....19.....

Approved by Board of Directors

.....19.....

.....
Secretary

J. H. C.

JUL 2 - 1973

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

June 29, 1973

FILE MEMORANDUM

Dees
JI Ranch
Superior East

Through Morrow Elias of UV Industries, I learned that a Larry Clark, president of a Salt Lake City firm called Petro Silver, Inc., had an interest in the JI (Dees) Ranch.

I called Mr. Clark on June 28th and he stated that the JI Ranch was purchased by a Limited Partnership consisting of four Salt Lake City individuals -- himself, Leonard Lewis (attorney who visited our office with Mr. Willis Dees) and two others not named. Besides these four Limited Partners, there are two general partners in Tucson -- Willis Dees and an unnamed man. Mr. Clark was very specific that Willis Dees was a minority holder, though the ranch was purchased and is held in Dees' name. Dees is responsible for running the ranch. Dees has always intimated to us that he was the sole owner.

Clark indicated that certain claims were transferred with the ranch and, therefore, held by the limited partnership.

Clark stated that he did not know whether additional claims staked by Dees were part of the ranch and, therefore, the limited partnership -- if Dees used ranch money they would be part of the ranch, but if Dees used his personal money then they would not be part of the limited partnership.

Clark was aware of our meeting with Dees and Lewis. Clark was aware of people carrying guns, camping on claims, etc., and expressed the opinion that he personally hoped no serious trouble developed.

I informed Clark that we (Asarco) considered none of Dees' claims valid and were going to send Dees a letter to this effect this week. I inquired whether a copy should be sent to him -- he suggested a copy to Mr. Leonard Lewis, the attorney.

Clark is interested in disposing of his interest in the ranch so that he may buy a small mill (for his Petro Silver, Inc.) from UV Industries. He has suggested to UV that UV approach Asarco for a joint venture on the ranch ground. I informed Clark Asarco would not be interested in a joint venture with UV at this time; however, we would consider purchase of the ranch with a mineral royalty reserved to them. This didn't seem to appeal to him at this particular time. (limited partnership)

I acquired the distinct impression that Clark didn't approve of all of Dees' actions and that we could negotiate on realistic terms with Clark.

The above information will be given to Mr. Verity.

W. L. Kurtz

WLK:lb

cc: TCOsborne
JHCourtright
JDSell
RBCrist

Note to TCOsborne:

Tom: This is the ranch that has the grazing rights on the dacite plateau and approx. 320 acres of fee land. 155 fee acres lie approximately 600 feet north of our drillsite AI-1. We had obtained verbal approval in April/72 from Mr. Collins to purchase the ranch ($300,000) but the Webb's elected to sell to Dees.

Cek

J. H. C.
MAR 16 1973

RECEIVED
MAR 16 1973
EXPLORATION DEPT.

OFFICE OF THE SECRETARY

New York, N.Y., March 13, 1973

Mr. J. J. Collins

The following is an extract from the minutes of the meeting of the Advisory Committee held on March 7, 1973:

Exploration Authorization #0010-05
Superior East Project
Pinal County, Arizona (Cu)

It was reported by Company Geologists that previous exploration authorizations for the Superior East Project had been approved in recent years totalling $800,000. It was further reported that Company Geologists recommend an additional exploration authorization in the amount of $130,000 for assessment work on State Prospecting Permits and for other assessment work; for drilling work, land acquisition and for surveying, legal fees and certain contingencies, in connection with the Superior East Project. This work will fulfill the 1973 assessment work requirements and will provide for the acquisition of open ground between the Superior East-Rawhide Project areas and the Fee land.

There was approved a supplementary exploration authorization in the amount of $130,000 for general assessment work requirements at the Superior East Project, Pinal County, Arizona, a possible copper project.

J. F. Hornbostel, Jr.
Assistant Secretary

JFH:lm
Enc.
FGHamrick
HQStringham - 2 w/enc.
WLKurtz w/enc.
JHCourtright
ADCoumides w/enc.
RBCrist

J.H.C.

J. H. C.
MAR 5 - 1973

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

February 28, 1973

Mr. T. C. Osborne
Assistant Director of Exploration
New York Office

Supplemental Exploration
Authorization Request
Superior East Project
Pinal County, Arizona

Dear Sir:

Reference is made to Mr. Sell's report "1971-1972 Summation Report with Recommendations for Additional Exploration, Superior East Project, Pinal County, Arizona" and my cover letter of September 1, 1972, which recommend additional drilling to explore the three deep copper discoveries made at Superior East. I quote from my letter of September 1, 1972:

1. Porphyry copper discovery. Drill Hole A-2(2W) intersected at the 3920-foot depth, leached capping within a gravity slide block that overlies "fringe-type" porphyry copper mineralization grading 0.13 to 0.42% Cu in the primary zone. The intensity of original mineralization in the oxidized gravity slide block coupled with the thickness (+621') of "fringe-type" mineralization penetrated beneath the fault are indicative of a major porphyry copper zone. At least four additional 5,000-foot drill holes will be necessary to assess the true significance of the discovery hole A-2(2W). One of these holes will be located on Inspiration Consolidated Copper ground under our Rawhide Project.

2. Limestone replacement discovery. Drill Hole A-4 intersected at the 6484-foot depth, 81 feet of limestone thoroughly replaced with specularite, hematite and containing 0.81% copper before passing through a fault and into weakly altered mineralized quartz monzonite. This is interpreted as indicating the replacement units at Magma, containing a proven 10 million tons @ 5.7% copper (after dilution), extend eastward beneath the Oak Flat Withdrawal Area to the Devils Canyon Fault. If we can obtain the mineral rights to the Oak Flat withdrawn area, then three additional 6,000-foot drill holes will be necessary to assess the significance of the limestone replacements discovered in A-4. Two of these holes will also test for the native copper deposits.

3. Native copper discovery. Drill Hole A-4 discovered at the 5083-foot depth, major quantities of native copper with minor cuprite, in the Whitetail Conglomerate. The 1256 feet of Whitetail Conglomerate below the lithic tuff marker bed contain three zones that average above 0.8% copper (248' @ 0.86; 130' @ 0.86; 170' @ 1.12). Structural-isopach studies suggest that ore grade native copper may be restricted to the deepest portion of the Whitetail basin -- an area greater than 1-1/2 square miles. Thus, the potential exists for major tonnages of native copper. An additional three 6,000-foot holes will be necessary to ascertain the significance of the native copper discovery. Two of these holes will also be testing the limestone replacements.

At this time I am not recommending a major exploration drilling program, but rather sufficient funds to complete the yearly land holding costs ($94,000 in direct physical work) and claim staking, registered surveying, and legal fees being incurred in connection with acquiring land adjacent to our Superior East-Rawhide projects and the fee land.

As shown on the attached maps, three drill holes will be started. The two proposed drill holes on the State sections will be left in a condition to be deepened next year, as will the proposed drill hole north of A-4 if it is not completed.

I estimate costs as follows:

Assessment work on State Prospecting Permits -- Drilling	$23,000
Drill site access to sec. 5	5,000
Assessment work north of Highway -- Drilling	54,100
Assessment work south of Highway -- Road building	16,900
Claim, Registered surveying, Legal fees	12,000
Supervision, Contingencies	19,000
Total	$130,000

If you approve, please request a Supplemental Exploration Authorization in amount of $130,000. Forms 302-EA and 302-EB are enclosed.

Respectfully submitted,

W. L. Kurtz

WLK:lb
Encs.

cc: JHCourtright - w/encs.
ADCoumides - w/forms only
RBCrist - w/encs.
JDSell - w/encs.

PROSPECT SUPERIOR EAST PROJECT

LOCATION Pinal County, Arizona

COST ESTIMATE, MINERAL EXPLORATION

OFFICE SWED - TUCSON

W. L. Kurtz

No.	Type of Work	Salaries/Wages Days	Salaries/Wages Amount	Material	Fees, Rent, Services	Traveling	Taxes	Other	Total Estimate Cost
501	Outright Purchase								
502	Option Payments								
503	Bonus Payments								
04	Minimum Royalties-								
	Deductible from								
	Future Production								
05	Minimum Royalties-Not				2,500				2,500
	Deductible from		4,000		45,000				49,000
	Future Production								
06	Rental Payments								
07	Staking Claims								
511	Surface Excavating								
512	Underground "								
521	Surface Drilling				626,400				626,400
522	Underground "								
530	Geologic								
540	Sampling, Assaying, Lab.		4,000		11,000	2,000			17,000
550	Geophysics								
560	Geochem				3,000				3,000
570	Engineering								
580	Construction (temp.)				81,100				81,100
590	Construction (perm.)								
610	Administration, Field		101,000			34,000			135,000
	Offices and Camps				3,000				3,000
620	Administration, General					13,000			13,000
641	Autos and Vehicles								
642	Aircraft and Boats								
650	Partner's Share								
	ASARCO'S SHARE		109,000		772,000	49,000			930,000
661	Commission or Fees								
663	Exchange								
	TOTAL		109,000		772,000	49,000			930,000

PRINTED IN USA 9/68

FORM 302-EB

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION AUTHORIZATION

February 28, 19 73

Originating Office SWED - Tucson

Application is hereby made for supplemental Authorization to cover cost, in excess of original estimate, of work authorized by New York.

No.....

Present total Estimated Cost (Form 302-EA attached)	$930,000
Amount previously authorized (date.....) 0010-00 $45,000, 6/70; 0010-01 $31,000, 8/70; 0010-02 $55,000, 12/70; 0010-03 $260,000, 3/71; 0010-04 $409,000 7/71	$800,000
Balance for which Authorization is now requested	$130,000

ADDITIONAL WORK CONTEMPLATED:

Road building for drilling access, start three drill holes, and land acquisition.

EXPLANATION OF INCREASED COST:

To fulfill 1973 assessment work requirements (drill holes will subsequently be deepened to complete exploration test) and to acquire open ground between the Superior East-Rawhide Project areas and the Fee land.

Reviewed by ..... Acct. Mgr. or Chief ~~Acct.~~

Approved by ..... Vice President

Recommended by ..... Supervisor

Approved by ..... Comptroller

Account Chargeable to .....
To be designated by Comptroller

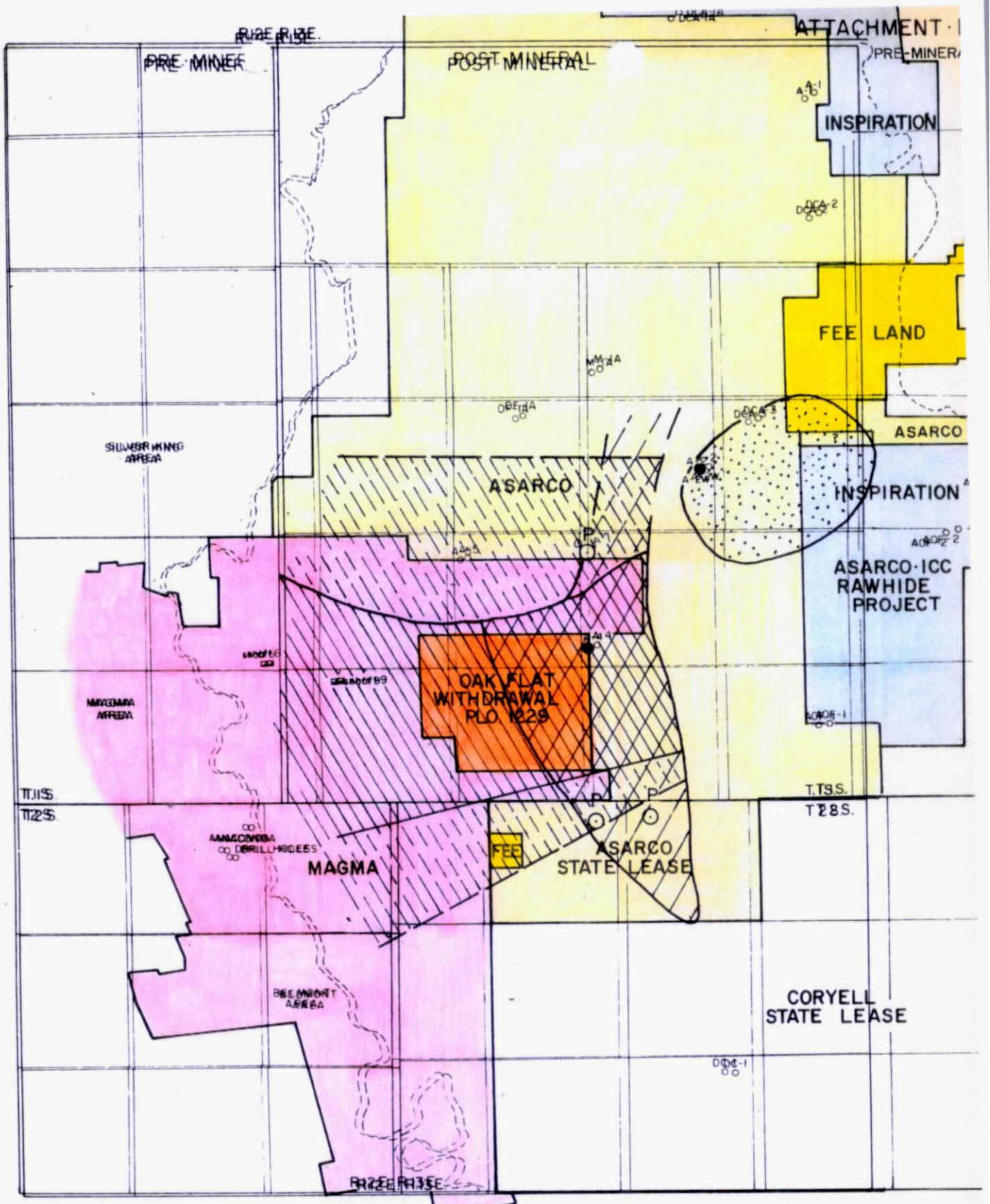
Approved by Advisory Committee

.....19.....

Approved by Board of Directors

.....19.....

.....
Secretary



TARGET AREAS

Porphyry Copper

Limestone Replacement

Copper in Conglomerate

DRILLING

P Proposed Drill Holes for 1973 Assessment work

● Discovery Hole

TO ACCOMPANY Supplemental Exploration Authorization

DATE Feb. 28, 1973

BY W. L. Kurtz

PLAN OF TARGET AREAS and PROPOSED DRILL HOLES

LAND STATUS MAP SUPERIOR EAST

GILA & PINAL COUNTY, ARIZONA

SCALE 1" = 1 mile

JDS

Feb. 1973

J. H C.

MAR 5 - 1973

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

February 23, 1973

FILE MEMORANDUM

Superior East Project
(Margaret-Little Rock)
Pinal County, Arizona

Paul Bryant called this morning to report:

1) Mr. Tom Dees had called him to arrange a trip to inspect the drill hole location to determine if it was all right. Bryant told Tom Dees that he was now putting the road south, along the old road. Dees said good because he wanted to get his jeep, or Government trapper's jeeps, down that way.

