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Arizona Geological Survey
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Tucson, Arizona 85701
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James Doyle Sell Mining Collection

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Appropriation Requests / Approvals.

FORM 302-MB (9/79)

New York No. 004x-07

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

.....19.... Originating Office New York

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

No. Thunder Mountain Project

Present total Estimated Cost (Form 302-MA attached)	$ 421,000
Amount previously authorized (date 0042 11/72)	$ 345,000
Balance for which Authorization is now requested	$ 76,000

ADDITIONAL WORK CONTEMPLATED:

Complete 1982 work commitments with Kerr-McGee by drilling 1000 ft. hole and casing for re-entry. Collect accumulated overrun from drilling and salaries since 1979.

Approved by Advisory Committee on Oct. 20, 1982.

EXPLANATION OF INCREASED COST:

High grade intersections justify holding the property.

Reviewed by ..... ACC'T. MGR. OR CHIEF ACCN'T.

Approved by R.J. O'KEEFE CONTROLLER

Account Chargeable to EXPLORATION EXPENSE TO BE FILLED IN BY CONTROLLER

Recommended by ..... SUPERVISOR

Approved by A.T. Graybeal F. T. Graybeal ~~VICE PRESIDENT~~

Approved by Advisory Committee

.....19.....

Approved by Board of Directors

.....19.....

..... SECRETARY

ASARCO

Southwestern Exploration Division

Apparently shelved at this early date not on record as of June 13 JDS

January 4, 1983

Mr. R. L. Brown
Vice President of Exploration
New York Office

Supplemental Exploration
Appropriation Request
Thunder Mountain Project
EA-0042
Santa Cruz County, AZ

Dear Sir:

Attached is the SEA request for $55,000 to fulfill the 1983 work commitment on the Kerr-McGee Thunder Mountain option. The drilling will be the continuation of hole TM-14, presently at a depth of 910 feet, and will then be cased for reentry after expenditure of the monies.

The requested monies will cover drilling, supervision, and assaying, and will fulfill the 1983 assessment work (due September 1) for the contiguous Thunder Mountain (159), Trench (7), and 3R (96) claims. The work commitment option agreement with Kerr-McGee is $50,000 per year.

Thunder Mountain claims adjoin the Trench Project where a previous intercept of copper-lead-zinc-silver values has been made.

If you approve of the above expenditure, please request a supplemental appropriation. Attached is a location map and the form 302-MB.

James D. Sell

James D. Sell

JDS/cg

Attachments

cc: WLKurtz
RBCrist
JRStringham
AJRobles (Form only)

FORM 302-MB (9/79)

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

January 4, 1983 Originating Office SWED, Tucson, AZ

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

No. EA-0042-00 thru EA-0042-07 Thunder Mountain, Santa Cruz Co., AZ

Present total Estimated Cost (~~Form 302-MA attached~~)	$ 476,000
Amount previously authorized (date 10/72-10/82)	$ 421,000
Balance for which Authorization is now requested	$ 55,000

ADDITIONAL WORK CONTEMPLATED:

Deepen hole TM-14, presently at a depth of 910 feet, and case for reentry.

EXPLANATION OF INCREASED COST:

Adjacent high grade intersections and fulfilling the work commitment justify holding the property

Reviewed by A. J. Robbs ACC'T. MGR. OR CHIEF ACCN'T.

Recommended by James D. Sell J. D. Sell SUPERVISOR

Approved by ..... CONTROLLER

Account Chargeable to ..... TO BE FILLED IN BY CONTROLLER

Approved by ..... VICE PRESIDENT

Approved by Advisory Committee

..... 19.....

Approved by Board of Directors

..... 19.....

..... SECRETARY

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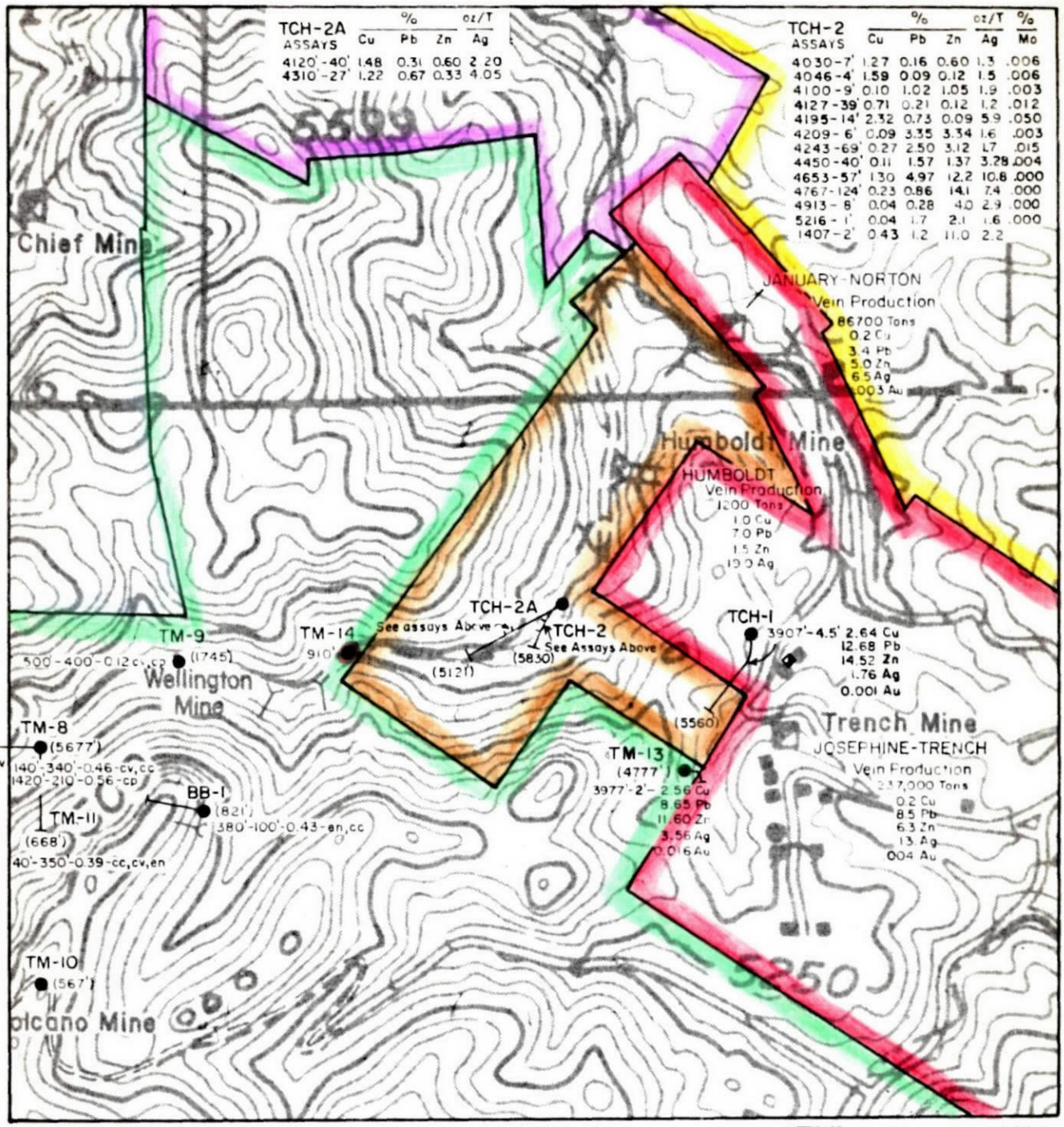

EXPLANATION

- ASARCO INC. Trench Group
- ASARCO-Kerr McGee Thunder Mtn Joint Venture
- ASARCO-Anaconda 3R Joint Venture
- Mendoza-Humboldt Group (ASARCO INC.)
- Kerr-McGee-Red Mtn.
- Lichty-Argentor

(821') BB-1 — Drill hole showing depth

⊙ Proposed drill hole

ASSAY DATA KEY

depth-length-%Cu-mineral

3860'-350'-0.59-cp

GEOLOGIC LEGEND

cp - chalcopyrite
cv - covellite
cc - chalcocite
en - enargite

TO ACCOMPANY Supplemental Exploration Appropriation Request DATED Jan. 4, 1983 BY James D. Sell

DRILL MAP
TRENCH PROJECT & THUNDER MTN. PROJECT
PATAGONIA MTNS.
Santa Cruz County, Arizona

SCALE: 1" = 1000'

F.R.K Dec., 1981

MVK 4048

ASARCO

New York Office
Office of the Secretary

September 19, 1983

Mr. R. L. Brown, Jr.:

The following is an extract from the minutes of the Advisory Committee meeting held August 17, 1983:

Exploration Appropriation #0042-08
Arizona
Thunder Mountain Project

The Thunder Mountain Project requires assessment work on 159 unpatented claims which will be completed by deepening hole TM-14. Drilling in TM-14 will also cover assessment work for seven claims in the Humboldt group and 97 claims in the 3R group. The 263 claims will require an aggregate expenditure of $27,000 for assessment year ending September 1, 1983. This work will also complete the 1982-1983 work commitment on the Thunder Mountain ground under the terms of the agreement with Kerr-McGee. Estimated total expenditures for assessment work will be $32,000 which will include $27,000 for drilling and $5,000 for geological studies, drill supervision and assaying.

Advisory Committee approval of an expenditure of $32,000 is requested.

There was approved a supplemental exploration appropriation of $32,000 for drilling, geological studies, drill supervision and assaying at the Thunder Mountain Project, Arizona.

F. J. Goldthwait
Assistant Secretary

FJG:jw
Enc.
cc: R. J. O'Keefe - w/enc.
S. P. McCandless - w/enc.

J. D. Sell
xc: AJR FRK

FORM 302-MB (9/79)

New York No. 0042-08

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

July 28 19 83. Originating Office SWED - Tucson, AZ

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

No. EA-0042-00 through EA-0042-07 - THUNDER MOUNTAIN PROJECT, Santa Cruz Co., AZ

Present total Estimated Cost	$ 453,000
Amount previously authorized (date 10/72-10/82)	$ 421,000
Balance for which Authorization is now requested	$ ~~70,000~~ 32,000

ADDITIONAL WORK CONTEMPLATED:

Deepen hole TM-14, presently at a depth of 910 feet, and case for reentry.

EXPLANATION OF INCREASED COST:

Adjacent high-grade intersections and fulfilling the work commitment justify holding the property.

Reviewed by [signature] ACC'T. MGR. OR CHIEF ACCN'T.

Approved by R.J. O'KEEFE CONTROLLER

Account Chargeable to EXPLORATION EXPENSE TO BE FILLED IN BY CONTROLLER

Recommended by James D. Sell J. D. Sell SUPERVISOR

Approved by A.T. Grayheal ~~VICE PRESIDENT~~

Approved by Advisory Committee

AUG 17 1983 19.....

XC: AJR + JDS

Approved by Board of Directors

..... 19.....

..... SECRETARY

PRINTED IN U.S.A.

New York, August 8, 1983

MEMORANDUM FOR: Advisory Committee

Thunder Mountain Project
Arizona

The Thunder Mountain Project requires assessment work on 159 unpatented claims which will be completed by deepening hole TM-14. Drilling in TM-14 will also cover assessment work for 7 claims in the Humboldt group and 97 claims in the 3R group. The 263 claims will require an aggregate expenditure of $27,000 for assessment work ending September 1, 1983. This work will also complete the 1982-1983 work commitment on the Thunder Mountain ground under the terms of the agreement with Kerr-McGee. Estimated total expenditures for assessment work will be $32,000 which will include $27,000 for drilling and $5000 for geological studies, drill supervision, and assaying.

Advisory Committee approval of an expenditure for $32,000 is requested.

Original signed by
F. T. Graybeal
F. T. Graybeal

bcc: WLKurtz
JDSell

Note for Messrs. Kurtz and Sell

The above request is a substantial reduction from the request made by Mr. Sell in his letter of July 28, 1983. Following several phone calls, I understand that an expenditure of approximately $23,000 will fulfill our work requirement due October 1, 1983 with Kerr-McGee. FTG

xc: TCB
FRK
JRS
AJR
8/12/83

RECEIVED
AUG 12 1983
S. W. U. S. EXPL. DIV.

FROM: J. D. SELL

3 August 1983

To: WLK
JRS
AJR
FRK
TCB

The Thunder Mountain (EA-0042) SEA Request for $70,000 (dated July 28, 1983) has been denied by the New York office.

A new request for approximately $40,000 is being prepared by F. T. Graybeal and copies of the revised SEA will be forwarded from N.Y.

James D. Sell

Thunder Mtn Proj. EA-0042

TM-(Mendoza) (1983)	159 unpat.	(160 in 1984)
Three R	97 "	
~~Tenuta~~ (Humbolt R	7 "	
	263 unpat. claims	

Need to spend by Oct 1, 1983 (K-M)	$ 250,000
Have Spent thru June '83	227,590
Need for ~~[illegible]~~ agreement (K-M)	22,410

Need for Assessment Work	26,300
Previous overspent on SEA	8,000
Supervision, assays, etc.	2,200
	36,500 → 40,000

Thunder Mtn Proj. EA-0042

TM-Mendoza (1983)	159 unpat.	(140 in 1984)
Three R	97 "	
Trench	7 "	
	263 unpat. claims	

Deficit to KM for 1982	= 8,500	) 58,500 for drilling
Work due to KM for 1983	= 50,000	
Prev. overspent on TM & 3R (July)	= 8,000	
Superv., assays, etc.	= 3,500	+ 3,500 = 7000
	70,000	

Tony Note: You have ±:

drilling & casing (?)	= 55,000
Superv, assays etc.	7,000
	$62,000 Total Expenditure from Aug 1.

ASARCO

Southwestern Exploration Division

July 28, 1983

Mr. R. L. Brown
Vice President of Exploration
New York Office

Supplemental Exploration
Appropriation Request
Thunder Mountain Project (EA-0042)
Santa Cruz County, AZ

Dear Sir:

Attached is the SEA request for $70,000 to fulfill the 1983 work commitment on the Kerr-McGee Thunder Mountain option. The drilling will be the continuation of hole TM-14, presently at a depth of 910 feet, and the hole will be cased, if necessary, for reentry.

The requested monies will cover the drilling, supervision, assaying, and previous overrun, and will fulfill the 1983 assessment work (due September 1) for the contiguous Thunder Mountain (160), Trench (7), and 3R (96) claims. The work commitment option agreement with Kerr-McGee is $50,000 per year with an additional $8,500 being in arrears for 1982.

Thunder Mountain and Mendoza claims adjoin the Trench Project where a previous mineral intercept of copper-lead-zinc-silver values has been made.

If you approve of the above expenditures, please request a Supplemental Appropriation. Attached is a location map and Form 302-MB.

James D. Sell

James D. Sell

JDS/cg

Attachments

cc: WLKurtz
JRStringham
AJRobles (Form only)

FORM 302-MB (9/79)

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

July 28 19 83 Originating Office SWED - Tucson, AZ

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

No. EA-0042-00 through EA-0042-07 - THUNDER MOUNTAIN PROJECT, Santa Cruz Co., AZ

Present total Estimated Cost		$ 491,000
Amount previously authorized (date 10/72-10/82)	421,000	$ 421,000
Balance for which Authorization is now requested		$ 70,000

ADDITIONAL WORK CONTEMPLATED:

Deepen hole TM-14, presently at a depth of 910 feet, and case for reentry.

Revised

EXPLANATION OF INCREASED COST:

Adjacent high-grade intersections and fulfilling the work commitment justify holding the property.

Reviewed by ..... ACC'T. MGR. OR CHIEF ACCN'T.

Recommended by James D. Sell J. D. Sell SUPERVISOR

Approved by ..... CONTROLLER

Account Chargeable to ..... TO BE FILLED IN BY CONTROLLER

Approved by ..... VICE PRESIDENT

Approved by Advisory Committee

..... 19.....

Approved by Board of Directors

..... 19.....

..... SECRETARY

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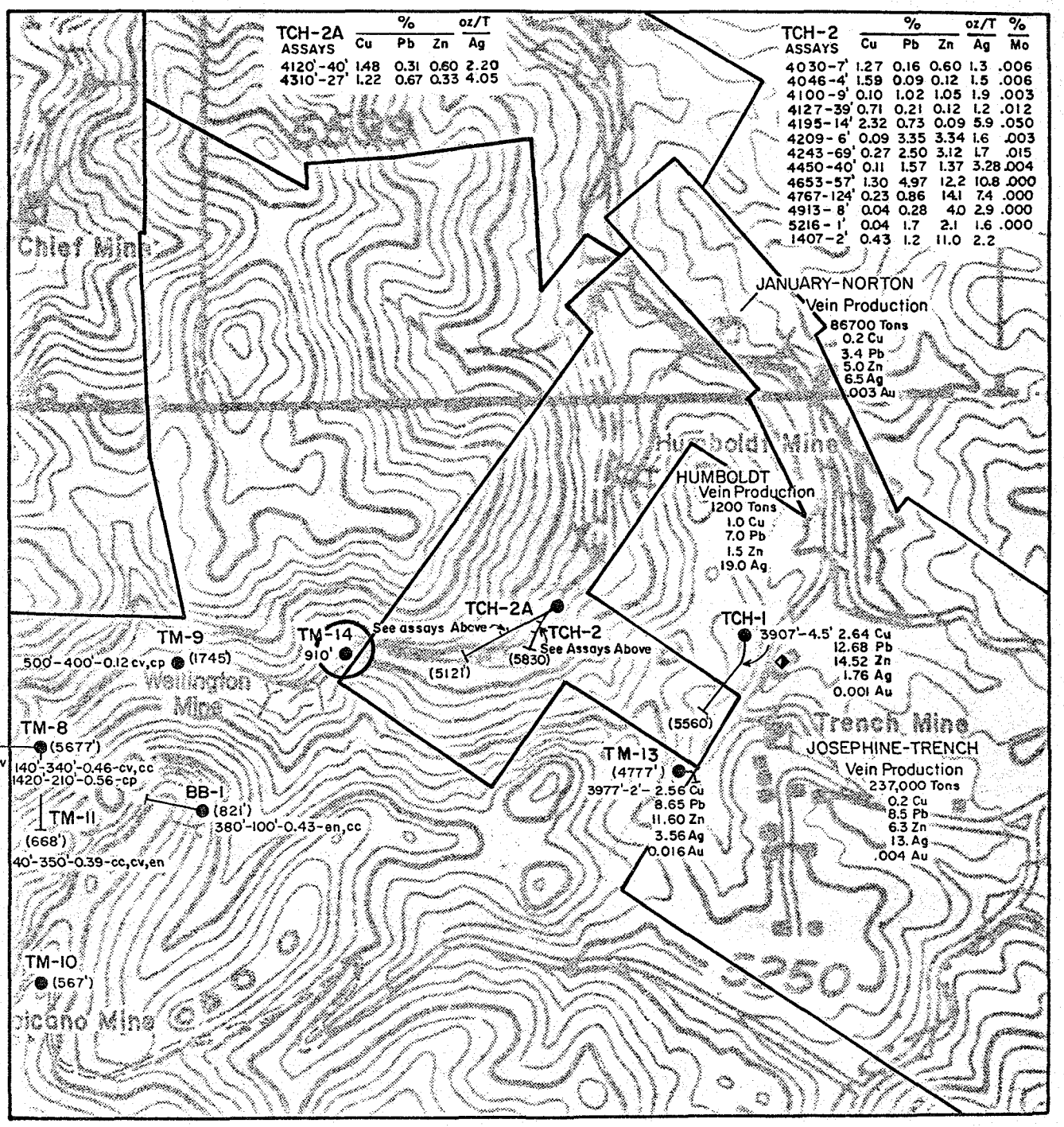

EXPLANATION

- ASARCO INC. Trench Group
- ASARCO-Kerr McGee Thunder Mtn. Joint Venture
- ASARCO-Anaconda 3R Joint Venture
- Mendoza-Humboldt Group (ASARCO INC.)
- Kerr-McGee-Red Mtn.
- Lichty-Argentor

(821') BB-1 — Drill hole showing depth

⊙ Proposed drill hole

ASSAY DATA KEY

depth-length-%Cu-mineral

3860'-350'-0.59-cp

GEOLOGIC LEGEND

cp- chalcopyrite
cv- covellite
cc- chalcocite
en- enargite

TO ACCOMPANY Supplemental Exploration Authorization Request DATED July 29, 1983 BY J. D. Sees

DRILL MAP

TRENCH PROJECT & THUNDER MTN. PROJECT

PATAGONIA MTNS.