2) Willis Dees was up on the ranch recently and told Bryant he had had a meeting with Asarco and that things were better but still not real good.

3) Bryant has seen more flagging and W. Dees had two "geologists" working in the area. (Putting up claim corners?)

I asked Bryant to have the Dees' call us if they want any information.

W. L. Kurtz

WLK:lb

cc: JHCourtright
RBCrist
JDSell

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. H. C.
AUG 24 1972

August 23, 1972

Mr. J. A. Staargaard
Salt Lake City Office

Dacite Plateau

At the request of Mr. Collins I am forwarding you, under separate cover, the aerial photos we have of the Dacite Plateau area. Enclosed with this letter is a topographic map showing location of all drill holes, with bottom depths, for which we have information. Also enclosed is an index map showing the main published maps and literature pertaining to the Globe-Miami-Superior districts.

As you are no doubt aware, we have developed considerable knowledge of the Globe-Miami-Dacite Plateau-Superior areas and Mr. Sell and I will review this with you when you arrive in Tucson.

W. L. Kurtz

WLK:lad

cc: JJCollins
JHCourtright
JDSell

Blind note to J.H.Courtright & J. D. Sell:
Mr. Collins requested all data (drill logs, assays, etc.) be forwarded to Staargaard in Salt Lake City. I have elected not to send what I consider Confidential Information to Salt Lake City, because Staargaard will be working with Jim Lindsay.

WLK

J H C.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

AUG 3 - 1972

July 21, 1972

J. H. C.
AUG 3 - 1972

TO: J. J. Collins
Director of Exploration
New York Office

Superior East Project
Oak Flat

Dear John:

In view of the part Oak Flat may play in company policy, I am enclosing for your information the pertinent data we have developed during the Superior East Project.

The 1" = 1 mile plan map shows the position of Oak Flat relative to the ground controlled by Asarco and the location of the drill holes.

The graphic log portrays the geology and assay data of hole A-4 located immediately east of Oak Flat.

The cross section A-A[1] portrays our interpretation of the geology beneath Oak Flat.

The graphic log and cross section show two extremely significant features:

a) The replacement horizons at Magma, containing a proven reserve of 10.4 million tons grading 5.7% copper, are present east of Oak Flat in drill hole A-4. At A-4 these beds are thoroughly replaced with hematite and specularite, the minerals found peripheral to the main copper ore bodies at Magma. Therefore we conclude that an excellent exploration target exists beneath Oak Flat for the development of substantial tonnages of replacement ore containing 5-6% copper.

b) Drill hole A-4 intersected three significant zones of native copper in the very competent Whitetail conglomerate. These three zones total 570 feet averaging 0.95% copper. This represents another excellent exploration target (a 1,000 foot radius about drill hole A-4 and 570 feet in thickness represents 143 million tons) which extends beneath Oak Flat.

Very truly yours,

W. L. Kurtz

W. L. Kurtz

WLK:lad
Encs.

cc: JHCourtright, JDSell, RBCrist

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

June 16, 1972

W.L. Kurtz

HANNA JOINT VENTURE

Please attach this memo to your letter transmitting Mr. Sell's report recommending exploration of the Bohme-Coryell property as a joint venture with Hanna Mining Company.

Mr. Sell's structural interpretations of the Miami district involving low angle gravity sliding with subsequent high angle normal faulting, are the results of careful study and original thinking, and are well supported by geologic data and field work. Large displacements on low angle post-ore structures have been demonstrated in the Mission and Sacaton districts and the conclusion that similar structures have been active in the Miami district is hardly debatable. The hypothesized block of copper mineralization (Black Segment) is overlain by Whitetail conglomerate and thus should have been involved in the main enrichment cycle, providing a valid objective, even though at a depth of possibly 2000 ft.

In my opinion, drilling of the concealed area on the Copper Cities - Castle Dome trend would offer a worthwhile exploration gamble on the basis of permissibility alone ----- considering the high density of major copper occurrences in the area.

J.H. Courtright

J.H. Courtright

JHC:kre

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. H. C.
JUN 5 1972

June 2, 1972

Mr. J. J. Collins
Director of Exploration
New York Office

Native Copper
Superior East Project

Dear Sir:

I believe you will find the attached memorandum by Mr. Graybeal a lucid description of a possible origin of the native copper in the Whitetail conglomerate.

Mr. Graybeal is to be complimented on his keen interest, both on a practical and theoretical basis, in our exploragion programs.

Very truly yours,

W. L. Kurtz

W. L. Kurtz

WLK:lad
Attach.

cc: FTGraybeal
JHCourtright
JDSell
SVFay - w/attach.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. H. C.
MAY 8 - 1972

May 5, 1972

Memorandum

TO: J. D. Sell

FROM: G. J. Stathis

Petrographic Examination of
Specimens X-14, Z-1 through Z-4
Superior, Arizona Region

Location: Unknown. Samples Z-1 through Z-4 said to be Manitou granite. X-14 is Lost Gulch quartz monzonite.

Conclusions:

Samples Z-1 through Z-4 appear to be basically the same rock. These rocks show some evidence of cataclastic deformation and recrystallization. The porphyry textures developed, which is not evident in handsample, may be partly due to crystallization of the "milled-down" material.

The sample X-14 of Lost Gulch quartz monzonite differs from the "Z" series of samples. Presence of Topaz (greisen environment) and calcite-clay veining suggests possibility that this rock may be peripheral to mineralization (Mo?)

Thin Section Descriptions

Section Z-2

Texture: Medium-grained porphyritic
75% volume phenocrysts
Orthoclase and microcline 25-30% vol.
Quartz 50-65% vol.
Plagioclase 15-20% vol.

Much of the quartz as lens-like concentrations. Plagioclase preferrentially replaced by fine sericite aggregate and extremely fine kaolin clay. Average 80-90 plag. phenocrysts volume replaced.

Orthoclase phenocrysts less alt. Limonite dusting common. Some perthite and myrmekite (qtz-plag?) noted. Orthoclase grains larger than plag. Both orthoclase and plagioclase show evidence of resorption and ragged outline due in part to groundmass replacement and cataclastic deformation. Groundmass 50:50 orthoclase and quartz.

Secondary biotite common to groundmass and associated with quartz. 5% biotite by volume.

Large shreddy sericite grains noted replacing altered (fine sericite-clay aggregate) plagioclase and quartz grains. This late sericite 2-3% by volume.

1 to 2% disseminated, late magnetite replacing secondary biotite and large sericite grains.

Relationship between secondary biotite and sericite not clear. Appear to replace one another. Associated with late magnetite introduction. At one corner of slide are traces of garnet with minute chlorite inclusions.

Rock is moderate to strongly altered. Lack of euhedral to subhedral feldspar grains due to cataclastic deformation and groundmass recrystallization and resorption.

Section Z-3

Similar to Z-2 -- somewhat less altered (less alteration in plagioclase 50% surface volume).

75% phenocryst volume (qtz-feldspar). More quartz than Z-2. Somewhat more K-felds. than plag. (<10%) compared to Z-2. K-feld. as orthoclase and microcline-perthite.

Groundmass more recrystallized than Z-2, and groundmass felds. less alt. (incipient clay).

Shreddy, dissem. sericite as in Z-2, mostly in groundmass, 2% by volume sericite. 0.5% dissem., secondary biotite in groundmass. Biotite-sericite relationship ? as in Z-2.

1% dissem. magnetite derived from biotite, unlike Z-2. Thus, some biotite may be altering to sericite.

Rock similar to Z-2 in that fracturing and other cataclastic features common.

Section Z-4

Texture similar to Z-2 and Z-3
80 to 85% of rock phenocrysts.
65-60% phenocrysts are K-feldspar, mostly orthoclase.
15% plagioclase and rest quartz.

Rock more limonite stained due to dusting of feldspars (both K-feld and plagioclase). Degree of rock alteration same as Z-2. Fine sericite and kaolin in plagioclase as Z-2.

Groundmass composed of quartz and orthoclase, plus some plagioclase. Groundmass resorption of phenocrysts common. 2-3% dissem. sericite flakes in groundmass. Disseminated magnetite, up to 0.5, by volume, oxidized to hematite. No secondary biotite (completely ozidized). Trace Zircon.

Section Z-1

Rock is basically same as Z-2, 3, and 4. Rock is fresher (less alteration of feldspar) and finer groundmass than other three rocks.

85-90% phenocrysts.

Quartz and K-feldspar (orthoclase and perthite) in about equal amounts.

10% plagioclase.

1% disseminated sericite grains.

No biotite.

2-3% disseminated magnetite (mostly derived from biotite originally) oxidized to hematite. Light, limonite dusting of feldspar gives reddish cast to rock.

Section X-14

Medium-grained, hypidiomorphic granuler.

Rock differs from "X" series.

10 to 20% quartz.

40 to 50% euhedral to subhedral plagioclase. Remainder large, anhedral, orthoclase plates, locally including plagioclase.

Limonite dusting or inclusions moderate to strong in feldspars.

5% disseminated, sericite laths replacing limonite-coated feldspars.

1% disseminated biotite oxidized to hematite and leucoxene.

0.5% (1% plus in handspecimen) disseminated and partly oxidized magnetite.

Trace fresh biotite, yet handspecimen shows 2% or more.

0.5 to 1.0% disseminated magnetite.

Trace zircon and fine apatite.

0.5% disseminated grains believed to be topaz.

Locally rock is shattered and veined with calcite plus clay material (Kaolin-illite mixed layer?). Veinlets are late and cut feldspar and sericite grains. Also clay? filled, vugs noted. The quartz monzonite is moderate to strongly altered.

George J. Stathis

GJS:lad

cc: JHCourtright
WLKurtz

J. H. C.

MAY 2 - 1972

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

May 1, 1972

TO: W. L. Kurtz

FROM: G. J. Stathis

file

Subject: Corocoro Copper Deposit, Bolivia/Superior East Project Area, Arizona

A review of the Entwistle-Gouin article in volume 50, issue #6 of Economic Geology suggested some similarities between the Bolivia deposit and Superior East. The arguments for a sedimentary control of native copper and chalcocite deposition appear to be convincing for the Corocoro deposit. A similar environment of copper deposition is indicated for the Superior East area. It's hard to buy the idea that copper has been remobilized upwards, perhaps from some deep, primary magmatic source as suggested by some for White Pine Michigan copper or heating up of the water saturated Superior East basin by the dacite flow cover as suggested recently by Kraston.

From reading the Corocoro article, I became impressed with the description that the older Ramos sedimentary series is native copper-rich while the Younger Vetas sedimentary series is chalcocite-rich. Therefore, despite the thick column of native copper indicated the the drilling to date at Superior East, one wonders if perhaps future drilling at Superior East might not encounter a change from native copper to substantial intercepts of other copper minerals. Chalcocite will be unlikely, but, barring effects of erosion, perhaps more copper oxides or silicates will be encountered which would reflect changes in the chemistry of the solutions carrying copper from the source area.

Geo J. Stathis

G. J. Stathis

GJS:sg

cc: JHCourtright
JDSell

EXPLORATION SERVICES DIVISION
3422 SOUTH 700 WEST
SALT LAKE CITY, UTAH 84119

RECEIVED
MAR 28 1972
EXPLORATION DEPT.

J. H. Courtright

March 27, 1972

H. C.
MAR 29 1972

Mr. W. L. Kurtz
Tucson Office

file

COOKSLEY SEISMIC REPORT
SUPERIOR EAST PROJECT
FEBRUARY 1972

Dear Bill:

I would like hereby to discuss the subject report in light of your letter of February 24, and in amplification of our intervening phone discussion.

As we all would conclude after studying the seismic data, Cooksley's interpretations include a high percentage of subjective content. It would not necessarily follow directly that his interpretations would be questionable, since he has unique experience in this work, and might have singular ability in evaluating the data.

An accurate interpretation of the seismic data depends upon the correct evaluation of two aspects of the problem. First the interpreter must be able to find a diagnostic character for reflection events on the seismic record which he can definitely attribute to identifiable interfaces of the geology; second he must have reasonably accurate velocity information for waves traveling through the respective intervals of the section.

As you point out, if a second geophysicist were able independently to make the same interpretations as Cooksley then the credence for the work would be enhanced. In lieu of a second interpreter, if Cooksley's interpretations over different portions of the ground were consistent with the geology as known from drilling, and if the results of his work predicted reasonable values for seismic velocities as compared with reference tables on this subject, then credence could be established on this basis.

I have tried to take the role of interpreter to compare my results

with Cooksley's; however, I am unable to assure myself that I can find distinctive characteristics in the seismic record with which to identify specific parts of the geologic section. Consequently, I can not support Cooksley's correlations. On the other hand, I cannot disprove his correlations -- overall, though, I retain considerable skepticism as to their validity.

In regard to the velocity logs which he derives from the computer data (again involving the subjective factor), I have re-worked his logs for the three profiles on the project. My motive in re-working his data is to show the actual velocity which his logs predict for the different rocks, rather than the average velocity from the surface to the horizon of interest, which his velocity log shows directly.

Attached are the graphs of my work which are based on his velocity logs. One can readily note the great range in velocity for the same section of geology, under different points on the Plateau. This large variation from one traverse to the next seems excessive. A second questionable feature on the graph relates to the extremely high velocities (plus 25,000 ft. /sec.), which come from his log. These velocities in turn seem excessively high.

In summary, while I personally question that Cooksley can identify reflections from particular geologic sections, I cannot completely refute this possibility. However, even granting that he can, I estimate that his velocity error could result in depth errors of 25%.

Up until this time, most of Cooksley's interpretations have had the benefit of prior knowledge of the geology. The best test to which we can subject Cooksley's work is in the field, by comparing his unbiased interpretation with known drilling results (as you and Jim have proposed). An alternate form of a test would be for us to supervise his field crew and use cross-spreads and parallel spreads for his interpretation, without his knowledge of the relative position of the measurements.

Further concern with this problem, of course, is dependent upon your continuing need of the type of data which seismics might provide on the Plateau.

CKM:am
Enc.
cc: J. J. Collins, wo/enc.
J. H. Courtright wo/enc.
J. D. Sell, w/enc.

Yours very truly,

Cal Moss

C. K. MOSS

J. H. C.

FEB 25 1972

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

February 22, 1972

Mr. C. K. Moss
Salt Lake City Office

Enclosed is a final report by J. W. Cooksley on his seismic work at our Superior East project. Also enclosed is Mr. Sell's covering letter to me. I would appreciate it if you would very critically review this report.

As pointed out by Mr. Sell, the velocity profile (Plate 1 - Appendix C) is critical in Mr. Cooksley's interpretations and it appears to me that the positioning of this curve is much more of an art than science. If truly all geophysicists would construct this curve in nearly the same position, then perhaps Cooksley has arrived at a feasible method of determining major rock contacts in an extremely complex area such as the dacite plateau. Again, as Mr. Sell points out, Cooksley's method, if it works, is usable only at a specific shot point. This would provide usable data for us since we could use it in the same manner as we do a drill hole in constructing a cross section.