Santa Cruz County, Arizona

SCALE: 1" = 1000'

F.R.K Dec., 1981

MVK 4048

ASARCO Southwestern Exploration Division

JDS cg

February 10, 1984

Mr. R. L. Brown
Vice President of Exploration
New York Office

Supplemental Exploration
Appropriation Request
Thunder Mountain Project
(EA-0042)
Santa Cruz County, AZ

Attached is the location map and the Form 302-MB requesting $60,000 to cover the $50,000 work commitment to Kerr-McGee, the $6,000 arrears for previous years, and support.

The request will fulfill the 1984 assessment work for the contiguous Thunder Mountain (160), Trench (7), and 3R (97) (total 264) claims.

Drill hole TM-14 is capped for reentry and is presently at a depth of 1705 feet. Drilling will resume in TM-14 and will be recapped upon expenditure of the K-M work commitment agreement.

If you approve of the above expenditures, please request a Supplemental Appropriation.

James D. Sell

James D. Sell

JDS/cg

Attachments

cc: WLKurtz
JRStringham
AJRobles (Form only)

FORM 302-MB (9/79)

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

February 10 19 84 Originating Office SWED - Tucson, AZ

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

No. EA-0042-00 through EA-0042-08, THUNDER MOUNTAIN PROJECT, Santa Cruz Co., AZ

Present total Estimated Cost (Form 302-MA attached)	$ 513,000
Amount previously authorized (date 10/72-08/83)	$ 453,000
Balance for which Authorization is now requested	$ 60,000

ADDITIONAL WORK CONTEMPLATED:

Deepen hole TM-14, presently at a depth of 1705 feet, case, and cap for reentry.

EXPLANATION OF INCREASED COST:

Ongoing program for fulfilling the work commitment, to justify holding the property, and exploring for the silver-copper-lead-zinc intercepts as found in adjacent holes.

Reviewed by [signature] ACC'T. MGR. OR CHIEF ACC'N'T.

Recommended by [signature] James D. Sell SUPERVISOR

Approved by ..... CONTROLLER

Account Chargeable to ..... TO BE FILLED IN BY CONTROLLER

Approved by ..... VICE PRESIDENT

Approved by Advisory Committee

..... 19.....

Approved by Board of Directors

..... 19.....

..... SECRETARY

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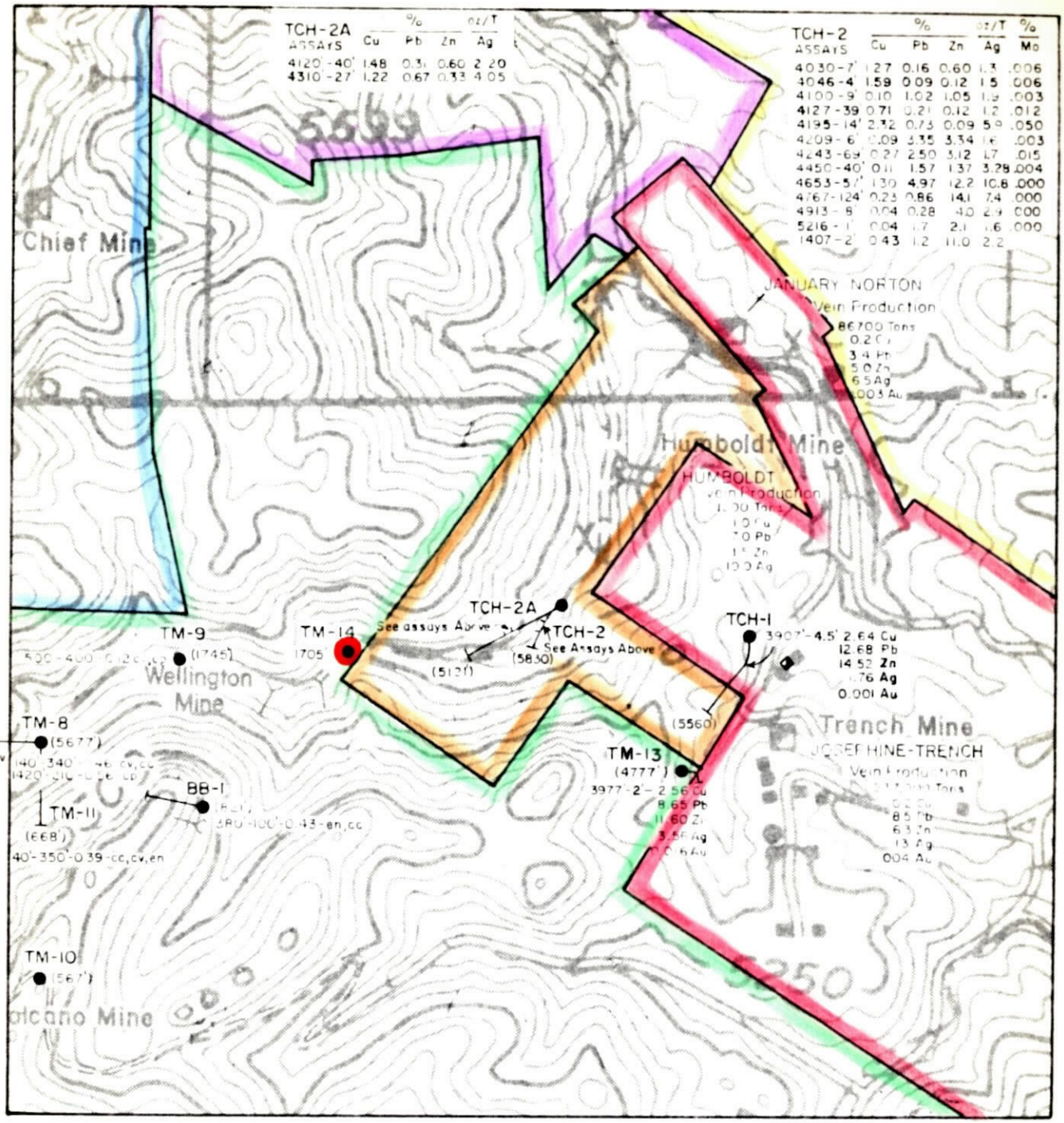

EXPLANATION

- ASARCO INC. Trench Group
- ASARCO-Kerr McGee Thunder Mtn Joint Venture
- ASARCO-Anaconda 3R Joint Venture
- Mendoza-Humboldt Group (ASARCO INC.)
- Kerr-McGee-Red Mtn.
- Lichty-Argentor

(821') BB-1 Drill hole showing depth

Proposed drill hole

ASSAY DATA KEY

depth-length-%Cu-mineral

3860'-350'-0.59-cp

GEOLOGIC LEGEND

cp - chalcopyrite
cv - covellite
cc - chalcocite
en - enargite

TO ACCOMPANY Supplemental Exploration Appropriation Request DATED 2/10/84
BY J.D. Sell

DRILL MAP
TRENCH PROJECT & THUNDER MTN. PROJECT
PATAGONIA MTNS.

Santa Cruz County, Arizona

SCALE: 1" = 1000'

F.R.K Dec., 1981

MVK 4048

JDS

ASARCO

Southwestern Exploration Division

June 26, 1985

R. L. Brown
Vice President Exploration
New York Office

Supplemental Exploration
Appropriation Request
Thunder Mountain Project
(EA-0042)
Santa Cruz County, AZ

Attached is the location map and Form 302-MB requesting $25,000 to cover the assessment work on a total of 248 claims in the Patagonia Mountains.

This request will fulfill the 1984-1985 assessment work by reentry hole TM-14, and applying the work to the contiguous Thunder Mountain (160 claims), Three-R (49 claims, reduced from 97), Ventura (32 claims, reduced from 91), and Trench (7 claims, Humbolt-Mendosa) claims.

Both Three-R (Anaconda) and Ventura (Noranda) have agreed to a reduction in their respective claim blocks to the numbers given above. Thunder Mountain (Kerr-McGee) has not agreed to a reduction and the claim number reflects their entire block. Asarco has requested a reduction from 160 down to 93 claims on the Thunder Mountain block. If such an agreement is reached prior to the expenditure, then such expenditure would be reduced by $6,000 for assessment on only the 93 claims.

Diamond drill hole TM-14 is capped for reentry and is presently cased NX to 2613 feet and open NX hole to 3075 feet. The requested monies will allow us to drill some 600 feet of new hole, log the interval (3 days), and minor assaying. The target of silver-copper-lead-zinc is expected below the 4000 foot depth. In the adjacent holes, the best interval in TCH-2 was 57 feet of 1.3% Cu, 4.97% Pb, 12.2% Zn, 10.8 opt Ag, with TCH-2A having 40 feet of 1.48% Cu, 0.31% Pb, 0.60% Zn, and 2.20 opt Ag.

If you approve the above expenditure, please request a Supplemental Appropriation.

James D. Sell

James D. Sell

JDS:mek

cc: A. J. Robles
F. R. Koutz

FORM 302-MB (9/79)

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

June .....19 85 Originating Office SWED - Tucson, AZ

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

EA-0042-00 thru
EA-0042-9, Thunder Mountain Project, Santa Cruz Co., AZ

No. .....

Present total Estimated Cost (~~Form 302 MB attached~~) $ 538,000

Amount previously authorized (date 10/72-2/84) $ 513,000

Balance for which Authorization is now requested $ 25,000

ADDITIONAL WORK CONTEMPLATED:

Deepen hole TM-14, presently at depth of 3075 feet, and cap for reentry. Approximately 600 feet of new hole, logging, and assaying to be done.

EXPLANATION OF INCREASED COST:

Ongoing program for fulfilling the work commitment, to justify holding the property, and exploring for the silver-copper-lead-zinc intercepts as found in adjacent holes.

Reviewed by ..... ACC'T. MGR. OR CHIEF ACCN'T.

Recommended by James D. Sell SUPERVISOR

Approved by ..... CONTROLLER

Account Chargeable to ..... TO BE FILLED IN BY CONTROLLER

Approved by ..... VICE PRESIDENT

Approved by Advisory Committee

..... 19.....

Approved by Board of Directors

..... 19.....

..... SECRETARY

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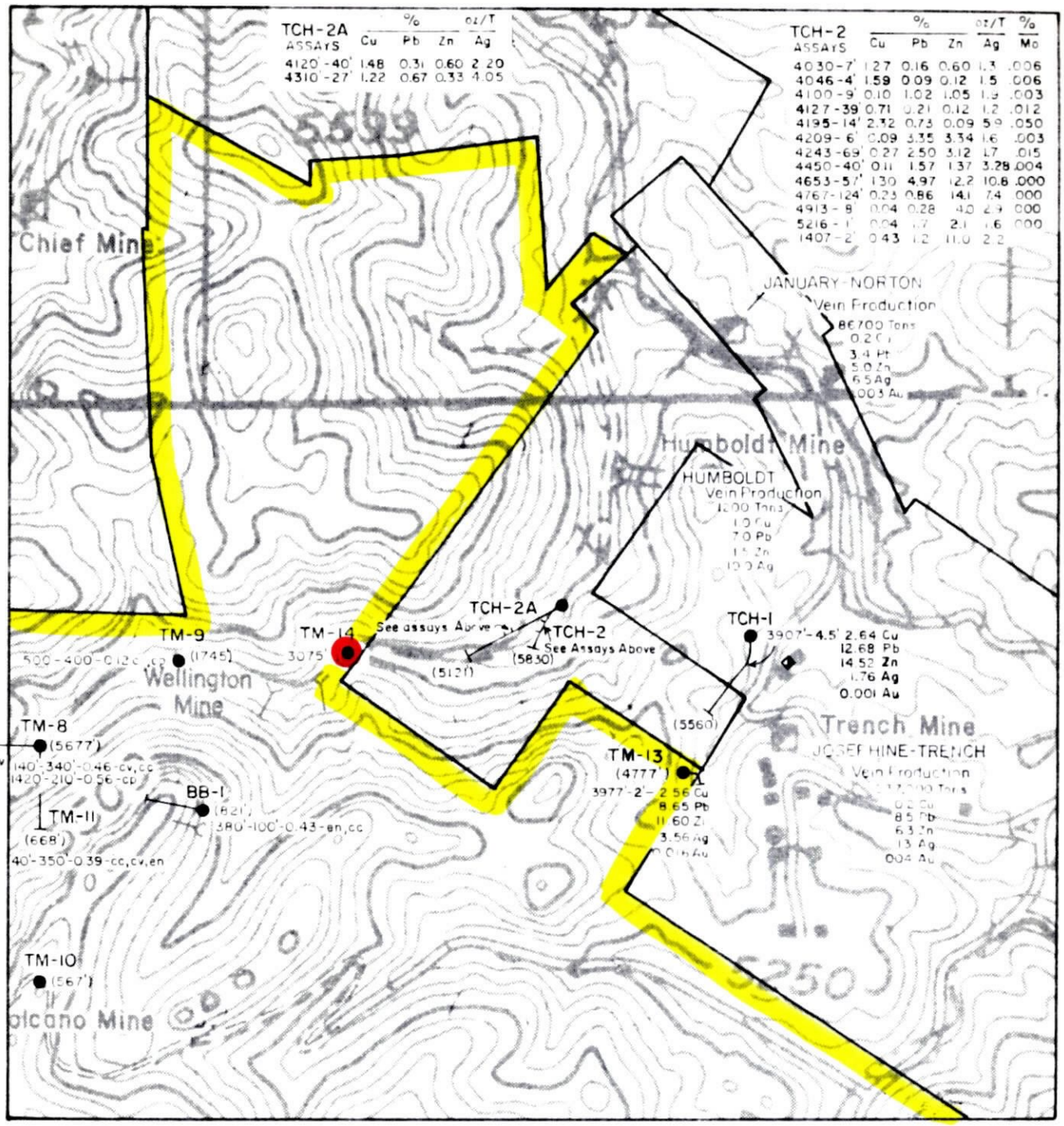

EXPLANATION

- ASARCO INC. Trench Group
- ASARCO-Kerr McGee Thunder Mtn Joint Venture
- ASARCO-Anaconda 3R Joint Venture
- Mendoza-Humboldt Group (ASARCO INC.)
- Kerr-McGee-Red Mtn.
- Lichty-Argentor

(821') BB-1 — Drill hole showing depth

Proposed drill hole

ASSAY DATA KEY

depth-length-%Cu-mineral

3860'-350'-0.59-cp

GEOLOGIC LEGEND

cp-chalcopyrite
cv-covellite
cc-chalcocite
en-enargite

TO ACCOMPANY Supplemental Explor. Appropriation request DATED 6/24/85
BY J.D.Sell

DRILL MAP

TRENCH PROJECT

&

THUNDER MTN. PROJECT

PATAGONIA MTNS.

Santa Cruz County, Arizona

SCALE: 1" = 1000'

F.R.K Dec.,1981

MVK 4048

ASARCO

Southwestern Exploration Division

June 26, 1985

R. L. Brown
Vice President Exploration
New York Office

Supplemental Exploration
Appropriation Request
Thunder Mountain Project
(EA-0042)
Santa Cruz County, AZ

Attached is the location map and Form 302-MB requesting $25,000 ** to cover the assessment work on a total of 248 claims in the Patagonia Mountains.

This request will fulfill the 1984-1985 assessment work by reentry hole TM-14, and applying the work to the contiguous Thunder Mountain (160 claims), Three-R (49 claims, reduced from 97), Ventura (32 claims, reduced from 91), and Trench (7 claims, Humbolt-Mendosa) claims.

Both Three-R (Anaconda) and Ventura (Noranda) have agreed to a reduction in their respective claim blocks to the numbers given above. Thunder Mountain * (Kerr-McGee) has not agreed to a reduction and the claim number reflects their entire block. Asarco has requested a reduction from 160 down to 93 claims on the Thunder Mountain block. If such an agreement is reached prior to the expenditure, then such expenditure would be reduced by $6,000 for assessment on only the 93 claims.

Diamond drill hole TM-14 is capped for reentry and is presently cased NX to 2613 feet and open NX hole to 3075 feet. The requested monies will allow us to drill some 600 feet of new hole, log the interval (3 days), and minor assaying. The target of silver-copper-lead-zinc is expected below the 4000 foot depth. In the adjacent holes, the best interval in TCH-2 was 57 feet of 1.3% Cu, 4.97% Pb, 12.2% Zn, 10.8 opt Ag, with TCH-2A having 40 feet of 1.48% Cu, 0.31% Pb, 0.60% Zn, and 2.20 opt Ag.

If you approve the above expenditure, please request a Supplemental Appropriation.

Kerr-McGee (TM), agreeded to claim reduction on June 25, 1985.
Anaconda of 3-R will be notified the work will be off the claim block before.
Noranda of Ventura agreed to having the work done off the claims, but for the benefit thereof, on July 2, 1985.

James D. Sell

JDS:mek

James D. Sell

cc: A. J. Robles
F. R. Koutz

** This should be reduced to $19,000. due to K-M reduction
See SEA final approval.

JDS

ASARCO

Southwestern Exploration Division

June 26, 1985

R. L. Brown
Vice President Exploration
New York Office

Supplemental Exploration
Appropriation Request
Thunder Mountain Project
(EA-0042)
Santa Cruz County, AZ

Attached is the location map and Form 302-MB requesting $25,000 to cover the assessment work on a total of 248 claims in the Patagonia Mountains.

This request will fulfill the 1984-1985 assessment work by reentry hole TM-14, and applying the work to the contiguous Thunder Mountain (160 claims), Three-R (49 claims, reduced from 97), Ventura (32 claims, reduced from 91), and Trench (7 claims, Humbolt-Mendosa) claims.

Both Three-R (Anaconda) and Ventura (Noranda) have agreed to a reduction in their respective claim blocks to the numbers given above. Thunder Mountain (Kerr-McGee) has not agreed to a reduction and the claim number reflects their entire block. Asarco has requested a reduction from 160 down to 93 claims on the Thunder Mountain block. If such an agreement is reached prior to the expenditure, then such expenditure would be reduced by $6,000 for assessment on only the 93 claims.

Diamond drill hole TM-14 is capped for reentry and is presently cased NX to 2613 feet and open NX hole to 3075 feet. The requested monies will allow us to drill some 600 feet of new hole, log the interval (3 days), and minor assaying. The target of silver-copper-lead-zinc is expected below the 4000 foot depth. In the adjacent holes, the best interval in TCH-2 was 57 feet of 1.3% Cu, 4.97% Pb, 12.2% Zn, 10.8 opt Ag, with TCH-2A having 40 feet of 1.48% Cu, 0.31% Pb, 0.60% Zn, and 2.20 opt Ag.

If you approve the above expenditure, please request a Supplemental Appropriation.

James D. Sell

James D. Sell

JDS:mek

cc: A. J. Robles
F. R. Koutz

FORM 302-MB (9/79)

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

June .....19 85 Originating Office SWED - Tucson, AZ

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

EA-0042-00 thru
EA-0042-9, Thunder Mountain Project, Santa Cruz Co., AZ

No. .....

Present total Estimated Cost (~~Form 302-MB attached~~)	$ 538,000
Amount previously authorized (date 10/72-2/84)	$ 513,000
Balance for which Authorization is now requested	$ 25,000

ADDITIONAL WORK CONTEMPLATED:

Deepen hole TM-14, presently at depth of 3075 feet, and cap for reentry. Approximately 600 feet of new hole, logging, and assaying to be done.

EXPLANATION OF INCREASED COST:

Ongoing program for fulfilling the work commitment, to justify holding the property, and exploring for the silver-copper-lead-zinc intercepts as found in adjacent holes.

Reviewed by ..... ACC'T. MGR. OR CHIEF ACCN'T.

Recommended by James D. Sell SUPERVISOR

Approved by ..... CONTROLLER

Account Chargeable to ..... TO BE FILLED IN BY CONTROLLER

Approved by ..... VICE PRESIDENT

Approved by Advisory Committee

..... 19.....

Approved by Board of Directors

..... 19.....

..... SECRETARY

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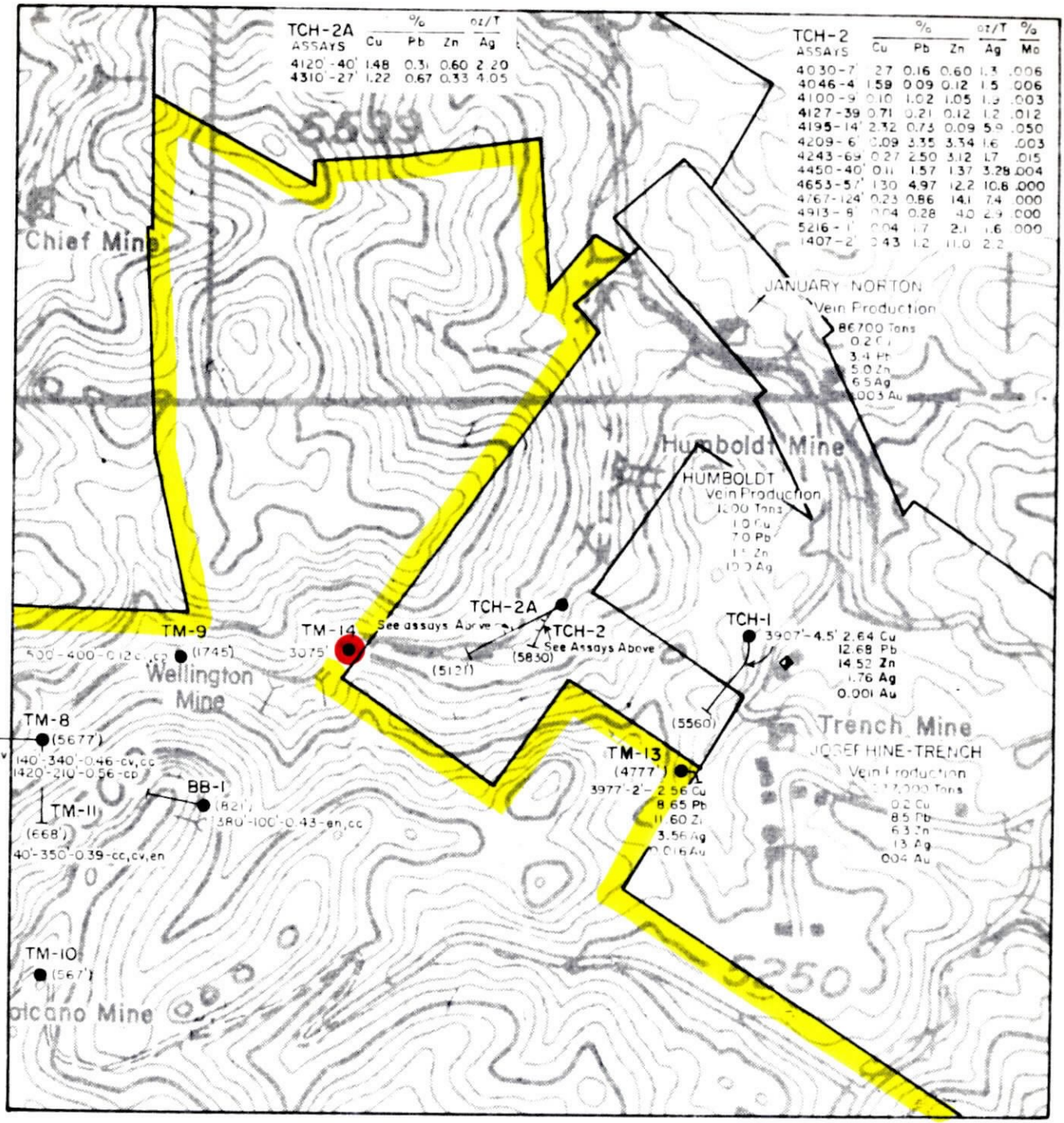


EXPLANATION

- ASARCO INC. Trench Group
- ASARCO-Kerr McGee Thunder Mtn Joint Venture
- ASARCO-Anaconda 3R Joint Venture
- Mendoza-Humboldt Group (ASARCO INC.)
- Kerr-McGee - Red Mtn.
- Lichty-Argentor

(821') BB-1 — Drill hole showing depth

Proposed drill hole

ASSAY DATA KEY

depth-length-%Cu-mineral

3860'-350'-0.59-cp

GEOLOGIC LEGEND

cp - chalcopyrite
cv - covellite
cc - chalcocite
en - enargite

TO ACCOMPANY Supplemental Explor. Appropriation request DATED 6/26/85
BY J.D.Sell

DRILL MAP
TRENCH PROJECT & THUNDER MTN. PROJECT
PATAGONIA MTNS.
Santa Cruz County, Arizona

SCALE: 1" = 1000'

F.R.K Dec., 1981

MVK 4048

CA Carbon Absorption Electrowinning
Merrill Crowe

4450 - 4490	(40')	3.25	471' (drillhole)
4490 - 4653	(163')	0.2	3.69 oz Ag
4653 - 4710	(57)	10.8	
4710 - 4767	(57')	0.2	
4767 - 4891	(124)	7.4	
4891 - 4913	(22')	0.2	
4913 - 4921	(8')	2.9	
4450 / 471'		1734.0	

4120 - 4160	(40')	2.20	217' (drillhole)
4160 - 4310	(150)	0.2	1.05 oz Ag
4310 - 4337	(27')	4.05	
	217'	227.35	

JDS

ASARCO PD 1
REVISED 1/1/58

PURCHASE ORDER

ASARCO Incorporated
~~American Smelting And Refining Co.~~

TUCSON OFFICE
P. O. BOX 5747

1150 NORTH 7TH AVENUE
TUCSON, ARIZONA 85703

DATE: July 18, 1985

ORDER NO.: T-157-5

PLANT JOB NO.:

APPROPRIATION NO.:

REQUISITION NO.:

To: J. H. Koontz, General Manager
Contract Core Drill Division
Joy Manufacturing Company
P. O. Drawer 489
La Porte, IN 46350

FINAL DESTINATION — PLEASE NOTE CONSIGNMENT BELOW

DATE REQUIRED AT DESTINATION:

CONSIGNMENT — SELLER WILL SHIP TO

SHIPPING INTERVAL PROMISED

SELLER WILL SHIP BEFORE:

POINT OF SHIPMENT

TERMS:

— RENDER BILLS AS PER ATTACHED SHIPPING INSTRUCTIONS —

F.O.B. POINT

SHIP VIA

QUANTITY	UNIT	SPECIFICATIONS	ITEM NO.	UNIT PRICE
		Joy Manufacturing Company (CONTRACTOR) will re-enter and drill a vertical exploration hole (TM-14) at ASARCO Incorporated's (ASARCO's) Thunder Mountain Project, Santa Cruz County, AZ, the location and depth of which will be specified by ASARCO's representative(s) at the jobsite. Payment for work performed will be in accordance with CONTRACTOR's letter of proposal dated May 21, 1985, a copy of which is attached and constitutes a part of this order.		
		CONTRACTOR will provide a drill and water truck complete with crews and ancillary equipment, or may install a water line in lieu of the water truck.		
		Mobilization of CONTRACTOR's equipment to take place on approximately July 25, 1985.		
		It is understood by both parties to this order that CONTRACTOR will perform all work in a diligent and workmanlike manner and in accordance with recognized standard drilling practices. ASARCO will not be charged for delays caused by failure of CONTRACTOR's equipment or personnel.		
		CONTRACTOR and his personnel will make every effort to minimize disturbance of the natural environment, and drill crews will establish and maintain sanitation systems which are acceptable to ASARCO and which comply with standards set by any government agency whether federal, state, county, or municipal which has jurisdiction over the site area, including fire safety and containment facilities.		
		CONTRACTOR's attention is called to Clause Eleven (11) on the reverse of this order. Before entering upon ASARCO's property to perform this work, CONTRACTOR will submit acceptable evidence of compliance with the Workmen's Compensation Laws of the State of Arizona, and, on ASARCO's standard insurance form, acceptable evidence of other required insurance.		

☞ *IMPORTANT*

~~Attached Acknowledgment Copy must be completed and returned promptly.~~

Orig: Joy Manufacturing Co.
cc: " " ", for acceptance
JDS, FRK, JRS, Joy Mfg.,
Acct. Dept., File

PLEASE ENTER OUR ORDER FOR THE ITEMS SPECIFIED ABOVE, SUBJECT TO ALL INSTRUCTIONS AND PROVISIONS ON REVERSE SIDE.

/s/ J. D. Sell
J. D. Sell, Manager
Southwestern Exploration Division

INSTRUCTIONS

INVOICE: Priced invoices in the requisite number giving the correct purchase order and requisition numbers, together with required Bills of Lading, must be forwarded on day of each shipment AS PER SPECIAL SHIPPING INSTRUCTIONS ACCOMPANYING THIS ORDER, otherwise delay in payment of account may result.

TERMS: As previously arranged or specified on this order. Care must be exercised to show cash discount, if allowed, on face of invoice.

PROVISIONS

1. ACCEPTANCE: Acceptance of this order constitutes acceptance of all terms herein stated. All representations and warranties by the seller relating to the subject-matter of this order or its performance shall be binding on the seller as if fully set forth herein, and shall survive inspection and acceptance of the goods ordered. No acknowledgment or acceptance of this order or any other communication by the seller shall vary or add any terms or conditions to those contained herein and any such attempted modification or addition which is not accepted in writing by the buyer, shall be void and may be disregarded without further notice or disclaimer.

2. PRICES: This order must not be filled at higher prices than last quoted without authority of the buyer.

3. SHIPMENTS: All materials must be forwarded by the route designated and seller will be held strictly accountable for any deviation therefrom.

When the material covered by this order shall aggregate a carload shipment or more, the seller must forward in carload lots, unless duly authorized in writing by the buyer to ship in less than carloads. If this order aggregates less than a minimum carload, seller must forward the entire quantity at one time unless otherwise authorized in writing by the buyer.

When blocking or dunnage, etc., not constituting a part of the car are used to protect and make shipments secure in transit, seller must show on Bills of Lading, separately, the weights of such materials, provided the lading shall aggregate a minimum carload or more, and will be held responsible for failure to comply with this rule.

Shipments will not be considered as completed until Bill of Lading, or express or mail receipt is received.

4. PACKING AND CARTAGE CHARGES: No charge will be allowed for packing, boxing or cartage, unless agreed upon at the time of purchase; damage to any material not properly packed to insure adequate protection in transit will be charged to the seller. All packing must conform with tariff or classification requirements so as to secure lowest possible freight rates. It is understood the buyer will receive the benefit of any decrease in freight charges between time of quotation and date of shipment, where freight enters into the price originally quoted.

5. QUALITY AND INSPECTION: All material furnished must be as specified and will be subject to inspection and approval of buyer after delivery. The right is reserved to reject and return at the risk and expense of the seller such portion of any shipment which may be defective or fail to comply with the specifications without invalidating the remainder of the order. If rejected it may be held for disposition at the expense and risk of the seller.

6. QUANTITY: The specific quantity ordered must not be changed without buyer's permission in writing.

7. NON-PERFORMANCE: Buyer reserves the right to cancel this order or any portion of same if delivery is not made when and as specified, time being of the essence of this order, and charge seller for any loss entailed.

8. PATENTS: The seller hereby guarantees the buyer against all losses of profits, damages, or both, resulting from any patent infringement by reason of purchasing or using goods covered by this order, or by reason of any loss suffered in not being able, without liability, to use such goods. This guarantee also includes the reimbursement to the buyer of all litigation costs which it may suffer as the result of any suit respecting the purchase or use of such goods, in addition to the recoveries which may be secured against it of profits and/or damages.

GENERAL:

9. The material on this order must be furnished only by the person or firm to whom the order is addressed unless otherwise authorized by the buyer.

10. No drafts for purchases made will be honored unless by agreement.

11. If it becomes necessary for the seller or any agent, contractor, or employee thereof to enter upon the property of the buyer in order to construct, inspect or deliver hereunder, the seller hereby agrees to protect the buyer's property and all persons thereon from injury, damage or loss, and the seller shall save harmless and indemnify the buyer from and against any expense, loss or damage on account of any claim, demand or suit made by any person whomsoever, including any employee of the buyer, which is in any way caused by or connected with or grows out of the performance hereunder by the seller or any agent, contractor or employee thereof; provided however that the seller shall not be required to indemnify the buyer against any loss caused solely by the negligence or willful fault of the buyer or its employees. If the seller performs any work hereunder knowing it to be contrary to any local law, ordinance, rule and regulation, the seller shall bear all costs arising therefrom. Seller to carry Liability Insurance and to carry Workmen's Compensation Insurance as provided by the laws of the State in which the work is performed and further, is to obtain a certificate for same, which is to be furnished for the file of the buyer. If for any reason the seller's or any subcontractor's employees or agents may acquire a status imposing liability on the buyer for employer's contributions or taxes under the Federal Social Security Act or under any State Unemployment Insurance, Old Age Benefit, or similar Acts, the seller shall be exclusively liable for, and shall indemnify the buyer against, the same and does agree to comply with all laws and regulations so as to relieve the buyer from any and all liability therefor or the responsibility of making any reports or keeping any records with respect thereto.

12. In accepting this order the seller certified that these goods were produced in compliance with all applicable requirements of Sections 6, 7 and 12 of the Fair Labor Standards Act of 1938, as amended, and of the regulations and orders of the United States Department of Labor issued under Section 14 thereof. It will be necessary in order for us to honor your future invoices to us that the above clause or a substantial equivalent thereof appear on your invoices.

13. By acceptance of this order, seller warrants that the prices specified do not exceed the maximum prices established under any applicable United States law or regulation thereunder.

JOY MANUFACTURING COMPANY
707 BOYD BOULEVARD
P. O. DRAWER 489
LaPORTE, INDIANA 46350
Phone: (219) 362-2191

May 21, 1985

Mr. Fleetwood Koutz
ASARCO, Incorporated
P. O. Box 5746
Tucson, Arizona 85703

Dear Fleet:

We appreciated receiving the invitation to bid on the additional drilling in hole TM-14. This hole has NX casing set to 2,613 feet, and the bottom is at 3,075 feet NX.