If you do indeed believe there is some definite merit in Cooksley's method, I believe additional work should be done to prove the method. Such work could be conducted by Cooksley or by your organization if you do have the capabilities. I would recommend a research project by your office to do this work.

Very truly yours,

W. L. Kurtz

W. L. Kurtz /lad

WLK:lad
Encs.

cc: JJCollins - w/o enc.
JHCourtright - w/o enc.
JDSell - w/o enc.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

February 16, 1972

J. H. C.
FEB 16 1972

MEMORANDUM TO STAFF

Superior East Project

I want to emphasize that all drill information from the Superior East project should be held in strict confidence by all of you, and this especially applies to the occurrence of native copper in the Whitetail conglomerate.

The occurrence of native copper in drill hole A-4 represents a major copper discovery and shall remain the exclusive information of ASARCO.

I am certain that none of you have disclosed any of the information and you are hereby formally instructed not to do so.

W. L. Kurtz

WLK:lad

cc: JDSell
JHCourtright

Blind Note:
Jim: You, of course, can give drill performance data on an exchange basis with other companies and other data for which you receive more than you give.

B.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 28, 1972

Memorandum

TO: W. L. Kurtz

FROM: J. D. Sell

Temperature Gradients
Superior East Project Area
Pinal County, Arizona

As per your request, this will summarize our present knowledge of temperatures in the area.

Drill Hole DCA-1A
Surface elevation: 4760 feet.
At 5173-foot depth (-413 subsea) = 121°F after 4 passes on Dec. 20, 1971
At 5600-foot depth (-840 subsea) = 151°F after 4 passes on Jan. 11, 1972
or 1°per 14 feet at the relative depths.
Note: First reading taken during relatively good consistent drilling, whereas second reading taken during period of high agitation of drill rods in hole.

Drill Hole A-4
Surface elevation: 4090 feet.
At 4500-foot depth (+400 above sea) = 164°F; geophysical probe on November 1, 1971
At 6650-foot depth (-1750 subsea) = 184°F after 2 passes on Nov. 4, 1971
or 1° per 107 feet at the relative depths.

Magma Mine (Workings in central and western areas)
Surface elevation: 3834 feet. (Ariz. Bur. Mines Bull. 151, p. 107)
At 2000-foot level (+1834 above sea) = 109°F
At 4800-foot level (-966 subsea) = 152°F
or 1° per 65 feet over depth range.
Note: Relative temperature appears to increase eastward along same level as workings are extended under the dacite cap rocks.

James D. Sell

JDS:lad

JHC

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 27, 1972

W. L. K.
FEB 2 1972

J. H. C.
FEB 2 1972

Memorandum

TO: W. L. Kurtz

FROM: J. D. Sell

Age Dates and Petrographic Examination
DDH M-1A and A-4
Superior East Project
Pinal County, Arizona

Results from separate studies on core from the Superior East Project are now available. The request for the age dates was in a memorandum to J. C. Balla dated November 11, 1971, while the petrographic request was submitted to G. J. Stathis on the same date.

Sample M-1A-A is a weakly altered porphyritic quartz monzonite with an age date of 59.9 ± 2.2 m.y. The mass was emplaced as a slide block within the Whitetail conglomerate sequence.

Sample A-4 is a weakly altered quartz monzonite porphyry with an age date of 62.6 ± 2.3 m.y. The mass was found under a fault and is interpreted to be in place.

The two ages are in the same range as the Schultze granite (62 m.y.) and granite porphyry phase of the Schultze granite (58 m.y.) as determined in the Miami mineral district.

Attached is the age date data from the Geochron Laboratories. The petrographic work was submitted by G. J. Stathis in a memorandum dated January 20, 1972.

James D. Sell

James D. Sell

JDS:lad
Attach.

KRUEGER ENTERPRISES, INC.
GEOCHRON LABORATORIES DIVISION
24 BLACKSTONE STREET • CAMBRIDGE, MA. 02139 • (617)-876-3691

POTASSIUM–ARGON AGE DETERMINATION — REPORT OF ANALYTICAL WORK

Our Sample No.: B-2177

Date Received: 1 December 1971

Your Reference: M-1A-A

Date Reported: 19 January 1972

Submitted by: J.C. Balla
American Smelting & Refining Co.
Southwestern Exploration Div.
P.O. Box 5747
Tucson, Arizona 85703

Sample Description & Locality: Granite

Material Analyzed: Biotite concentrate, -40/+100 mesh.

Ar^{40*}/K^{40} = .003561 **AGE =** 59.9 ± 2.2 **M.Y.**

Argon Analyses:

Ar^{40*}, ppm.	Ar^{40*}/ Total Ar^{40}	Ave. Ar^{40*}, ppm.
.03291	.540	.03285
.03278	.547	

Potassium Analyses:

% K	Ave. %K	K^{40}, ppm
7.514	7.559	9.222
7.605		

Constants Used:

$\lambda_\beta = 4.72 \times 10^{-10}$/ year

$\lambda_e = 0.585 \times 10^{-10}$/ year

$K^{40}/K = 1.22 \times 10^{-4}$ g./g.

$$AGE = \frac{1}{\lambda_e + \lambda_\beta} \ln\left[\frac{\lambda_\beta + \lambda_e}{\lambda_e} \times \frac{Ar^{40*}}{K^{40}} + 1\right]$$

Note: Ar^{40*} refers to radiogenic Ar^{40}.
M.Y. refers to millions of years.

KRUEGER ENTERPRISES, INC.
GEOCHRON LABORATORIES DIVISION
24 BLACKSTONE STREET • CAMBRIDGE, MA. 02139 • (617)-876-3691

POTASSIUM-ARGON AGE DETERMINATION — REPORT OF ANALYTICAL WORK

Our Sample No. B2178 — **Date Received:** 1 December 1971

Your Reference: A-4-C-121 — **Date Reported:** 19 January 1972

Submitted by: J.C. Balla
American Smelting & Refining Co.
Southwestern Exploration Div.
P.O. Box 5747
Tucson, Arizona 85703

Sample Description & Locality: Granodiorite

Material Analyzed: Biotite concentrate, -40/+100 mesh.
Purity greater than 95%.

Ar^{40*}/K^{40} = .003725 — **AGE =** 62.6 ± 2.3 **M.Y.**

Argon Analyses:

Ar^{40*}, ppm.	Ar^{40*}/ Total Ar^{40}	Ave. Ar^{40*}, ppm.
.03099	.680	.03122
.03144	.638	

Potassium Analyses:

% K	Ave. %K	K^{40}, ppm
6.900	6.868	8.379
6.837		

Constants Used:

$\lambda_\beta = 4.72 \times 10^{-10}$/ year

$\lambda_e = 0.585 \times 10^{-10}$/ year

$K^{40}/K = 1.22 \times 10^{-4}$ g./g.

$$AGE = \frac{1}{\lambda_e + \lambda_\beta} \ln\left[\frac{\lambda_\beta + \lambda_e}{\lambda_e} \times \frac{Ar^{40*}}{K^{40}} + 1\right]$$

Note: Ar^{40*} refers to radiogenic Ar^{40}.
M.Y. refers to millions of years.

Geochron Laboratories, Inc.

24 Blackstone Street, Cambridge, Mass. 02139
Telephone TRowbridge 6-3691

20 January 1972

J.C. Balla
American Smelting and Refining Co.
Southwestern Exploration Div.
P.O. Box 5747
Tucson, Arizona 85703

Dear Mr. Balla:

Enclosed are the analytical reports of the K-Ar age determinations on the two rock samples described in your letter of 24 November 1971.

We analyzed a biotite concentrate sample and obtained indistinguishable ages of about 60 million years. You did not indicate the magnitude of the expected ages for these samples, so I cannot comment too much about them, other than to say that the biotites appeared to be in quite good condition and I would expect the measured ages to be reliable.

I am sending the mineral concentrates to you under separate cover.

If you should have any questions about the analyses, please do not hesitate to contact me. In the meantime, I am enclosing our invoice for this work. I hope that we may be able to serve you again in the near future.

Sincerely,
GEOCHRON LABORATORIES DIV.

Richard H. Reesman

Richard H. Reesman
General Manager

RHR/dm

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 20, 1972

JAN 21 1972

FILE MEMORANDUM

Petrographic Examination of
Thin Sections from Core Holes
M-1A and A-4
Superior East Project
Pinal County, Arizona

Introduction

Seven rock samples, from Superior East Project, were submitted by J. D. Sell on November 11, 1971 for thin section examination. The samples were notated as follows by R. B. Cummings:

1. Sample #1 (2981' depth) drill hole M-1A.
   Porphyritic quartz monzonite from slide block within Miocene Whitetail conglomerate.

2. Sample #1 (6656' depth) drill hole A-4.
   Porphyritic biotite quartz monzonite (?) or granodiorite (?). 10-20% secondary K-spar (?), salmon-colored, as replacement band along fracture planes and in phenocrysts. Trace of pyrite and chalcopyrite.

3. Sample #2 (6602' depth) drill hole A-4.
   Quartz biotite schist, well banded. Trace of pyrite and chalcopyrite. Could it be a mafic-rich border phase to the intrusive (samples A-4-1 and A-4-6)?

4. Sample #3 (6573' depth) drill hole A-4.
   Cemented fault gouge. Could it be Whitetail conglomerate? Are catoclastic textures prominent? What is the gray sulfide -- is it detrital?

5. Sample #4 (6562' depth) drill hole A-4.
   Silicic limestone. Could it be a siltstone?

6. Sample #5 (6445' depth) drill hole A-4.
   Silicic limestone breccia or siltstone breccia.

7. Sample #6 (6612' depth) drill hole A-4.
   Biotite quartz monzonite. Highly sheared portion of equivalent (?) sample number A-4-1 above.

Thin sections of the seven rock samples were cut and examined last month. At that time, a brief summary of the examination was reported verbally to Messrs. Kurtz and Sell.

Thin Section Descriptions

1. Section M-1A-1
   Texture: Medium grained, hypidiomorphic-granular.
   Slight tendency to porphyritic texture.
   60 percent (volume) plagioclase.
   20 percent (volume) quartz. Some quartz "eyes".
   5 percent (volume) biotite. Shreddy, little alteration to magnetite.
   Remainder -- mostly orthoclase.
   Weak alteration of feldspars (oligoclase and orthoclase) consisting of incipient clay and traces of sericite.
   Reflected light shows 5 percent geothite and some jarosite staining. Minor hematite along microfractures. Trace to 0.5 percent disseminated magnetite.
   Conclusion: Weakly altered porphyritic quartz monzonite.

2. Section A-4-1
   Texture: Medium grained, porphyry.
   Groundmass accounts for 20 percent of the rock volume and consists of 50:50 or more orthoclase over quartz.
   Phenocrysts mostly plagioclase, 75 percent by volume.
   Quartz phenocrysts 20 percent of phenocryst volume. Locally some large (greater than 1/4") quartz "eyes".
   Less than 10 percent orthoclase phenocrysts.
   6 to 8 percent biotite in groundmass.
   Biotite shreddy, 1/3rd altered to chlorite.
   Feldspar phenocrysts moderately altered, 1/3rd to locally 1/2 of the feldspar phenocrysts surface altered to sericite and incipient clay.
   Reflected light shows traces of magnetite, limonite and groundmass sericite.
   Conclusion: Weak to moderately altered quartz monzonite porphyry. Traces of pyrite and chalcopyrite noted in hard sample along microfractures. Salmon coloration along fracture planes appears to be limonite "dusting" of quartz and plagioclase phenocrysts (cross-cutting relationships noted under binocular microscope).

3. Section A-4-2
   Quartz-biotite-chlorite-sericite schist. Some quartz veinlets parallel to and nearly at right angle to the schistosity.
   0.5 to 1.0 (volume) percent, very finely disseminated pyrite and chalcopyrite.
   Conclusion: A good schist. Highly unlikely that it represents a mafic-rich border phase of an intrusive rock.

4. Section A-4-3
   Texture: Cataclastic.
   Quartzite and quartz-sericite schist fragments.
   60 (volume) percent ferruginous (hematitic) groundmass.
   6 (volume) percent disseminated, bluish-gray, fine grained, opaque grains noted in groundmass believed to be chalcocite (copper assay return from 10-foot interval in the fault zone averaged over 1.5 percent, according to J. D. Sell).
   Conclusion: Original rock type ?
   Rock can be termed a cataclasite.

5. Section A-4-4
   Texture: Highly contorted, banded rock. Mylonitized.
   Fine quartz crushed. Selective, goethite staining along bands.
   Opal along bands. Minor chalcedony veinlets, fine Kaolin ? clay.
   Conclusion: Mylonitized siltstone ?

6. Section A-4-5
   Texture: Fine grained, banded (bedding).
   Fine magnetite (locally oxidized) distributed along bedding.
   Quartz augen structures developed occasionally along bedding often with native copper concentrated along the edge of the quartz augens and alongside recrystallized quartz bands (with magnetite).
   Traces sericite. Bulk of rock fine clay-quartz aggregate.
   Conclusion: Siltstone. Native copper concentrated along bedding and strong preference to deposit along edge of quartz-rich zones locally recrystallized (augens common). Magnetite shows similar detrital association with quartz.

7. Section A-4-6
   Texture: Porphyry. Cataclastic.
   Groundmass is much finer than A-4-1 and accounts for 40 percent of the rock volume.
   70 percent of the phenocryst volume consists of plagioclase, 6 percent biotite and the rest quartz (quartz phenocrysts are smaller than those in A-4-1).

Plagioclase phenocrysts are incipiently altered to clay. Biotite phenocrysts shreddy, trace chloritization.
Groundmass composed mostly of quartz and orthoclase.
Traces of sericite in groundmass.
Rock is shattered and veined by carbonate (dolomite?) stringers which cut groundmass, quartz and biotite phenocrysts.
5 to 7 (volume) percent carbonate veining in rock.
No magnetite or limonite veining in reflected light.
Conclusion: Biotite quartz monzonite porphyry. Rock essentially fresh (assuming porphyry texture is a primary feature).

George J. Stathis

George J. Stathis

GJS:lad

cc: JHCourtright
WLKurtz
JDSell
RBCummings

J. H. C.
JAN 21 1972

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 19, 1972

FILE MEMORANDUM

Petrographic Examination of
Cactus Breccia and Whitetail
Conglomerate
Superior East Project Area
Pinal County, Arizona

Conclusions:

1. Thin section examination revealed no obvious difference in the texture and matrix between the Cactus breccia and Whitetail rocks.

2. The Whitetail sections examined showed that some of the clasts were composed of granitic (quartz monzonite?) material. Thin sections of the Cactus breccia showed no granitic clasts. However, granitic clasts are common to parts of the Cactus breccia in diamond drill core shown to the writer while visiting the project area.