Please consider the following:

Mobilization	$500.00/rig
Demobilization	$500.00/rig
Road Truck Trips to Jobsite from Tucson for hole reductions if and when required	$150.00 each

Core Drilling	NX Wireline	BX Wireline
3000 to 3500 feet	$25.70/foot	$25.50/foot
3500 to 4000 feet	$29.20/foot	$29.00/foot
4000 to 4500 feet	$33.10/foot	$33.30/foot
4500 to 5000 feet	$38.70/foot	$38.50/foot

Rig Time & Hourly Work

Setting and Pulling Casing and Pipe	$46.00/hour + materials used
Cementing and/or Plugging Drill Holes (two man crew). Includes all time required to maintain good hole conditions while drilling. Also includes time required to close or complete hole as required.	$46.00/hour + materials used
Reaming, if necessary	$46.00/hour + materials used

May 21, 1985

Rig Time & Hourly Work (continued)

Re-entering Previously Drilled Holes (two man crew). Includes all time worked entering previously drilled hole until wireline core bit is cutting in solid rock formation on true bottom of hole. This will also include:	$55.00/hour + materials used
(a) Time which is required to line up drill over previously drilled hole.	
(b) Time required to set casing in pre-drilled hole before starting to drill with wireline tools.	
(c) All time required to correct any problems encountered with existing casing or pipe in hole.	
Survey	$46.00/hour + ASARCO supplies instrument
Standby Time for Your Convenience	$30.00/hour
Overtime Premium in Excess of 88 hours per two-week period (if requested)	$6.00/man hour

Supplies

Casing Ordered Left in Place - BX	$7.00/foot
Casing Lost through Normal Drilling Operations	At 70% of list price
Diamond Bit Loss in Excess of $2.50/foot	At Actual Cost
Drilling Mud and Additives	At Jobsite Cost + 20%
Weather-treated Core Boxes which hold ten feet of core	$2.50 each

Water Pumping or Hauling

Water Truck Usage	$600.00/month
Mileage	$.75/mile
Water Truck Driver (if required)	$2,000.00/month

May 21, 1985

The above prices are firm if accepted within 60 days and will remain in effect until 9/25/85. Our terms are Net 30 Days on monthly progress invoices.

We understand ASARCO will build and maintain all-weather or passable access roads, level drill sites, dig mud pits and provide water, on surface, free of cost to Joy. We further understand that ASARCO will provide all rights of ingress and egress to all lands that may be required to enable Joy to carry out the specified work. Also, you will arrange for the necessary drilling permits.

We cannot take back casing that might be recovered from this hole. We would be agreeable to storing it for use on subsequent work.

The 36 drill is not licensed and has not been used for a while. If there is little probability of drilling beyond 5,000 feet, a 22 drill, which has been in service, should be very adequate.

We will look forward to working with you on this project.

Yours very truly,

JOY MANUFACTURING COMPANY

J. H. Koontz

J. H. Koontz
General Manager
Contract Drill Division

JHK/js

FILE
JPS

June 28, 1985

MEMORANDUM FOR: H. E. Kelshaw, Jr.

Thunder Mountain Project
Arizona

Attached for safekeeping is a xerox copy of an Amendment between Kerr-McGee and Asarco which also includes three pages of exhibits.

F. T. Graybeal

F. T. Graybeal

encl.: a/s

cc: J. R. Stringham/J. D. Sell
w/encl.

RECEIVED
JUL 1 1985
EXPLORATION DEPARTMENT

KERR-McGEE CORPORATION
KERR-McGEE CENTER • OKLAHOMA CITY, OKLAHOMA 73125

F.T.G.
JUN 28 1985

MINERALS EXPLORATION DIVISION
G. D. CHRISTIANSEN
VICE PRESIDENT, EXPLORATION

June 25, 1985

RECEIVED
JUN 28 1985
EXPLORATION DEPT.

Mr. Frederick T. Graybeal
ASARCO INCORPORATED
180 Maiden Lane
New York, NY 10038

Dear Mr. Graybeal:

Attached is an executed copy of the 7th amendment to the Operating Agreement dated October 1, 1972.

Sincerely,

KERR-McGEE CORPORATION
Minerals Exploration Division

G.D. Christiansen

G.D. Christiansen

GDC:nw

Attachment

SEVENTH AMENDMENT TO OPERATING AGREEMENT DATED OCTOBER 1, 1972 BETWEEN KERR-McGEE CORPORATION AND ASARCO INCORPORATED

WHEREAS Kerr-McGee Corporation, herein referred to as "Kerr-McGee" and ASARCO Incorporated, herein referred to as "Asarco" did on October 1, 1972 enter into an Operating Agreement in regard to certain mining claims located in Santa Cruz County, Arizona, being more particularly described in Exhibit A to said Operating Agreement; and

WHEREAS Asarco has determined that certain claims described in Exhibit A to said Operating Agreement are no longer necessary for Asarco's purposes, and Kerr-McGee and Asarco mutually agree that these claims, more particularly described in Exhibit C attached to this amendment, shall be excluded from said lands and those claims described in Exhibit B, attached, shall replace the claims described in Exhibit A, as if Exhibit B had been attached to the Operating Agreement dated October 1, 1972.

NOW, THEREFORE, Kerr-McGee and Asarco do hereby agree that the Operating Agreement, dated October 1, 1972, shall be amended by replacing the Exhibit A to that agreement with Exhibit B attached hereto.

IN WITNESS WHEREOF, the parties hereto have duly executed this Seventh Amendment to Operating Agreement effective as of the 25th day of JUNE, 1985

KERR-McGEE CORPORATION

By: _____

ASARCO Incorporated

By: _____
R. L. Brown, Jr., V.P.

ATTEST: Elizabeth J. Collow
ELIZABETH J. COLLOW
Notary Public, State of New York
No. 31-4797774
Qualified in New York County
Commission Expires March 30, 1987

EXHIBIT B

THUNDER MOUNTAIN PROJECT

Kerr-McGee Agreement

Claims to be kept - 93

	Name of Claim	AMC BLM Serial No.
	~~TM 30-35~~	32934-32939
18	TM 67-84	32971-32988
4	TM 92-95	32996-32999
	Welington	33769
	Lafayette	33770
	Bryan	33771
	Copper Dyke	33772
	Warren Harding	33773
	Abraham Lincoln	33774
	Calvin Coolidge	33775
	Roosevelt	33776
23	Jesse 1-23	32307-32329
1	Jesse 24	137599
6	Orb 1-6	32501-32506
4	Orb 7-10	192265-192268
	~~OCCI~~	33746
	~~OCCI 1-19~~	33747-33765
	Big Jim	33768
	Campsite	33767
	American Annex	33766

67 items

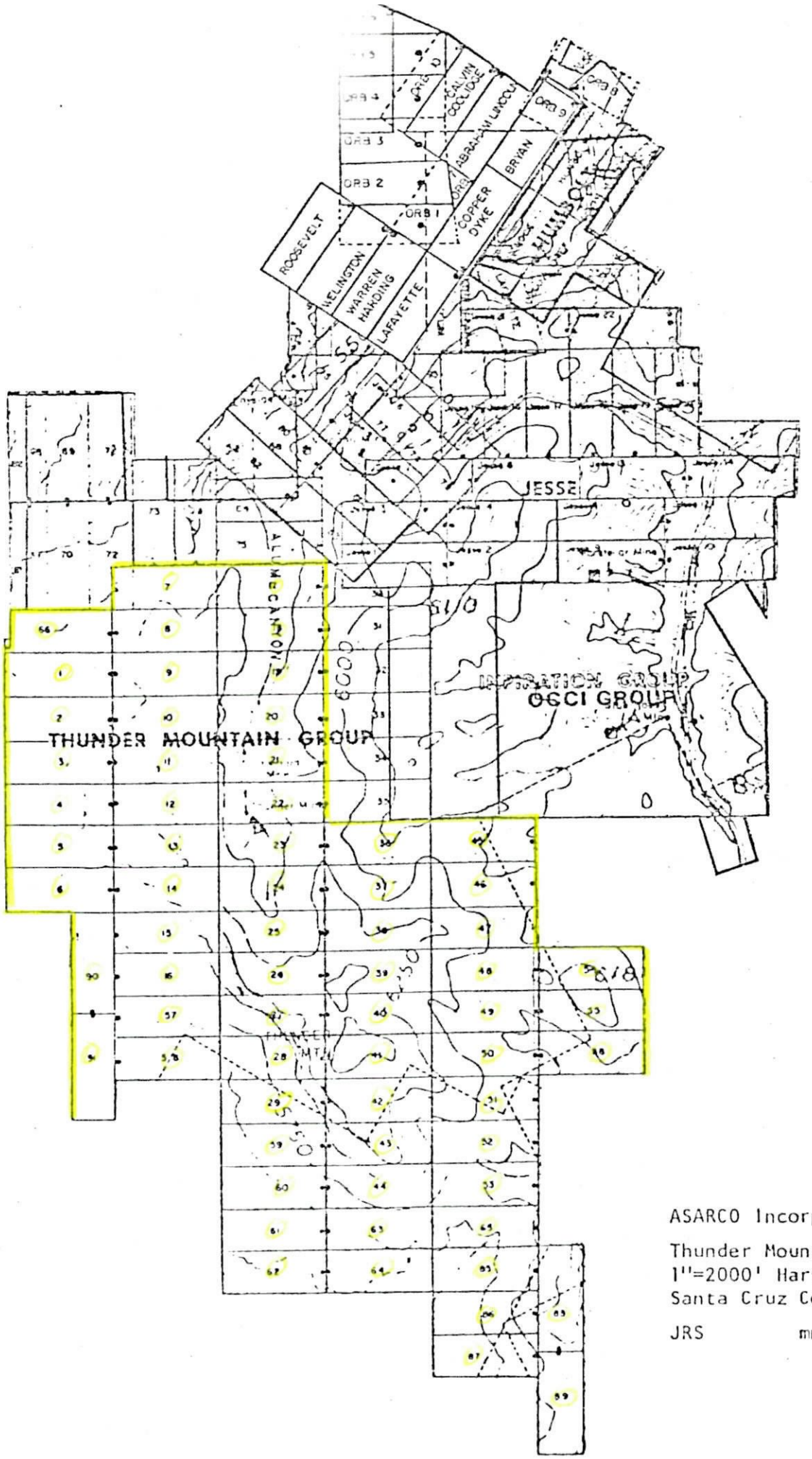
EXHIBIT C

THUNDER MOUNTAIN PROJECT

Kerr-McGee Agreement

Claims to be relinquished - 67

Name of Claim	AMC BLM Serial No.
TM 1-29	32905-32933
TM 36-66	32940-32970
TM 85-91	32989-32995



ASARCO Incorporated

Thunder Mountain Group
1"=2000' Harshaw Dist.
Santa Cruz Co.,Arizona

JRS mn6156 4/85

ASARCO

New York Office
Office of the Secretary

JDS

August 14, 1985

Mr. R. L. Brown, Jr.:

The following are extracts from the minutes of the Advisory Committee meeting held July 10, 1985:

Western Australia
Wiluna Project

Asarco recently became vested in 51% ownership of the Wiluna Joint Venture, where the reserve of oxidized gold ore totals about 2 million tons grading .12 oz. Au per short ton. Feasibility studies have been started.

The company has formed a wholly owned subsidiary, Wiluna Gold Mines, Ltd., as the vehicle which will formally own Asarco's share of the Wiluna Joint Venture.

Advisory Committee approval to transfer the company's asset at Wiluna from Asarco (Australia) Pty. Ltd. to Wiluna Gold Mines, Ltd. is requested.

There was approved the transfer of the company's asset at the Wiluna Project, Western Australia from Asarco (Australia) Pty. Ltd. to Wiluna Gold Mines, Ltd.

Exploration Appropriation #0042-10
Arizona
Thunder Mountain Project

Thunder Mountain is a joint venture option with Kerr-McGee which requires that Asarco spend $1 million to earn a 50% interest by October 1, 1990. Expenditures to date which qualify are approximately $280,000. Assessment work for the 1984-85 year is required to keep the 93 claims in this group in good standing. Retention of the claims is justified by previous drilling which has located significant intersections of high grade base-precious metal mineralization in altered carbonate rocks at depths of 4000-5000 ft. (for example TCH-2 at a depth of 4653 ft. intersected 57 ft. averaging 1.30% Cu, 4.97% Pb, 12.2% Zn, and 10.8% oz Ag). Although these expenditures will all qualify toward vesting in the Thunder Mountain claim block, the expenditures will also serve to complete 1984-85 assessment work on the adjacent 3R, Ventura, and Humboldt claim groups. The cost of this work will be $25,000 and will be expended by deepening an existing diamond drill hole.

Advisory Committee approval of a $25,000 expenditure to complete assessment work on Thunder Mountain and on adjacent claim groups is requested.

There was approved a supplemental exploration appropriation of $25,000 for assessment work on the Thunder Mountain Project, Arizona and on adjacent claim groups.

Carmen D. Gonzalez

Carmen D. Gonzalez
Assistant Secretary

CDG:ls
Encs.
cc: R. J. O'Keefe (w/enc.)
S. P. McCandless (w/enc.)

cc: A. J. Robles (9/27/85)

ASARCO

JDS

R. L. Brown
Vice President

July 10, 1986

93 KM claims
7 Humbolt claim
100 claims total

Mr. R. L. Hoyle
Accounting Manager
Tucson Office

Dear Mr. Hoyle:

Enclosed are copies of the 302 forms concerning the Superior East Project, the Thunder Mtn. Project and the Ventura Project.

Please note that these forms have been processed by the controller and that the approval of the Advisory Committee on June 26, 1986 is indicated.

Yours very truly,

R. L. Brown

RLB/med
Encl.

cc: JDSell - w/encl. and copy of minute
RJO'Keefe/EJFranko - w/encl.

ASARCO Incorporated
JUL 14 1986
SW Exploration

ASARCO Oil and Gas Company, Inc. 180 Maiden Lane New York, N.Y. 10038
(212) 510-2000 Telex: 125991

New York, May 19, 1986

TO: The Advisory Committee

Thunder Mountain Project,
Arizona

Thunder Mountain is a joint venture option with Kerr-McGee to earn a 50% interest in 93 claims covering a deep disseminated copper zone and a deep high grade Cu-Pb-Zn-Ag carbonate replacement zone. Assessment work is required to keep the claims in good standing. Work done on the Thunder Mountain block also covers assessment work on the adjoining Three R Project (97 claims including the Flux Mine) and Mendoza Project (7 claims). Anticipated work will involve deepening a drill hole to test the carbonate replacement.

Advisory Committee approval is requested for an expenditure of $130,000 to cover drilling, geologic studies, and administrative costs.

F. T. Graybeal

F. T. Graybeal

FTG:mr
Att.

3-R = 37 claims
Flux = 12 "
49 claims total in 3-R Project

Thunder Mtn: 93 K-M claims
+ 7 Mendoza-Humbolt (ASARCO) claims*
100 claims total in block.

*help! Note with 1980 filing says the 7 Mendoza claims are part of the Hardshell group of the mining Dept.

ASARCO Incorporated
JUL 14 1986
SW Exploration

FORM 302-MB (9/79)

New York No. 00 #2-11

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

May 19, 1986 Originating Office Tucson

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

No. 0042 Thunder Mtn., Arizona

Present total Estimated Cost (Form 302-MA attached)	$ 668,000
Amount previously authorized (date 7/10/85)	$ 538,000
Balance for which Authorization is now requested	$ 130,000

ADDITIONAL WORK CONTEMPLATED:

Drilling, mapping, administrative

ASARCO Incorporated
JUL 14 1986
SW Exploration

EXPLANATION OF INCREASED COST:

Previous results justify holding the ground.

Reviewed by ..... ACC'T. MGR. OR CHIEF ACCN'T.

Recommended by J. D. Sell SUPERVISOR

Approved by R. J. O'KEEFE CONTROLLER

Account Chargeable to EXPLORATION EXPENSE TO BE FILLED IN BY CONTROLLER

Approved by A. T. Graybeal ~~VICE PRESIDENT~~

Approved by Advisory Committee
JUN 26 1986 19.....

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

PRINTED IN U.S.A

ASARCO

Southwestern Exploration Division

June 10, 1987

R.L. Brown
Vice President of Exploration
New York Office

Supplemental Exploration
Appropriation Request
Thunder Mountain Project
(EA-0042)
Santa Cruz County, AZ

A Supplemental Exploration Appropriation is requested for 1987 assessment work on 181 claims. Five copies of Form 302, an index map, and a drill hole location map are enclosed to facilitate this request.

The requested funds will be used to deepen drill hole TM-14 from its present depth of 3500' to a depth sufficient to meet the assessment work expenditure requirements. When this drilling is completed the hole will be left in such a condition that it can be deepened in the future. The deepening of T-14 will further test the carbonate replacement potential.

This drilling will be assessment work for 181 claims consisting of 7 Trench (Humbolt) claims, 32 Ventura claims, 49 3-R claims, and 93 Thunder Mountain claims. Thunder Mountain is a joint venture option with Kerr-McGee to earn 50% interest in 93 claims covering a deep disseminated copper zone and a deep high grade Cu-Pb-Zn-Ag carbonate replacement zone.

The funds requested for this assessment work drilling program are:

Mobilization and demobilization	$ 1,000
Footage drilling costs, 460' at $29/ft.	13,500
Hourly rates, additives, etc.	3,500
Other costs	2,000
Total	$20,000

If you approve of the above expenditure, please request a Supplemental Exploration Appropriation for the above amount.

Henry G. Kreis

Henry G. Kreis

HGK:mek
Enclosures

cc: W.L. Kurtz
J.D. Sell
W.D. Gay
A.J. Robles (form only)

FORM 302-MB (9/79)

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

June 11, 19 87 Originating Office Tucson

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

No. 0042 Thunder Mtn., Arizona

Present total Estimated Cost (Form 302-MA attached)	$ 688,000
Amount previously authorized (date 6/26/86)	$ 668,000
Balance for which Authorization is now requested	$ 20,000

ADDITIONAL WORK CONTEMPLATED:

Diamond drilling in drill hole TM-14
below its present depth of 3500'.

EXPLANATION OF INCREASED COST:

1986-1987 assessment work on unpatented mining claims.

Prepared by: H. G. Kreis
H.G. Kreis

Reviewed by ..... ACC'T. MGR. OR CHIEF ACCN'T.

Recommended by James D. Sell
J.D. Sell SUPERVISOR

Approved by ..... CONTROLLER

Account Chargeable to ..... TO BE FILLED IN BY CONTROLLER

Approved by ..... VICE PRESIDENT

Approved by Advisory Committee

..... 19.....