3. The Whitetail fragments or clasts are quite angular like the Cactus breccia material. The impression gained is that there has been very little water transport of the Whitetail material and that the "conglomerate" material was quickly dumped in a basin.

4. Diabase and basic volcanic clast material was noted only in section TBA-5 (Whitetail).

Introduction

A company memo of September 7, 1971, by J. C. Balla to J. D. Sell, states that: "Nine samples were collected for thin section study in an attempt to ascertain if there was a difference in the matrix between Cactus breccia rocks and Whitetail rocks."

Information supplied to the writer is as follows:

Section #	Description
TBX-1	Cactus breccia, road cut
TBX-2	Cactus breccia, road cut
TBX-3	Cactus breccia, road cut
TBX-4	Cactus breccia, drill hole A-1, 1397'
TBX-5	Whitetail, drill hole A-1, 1557'
TBX-6	Cactus breccia, drill hole A-1, 1509'
TBX-7	Whitetail, drill hole M1-A, 2457'
TBX-8	Whitetail, drill hole M1-A, 3125'
TBX-9	Whitetail, drill hole M1-A, 4278'

Thin sections were examined in the fall of '71 and results were reported verbally to J. D. Sell. Notes on the thin section examination are appended to this report.

George J. Stathis

GJS:lad

cc: JHCourtright
WLKurtz
JDSell
JCBalla
RBCummings

APPENDIX

Notes on Thin Section Examination

1. Section TBX-1
   Texture: breccia
   Moderate to strong pervasive oxidation.
   Mostly goethite with traces of hematite and leucoxene.
   80 (volume) percent of the rock comprised of breccia clasts.
   Two sizes ranges of clasts:
      1. 0.25 mm or less.
      2. 0.5 mm to 5 mm -- average 1.0 mm.
   75 (volume) percent of clasts consist of small size material which is comprised of nearly all quartz.
   Large clasts -- 75 (volume) percent.
   Composed of quartz and 25 (volume) percent sericitized (schist?) clasts with some biotite and trace augite.
   Trace secondary biotite in groundmass.

2. Section TBX-2
   Texture: breccia
   Weak oxidation as light geothite staining and trace hematite.
   90 (volume) percent of the rock comprised of moderately altered breccia clasts.
   Two size ranges of clasts:
      1. 0.25 mm or less.
      2. 1.0 mm to 2.5 mm (plus? alteration masking).
   Two size ranges of clasts occur 50:50?
   Small clasts all quartz.
   Large clasts composed nearly 50:50 quartz and sericite (schist?) with 0.5 (volume) percent biotite.
   Sericite alteration extends into groundmass. Estimate 1/3rd of rock sericitized. 0.5 (volume) percent disseminated magnetite in groundmass.

3. Section TBX-3
   Texture: breccia
   Strong pervasive oxidation (goethite-hematite).
   80 (volume) percent of rock comprised of breccia clasts.
   Two size ranges of clasts:
      1. 0.25 mm or less.
      2. 0.5 mm to 6 mm -- average 1.5 mm.
   75 (volume) percent of clasts consist of small size material (all quartz).
   Half of the large clasts are completely sericitized with minor biotite and trace augite. The remaining large clasts composed of quartz and 1/3rd banded (schistosity) sericite.

4. Section TBX-4
   Texture: breccia
   Moderate to strong oxidation (goethite-hematite).
   80 (volume) percent of rock comprised of breccia clasts.
   Two size ranges of clasts:
      1. 0.25 mm or less.
      2. 0.5 mm to 6 mm.
   75 (volume) percent of clasts consist of small size material (all quartz).
   Half of the large clast volume consists of quartzite. The remaining half consists of quartz-sericite-biotite schist fragments. 1 (volume) percent or so, fine biotite disseminated in groundmass.

5. Section TBX-5
   Texture: breccia
   Light, selective oxidation locally.
   90 to 95 (volume) percent of the rock comprised of breccia clasts.
   Two size ranges of clasts:
      1. 0.25 mm or less.
      2. 0.5 mm to 3.5 mm -- average 1.2 mm.
   70 (volume) percent plus of clasts consist of the <u>larger</u> size material.
   Large clasts consist of diabase and basic volcanic material (felty texture).
   Orthopyroxenes in diabase altering to chlorite and serpentine. Some large clasts containing plagioclase, perthite, and quartz (granitic) noted. Small clasts mostly quartz, some plagioclase locally.
   Rock moderately to strongly altered (80 percent by volume).
   Siderite? as fracture fillings.
   Chalcedony as cavity fillings.
   Minor sericite and gypsum noted locally.
   2 to 3 (volume) percent disseminated, weakly oxidized magnetite.
   6 to 7 (volume) percent geothite in mafic clasts.

6. Section TBX-6
   Texture: breccia
   Very light oxidation
   85 (volume) percent of the rock comprised of breccia clasts.
   Two size ranges of clasts:
      1. 0.25 mm or less.
      2. 0.5 mm to greater than 7 mm -- average 1.5 mm.
   85 (volume) percent of clasts consist of small size (quartz) material.
   Half of the large size clasts are completely sericitized. Remainder consist of quartz and minor sericite (schist?), with traces of biotite. Trace, incipient biotite in groundmass. 3 (volume) percent disseminated, partly oxidized, magnetite in clasts and groundmass.

Section TBX-7

Texture: breccia
Light oxidation (goethite-hematite).
80 (volume) percent of the rock comprised of breccia clasts.
Two sizes of clasts:
1. 0.25 mm or less.
2. 0.5 to 2.5 mm -- average 1.0 mm.

Two size ranges of clasts occur 50:50.
Small clasts quartz. Large clasts consist of quartzite?, qtz.-sericite schist and quartz-perthite-plagioclase fragments in about equal proportions.
0.5 (volume) percent, small, biotite laths in groundmass.
0.5 (volume) percent disseminated magnetite mostly in large clasts.

Section TBX-8

Texture: breccia
Light oxidation (goethite-hematite).
90-95 (volume) percent of the rock comprised of breccia clasts.
Two sizes of clasts:
1. 0.25 mm or less.
2. 0.5 mm to 3.5 mm -- average 0.7 mm.

Two size ranges of clasts occur 50:50.
Large clasts consist of quartz-sericite (with biotite and minor chlorite) schist, quartzite, and quartz-microcline-perthite-plagioclase fragments in about equal proportions.
0.5 to 1.0 (volume) percent biotite laths in groundmass.
0.5 (volume) percent disseminated magnetite mostly in clasts.

Section TBX-9

Texture: breccia
Light oxidation (goethite-hematite).
90 (volume) percent of the rock comprised of breccia clasts.
Two sizes of clasts:
1. 0.25 mm or less.
2. 0.5 mm to 5.0 mm -- average 1.0 mm.

Two size ranges of clasts occur 50:50.
Large clasts mostly altered to sericite clay (kaolin) and chlorite.
15 to 20 (volume) percent chlorite in clasts and 5 (volume) percent overall in section. Groundmass chlorite Fe>Mg variety.
Estimate 80 (volume) percent plus of large clasts probably altered quartz monzonite, remainder quartzite.
Most of groundmass chlorite after biotite laths.
2 to 3 (volume) percent disseminated jarosite in groundmass.
5 (volume) percent disseminated, oxidized magnetite.
2 to 3 (volume) percent gypsum intimately associated with chlorite.
Trace epidote.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 6, 1972

Memorandum

TO: W. L. Kurtz

FROM: J. D. Sell

Reserve Figures - Copper
Major Deposits

This memorandum is to upgrade and supplement my memo to W. E. Saegart (June 16, 1971) entitled: Production - Grade - Reserves, Major Mines - Superior East Project Area. The figures, by company, are based on published reports unless otherwise indicated.

Anaconda Company. Sulfide reserves Sept. 1, 1968; World Mining, vol. 4, no. 13, p. 56, December 1968.

Twin Buttes	292,000,000 tons of 0.88%	
Twin Buttes	20,000,000 tons of 0.8% oxide stockpiled	(Verbal)
Eisenhower (Palo Verde)	76,400,000 tons of 0.65%(?)	1962 Mineral Yearbook
Yerington	67,000,000 tons of 0.54%	
Yerington	28,000,000 tons of 0.57% oxide	
Butte, open pit	414,000,000 tons of 0.74%	
Butte, underground	12,500,000 tons of 4.27%	
Cananea	177,000,000 tons of 0.81%	
Cananea (Proposed Pit)	825,000,000 tons of 0.73%	Pay Dirt, Sept. 1971

ASARCO. Prospectus, Jan. 1, 1968.

Mission	113,360,000 tons of 0.68%
Silver Bell	
Oxide Mine	21,140,000 tons of 0.68%
El Tiro Mine	27,343,000 tons of 0.73%
Leach Dumps	40,822,000 tons of 0.35%
San Xavier	
Sulfide	69,076,000 tons of 0.51%
Oxide	7,292,000 tons of 0.83%
Sacaton	
Open-pit	22,400,000 tons of 0.86% sulfide
Underground	14,558,000 tons of 1.36% sulfide

Bagdad Copper Company - 1969.

Bagdad	46,000,000 tons of 0.69%
"	200,000,000 tons of 0.50%
"	110,000,000 tons of 0.40%

Cities Service Company - December 31, 1968.

Copper Cities	18,000,000 tons of 0.55%
Diamond H	13,000,000 tons of 0.55% sulfide
Diamond H	6,000,000 tons of 0.55% oxide
Pinto Valley	350,000,000 tons of 0.45% (Verbal communication suggests at least twice this amount and possibly three times.)

Miami Mine -- Expansion to NW into Inspiration townsite plus common boundary area with ICC Thorton pit suggests ± 100,000,000 tons at ± 0.5%.

Central zone of Copper Cities - Diamond H altered area is known to contain minor chalcocite and primary values running 0.3-0.35% copper under +300 feet of leached capping. Chalcocite is not sufficient to support stripping at this time. Note in U of A Porphyry Copper Volume, p. 154, reports..... "Recent drilling to the west (of Copper Cities), outside the pit, has shown a significant increase in copper with depth. A thickness of 200 to 300 feet of material averaging +0.4 percent total copper is overlain by 700 to 1000 feet of material averaging about 0.1 percent total copper." Area and thickness of primary suggests +300,000,000 tons of +0.3%.

Also, verbal pit foreman 1969, ore continues under the shallow dipping Drummond fault northeast side of Copper Cities pit. The "barren" hanging wall material will not presently carry the stripping necessary to expose ± 20,000,000 tons of 0.5% in this area.

Miami East. From reported depths and assays of the three companies involved in the faulted offset, it is suggested that Miami's portion may be ± 300,000,000 tons of ± 1.0%. Also verbal, the present Miami feasibility study probably is in the best area and involves some 80,000,000 tons. Underground work is being pushed into this area.

Cactus Area. The area is underlain by a flat fault which cuts off a chalcocite-enriched mineral deposit suggested to be some 15-20,000,000 tons of ± 0.5%. Abundant oxide copper overlies and surrounds the sulfide body. Calculation of the size of altered schist breccia and possible grade suggests some 40,000,000 tons of +0.5% oxide copper in the block controlled by Cities Service.

CONOCO Reported in 1971 Annual Report, p. 27
Florence (Pasto Butte) "Indicated total ore reserves are about 500 million tons with an average grade slightly above 0.5% copper." Verbal: PB west has 75-100 million tons of ore @ 20.5%. PB East has 200-250 million tons of ore @ +0.4% copper.

Duval Corporation. Reserves of January 1, 1968. Mining World, v. 5, no. 3, p. 51, March 1969 and also see Prospectus.

Ithica Peak	54,538,000	tons of 0.49% Cu + 0.044% Mo
Esperanza	41,215,000	tons of 0.45% Cu + 0.032% Mo
Copper Canyon (Nev.)	18,237,000	tons of 0.74% Cu
Copper Basin (Nev.)	3,437,000	tons of 1.43% Cu
Sierrita (1971)	524,000,000	tons of 0.33% Cu + 0.033% Mo

El Paso-Hecla.

Lakeshore	207,000,000	tons of 0.71% oxide
"	241,000,000	tons of 0.7% sulfide
"	24,000,000	tons of 1.69%, tactite sulfide

Homestake Production. Verbal and visual information.

Carlotta	3,600,000	tons of 1.65% Kelly ore (fault zone)
"	5,000,000	tons of 1.03% Carlotta ore (breccia)
"		(based on property boundary and mineral location it is calculated that the Carlotta block contains some 15,000,000 tons of ore.)

Inspiration Consolidated Copper Co. Annual Report for 1970, with reserves to January 1, 1971

Inspiration area	1,507,622,000	pounds of recoverable copper ≅ 85 million tons of ore
Christmas, underground	567,605,000	" " " "
Christmas, open-pit	278,122,000	" " " "
Sanchez	160,917,000	" " " "

Kennecott Copper Corporation. "Proven" reserves as of January 1, 1971. World Mining, vol. 24, no. 6, p. 48, June 1971.

Ray	736,310,000	tons of 0.82%
Chino	452,307,000	tons of 0.78%
Nevada	63,100,000	tons of 0.79%
Utah	1,773,000,000	tons of 0.71%
Safford	1,000,000,000(?)	tons of +0.4%(?) (Not published)

Newmont Mining Company. January 1, 1969. Various sources.

San Manuel	496,800,000	tons of 0.728% sulfide
San Manuel	130,000,000	tons of 0.70% mixed; of which 0.47% is oxide copper
Kalamazoo	565,000,000	tons of 0.72% sulfide
Superior	10,400,000	tons of 5.7%
Vekol	107,000,000	tons of 0.55% Cu + 0.015% Mo

Occidental Minerals. Calculated from drill pattern and published reports indicates some 100,000,000 tons averaging between 0.50 and 1.2% copper as oxide.

Phelps Dodge Corporation. "Economic" ore reserves of January 1, 1971. Prospectus dated June 16, 1971.

Morenci	736,800,000 tons of 0.80%
Metcalf, open-pit	220,600,000 tons of 0.74%
Metcalf, underground	126,700,000 tons of 0.92%
Ajo	138,000,000 tons of 0.70%
Bisbee, open-pit	8,100,000 tons of 0.94%
Bisbee, underground	1,900,000 tons of 5.41%
Safford, underground	250,000,000 tons (probable) of 0.92%
Tyrone	292,200,000 tons of 0.81%

Pima Mining Company. January 1, 1969.

Pima	216,000,000 tons of 0.56%

Ranchers Exploration. Annual report, reserves of January 1, 1971.

Blue Bird	75,000,000 tons of 0.52% (open-ended)
Old Reliable	4,000,000 tons of 0.74%
Big Mike (Nev.)	400,000 tons of 3%(?) in place
Big Mike (Nev.)	300,000 tons of 2%, mixed, in stockpile

James D. Sell

JDS:lad

State District Name	Owner	Operati	Potenti	Production 1970 Tons of Leach Cu	Oxide Reserves Grade
ARIZONA					
Miami Distric					
Inspiration	ICC	X		10,038	Expansion
Miami*	Cities Service	X		7,483	Expansion potential
Ox Hide*	ICC	X		6,720	20-40(?) million @ ± 0.5%, all oxide
Blue Bird*	Ranchers	X		5,930	75 million @ 0.52%
Copper Cities	Cities Service	X		2,246	
Castle Dome	Cities Service	X		467	Operations ceased at end of 1970
Gibson Mine*	Private	X		3 (year 1969)	Oxidized sulfides in shear zone pods; probable limited
Barney*	ICC		X		Reported equivalent to Ox Hide
Miami East	Cities Service		X		100-140(?) million tons @ ± 1% Probably mixed oxide
Van Dyke	Occidental		X		80-100(?) million tons @ ± 1%; Half oxide (?)
Cactus*	Cities Service		X		40(?) million tons @ ±0.7%; Mostly oxide
Carlota*	Homestake Production		X		4-5 million tons @ ± 1.0%; All oxide
Copper Springs	Humble		X(?		
Diamond H	Cities Service	0	X		6 million @ 0.55%

*Leach Operations Only

0 - Past or Anticipated leach production

State District Name	Owner	Operati	Potenti	Production 1970 Tons of Leach Cu	Oxide Reserves Grade
ARIZONA					
Florence District					
Poston Butte West	ASARCO		X		100-175 million tons @ ± 0.6%; Partially drilled
Poston Butte West	Conoco		X		75-100 million tons @ ± 0.5%; Partially drilled
Poston Butte East	Conoco		X		200-250 million tons @ + 0.4% Drilled oxide; Sulfides not included
Red Hill*	Private	X	X		Limited; Expansion drilling in progress
Mineral Butte	Duval		X		40 million tons @ 0.4%(?): Drilled

*Leach Operations Only

0 - Past or anticipated leach production

J. H. C.

DEC 23 1971

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

December 17, 1971

MEMORANDUM FOR J. J. COLLINS
New York Office

Superior East Project

Per your request, I enclose the east-west and north-south cross sections of the Superior East Project. Also enclosed is a copy of your memorandum, December 13, 1971, to R. L. Hennebach with a few additions Mr. Sell and I thought appropriate.

Please note that we have indicated the property boundaries on the cross sections. Mr. Crist has inquired into obtaining a prospecting permit on the Oak Flat Withdrawal Area and believes that we can obtain one. Hopefully, we will be able to give you all the details when you visit us in January.

W. L. Kurtz

WLK:lad
Encs.

cc: JHCourtright
JDSell

12-13

From: J. J. Collins

To: Mr Kurtz

Pl correct where necessary

Retyped with minor changes by Kurtz & Sell.

Bill
Dec 17, 1971

RECEIVED
DEC 15 1971
S. W. U. S. EXPL. DIV.

New York December 13, 1971

MEMORANDUM FOR: Mr. R. L. Hennebach

Superior East, Arizona

The attached map and this tabulation may help to put this project in perspective. From north to south and west to east:

Hole DCA-1

An old Inspiration hole (but actually in one of our claims) was reentered last month and our core drilling started from 4002 ft. At the end of November depth was 4307 ft. No ore.

Hole A-1

A new Asarco hole 2129 ft. deep. Bottomed in pyritized basement schist. No ore.

Hole DCA-2

An old hole bottomed in pyritized basement schist and Tertiary granite. No ore.

Hole M-1A

An old hole reentered, drilled from 2402 ft., and bottomed at 5322 ft. in weakly mineralized Paleozoic limestone and with visible native copper in the overlying Whitetail conglomerate.

Hole OF-1A

An old hole. Stoped in volcanics.

Hole DCA-3

An old hole in Whitetail conglomerate. No ore. Could not be reentered.

Hole A-5

A new Asarco hole rotary drilled to 3145 ft. and waiting for the core drilling rig. Rotary cuttings from Whitetail conglomerate show visible native copper.

9 - Magma's #9 shaft 2960 ft. deep. Cut 1400 feet of Whitetail conglomerate with native copper. Minor mineralization in underlying breccia.

Hole A-4

A new Asarco hole bottomed at 6664 ft. in November in monzonite with traces of mineralization, but the surprising thing is the amount of native copper in the Whitetail conglomerate: 1460 ft. average 0.66% Cu, from 5080 to 6540 ft. (or 860 feet average 0.81% from 5680-6540).

Hole I-1

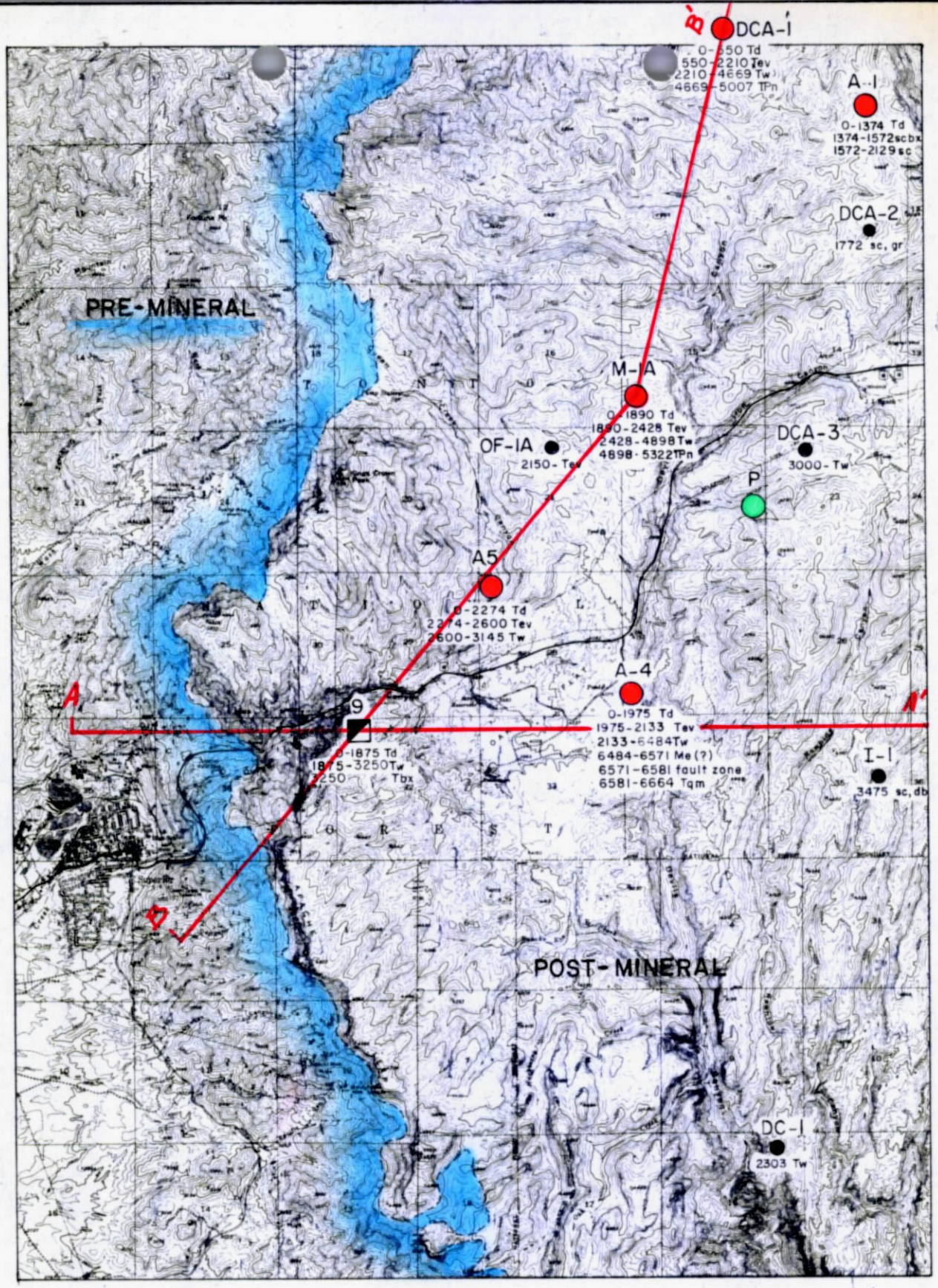
An old hole bottomed in basement schist at 3475 ft.

Summary

The mineralization in the conglomerate and limestone in Hole A-4 is not what we were looking for and the depth is extreme. Nevertheless, its existence encourages search for the bedrock source. The discovery should be kept confidential while we negotiate a permit or lease on the adjoining state land.

John J. Collins

Attach.



EXPLANATION

- Previous drill hole
- ASARCO drill hole
- Magma's #9 shaft
- DCA-1 (hole designation)
- 4011 Tw
  - Tw → Rock type
  - 4011 → Bottom hole depth
- P — Proposed drill site

POST-MINERAL ROCK UNIT

Td - Dacite
Tev - Early volcanics
Tw - Whitetail

PRE-MINERAL ROCK UNIT

Tbx - Breccia
Tqm - Quartz Monzonite
Tgr - Granite
TPn - Naco limestone
Me - Escabrosa limestone
p€db - Diabase
p€sc - Schist

Summary

DRILLING PROGRESS MAP
for the month of _____
SUPERIOR EAST
GILA & PINAL COUNTY, ARIZONA
SCALE: 1" = 1 mile
J.D.S.
2463

J. H. C.

AUG 4 1971

OFFICE OF THE SECRETARY

New York, N.Y., July 27, 1971.

RECEIVED

JUL 29 1971

EXPLORATION DEPT.

Mr. J. J. Collins

The following is an extract from the minutes of the Advisory Committee meeting held July 21, 1971:

Mining Authorization #0010-04
Superior East Project
Pinal County, Arizona

At a meeting of the Advisory Committee held on March 24, 1971, there was approved an expenditure of $260,000 (M.A. #0010-03), for drilling six holes at the Dacite Plateau, Superior East Project, Arizona.

It was reported that Company Geologists recommend an additional expenditure in the amount of $409,000 to complete rotary and core drilling in the primary target areas.

There was approved an expenditure in the amount of $409,000, subject to ratification by the Board of Directors, for drilling at the Superior East Project, Arizona.

J. F. Hornbostel, Jr.

JFH:pf
Encl.
FGHamrick
HQStringham - 2 w/encl.
JHCourtright encl.
WESaegart w/encl.
KAvdSteinen w/encl.

M.A. 5 copies

PRINTED IN USA 9/69

FORM 302-MB

New York No. 0010-04

AUTHORIZATION FOR SUPPLEMENTAL MINERAL EXPLORATION

July 15 1971

Originating Office SWED - TUCSON

Application is hereby made for supplemental Authorization to cover cost, in excess of original estimate, of work authorized by New York.

No.....

Present total Estimated Cost (Form 302-MA attached)	$800,000.
Amount previously authorized (date.....) 0010-00-$45,000., 6/70; 0010-01-$31,000., 8/70; 0010-02-$55,000., 12/70; 0010-03-$260,000., 3/71	$391,000.
Balance for which Authorization is now requested	$409,000.

ADDITIONAL WORK CONTEMPLATED:
To effect the total of seven premineral bedrock penetrations necessary for a minimum exploration test, the following drilling is necessary:

1.) Complete 3150 feet of rotary and core drilling in holes presently in progress in primary target areas.
2.) Complete 9600 feet of rotary and core drilling in two new holes in primary target areas.
3.) Cleanout two previously drilled holes and complete 2500 feet of core drilling in primary target areas.

EXPLANATION OF INCREASED COST:
Increased drill footages to premineral bedrock surface and higher costs per foot in work performed.

Reviewed by H. G. [illegible] Acct. Mgr. or Chief Acct.

Approved by [illegible] ~~Vice President~~ Director

Recommended by W. E. [illegible] Supervisor

Approved by H. O. STRINGER Comptroller

Account Chargeable to Exploration Expense
To be designated by Comptroller

Approved by Advisory Committee
JUL 21 1971
.....19.....

Approved by Board of Directors
.....19.....

[illegible] Secretary

FORM 302-MA

Printed in U.S.A.

PROSPECT SUPERIOR EAST PROJECT

COST ESTIMATE, MINERAL EXPLORATION

OFFICE SWED - TUCSON

LOCATION Pinal County, Arizona

BY W. E. Saegart

No.	Type of Work	Salaries/Wages Days	Salaries/Wages Amount	Material	Fees, Rent, Services	Traveling	Taxes	Other	Total Estimate Cost
501	Outright Purchase								
502	Option Payments								
503	Bonus Payments								
504	Minimum Royalties-								
	Deductible from								
	Future Production								
505	Minimum Royalties-Not								
	Deductible from								
	Future Production								
506	Rental Payments				2,500.				2,500
507	Staking Claims				37,000.				37,000.
511	Surface Excavating								
512	Underground "								
521	Surface Drilling				549,300.				549,300.
522	Underground "								
530	Geologic								
540	Sampling, Assaying, Lab.				10,000.				10,000.
550	Geophysics								
560	Geochem				3,000.				3,000.
570	Engineering								
580	Construction (temp.)				59,200.				59,200.
590	Construction (perm.)								
610	Administration, Field	2130	93,000.			30,000.			123,000.
	Offices and Camps				3,000.				3,000.
620	Administration, General					13,000.			13,000.
641	Autos and Vehicles								
642	Aircraft and Boats								
650	Partner's Share								
	ASARCO'S SHARE		93,000.		664,000.	43,000.			800,000.
661	Commission or Fees								
663	Exchange								
	TOTAL		93,000.		664,000.	43,000.			800,000.

COURTRIGHT

RECEIVED
JUL 16 1971
EXPLORATION DEPT.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. H. C.
AUG 4 1971

July 15, 1971

Mr. J. J. Collins
New York Office

Dear Sir:

Supplemental Authorization Request
Superior East Project
Pinal County, Arizona

Transmitted herewith is a copy of Mr. J. D. Sell's memorandum of July 9, with enclosed map of our Superior East Project and a graphic log of Hole M-1A.

The present status of drilling at Superior East is as follows:

Hole M-1A completed at a depth of 5322 feet. Premineral bedrock contact logged at 4898 feet. Bedrock is unmineralized Pennsylvanian Naco limestone.

Hole A-1 rotary drilled and cased to 1306 feet. Probable pre-Cambrian schist bedrock contact at ± 1300 feet. Hole scheduled for coring from 1300 to 1800 feet, beginning July 12th.

Hole A-4 rotary drilling in Whitetail conglomerage at 3327 feet.

Our last Supplemental Authorization, 0010-03, was in the amount of $260,000., (3/24/71). This sum was considered adequate to provide four bedrock penetrations by deepening two existing holes and drilling two new holes. It was not our expectation that these four penetrations would be sufficient to constitute a minimum exploration test of the Dacite Plateau along the favorable mineral trend. The first phase drilling program, consisting of these four bedrock intersections, had the objective of providing geologic information to define the western extent of the Schultze granite beneath cover rocks of the Dacite Plateau. It was anticipated that additional drill holes authorized in a second exploration phase would be required to complete a minimum exploration program. Our proposed second phase of exploration is the basis of this supplemental authorization request.