Approved by Board of Directors

..... 19.....

..... SECRETARY

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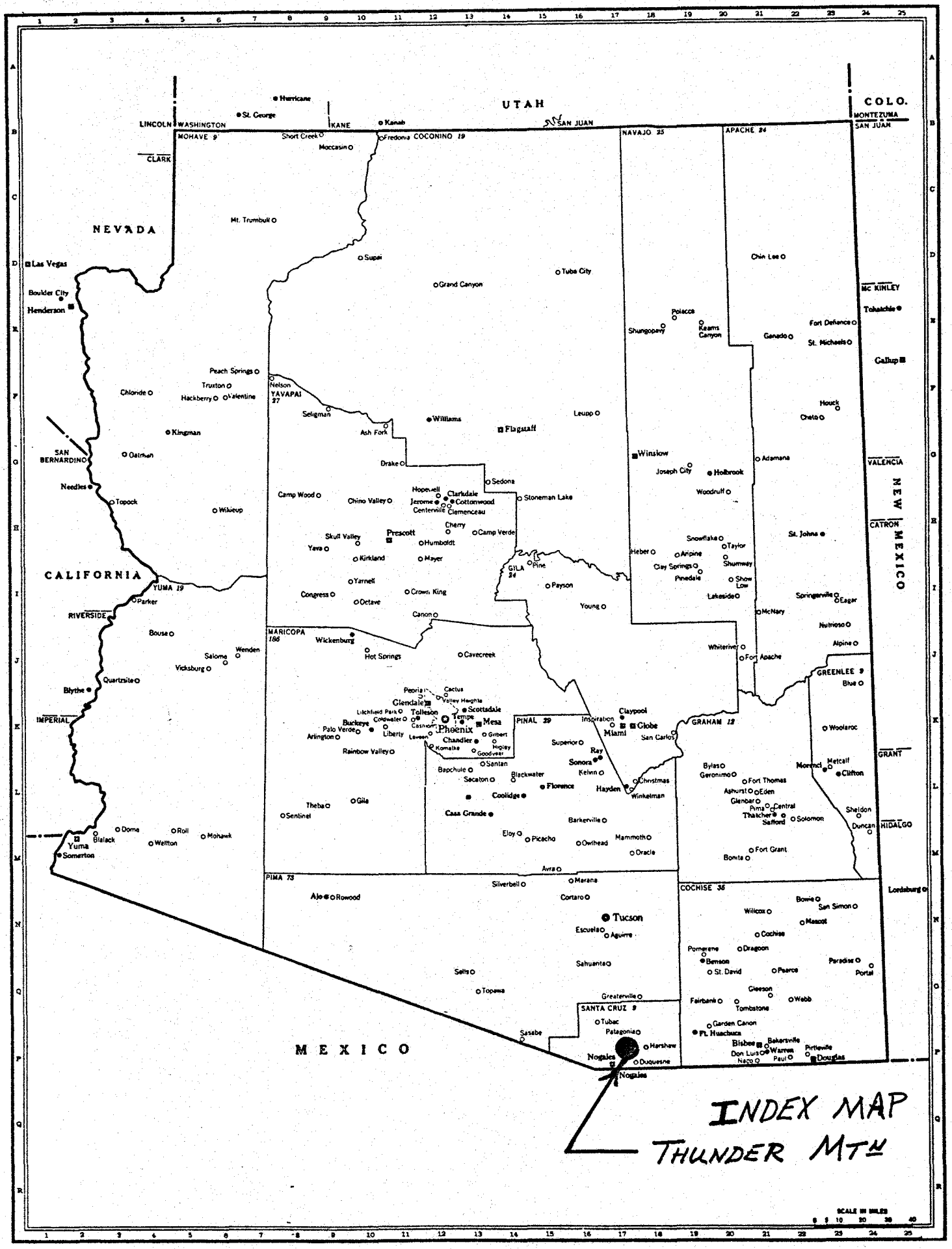
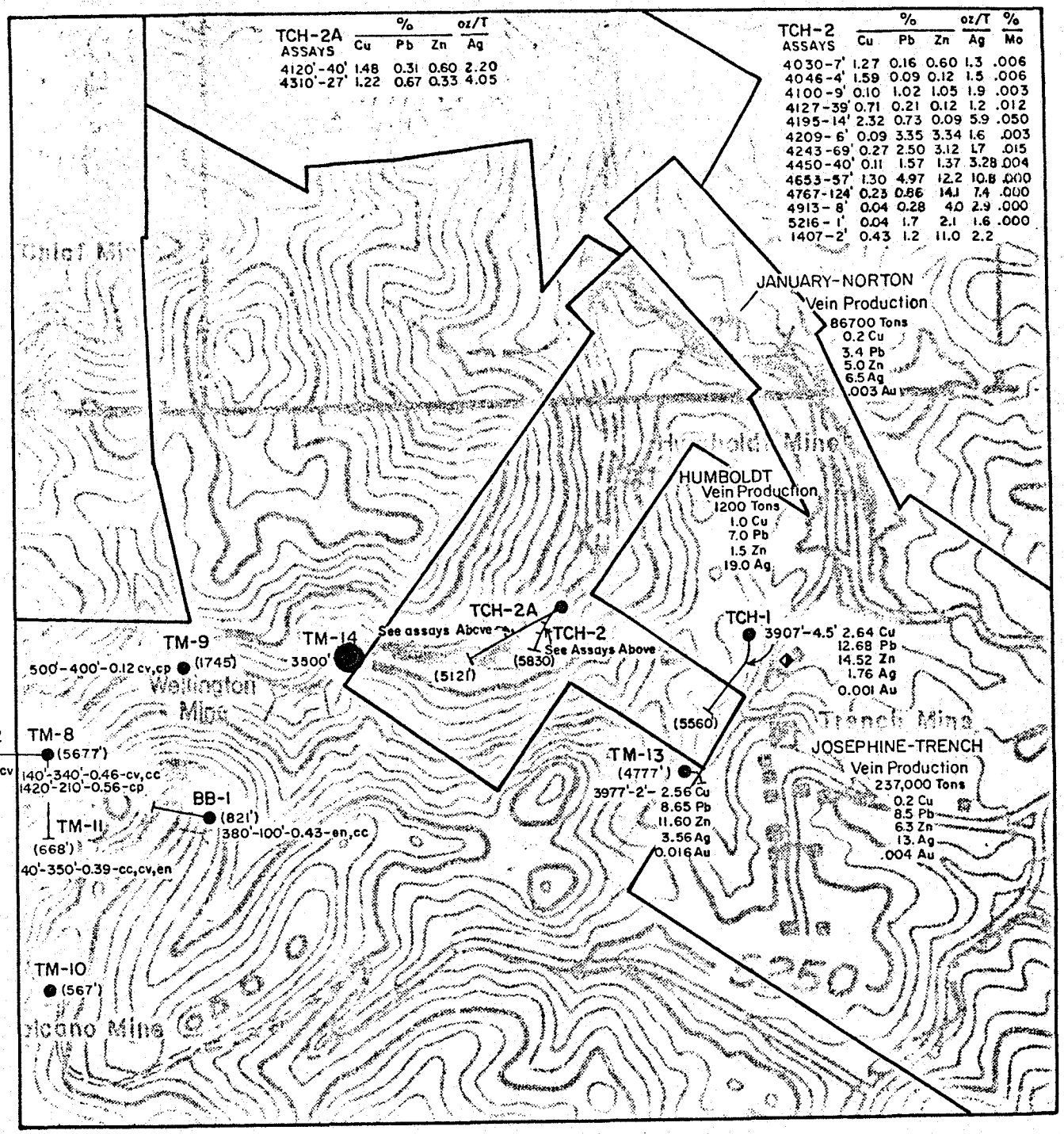

UTAH
COLO.
NEVADA
CALIFORNIA
NEW MEXICO
MEXICO
LINCOLN
WASHINGTON
KANE
SAN JUAN
MONTEZUMA
MOHAVE 9
COCONINO 19
NAVAJO 25
APACHE 24
CLARK
YAVAPAI 27
SAN BERNARDINO
YUMA 19
RIVERSIDE
IMPERIAL
MARICOPA 186
PINAL 29
GILA 34
GRAHAM 12
GREENLEE 9
PIMA 73
COCHISE 35
SANTA CRUZ 9
MC KINLEY
VALENCIA
CATRON
GRANT
HIDALGO
Hurricane
St. George
Kanab
Fredonia
Short Creek
Moccasin
Mt. Trumbull
Las Vegas
Boulder City
Henderson
Supai
Grand Canyon
Tuba City
Chin Lee
Tohatchi
Fort Defiance
Ganado
St. Michaels
Gallup
Polacca
Shungopavy
Keams Canyon
Peach Springs
Truxton
Hackberry
Valentine
Chloride
Nelson
Seligman
Ash Fork
Williams
Flagstaff
Leupp
Houck
Chinle
Kingman
Oatman
Needles
Topock
Wikieup
Drake
Sedona
Stoneman Lake
Winslow
Joseph City
Holbrook
Adamana
Woodruff
Camp Wood
Chino Valley
Hopewell
Clarkdale
Jerome
Cottonwood
Centerville
Clemenceau
Cherry
Camp Verde
Prescott
Humboldt
Skull Valley
Yava
Kirkland
Mayer
Pine
Payson
Snowflake
Taylor
Heber
Aripine
Clay Springs
Shumway
Pinedale
Show Low
Lakeside
St. Johns
Springerville
Eagar
Yarnell
Congress
Octave
Crown King
Canon
Young
McNary
Nutrioso
Alpine
Parker
Bouse
Salome
Wenden
Vicksburg
Quartzsite
Blythe
Wickenburg
Hot Springs
Cavecreek
Whiteriver
Fort Apache
Blue
Peoria
Cactus
Glendale
Valley Heights
Litchfield Park
Tolleson
Scottsdale
Tempe
Mesa
Buckeye
Cashion
Phoenix
Palo Verde
Arlington
Liberty
Laveen
Gilbert
Chandler
Higley
Komalke
Goodyear
Rainbow Valley
Santan
Bapchule
Secaton
Blackwater
Florence
Coolidge
Casa Grande
Superior
Inspiration
Claypool
Miami
Globe
San Carlos
Ray
Sonora
Kelvin
Hayden
Christmas
Winkelman
Woolaroc
Bylas
Geronimo
Morenci
Metcalf
Clifton
Fort Thomas
Ashurst
Eden
Glenbar
Pima
Central
Thatcher
Safford
Solomon
Sheldon
Duncan
Theba
Gila
Sentinel
Dome
Roll
Mohawk
Yuma
Blaiack
Wellton
Somerton
Barkerville
Eloy
Picacho
Owlhead
Mammoth
Oracle
Fort Grant
Bonita
Avra
Marana
Silverbell
Cortaro
Ajo
Rowood
Tucson
Escuela
Aguirre
Sahuarita
Sells
Topawa
Greaterville
Tubac
Patagonia
Sasabe
Harshaw
Nogales
Duquesne
Bowie
San Simon
Willcox
Mescal
Cochise
Pomerene
Dragoon
Benson
St. David
Pearce
Paradise
Portal
Gleeson
Fairbank
Webb
Tombstone
Garden Canon
Ft. Huachuca
Bisbee
Bakersville
Don Luis
Warren
Pirtleville
Naco
Paul
Douglas
Lordsburg
SCALE IN MILES
INDEX MAP
THUNDER MTN



EXPLANATION

- ASARCO INC. Trench Group
- ASARCO-Kerr McGee Thunder Mtn. Joint Venture
- ASARCO-Anaconda 3R Joint Venture
- Mendoza-Humboldt Group (ASARCO INC.)
- Kerr-McGee-Red Mtn.
- Lichty-Argentor

(821') BB-1 Drill hole showing depth

Proposed drill hole *deepening*

ASSAY DATA KEY

depth-length-%Cu-mineral

3860'-350'-0.59-cp

GEOLOGIC LEGEND

cp-chalcopyrite
cv-covellite
cc-chalcocite
en-enargite

DRILL MAP
TRENCH PROJECT & THUNDER MTN. PROJECT
PATAGONIA MTNS.

Santa Cruz County, Arizona

SCALE: 1" = 1000'

F.R.K *HGK 6-11-87* Dec., 1981

MVK 4048

ASARCO

Exploration Department
Frederick T. Graybeal
Chief Geologist

September 15, 1987

Mr. W. L. Schoonmaker
Accounting Manager
Wallace Office

Thunder Mtn. Project
Superior East Project
Arizona

Dear Mr. Schoonmaker:

Attached please find supplemental exploration appropriation forms for the above-mentioned projects which described expenditures which have been approved by Mr. T. C. Osborne.

Very truly yours,

F. T. Graybeal

F. T. Graybeal

FTG:mr
Att.

cc: E. J. Franko (w/att.)
J. D. Sell (w/att.)

cc: C.L. Snow - Tucson Accounting
9/18/87

ASARCO Incorporated

SEP 1 8 1987

SW Exploration

FORM 302-MB (9/79)

New York No. 0042 -12

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

June 11, 19 87 Originating Office Tucson

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

No. 0042 Thunder Mtn., Arizona

Present total Estimated Cost (Form 302-MA attached)	$ 688,000
Amount previously authorized (date 6/26/86)	$ 668,000
Balance for which Authorization is now requested	$ 20,000

ADDITIONAL WORK CONTEMPLATED:

Diamond drilling in drill hole TM-14
below its present depth of 3500'.

EXPLANATION OF INCREASED COST:

1986-1987 assessment work on unpatented mining claims.

Prepared by: H. G. Kreis
H.G. Kreis

Reviewed by A. J. Robb
ACC'T. MGR. OR CHIEF ACCN'T.

Recommended by James D. Sell
J.D. Sell
SUPERVISOR

Approved by
CONTROLLER

Account Chargeable to
TO BE FILLED IN BY CONTROLLER

Approved by F. T. Graybeal
~~VICE PRESIDENT~~

Approved by Advisory Committee

19

Approved by Board of Directors

19

SECRETARY

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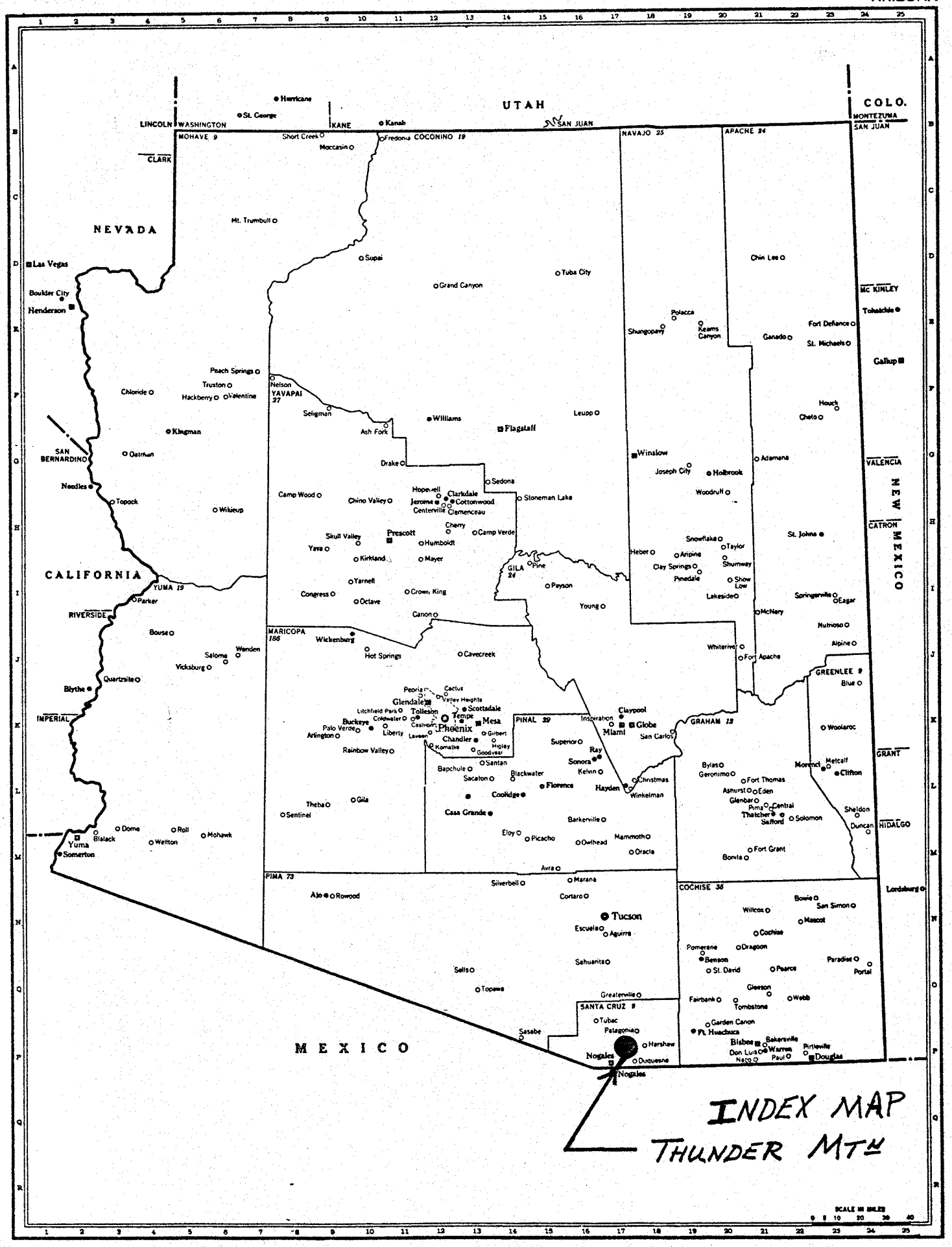
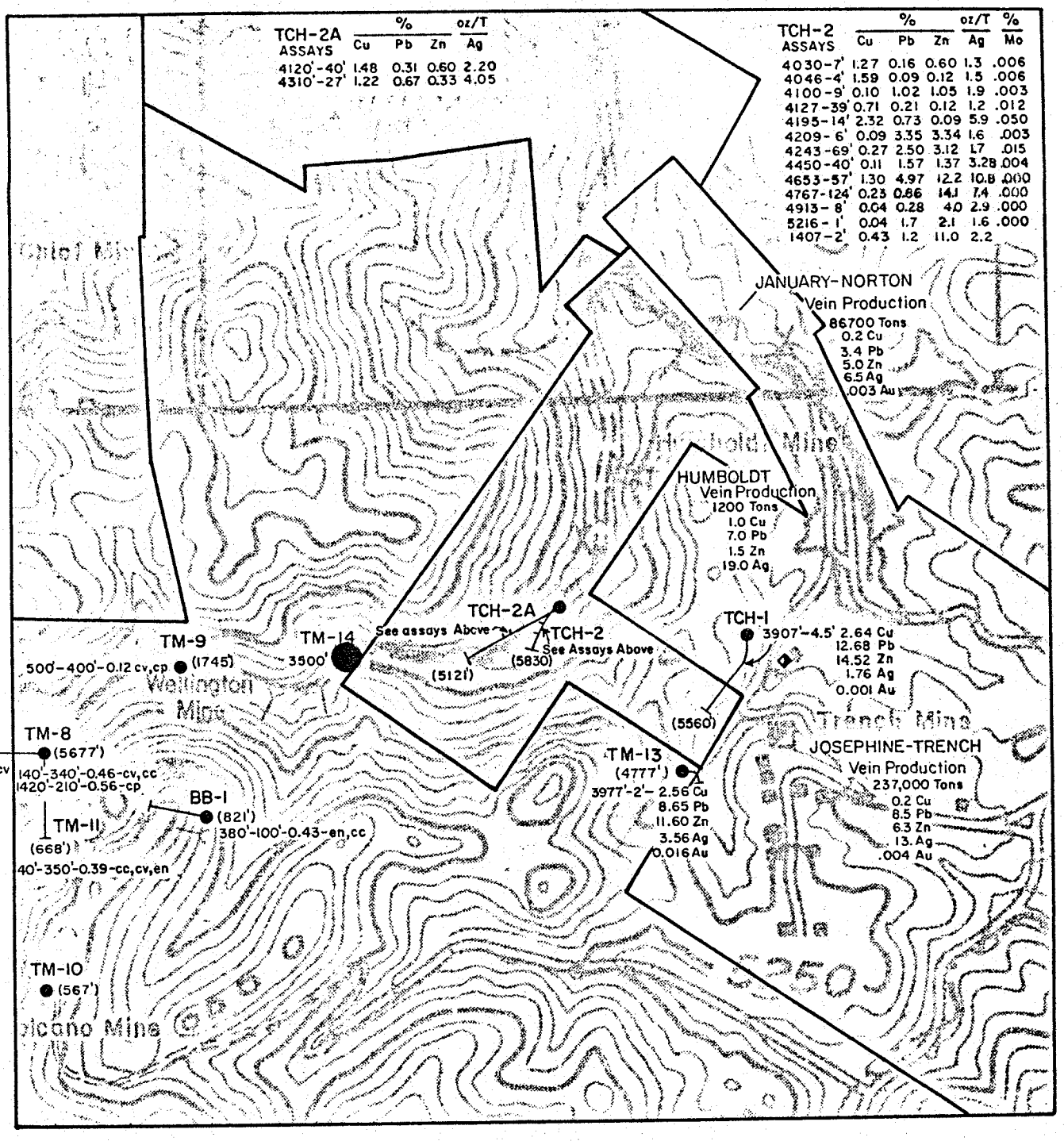

UTAH
COLO.
NEVADA
CALIFORNIA
NEW MEXICO
MEXICO
LINCOLN
WASHINGTON
KANE
SAN JUAN
MONTEZUMA
MOHAVE 9
COCONINO 19
NAVAJO 25
APACHE 34
CLARK
YAVAPAI 27
MC KINLEY
SAN BERNARDINO
VALENCIA
CATRON
YUMA 19
RIVERSIDE
IMPERIAL
MARICOPA 186
PINAL 29
GILA 24
GRAHAM 13
GREENLEE 9
GRANT
HIDALGO
PIMA 73
COCHISE 36
SANTA CRUZ 9
Hurricane
St. George
Kanab
Short Creek
Moccasin
Fredonia
Mt. Trumbull
Las Vegas
Boulder City
Henderson
Supai
Grand Canyon
Tuba City
Chin Lee
Polacca
Shungopavy
Keams Canyon
Fort Defiance
Ganado
St. Michaels
Tohatchi
Gallup
Peach Springs
Truxton
Hackberry
Valentine
Chloride
Nelson
Seligman
Williams
Flagstaff
Leupp
Houck
Chelo
Kingman
Oatman
Ash Fork
Winslow
Joseph City
Holbrook
Adamana
Needles
Topock
Drake
Sedona
Hopewell
Clarkdale
Jerome
Cottonwood
Centerville
Clemenceau
Stoneman Lake
Camp Wood
Chino Valley
Wikieup
Woodruff
Cherry
Skull Valley
Prescott
Humboldt
Camp Verde
Yava
Kirkland
Mayer
Pine
Snowflake
Taylor
Heber
Aripine
Shumway
Clay Springs
Pinedale
Show Low
Lakeside
St. Johns
Yarnell
Congress
Octave
Crown King
Payson
Young
Springerville
Eagar
McNary
Parker
Bouse
Canon
Nutrioso
Alpine
Wenden
Salome
Vicksburg
Wickenburg
Hot Springs
Cavecreek
Whiteriver
Fort Apache
Quartzsite
Blue
Blythe
Peoria
Cactus
Glendale
Valley Heights
Scottsdale
Litchfield Park
Tolleson
Tempe
Mesa
Buckeye
Coldwater
Cashion
Phoenix
Palo Verde
Liberty
Laveen
Gilbert
Chandler
Arlington
Komatke
Holey
Goodyear
Rainbow Valley
Superior
Inspiration
Claypool
Globe
Miami
San Carlos
Woolaroc
Ray
Sonora
Santan
Bapchule
Sacaton
Blackwater
Kelvin
Christmas
Hayden
Winkelman
Florence
Coolidge
Bylas
Geronimo
Morenci
Metcalf
Clifton
Fort Thomas
Ashurst
Eden
Glenbar
Pima
Central
Thatcher
Safford
Solomon
Sheldon
Duncan
Theba
Gila
Sentinel
Casa Grande
Barkerville
Eloy
Picacho
Owlhead
Mammoth
Oracle
Dome
Roll
Mohawk
Yuma
Blaisch
Wellton
Somerton
Avra
Fort Grant
Bonita
Silverbell
Marana
Lordsburg
Ajo
Rowood
Cortaro
Tucson
Escuela
Aguirre
Bowie
San Simon
Willcox
Mascot
Cochise
Pomerene
Dragoon
Benson
St. David
Paradise
Portal
Pearce
Sahuarita
Sells
Topawa
Greaterville
Gleeson
Fairbank
Tombstone
Webb
Tubac
Garden Canon
Sasabe
Patagonia
Ft. Huachuca
Hereford
Bisbee
Bakersville
Nogales
Duquesne
Don Luis
Warren
Pirtleville
Naco
Paul
Douglas
SCALE IN MILES
INDEX MAP
THUNDER MTN



EXPLANATION

- ASARCO INC. Trench Group
- ASARCO-Kerr McGee Thunder Mtn. Joint Venture
- ASARCO-Anaconda 3R Joint Venture
- Mendoza-Humboldt Group (ASARCO INC.)
- Kerr-McGee-Red Mtn.
- Lichty-Argentor

(821') BB-1 Drill hole showing depth

Proposed drill hole *deepening*

ASSAY DATA KEY

depth-length-%Cu-mineral
3860'-350'-0.59-cp

GEOLOGIC LEGEND

cp-chalcopyrite
cv-covellite
cc-chalcocite
en-enargite

DRILL MAP
TRENCH PROJECT & THUNDER MTN. PROJECT
PATAGONIA MTNS.

Santa Cruz County, Arizona

SCALE: 1" = 1000'

F.R.K HGK 6-11-87 Dec., 1981

MVK 4048

ASARCO

Exploration Department
Frederick T. Graybeal
Chief Geologist

August 16, 1988

Mr. J. D. Sell
Tucson Office

Thunder Mtn.
Arizona

Dear Mr. Sell:

I attach hereto a copy of Form 302-MB for the Thunder Mtn. Project. Please note that this form has been processed by the Controllers Department and that the approval by Mr. T. C. Osborne is indicated.

Very truly yours,

F. T. Graybeal

F. T. Graybeal

FTG:mc
Att.

cc: E. J. Franko (w/att.)
W. L. Schoonmaker (w/att.)

cc: C.L. Snow (8/19/88)

ASARCO Incorporated
AUG 19 1988
SW Exploration

FORM 302-MB (9/79)

New York No. 0042-13

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

August 9, 19 88 Originating Office Tucson

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

No. Thunder Mtn., Arizona 0042

Present total Estimated Cost (Form 302-MA attached)	$ 718,000
Amount previously authorized (date 9/18/87)	$ 688,000
Balance for which Authorization is now requested	$ 30,000

ADDITIONAL WORK CONTEMPLATED:

Deepen existing drill hole to final depth.

EXPLANATION OF INCREASED COST:

Hole can no longer be left uncased and must be completed into carbonate section where adjacent holes have intersected high grade base and precious metals.

Reviewed by ACC'T. MGR. OR CHIEF ACC'N'T.

Approved by R.J. O'KEEFE CONTROLLER

Account Chargeable to EXPLORATION EXPENSE TO BE FILLED IN BY CONTROLLER

Recommended by J. D. Sell SUPERVISOR

Approved by J. F. Graybeal VICE PRESIDENT

Approved by Advisory Committee

T. C. O.

19

Approved by Board of Directors

19

SECRETARY

PRINTED IN U.S.A.

need letter
to Forest
Service
w/ map
cleared road
~~new~~
etc

W L Kurtz
G W Sell

In for typing & drafting 5-10-90

Bucket Breccia Zone
Thunder Mountain Project
~~Patagonia Mountains~~, AZ
Santa Cruz Co., AZ

I submit SEA form 302-MB for $250,000, to commence a drilling program in the vicinity of BB-1, TM-8, TM-11, and TM-12, within the Thunder Mountain Project.

The Bucket Breccia Zone is named from drill hole BB-1 (Bucket Breccia-1) which initially intercepted ~~the~~ 100' of 0.43% copper from 380-~~to~~ 480 feet in a inclined hole at a bearing of N75° W, and inclined at minus 60°. ~~BBC~~ The intercept in BB-1 is ~~four~~ located within a 320 foot intercept of 0.32% copper with 0.04 oz silver. The mineralogy is primarily covellite ~~and~~ ~~pyrite~~, with ~~enargite~~ and chalcocite, disseminated in a high-level blanket above the TM-8 deep mineralization.

Based on the four holes which have intercepted similar mineralization and grade it is suggested that perhaps 50 million tons of 0.35%, or better, copper can be outlined in the zone with ~~less than~~ around 2:1 stripping ratio. I also believe that the

covellite, minor chalcocite mineralization is a ~~candidate~~ candidate for In Situ sulfide leaching technology based on the solubility of covellite, the primary copper mineral.

Attached is a location map; land status - galena; drilling map with postulated Bucket Breccia mineralized zone, cross-sections A-A' thru I-I' showing the ~~drill~~ drill intercepts and recommended ~~drill~~ core holes. Table 1 lists the previous intercepts. Table 2 lists the proposed holes.

James D Sell

Attachment

cc: RL Brown / FT Graybeal

FORM 302-MB (9/79)

New York No. .....

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

May 10 1990 Originating Office Tucson, SWED

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

No. Thunder Mountain, AZ EA-0042

Present total Estimated Cost	$ 968,000
Amount previously authorized (date 8-9-88) EA-0042-13	$ 718,000
Balance for which Authorization is now requested	$ 250,000

ADDITIONAL WORK CONTEMPLATED:

Initiate an expanded drilling program of shallow holes, average depth 750', to fully define a 50 million ton, 0.35+% copper zone with a 2/1 stripping ratio.

EXPLANATION OF INCREASED COST:

Expanded program to define previously indicated zone and the work toward our 50% ownership of the area.

Reviewed by ..... ACC'T. MGR. OR CHIEF ACCN'T.

Recommended by James W. Sell SUPERVISOR

Approved by ..... CONTROLLER

Account Chargeable to ..... TO BE FILLED IN BY CONTROLLER

Approved by ..... VICE PRESIDENT

Approved by Advisory Committee

..... 19.....

Approved by Board of Directors

..... 19.....

..... SECRETARY

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Figure:

1. Index map — Location

2. ~~E~~ Geology map 1" = 500 (blow up central 1 = 1000)

3 Drill Hole-Geology-Assay Section A-A'
drill holes BB-1 ~~and~~ TM-11, and TR-11

4 " " " " " B-B'
drill holes TM-8 ~~and~~, TM-10, and TM-11.

5 " " " " " C-C'
drill holes BB-1 and TM-9

6. Sketch Sections A-A'-2 and B-B'-2
Drill holes BB-1, BB-2, BB-3, BB-10, & BB-11 Drill holes ~~B~~TM-8, TM-11, BBB and BB-14

7. " " C-C'-2 and D-D'
Drill holes BB-1 and BB-4 Drill Holes BB-5, BB-6, & BB-7

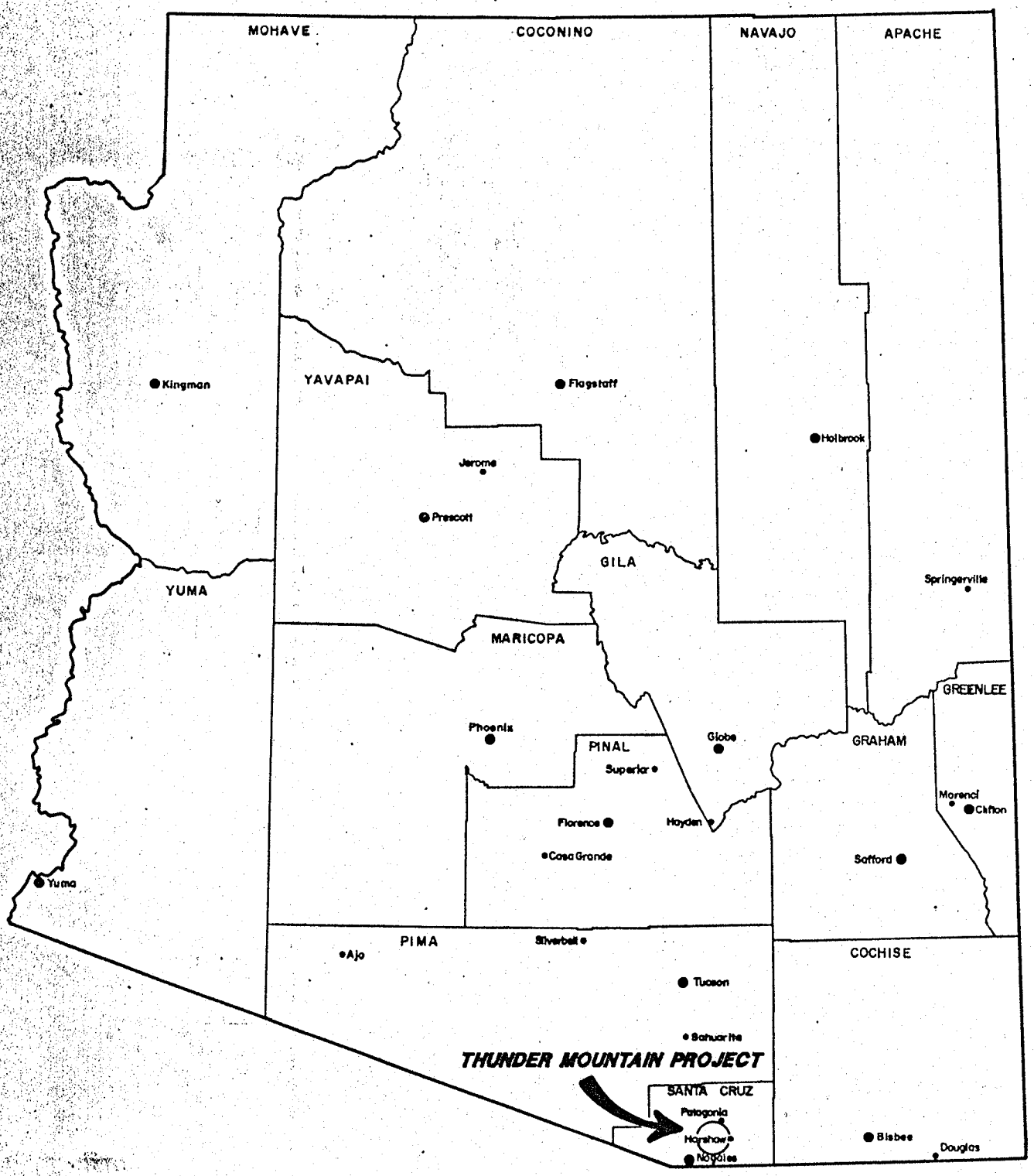
8. " " E-E' and F-F'
Drill holes BB-8 and BB-9 Drill Hole BB-10