Drilling costs per foot have proven to be higher than estimated and actual depths to bedrock are greater than were originally projected. The unexpended balance of our authorization, as of July 1, was estimated at $74,500. As now projected, the remaining costs to complete three of the four bedrock penetrations will be approximately $85,000. - - - or some $10,000. more than our current unexpended balance.

Mr. Sell has now estimated the costs of the second phase drilling program which, combined with the completion of the current program, will provide a sufficient density of drill holes to offer reasonable expectation for discovery. This estimate covers a total of seven drill holes, including the three which are already in progress, or completed. Two existing holes, DCA-1 and DCA-3 are proposed for deepening, assuming they can be reopened without excessive work, and two additional new holes, A-5 and A-6, are proposed. From Marvin Barnes' computer simulation, we can project a 53% probability of discovery of a porphyry copper deposit, or its alteration halo, utilizing a seven hole exploration program. This statistical approach assumes that one buried porphyry copper deposit does exist under the Dacite Plateau along the favorable trend.

Although drilling costs have proven to be considerably greater than originally estimated (actual costs of ± 5000 foot holes are now estimated at $30/ft.), we have conclusively demonstrated that bedrock penetrations are possible in this difficult drilling environment. Almost all previous efforts to penetrate the Whitetail conglomerate, by our competitors, resulted in failures. I think our success in this regard can be attributed to our selection of proper drilling equipment and the utilization of modern drilling technology. Excellent hole conditions in both M-1A and A-4 have been maintained throughout the project. With this experience, we are confident that additional penetrations can be successfully completed.

The occurrences of substantial amounts of native copper in the postmineral Whitetail conglomerate is extremely encouraging. A 1790 foot interval of the Whitetail in Hole M-1A contains an estimated average copper grade of 0.15%. This native copper occurs both in the fine grained matrix and in the boulders and pebbles (especially diabase fragments). Minor chalcocite has also been observed. Lesser amounts of native copper are present in the Whitetail in Hole A-4 and in Magma's #9 Shaft and the service adit, which will connect with this shaft. These three localities of observed native copper in Whitetail are separated by distances of two to three miles.

We assume the native copper in the Whitetail was chemically precipitated from surface waters during the accumulation and formation of the conglomerate. A large mineralized source area must have been exposed for a sustained period during Oligocene time to continuously supply copper bearing solutions throughout the accumulation of almost 2000 feet of Whitetail. We do not believe that the Magma replacement ore bodies could have been the source area for this copper. The reactive environment of enclosing calcareous sediments would not have permitted significant migration of copper undergoing oxidation within these replacement horizons. The exotic copper which has accumulated in the Whitetail conglomerate was almost certainly derived from a siliceous porphyry copper type deposit. It is not likely that the source was as distant as the Castle Dome deposit or the Miami-Inspiration deposit. The interpretation of a porphyry copper deposit concealed under the Dacite Plateau is considerably reinforced by the observed widespread distribution of native copper in the Whitetail. The favorability of the Dacite Plateau

has also been enhanced through the work conducted by Mr. Graybeal, with the resulting interpretation that the root segment of the Cactus breccia porphyry copper deposit is located within the property we control on the Dacite Plateau.

The greater than anticipated depth of premineral bedrock in Hole M-1A, and perhaps elsewhere on the Dacite Plateau, will influence the economics of mining in the event that an ore deposit is discovered. Enclosed with my memorandum of December 24, 1970, were outcome analyses for various hypothetical ore deposits. The "Case 2 - Porphyry Copper Deposit of the Miami - Inspiration Type", buried at a depth of 4500 feet to its top, yielded a 19.5% discounted rate of return on investment at $0.50 copper. A somewhat lower rate on investment would be realized if the same deposit were at a depth of 5000 feet. I think it is fair to assume, however, that the increased depth (to 5000 feet) would not reduce the profitability to less than 15% discounted rate of return.

Mr. Sell has estimated the cost to complete the seven hole test at $483,500. ($74,500. unexpended balance as of July 1, plus $409,000. in additional funds). Continuation of the Superior East Project is justified in view of the high expectation of discovery. It is doubtful that we could develop alternate exploration localities which would offer this degree of favorability for successful exploration. Mr. Kurtz and I strongly recommend the approval of this supplemental authorization request. If you agree, please request an additional authorization in the amount of $409,000., as itemized in attached accounting Forms 302-MA and 302-MB.

W. E. Saegart

W. E. Saegart

WES:van
Att (302-MA, 302-MB)
Enc (Sell memorandum)

cc: WLKurtz w enc/att
JHCourtright w enc/att
JDSell w/att
KvdSteinen w/att
HLCrittendon w/enc
RBCummings w/enc

PRINTED IN USA 9/69

FORM 302-MB

New York No. .....

AUTHORIZATION FOR SUPPLEMENTAL MINERAL EXPLORATION

.....July 15.....1971..

Originating Office .SWED.-.TUCSON.....

Application is hereby made for supplemental Authorization to cover cost, in excess of original estimate, of work authorized by New York.

No.....

Present total Estimated Cost (Form 302-MA attached)	$.800,000..
Amount previously authorized (date.....) 0010-00-$45,000., 6/70; 0010-01-$31,000., 8/70; 0010-02-$55,000., 12/70; 0010-03-$260,000., 3/71	$.391,000..
Balance for which Authorization is now requested	$.409,000..

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2.) Complete 9600 feet of rotary and core drilling in two new holes in primary target areas.
3.) Cleanout two previously drilled holes and complete 2500 feet of core drilling in primary target areas.

EXPLANATION OF INCREASED COST:
Increased drill footages to premineral bedrock surface and higher costs per foot in work performed.

Reviewed by ..... Acct. Mgr. or Chief Acct.

Approved by ..... Vice President

Recommended by W. E. Seegan Supervisor

Approved by ..... Comptroller

Account Chargeable to .....
To be designated by Comptroller

Approved by Advisory Committee

.....19.....

Approved by Board of Directors

.....19.....

.....
Secretary

PROSPECT SUPERIOR EAST PROJECT COST ESTIMATE, MINERAL EXPLORATION OFFICE SWED - TUCSON

LOCATION Pinal County, Arizona BY W. E. Saegart

No.	Type of Work	Salaries/Wages Days	Salaries/Wages Amount	Material	Fees, Rent, Services	Traveling	Taxes	Other	Total Estimate Cost
501	Outright Purchase								
502	Option Payments								
503	Bonus Payments								
504	Minimum Royalties-								
	Deductible from								
	Future Production								
505	Minimum Royalties-Not								
	Deductible from								
	Future Production								
506	Rental Payments				2,500.				2,500
507	Staking Claims				37,000.				37,000.
511	Surface Excavating								
512	Underground "								
521	Surface Drilling				549,300.				549,300.
522	Underground "								
530	Geologic								
540	Sampling, Assaying, Lab.				10,000.				10,000.
550	Geophysics								
560	Geochem				3,000.				3,000.
570	Engineering								
580	Construction (temp.)				59,200.				59,200.
590	Construction (perm.)								
610	Administration, Field	2130	93,000.			30,000.			123,000.
	Offices and Camps				3,000.				3,000.
620	Administration, General					13,000.			13,000.
641	Autos and Vehicles								
642	Aircraft and Boats								
650	Partner's Share								
	ASARCO'S SHARE		93,000		664,000	43,000			800,000
661	Commission or Fees								
663	Exchange								
	TOTAL		93,000.		664,000.	43,000.			800,000

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

W.E.S.
JUL 9 1971

July 9, 1971

TO: W. E. Saegart

FROM: J. D. Sell

SUPPLEMENTAL AUTHORIZATION REQUEST
SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

The first phase costs have exceeded the preliminary estimates and due to various situations the pre-mineral bedrock exposures have not been secured.

Of the work scheduled (see my memo on subject, dated 3/18/71, with Kurtz's covering letter of 3/19/71), drill hole A-1 was rotary drilled to 1317 feet and 4-inch casing set to 1306 feet. The hole lost all circulation in the bottom footage and I am not sure what is under the basal vitrophyre-tuff layer of dacite encountered. It is probably pre-mineral schist and approximately 500 feet of core should be taken to test the original objective. Costs on the hole to date have exceeded the estimate to this point. Attachment A contains the present and proposed hole locations on the land status map.

Drill hole M-1A was the reentering of Continental's drill hole M-1 which they terminated at 2402 feet. The attempt was successful in that we penetrated their "pre-mineral" rock after 26 feet of new core and encountered Whitetail conglomerate, a post-mineral unit. Thus, their bottom unit was in reality the lower portions of the earlier volcanic sequence, a post-mineral unit. The thickness of the Whitetail, however, exceeded our estimate by a considerable sum and the pre-mineral rock was not encountered until 500 feet below the total proposed depth. We are in Naco limestone with associated red beds and will terminate the hole at around 5300 feet for evaluation purposes. Present plans are to utilize the hole for a down-the-hole EM antenna probe. Although nearly all of the 2470 feet of Whitetail contains trace to moderate visible native copper (the highest assay to date being 0.384% copper), the limestone below does not appear to be altered and contains only a few veinlets of pyrite and specularite. Figure 1, attached, is a condensed graphic log of the drill hole M-1A and records the assay intervals and results of the typical native copper content within the conglomerate. It is to be noted that native copper was also found in the slide block of quartz monzonite. The existance of a mineable zone of replacement ore cannot be discounted on available evidence as even the non-mineralized limestones at Magma show little fringe effect. To test the entire Paleozoic section, and the lower most favorable replacement horizon, it would be necessary to drill approximately 2000 feet below our present position.

Drill hole A-4 is at 3041 feet and coming along well. Our depth estimate to the base of the dacite being very close at 1975. However, water problems in the dacite caused much time delay and increased the cost considerably. Also, the intercepting of 165 feet of the earlier volcanics cut the drilling time sharply with a resultant cost increase. Down time was also recorded during change over of drill contractors. Based on the information gained in M-1A and verbal reports on Magma's No. 9 shaft, the depth estimate to pre-mineral rock is now believed to be around 5000 feet and the additional coring will increase the depth to 5500 total depth. The cost to date exceeds that of the original estimated cost to this point and of course will be even greater to final depth with the additional anticipated drilling depth. The Whitetail cuttings have again shown native copper and splits of the cuttings have been prepared for assay. As mentioned in the monthly progress reports, Magma also has native copper in their drift in Whitetail and in the No. 9 Shaft. The source for this impressing amount of native copper in the post-mineral detrital sediments must indeed, be a large porphyry type deposit.

Drill hole DCA-3 was proposed as a cleanout and deepening project. Schlumberger's probe showed a block at 680 feet which could not be cleared with their probe. The total depth of the hole is said to be 3000 feet, and with the rotary rig tied up on the other holes, no further work has been accomplished on DCA-3. Likewise, DCA-1 was probed this past week, and found to be blocked at 613 feet though it has a depth of 4011 feet. DCA-1 is within the proposed root zone of Graybeal's analysis of the movement on the Cactus-Carlota breccia mass. Written agreements are being drafted between Asarco and Inspiration Copper with the idea that a cable-tool rig may be capable of cleaning the holes and giving us two holes which would save considerable drilling for completion to the same depths.

Drill holes A-2 and A-3 are on State Lease land. A drill road and preliminary site was cleared to A-2 over an existing trail. No drilling was done on either site however, roadwork and seismic contract work was utilized to fulfill the lease agreement.

Costs assumptions to complete the drilling started and to continue testing favorable areas are tabulated below. The sites are shown on Attachment A.

DRILL HOLE	DRILLING NEEDED	PROJECTED COSTS
A-1	500 FT. CORE (Interval 1317-1817)	$ 10,000.
A-4	2500 FT. ROTARY + CORE (Interval 3000-5500)	$ 75,000.
M-1A	150 FT. CORE (Interval 5150-5300)	$ 4,500.
A-5	4600 FT. ROTARY + CORE (Interval - TOTAL)	$ 138,000.
A-6	4000 FT. ROTARY + CORE (Interval - TOTAL)	$ 120,000.
DCA-1 AND DCA-3 CLEANOUT TEST		$ 5,000.
DCA-1	DEEPEN 1250 FT. CORE (Interval 4000-5250)	$ 37,500.
DCA-3	DEEPEN 1250 FT. CORE (Interval 3000-4250)	$ 37,500.
ROADWORK - 10,000 FEET		$ 50,000.
CLAIM LOCATION & VALIDATION		$ 6,000.
	TOTAL	$ 483,500.
	UNEXPENDED BALANCE MA-0010-03 (-)	$ 74,500.

SUPPLEMENTAL AUTHORIZATION REQUEST . . . . . .$ 409,000.