9. " " G-G' and H-H'
Drill holes TM-9 and BB-11 Drill Hole BB-12

10. " " I-I'
Drill Hole TM-8, BB-15 and BB-16

JRSell

being drafted by Ron



ASARCO Incorporated

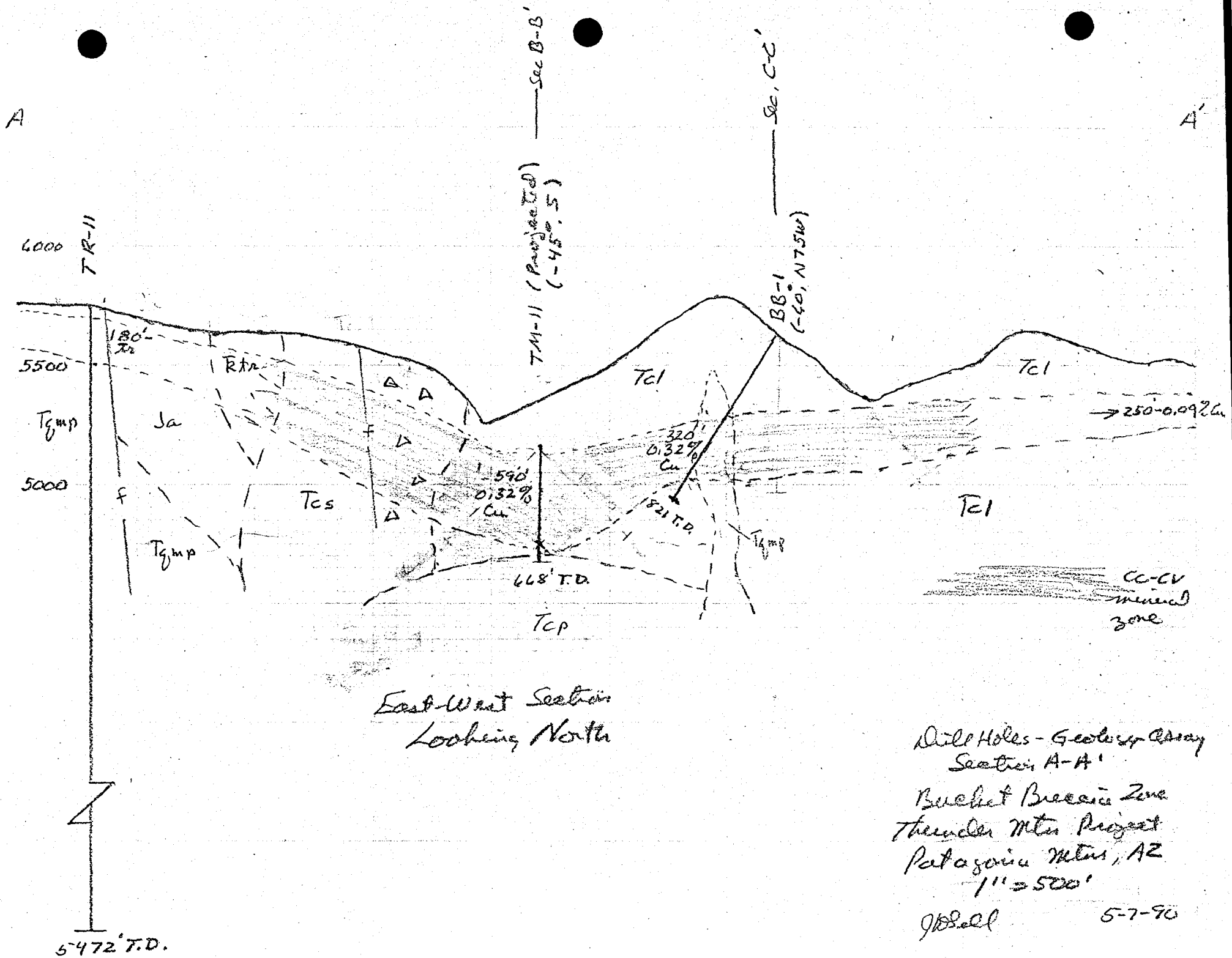
INDEX MAP

THUNDER MOUNTAIN PROJECT
SANTA CRUZ CO., ARIZONA
J.D.S. 4-88

0 50
MILES

mn6599 JDS/dam tuc 4-88

TR-7
Chief Mine
TR-9
(785)
TR-6
TR-4
(1927)
SJ-1
(701)
Humboldt
TCH-2
TCH-
TM-9
(1745)
Wellington
Mine
TM-8
TM-12
TM-11
TR-11
(5472)
BB-1
(821)
TM-13
(4777)
(5560)
(5830)
Oversaide Mine
TR-10
(5486)
TM-10
Volcano Mine
TR-14
TR-16
(5309)
possible extent of mineralization
Geology map
Three R - Thunder Mtn
Area
Patagonia Mtns
Santa Cruz Co, AZ
1" = ~~1000~~ 500'
(Enlarged from FTQ map 2626)
JW Sell
5-7-90
ALUM CANYON
6000
TM-7
(1314)
TM-1
(626)
TM-5
(677)
TM-3
(616)
Standard
Mine

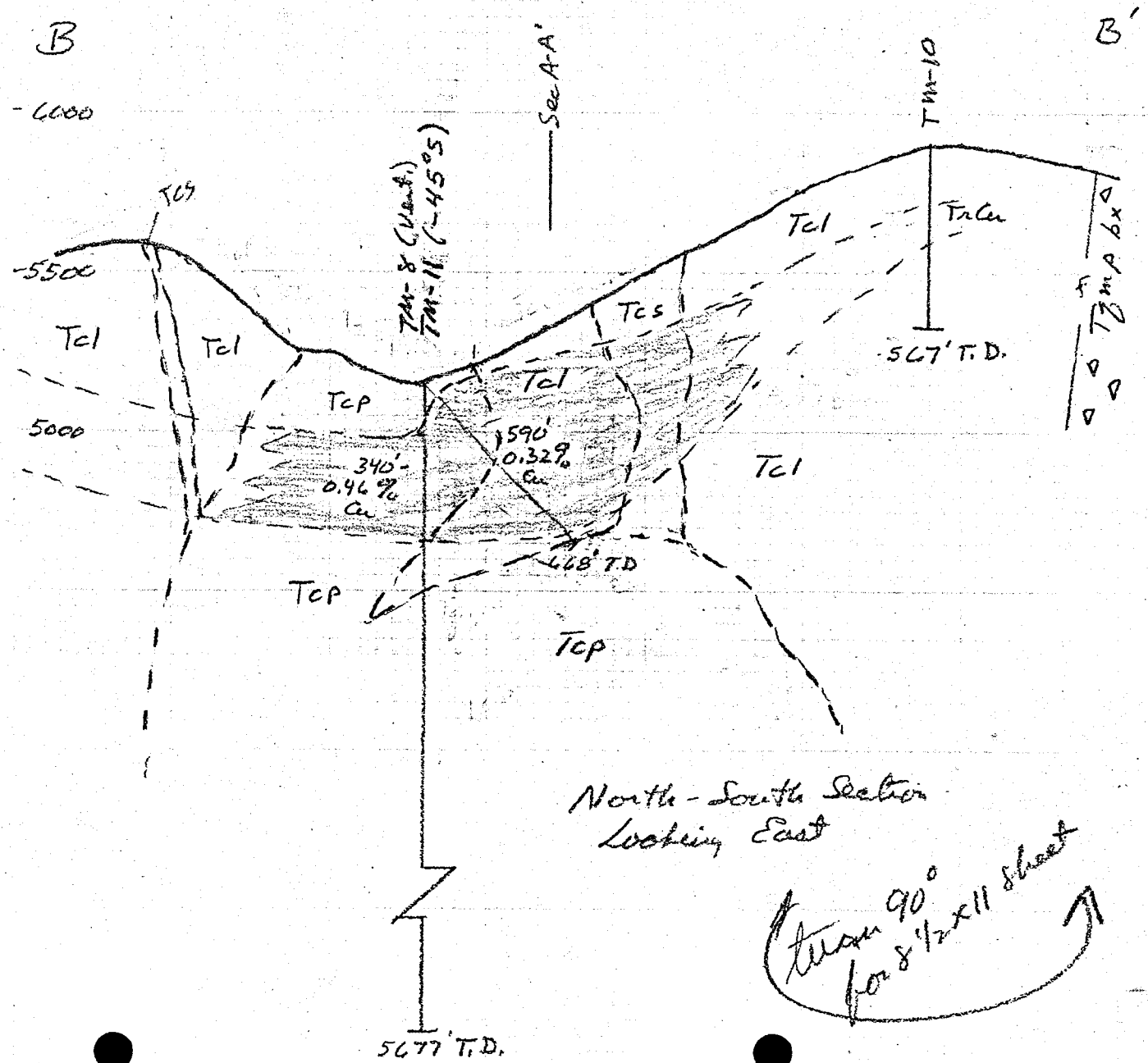


East-West Section
Looking North

Drill Holes - Geology Array
Section A-A'

Bucket Breccia Zone
Thunder Mtn Project
Patagonia Mtns, AZ
1" = 500'

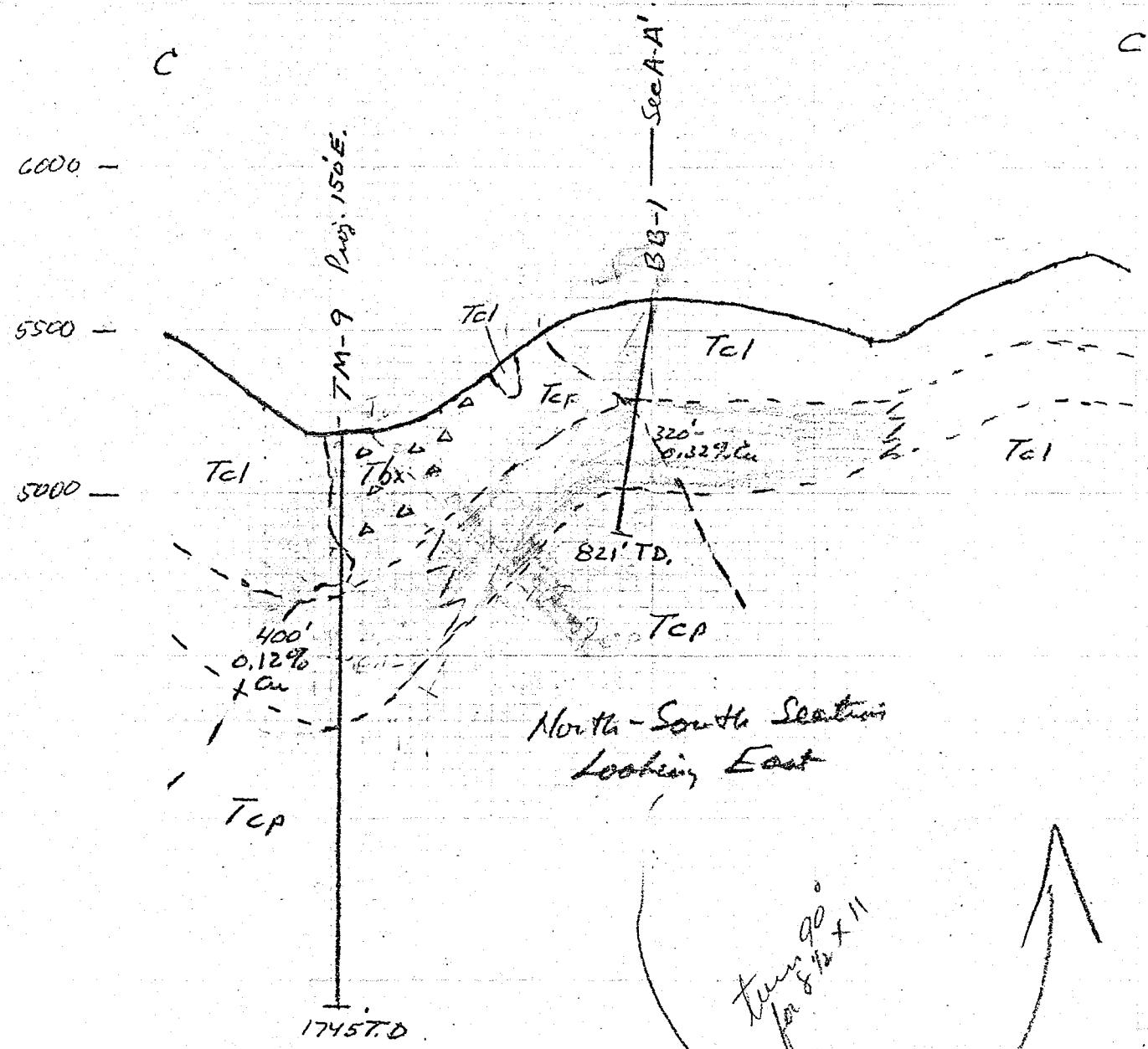
J.D. Bell 5-7-90



CC-CV mineral zone

Ouellette Hollow-Gaskill Gap-Oldscamp
Section B-B'
Buckhat Breccia Zone
Thunder Mtn Project
Pantagonia Mtns, AZ
1" = 500'

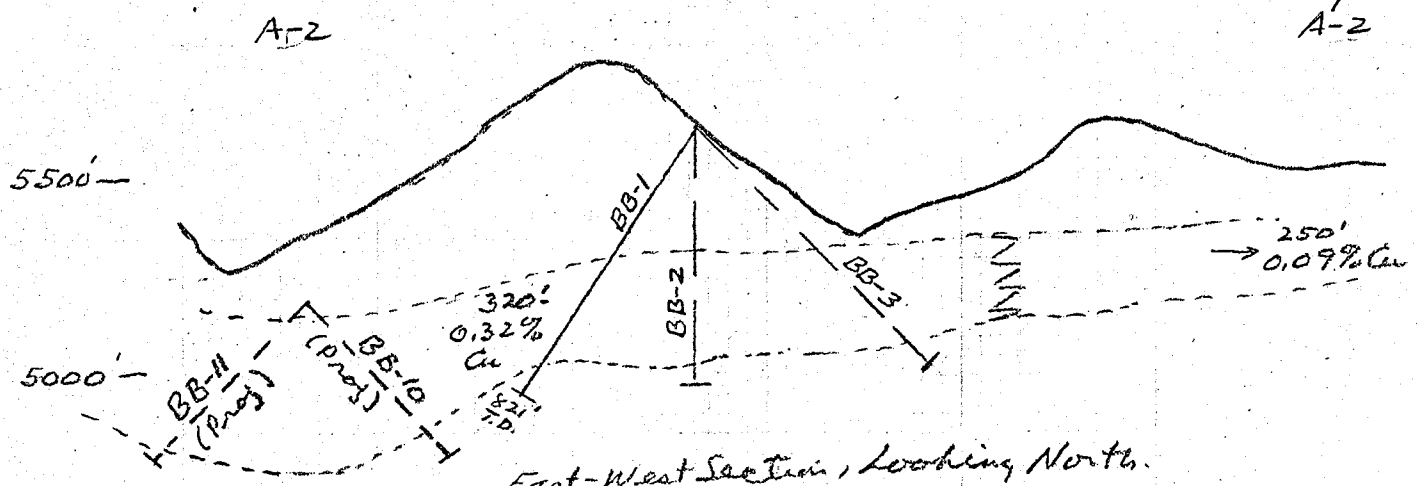
5-7-90



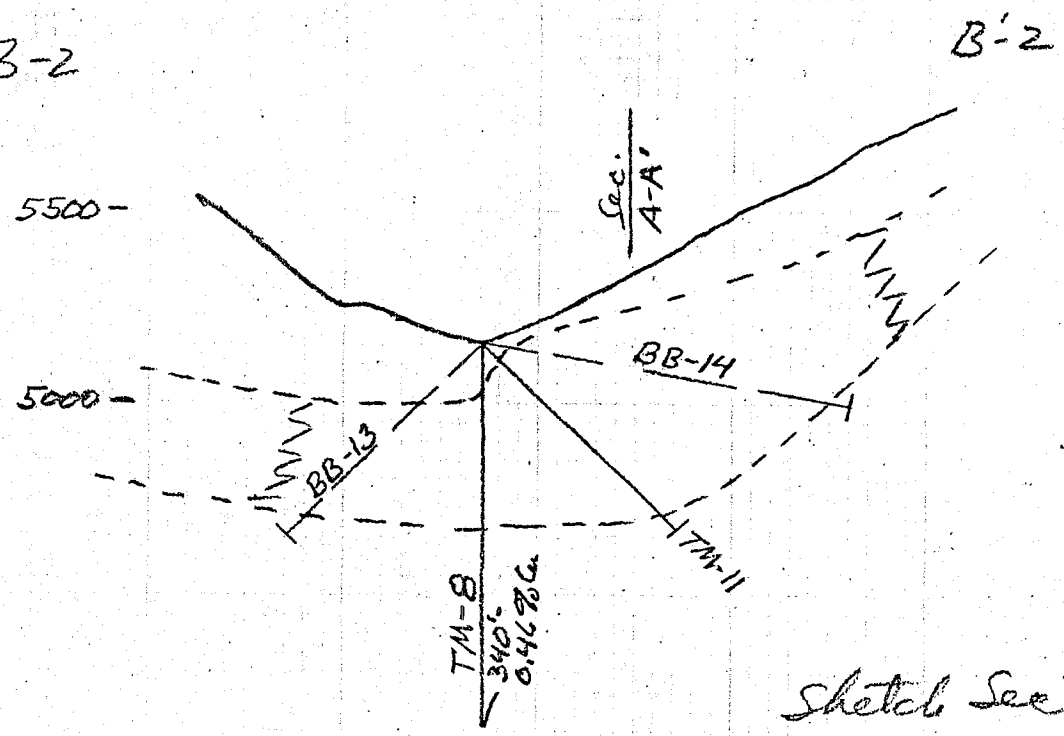
Drill Holes - Geology - Assay
Section C-C'
Bucket Breccia Zone
Thunder Mtn Project
Pataguania Mtns, AZ
1" = 500'

5-7-90

CC-CV mined zone



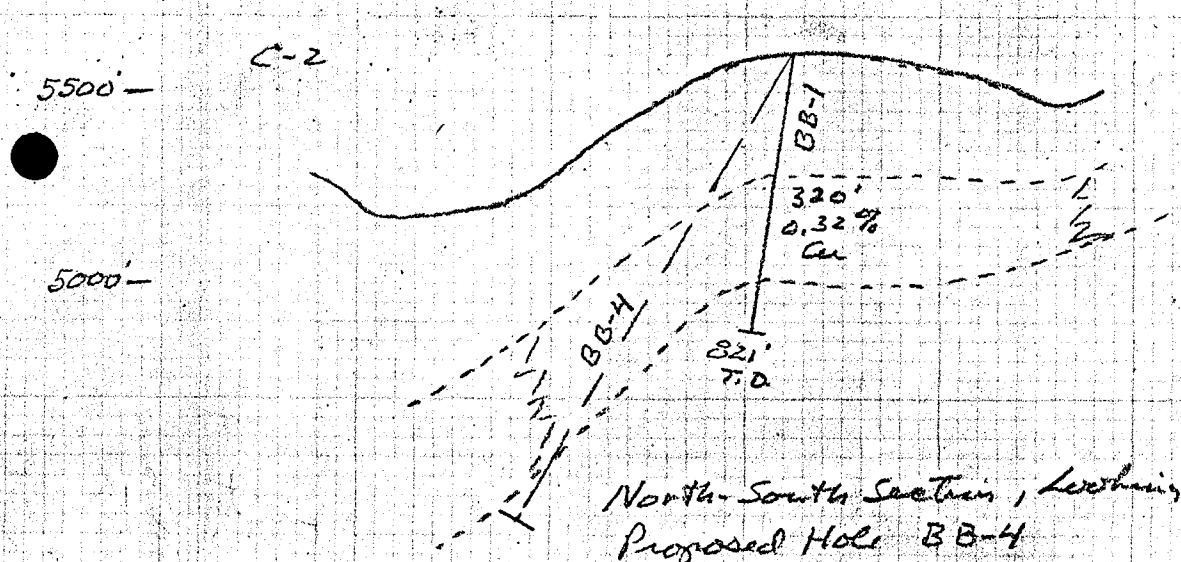
East-West Section, Looking North.
Proposed Holes BB-2 and BB-3