J. D. Sell/van

J. D. Sell

JDS:van

cc: W. L. Kurtz

EXPLORATION SERVICES DIVISION
3422 SOUTH 700 WEST
SALT LAKE CITY, UTAH 84119

July 14, 1971

J. H. C.
AUG 4 1971
RECEIVED
JUL 15 1971
EXPLORATION DEPT.

Superior East Project

MEMORANDUM to W. E. SAEGART:

SCHULTZE GRANITE,
PINAL COUNTY, ARIZONA
Cu CONTENT OF BIOTITES

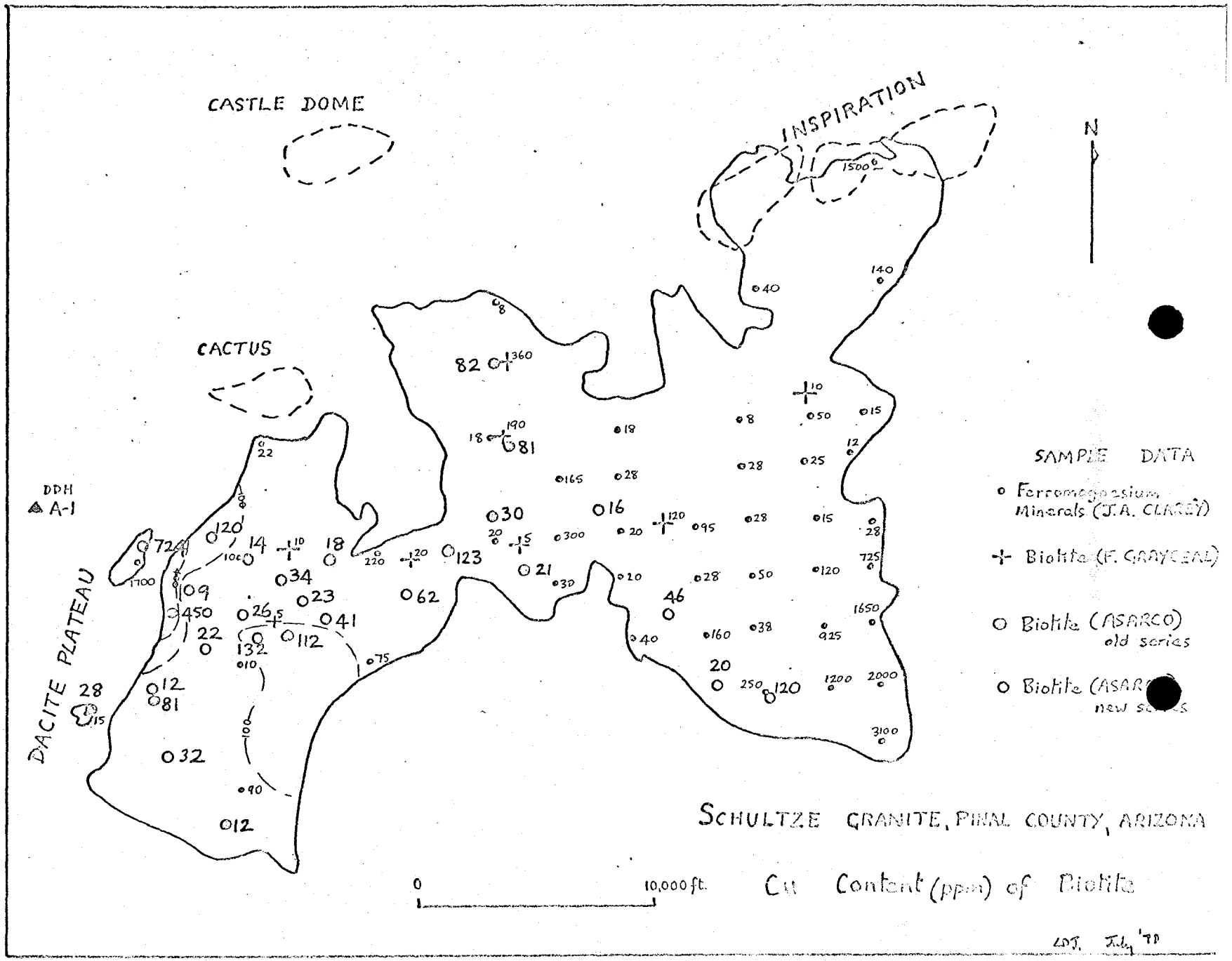
We have just completed the Cu analyses of the biotite fractions obtained from the samples of Schultze Granite recently collected and sent to the Geochemical Laboratory by Mr. J. R. King. (Reference his letter of June 2, 1971). The resultant data are shown on the attached sketch map. It verifies the presence of an area of high Cu concentration in the biotites from the western extremity of the central portion of the west limb of the Schultze Granite adjacent to the Dacite Plateau. Also of possible significance is the anomalously high Cu concentration (660 ppm) detected in biotite from the Schultze Granite (?) intersected by DDH M-1A beneath the Dacite Plateau. The analytical data sheets will be sent to you as soon as they are complete.

L. D. James

L. D. JAMES

LDJ:db
Encl.

cc:J.J.Collins w/encl.
J.H.Courtright "
J.R.King "
J.D.Sell "


CASTLE DOME
INSPIRATION
CACTUS
DACITE PLATEAU
DDH A-1
DDH M-1A 660
N
SAMPLE DATA
Ferromagnesium Minerals (J.A. CLAREY)
Biotite (F. GRAYCEAL)
Biotite (ASARCO) old series
Biotite (ASARCO) new series
0
10,000 ft.
SCHULTZE GRANITE, PINAL COUNTY, ARIZONA
Cu Content (ppm) of Biotite
LDJ. July '70

J. H. C.

AUG 3 1971

RECEIVED

JUN 25 1971

EXPLORATION DEPT.

June 23, 1971

Mr. V. Kudryk
Asarco - Central Research Laboratories
South Plainfield, N.J.

Superior East
Arizona

Dear Sir:

Herewith is a piece of drill core from our deep hole project on the Dacite Plateau between Superior and Miami, labeled Hole M-1A, depth 4209 ft. This is a boulder in a Tertiary conglomerate.

The native copper is obvious but we wonder if it is a replacement of a copper sulphide mineral. Perhaps the scanning electron microprobe will reveal sulphur associated with the native copper? Would you try please and charge this to project MA #0010-03, sending a copy of the results to Mr. Kurtz, address below.

If you can concentrate some of the native copper, please run a semi-quantitative spectrographic analysis for minor elements.

Thank you.

Very truly yours,

Original Signed By
John J. Collins
John J. Collins

CC-WLKurtz
American Smelting and Refining Co.
P.O. Box 5747
Tucson, Arizona 85703

JHCourtright

J.H.C.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

W.E.S. JUN 17 1971

June 16, 1971

J.H.C. JUN 18 1971

TO: W. E. Saegart

FROM: J. D. Sell

PRODUCTION - GRADE - RESERVES
MAJOR MINES - SUPERIOR EAST
PROJECT AREA
PINAL - GILA COUNTIES, ARIZONA

I have recently compiled, from various sources, the production figures from the Cities Services, Inspiration, Kennecott, Newmont, and Ranchers properties in their mines surrounding the Superior East project area.

The total tonnage-grades are impressive for the district as well as the continued reserve and potential. The tonnage-grade figures for the total strip-dump-leach operations at Ox Hide and Blue Bird are not equatable since leach production from the dumps will continue long after mining has ceased and thus the actual recoverable copper per ton will increase over the figure presently given.

Company and Mine	Ore, Tons	Total Copper, Lbs.	Ave. Prod. Grade
Cities Services (thru 1969)			
Miami	152,702,609	2,500,073,136	0.82
Copper Cities	52,125,634	613,606,930	0.59
Castle Dome	41,442,617	578,183,368	0.70
Inspiration (thru 1970)			
Inspiration	231,980,858	4,159,552,910	0.90
Ox Hide	8,963,285	21,490,703	0.12
Kennecott (thru 1970)			
Ray	208,173,274	4,213,477,221	1.01
Newmont (thru 1970)			
Magma	15,986,604	1,664,480,207	5.21
Ranchers (thru June 1970)			
Blue Bird	13,399,700	60,045,703	0.22
TOTAL	724,774,581 tons of ore	13,810,800,178 pounds of produced copper	

Reserve figures are difficult to secure but the following notes are published figures.

Cities Services

Miami: Leaching practices currently produce 13,000,000 pounds of copper per year with an anticipated gradual decrease in forthcoming years. Miami has asked ICC for the return of the Miami ground now occupied by ICC housing and with known alteration and leached capping in the area it suggests expansion of working areas in that direction. Also, Miami and Inspiration are presently stripping their common boundary for production in the pit area.

Copper Cities: The December 31, 1968 figure of 31,000,000 tons of 0.55% copper reserves was released for both Copper Cities and Diamond H pits with a recoverable 290,000,000 pounds of copper. Approximately 18 million tons is at Copper Cities and 13 million tons of ore at Diamond H. Each pit occupies the distant ends of the same alteration zone which is known to contain values of 0.3% copper.

Castle Dome: Leaching has been discontinued at this area, other than the collection of extraneous water flowing from the area. The new Pinto Valley project includes the Castle Dome area and figures of 350,000,000 tons of 0.45% are reported.

Inspiration

Inspiration: Expansion of the pit area between the Live Oak and Thornton pits is underway in stripping the Red Hill area with a proven reserve of 24 million tons of 0.62%. Ore production is scheduled for late 1971.

Ox Hide: No reserve figure has been released for this deposit. Inspiration has announced the Barney ore deposit to the west and northwest of the Live Oak pit which is similar to the Ox Hide and will also be dump leached.

Inspiration in the 1970 annual report listed total area reserves of 1,507,622,000 pounds of recoverable copper.

Kennecott

Ray: Recent pit expansion east of the Ray fault has added considerable reserves but no firm figures are known.

Newmont

Magma: Reserves of 10,100,000 tons of 5.88% copper continued to be announced. This includes the stacked replacement ore as well as the previous known but unmined portions. The reserve is open ended to the east.

Ranchers

Blue Bird: The annual report of 1970 lists 13,500,000 tons of 0.50% copper and a potential of much more. Also, the present unrecovered copper on the leach dumps will continue to produce leach copper for considerable time.

Inspiration-Miami-Occidental: The faulted segment of the massive Inspiration-Miami ore body (which has produced about one-half of all the copper listed in the tonnage-grade tabulation) has been intercepted by the three named companies. Inspiration is on the north and releases depths of 4800 - 5500 feet to mineral intercepts (5 holes drilled in the current program). Miami is in the middle and released depths of 2460 - 3300 feet with an average ore intercept of 465 feet averaging 1.51% copper, based on six holes (some 15 have now been drilled). Occidental is on the south and released depths of 1100 - 2000 feet showing 103 - 368 feet of ore running 0.56 - 1.26% copper as oxide, based on ten intercepts out of 18 holes drilled. Both Miami and Occidental are running feasibility studies and Miami is deepening their No. 5 shaft for exploration purposes.

J. D. Sell

JDS:sh

J. H.
MAY 24 1971

RECEIVED
MAY 3 1971
EXPLORATION DEPT.

AIR MAIL

April 30, 1971

Mr. M. P. Barnes
Asarco - Salt Lake Office

E. Superior Project
Arizona

File

Dear Sir:

I am glad to acknowledge receipt of your report on "Probability of Discovery of a Porphyry Copper Deposit" dated April 26. It seems well reasoned and is helpful in appraising our chances, accepting the conditions you describe.

I see that drilling 5 holes gives us a 45% probability of hitting the alteration zone, if not the orebody itself; and 10 holes would give a 64% probability, if a porphyry copper deposit does, in fact, exist. Such existence is itself a 76% probability.

My compliments on a good job.

Very truly yours,

Original Signed By
John J. Collins
John J. Collins

CC-JHCourtright
WESaegart

J. H. C.

APR 2 1971

OFFICE OF THE SECRETARY

Mr. C. P. Pollock March 31, 1971

The following is an extract from the minutes of the Advisory Committee meeting held March 24, 1971:

Mining Authorization #0010-03
Superior East Project
Pinal County, Arizona
(Dacite Plateau)

file

At a meeting of the Advisory Committee held on December 9, 1970 there was approved an expenditure of $55,000 (MA#0010 - 02) for geological studies and over expenditures at the Superior East Project, Pinal County, Arizona, a possible copper project.

It was reported that Company Geologists recommend entering into an agreement with Continental Copper Inc. (Continental) covering 348 unpatented claims owned by Continental in the Superior East Area, Arizona (Dacite Plateau). This agreement provides that Asarco will spend $75,000 for the first year; and $50,000 in subsequent years until notice of intention to equip the property is given by Asarco. The agreement also provides that Asarco shall recover its expenditures, minus $500,000, from 100% of the net proceeds with interest at 1% above the prime rate and after Asarco is reimbursed it shall retai 80% and Continental 20% of the net proceeds. This agreement further provides that Continental has the right to subscribe to an additional 20% within 90 days of notice of intent to produce, accompanied by a cost estimate. The agreement further provides that Asarco may terminate the agreement at any time, prorating the expenditure requirement.

Company Geologists also recommend authorization for an expenditure of $260,000 for drilling six holes at the Dacite Plateau, Superior East Project, Arizona.

There was approved execution of the agreement with Continental Copper, Inc. in the form submitted to the meeting and an expenditure of $260,000, subject to ratification by the Board of Directors, for drilling at the Dacite Plateau, Superior East Project, Arizona.

J. F. Hornbostel, Jr.

JFH:aa
Encl F. G. Hamrick
HQStringham -2 HEKelshaw, Jr. WESaegart, JHCourtright
WL Kurtz JPSell RBCrist KAVdSteinen

J. H. C.

APR 2 1971

RECEIVED
APR 2 1971
EXPLORATION DEPT.

OFFICE OF THE SECRETARY

Mr. C. P. Pollock

March 31, 1971

The following is an extract from the minutes of Advisory Committee meeting held March 24, 1971:

Mining Authorization #0013-11
Hardshell Project
Santa Cruz County, Arizona

At a meeting of the Advisory Committee held on July 29, 1970 there was approved an expenditure of $18,500 (MA#0013-10) for drilling costs and assessment work requirements at the Hardshell Project, Santa Cruz County, Arizona, a possible silver prospect.

It was reported that Company Geologists recommend an additional expenditure in the amount of $1,300 to cover an overrun which resulted from encountering drilling conditions which were more adverse than anticipated.

There was approved an additional expenditure of $1,300 for an overrun at the Hardshell Project, Santa Cruz County, Arizona.

J. F. Hornbostel, Jr.

JFH:aa
Encl: FGHamrick
HQStringham -2
WESaegart
JHCourtright
RBCrist
KAVondenSteinen

Mr. Courtright

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

March 19, 1971

Mr. J. J. Collins
New York

Dear Sir:

Re: Supplemental Authorization Request
Superior East Project
Pinal County, Arizona

Enclosed is Mr. Sell's memorandum of March 18, 1971, recommending a drilling program at the Superior East Project. Mr. Saegart, Mr. Sell and I have discussed this program in detail and we are all in agreement with the recommendation. In his absence, Mr. Saegart has requested that I prepare this Supplemental Authorization Request.

As discussed recently in Chandler, we believe the Superior East Project area represents one of the best locations in the Southern Arizona Porphyry Copper Province for the discovery of a secondary enriched copper deposit of superior grade. Our property position has been firmly established in the strategic area and I am forwarding, under a separate covering letter, the Continental Copper joint venture agreement for Asarco's signature.

The Continental Copper agreement calls for an expenditure of $75,000 in the first year. This commitment plus the other property commitments require a minimum expenditure of $87,800 before August 31, 1971.

Mr. Sell recommends six drill holes. (See attachment in Mr. Sell's memo) Two of these (A-2 and A-3) will be drilled to fulfill state lease requirements and could be deepened to premineral bedrock in subsequent drill programs. Two (A-1 and A-4) will be new holes drilled to premineral bedrock and two (M-1 and DCA-3) will deepen pre-existing holes to the premineral bedrock. The position of each drill hole has been carefully selected. Each not only will test a prime exploration target but will also procure the much needed geological information to allow a more definitive understanding of the geologic history, structure and mineralization which are so important in target definition in this covered area. We feel strongly that all the proposed holes need to be drilled at this stage of the exploration to provide sufficient information for meaningful geological evaluation.

Therefore, while procuring the important geological information, the proposed drill holes will test the following targets:

A-1 - Extent of known exotic copper mineralization and possible root of Powers Gulch - Cactus - Carlota thrust plate mineralization.

A-4 - Eastward extension of the Magma vein system and its associated massive limestone replacement orebodies; and possible mineralizing porphyry source.

M-1 - Miami-Inspiration class mineralization localized along margin of Schultze granite or Satellitic porphyry class mineralization.

DCA-3 - Miami-Inspiration class mineralization localized along margin of Schultze granite.

The drilling costs have been estimated high because of the prior history of severe drilling conditions on the dacite plateau. We firmly believe that close supervision by our drilling supervisor will enable us to develop techniques to achieve appreciably more modest drilling costs in subsequent drilling programs.

Cost of the drilling program are shown in the tabulation in Mr. Sell's memo. I have enclosed completed forms 302-MB and 302-MA. (3 copies each)

If you agree with this proposal, please request a supplemental authorization for the Superior East Project in the amount of $260,000.

Yours truly,

W. L. Kurtz

W. L. Kurtz

WLK:sh
enc. (Sell memorandum)
attach. (302-MA, 302-MB)

cc: WESeagart - w enc./attach.
JHCourtright - w enc
JDSell - w enc.
RBCrist - w enc.
KvdSteinen - w attach.

AMERICAM SMELTING & REFINING COMPANY
Tucson Arizona
March 18, 1971

TO: W. E. Saegart

FROM: J. D. Sell

Drilling Proposal and Costs
First Phase, Superior East
Pinal - Gila Counties, Arizona

Shown as Attachment A is a modified copy of the previous maps of the Superior East Project area. On the map is the up-dated and verified locations of previous drill holes (including some shallow holes drilled for assessment work) and their numbers. Also shown are the site locations for proposed Asarco drilling for the first phase development. Major claim outlines are also shown. Background information on the project area and proposal was given in two previous memorandums (dated May 26, 1970 and June 3, 1970).

In the first phase testing of the area, which is deemed basic for the subsurface information necessary to continue and project geologic information, concepts, and costs, it is proposed to drill two new holes and reenter two holes and complete all to premineral bedrock. Two holes (A-2 and A-3) will be drilled to fulfill State Lease requirements.

Attachment A shows the location of A-1 (on Continental ground) to test the extent of exotic copper mineralization, flat-fault zone, and the potential source area for the thrusted plate mineralization known in Powers Gulch and at Cactus-Carlota. Projected depth of A-1 is 2300 feet. Hole A-4 is projected to 4000 feet for testing the premineral rock type on the eastward extension of the Magma vein system with its associated massive replacement limestone orebodies, and will also aid in the interpretation of the extent of the Schultze granite intrusive from the east. The drill hole is on Asarco claims. Hole M-1 is on Continental ground and was recently drilled by them to a depth of 2402 feet where they bottomed in post-mineral basalt. Asarco will reenter the cased hole and continue to a depth of 4400 feet in testing for the edge of the intrusive body and its contact with the intruded units. Drill hole DCA-3 is now on Continental ground but was drilled in an earlier program by another company to a depth of 3000 feet where it was terminated in post-mineral Whitetail Conglomerate. The hole, at present, is uncased but preliminary testing suggests it is open and may be so to its total depth. The hole is positioned on the downthrown side of a major north-south fault structure and the aeromagnetics suggest that the intrusive may be faulted to the south. The completion of DCA-3 to a depth of 4500 feet will add considerable information on the subsurface structure and the trend of the intrusive. Holes A-2 and A-3 are on Asarco State Leases and will be initially drilled to comply with lease regulations and could be deepened to pre-mineral bedrock in subsequent programs.

Cost of this critical first phase is estimated to be $260,000.00 based on the following:

DRILL HOLE	PROJECTED DEPTH	TO BE DRILLED	COST
A - 1	2300	2300	$35,000.00
A - 4	4000	4000	$80,000.00
M - 1	4400	2000	$40,500.00
DCA - 3	4500	1500	$45,000.00

DRILLING	$200,500.00
ROAD WORK	7,500.00
OVERHEAD	20,000.00
CONTINGENCIES	32,000.00
	$260,000.00

J. D. Sell

J. D. Sell

JDS:van

cc: WLKurtz

RECEIVED

JAN 1 1 1971

EXPLORATION DEPT.

OFFICE OF THE SECRETARY

New York, N.Y., January 7, 1971

Mr. C. P. Pollock

J.H.C.
JAN 1 1 1971

Re: Mining Authorization No. 0010-02
Superior East Project
Pinal County, Arizona

Enclosed is a copy of the supplemental mining authorization request forms 302-MA and 302-MB, approved by the advisory committee at a meeting held on December 15, 1970, for $55,000 to cover an overexpenditure and geological studies.

J. F. Hornbolster, Jr.

JFH:v

JHCourtright

OFFICE OF THE SECRETARY

RECEIVED
DEC 18 1970
EXPLORATION DEPT.

December 15, 1970

Mr. C. P. Pollock

J. H. C.
DEC 18 1970

The following is an extract from the minutes of the meeting of the Advisory Committee held December 9, 1970:

Mining Authorization #0010-02
Superior East Project
Pinal County, Arizona

At a meeting of the Advisory Committee held on August 26, 1970, there was approved an expenditure of $31,000 for road construction and claim validation expenses at the Superior East Project Area, Pinal County, Arizona.

It was reported that Company Geologists request an additional expenditure in the amount of $55,000 in order to continue geological studies at the Superior East Project until the end of February, 1971, as well as to cover an overexpenditure at the Project in the amount of approximately $24,000.

There was approved an additional authorization int the amount of $55,000 for geological studies and overexpenditures at the Superior East Project, Pinal County, Arizona.

In connection with this Mining Authorization, please submit the appropriate Mining Authorization request forms as outlined in the accounting instructions.

J. F. Hornbostel, Jr

JFH:pf
Encl.
FGHamrick
HQStringham - 2
JHCourtright
WESaegart
KAvdSteinen

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

RECEIVED
DEC 2 1970
EXPLORATION DEPT.

December 1, 1970

J. H. C.
DEC 2 1970

Mr. J. J. Collins
New York

Dear Sir:

Re: Supplemental Authorization Request
Superior East Project
Pinal County, Arizona

In accordance with your recent telephone request, this letter will serve as our estimate of the cost to conduct the complete geological studies in progress and scheduled on the Superior East project. This work, under the supervision of Mr. J. D. Sell, is being conducted by three geologists and one field assistant. The work can be categorized into four phases:

1. Mapping of the post-mineral dacite. Utilizing photo geology, we are investigating major faults which cut the dacite. To interpret relative movement between structural blocks, pumice flattening ratios are being tabulated and statistically evaluated. Lithologic sequences and bedding attitudes of the ash flow sheets are also being mapped.

2. Mapping of pre-mineral rocks along east side of the dacite plateau. Special emphasis is being placed on distribution of exotic copper values which occur extensively in this area.

3. Mapping and sampling of the White Tail Conglomerate.

4. Mapping and sampling of the intrusive porphyry stocks situated on the northwest side of the dacite plateau.

Mr. Sell estimates that his team can complete these studies by March 1, 1971. Total estimated cost for this work is $30,000. Final over-expenditures of prior Authorizations 0010-00 and 0010-01 total $24,039.52. To clear this over-expenditure and provide adequate funds to complete the geologic studies, please request a supplemental authorization in the amount of $55,000.

Yours truly,

W. E. Saegart

W. E. Saegart

WES:mw
cc: J. H. Courtright
W. L. Kurtz
J. D. Sell
K. A. von den Steinen

RECEIVED
NOV 27 1970
EXPLORATION DEPT.

J. H. C.

NOV 30 1970

AIR MAIL

November 24, 1970

Mr. W. E. Saegart
Asarco - Tucson Office

Superior East, Arizona

Dear Sir:

With reference to Mr. Barnes' memorandum of November 18 on "Probability of Discovery of a Porphyry Copper" under the Dacite Plateau, I can caution you that the prospect of drilling a dozen holes a half mile deep is something more costly than we want right now.

I think, however, Mr. Sell will be able to improve the odds by eliminating less favorable ground after he has completed this season's field work. At that time Mr. Barnes should re-run this interesting program and tell us the new probability.

Very truly yours,

Original Signed By
John J. Collins

John J. Collins

CC-JHCourtright
RJLacy
MPBarnes
JDSell

RECEIVED
SEP 8 1970
EXPLORATION DEPT.

J. H. C.
SEP 18 1970

OFFICE OF THE SECRETARY

New York, N.Y. September 3, 1970

TO: Mr. C. P. Pollock

The attached is the correct extract from the minutes of the meeting of the Advisory Committee held August 26, 1970

J. F. Hornbostel, Jr.

JFH:aa
Encl:
cc: HQ Stringham
JH Courtright ✓
WE Saegart
WL Kurtz
KA von den Steinen

RECEIVED
SEP 4 1970
EXPLORATION DEPT.

J. H. C.
SEP 4 1970

OFFICE OF THE SECRETARY

New York, N.Y. August 31, 1970

TO: Mr. C. P. Pollock

The following is an extract from the minutes of the meeting of the advisory Committee held August 26, 1970:

Mining Authorization 0010-00
Superior District, Pinal County, Arizona

At a meeting of the Advisory Committee heldon June 3, 1970 there was approved an expenditure in the amount of $45,000 (MA#0010-00) to cover the costs of locating, surveying and drilling on claims and rental payments on state land in Pinal County, Arizona.

It was reported that Company Geologists request an expenditure in the amount of $31,000 for road construction and claim validation drilling in the Superior District Area, Pinal County, Arizona.

There was approved an expenditure of $31,000 for road construction and claim validation drilling at the Superior District Area, Arizona.

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J. H. ~
AUG 24 1970

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

August 24, 1970

Mr. J.J. Collins
Assistant to the Vice President
New York Office

Supplemental Authorization
Superior East Project
Pinal County, Arizona

Dear Sir:

Claim location and validation work as authorized for the subject project under 0010-00 has progressed much slower than anticipated. We initially estimated that despite the rugged topography of the Dacite Plateau, weathering was sufficient to permit crude road construction with very little drilling and blasting. In actuality, extensive drilling and blasting has been required during the road construction to date. Somewhat more than 50% of our appropriation has been expended in the construction of the 1 1/2 miles of road to be used for claim validation drilling in the northern part of the claim group. The present authorization will be insufficient to carry out the required validation drilling. Authorization 0010-00 has been completely expended as of August 22.

To date approximately 95% of the claims have been surveyed and cornered and the road construction on the northern part of the group is nearing completion. Because of the excessive cost of road construction we plan to validate part of the group by drilling 10 foot holes with a portable gasoline powered drill which can be packed from claim to claim without road access. In the northern part of the group, utilizing the new road and in other areas where there are existing roads validation will be effected by drilling 100 foot holes for each 10 claims with an airtrack drill.

Estimated costs for completion of these claim locations and validations are tabulated below:

Location, Surveying and cornering of balance of claim group	$5,500	
10 foot validation holes on approximately 50 claims at $100 each	$5,000	
Drill 23 airtrack validation holes to depths up to 100 feet	$10,000	
Completion of road construction plus dozer work on clearing of drill sites	$7,200	
Supervision	$3,300	
TOTAL		$31,000

Costs are itemized on Forms 302-MA and 302-MB attached.

Please request a supplemental authorization in the amount of $31,000 to complete our property acquisition for the Superior East Project.

An authorization request for the exploration and drilling funds for the project is being deferred until after completion of joint venture negotiations with Continental Materials Corp., owners of a large adjacent claim group.

Very truly yours,

W. E. Saegart

W. E. Saegart

WES:lab

cc: JHCourtright
WmLKurtz
JDSell
KvdSteinen

Ha 16A.16.19C
(Superior-East)

JUN 10 1970

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

May 28, 1970

Mr. J. J. Collins
Assisstant to the Vice President
New York Office

JHCourtright

Authorization Request
Dacite Plateau
Globe-Superior Area
Pinal County, Arizona

Dear Sir:

Mr. J. D. Sell's Memorandum of May 26 proposing exploration in the subject area is transmitted herewith.

During the past four months, Mr. Sell has reviewed the exploration possibilities of that portion of the Miami-Superior porphyry copper lineament which is covered by post-mineral rocks. This area is known as the "Dacite Plateau" and is located immediately northeast of the Magma Mine at Superior. Mr. Sell has compiled, in detail, the results of previous exploration efforts in the area, including the information obtained in deep holes drilled by a Miami Copper-Superior Oil joint venture and by Inspiration Copper and Kerr McGee.

The geologic environment is highly favorable for the existence of important copper mineralization covered by the "Dacite Plateau". As described by Mr. Sell, all the copper deposits in the Miami-Superior District are associated with porphyry copper intrusives which are localized along the northern margin or are satellitic to the Laramide Schultze granite. The northern margin of the Laramide Schultze granite is also the contact, on a regional scale, with a large mass of pre-Cambrian granite. This contact zone containing various porphyry copper deposits is marked by a prominent aeromagnetic gradient resulting from contrasting magnetic susceptibilities between the two granites (high magnetite content in pre-Cambrian vs. low content in Laramide). This gradient continues westward from Miami across the "Dacite Plateau" indicating a similar host environment beneath the post-mineral cover rocks in the area of our current interest.

Because of a great thickness of post-mineral cover on the "Dacite Plateau" previous exploration has been for the most part inconclusive. Most of the holes which have been drilled failed to reach the underlying pre-mineral rocks. Despite the prior exploration efforts by several companies, the "Dacite Plateau" area remains largely untested. Target depths range from 2000 to 5000 feet beneath the surface. These depths

are not prohibitive considering the grade of copper mineralization which could be reasonably expected for another deposit in this district. Underground mining would be feasible today for deposits of the Magma or Miami type and would probably be economic in the future with mineralization of the Castle Dome category.

Mr. Sell proposes and I concur that ASARCO acquire a property position on certain portions of the "Dacite Plateau" that are open for claim location and State prospecting permits. This proposed property acquisition would cover the ground to the west and south of a large claim block controlled by Continental Materials Company (Continental Uranium) and immediately northeast and southeast of Magma Copper's claims over their stacked replacement orebodies.

Acquisition of the land proposed by Mr. Sell would serve two purposes:

1. Improve our bargaining position with either Continental Materials or Magma Copper for joint venture exploration of the Plateau; and

2. Provide control of enough land on the Plateau to complete essentially all the exploration drilling proposed should joint venture negotiations prove unsuccessful. (The Local Manager of Continental Materials expressed interest in our suggestion of a joint venture but this Company now appears to be stalling for more time-perhaps to enlarge their holdings).

If you agree, please request a Mining Authorization in the amount of $45,000 to cover the cost of locating, surveying, cornering, and validation drilling of some 200 claims and two year rental payments on two sections of State Land. Accounting Department Mining Authorization Request Forms 302-M and 302-MA are enclosed.

Our recommendations for deep exploration holes on the Plateau will be deferred until property is acquired and joint venture negotiations are concluded or rejected. The cost of a reasonably comprehensive drilling program will be large. We believe this project is justifiable, however, in view of its favorable location and the size and grade of the anticipated targets.

Mr. Sell should be commended for an excellent job of compiling a great deal of information on this subject and evaluating the exploration possibilities of the "Dacite Plateau".

He is now preparing an adendum to the enclosed Memorandum in which information and data supporting his evaluation will be tabulated. This adendum will be available on request.

Very truly yours,

W. E. Saegart

W. E. Saegart

WES:lab
cc: JHCourtright JDSell
RJLacy