North-South Section
Looking East

Sketch Section
A-2 + B-2

Proposed Holes
Bucket Branch Zone
Thunder Mtn Project
Pinaleno Mtns, AZ



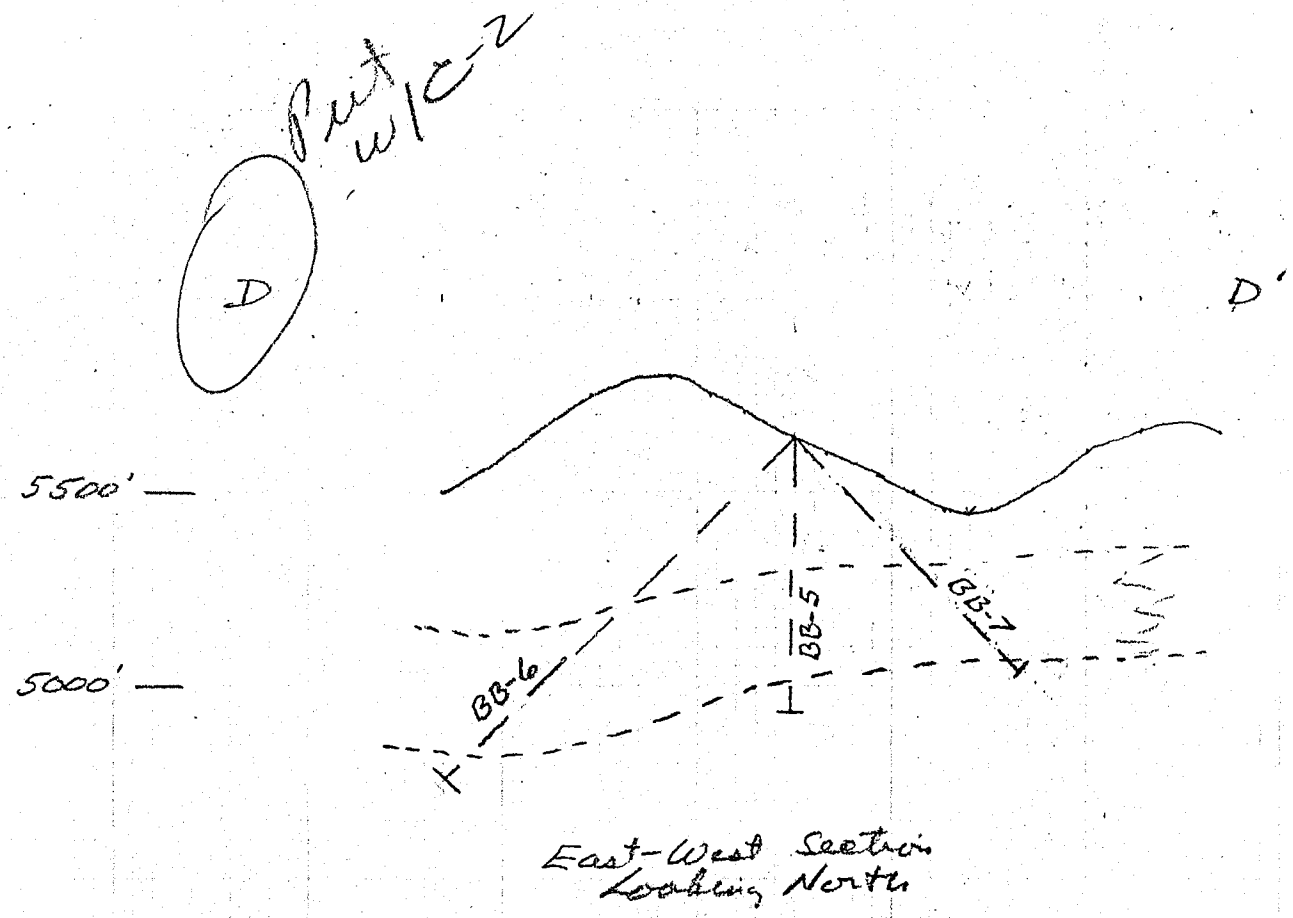
North-South Section, Looking East
Proposed Hole BB-4

Sketch Sections
C2 & D2
Proposed Holes
Bucket Breccia Zone
Thunder Mtn. Project
Patagonia Mtns, AZ
1" = 500'
JOSell 5-9-90

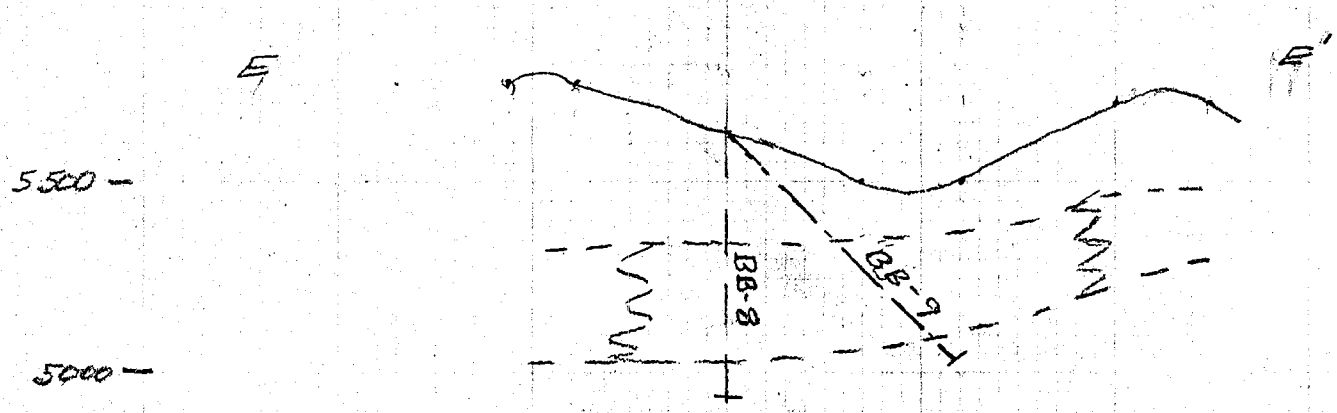
TRACING & GUIDE LINE 10 5641
10 X 10 TO THE INCH
KEUFFEL & ESSER CO.
MADE IN U.S.A.

D

D'



East-West Section
Looking North



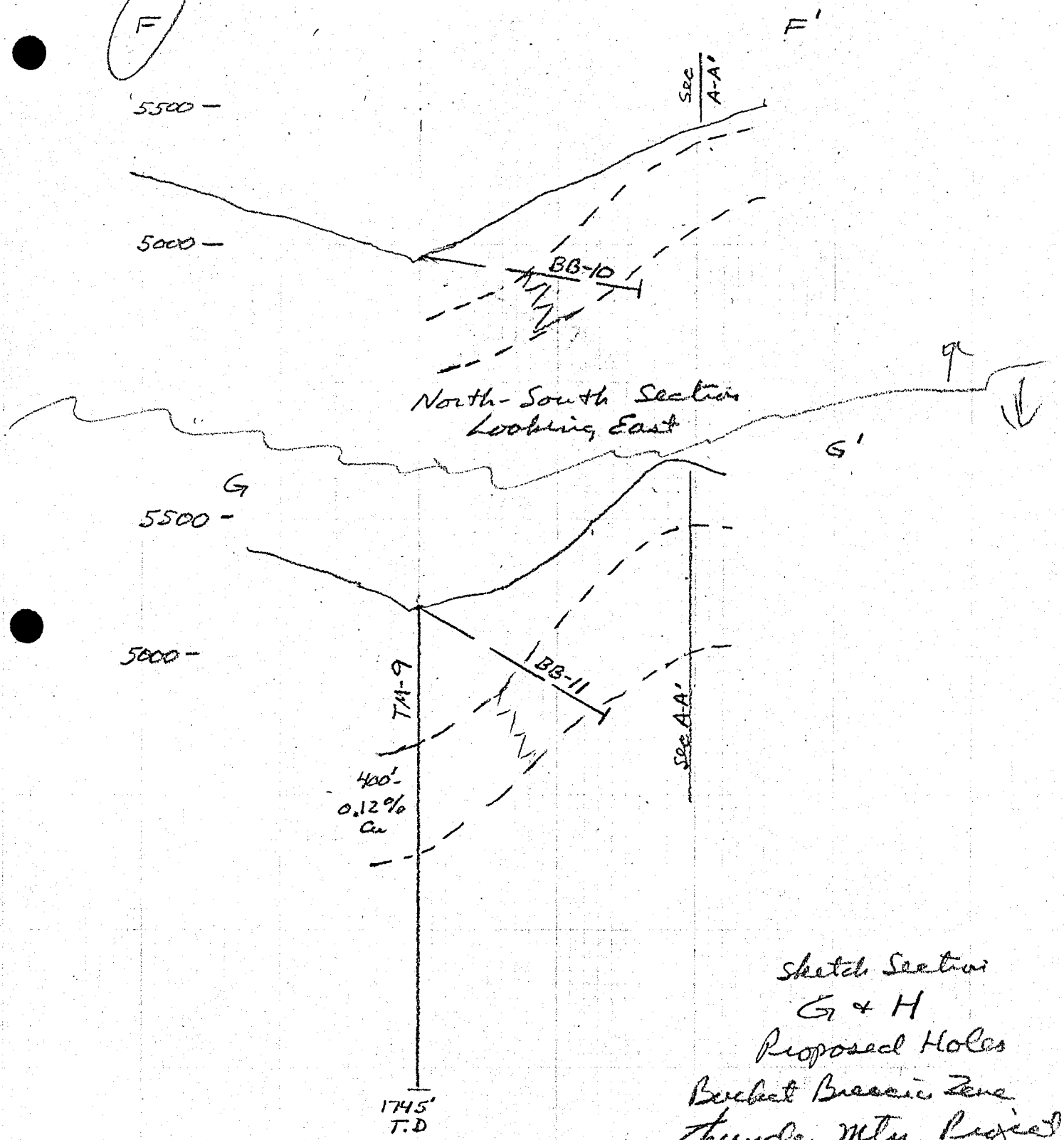
East-West Section
Looking North.

Sketch Section
E & F
Proposed Holes
Bucket Breccia Zone
Thunder Mtn Project
Patagonia Mtns, AZ
1" = 500'

JRSell

5-9-90

put w/E



North-South Section
Looking East

Sketch Section
G + H
Proposed Holes
Bucket Breccia Zone
Thunder Mtn Project
Patagonia Mtns, AZ
1" = 500'

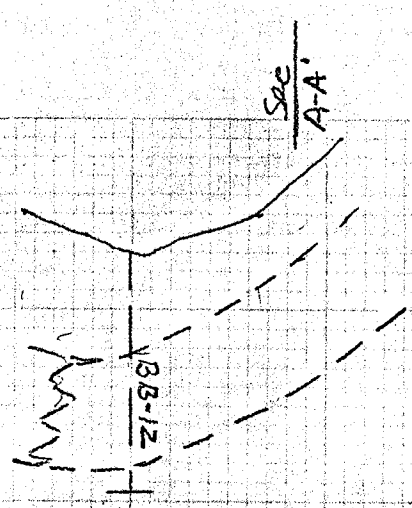
JDSell

5-9-90

Put below G

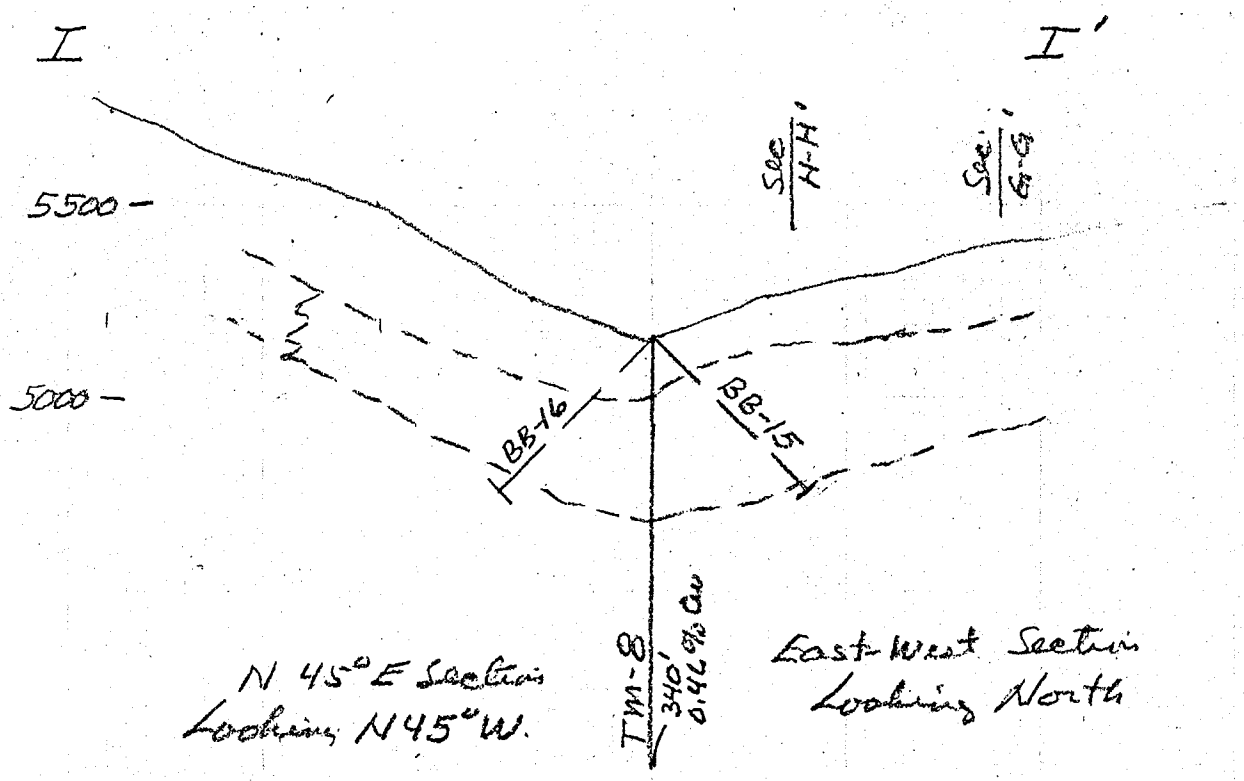
H

5250 —



H'

North-South Section
Looking East.



Sketch Section
I
Proposed Holes
Bucket Breccia Zone
Thunder Mountain Project
Patagonia Mtns, AZ
1" = 500'

GWSeel

5-9-90

JDS note

Thunder Mtn

SEA Requested: 6/ /90 Approved:

ADWR Requested: May 24, 1990 Approved: June 5, 1990

Notified FS: 5/25/90 Approved: in reviews.

Joy CBC bid received: May 23, 1990

ASARCO

Southwestern Exploration Division

June 8, 1990

R.L. Brown
New York Office

Supplemental Exploration
Appropriation
Thunder Mountain Project
Santa Cruz Co., Arizona

Mr. Sell requests $250,000 to drill 15 holes to define a previously indicated copper resource of perhaps 50 million tons with a 2:1 waste to ore ratio and grading +0.35% copper. The copper is contained mainly in the mineral covellite and is mainly fractured controlled, so may be amenable to dump leaching or perhaps even in situ leaching.

To date Asarco has spent $458,000 and must spend a total of $1 million to earn its 50% interest with Kerr McGee holding the other 50%.

W. L. Kurtz

W.L. Kurtz

WLK:mek
Atts.

cc: J.D. Sell

ASARCO

Southwestern Exploration Division

June 8, 1990

W.L. Kurtz

Supplemental Exploration
Appropriation
Thunder Mountain Project
Patagonia Mountains
Santa Cruz County, AZ

I submit SEA Form 302-MB for $250,000 to commence a drilling program in the vicinity of drill holes BB-1, TM-8, TM-11, and TM-12, within the Thunder Mountain Project (Figure 1).

The Thunder Mountain Project is a joint venture with Kerr-McGee initiated in 1972. Through the end of 1989, Asarco has spent $458,000 toward a $1,000,000 expenditure to become a 50% vested interest in the Joint Venture.

The Asarco/Kerr-McGee joint venture land is colored yellow on the claim map (Figure 2A).

Four drill holes have previously been drilled into chalcocite-covellite copper mineralization and based on these holes it is suggested that perhaps 50 million tons (approx. 80% of JV land) of 0.35% copper, or better, with 0.03-0.05 ounces silver, can be outlined in a zone with around 2/1 stripping ratio. As the zone has abundant fracture controlled mineralization, an in situ system of recovery might be possible.

Fifteen drill holes have been proposed to test the zone (Figure 2B, Table 2), with a total of 12,150 feet of drilling at an average depth of 800 feet.

Estimated drilling costs, per 800 feet, are:

a)	Contract core drilling, angle	$16,000
b)	Mob.-Demob., drilling supplies	2,000
c)	Assays Cu, Au, Ag @ $19/sample	3,000
d)	Supervision, logging, core-splitting	5,000
	Total	$26,000

The deeper holes will cost an estimated $10,000 in addition to the above cost.

The zone proposed for drilling is the Bucket Breccia zone named for the drill hole BB-1 (Bucket Breccia-1) which initially intercepted 100 feet of 0.43% copper, from 380-480 feet, in an inclined hole bearing N75°W and inclined at minus 60°. The intercept in BB-1 is located within a 320 foot zone of 0.32% copper with 0.04 oz. silver. The mineralogy is primarily covellite and pyrite, with enargite and chalcocite, disseminated and fracture-controlled, in a high-level blanket above the deep TM-8 porphyry copper mineralization.

Figure 3, 4, and 5 show the initial holes and their intercepts in the proposed zone. Figures 6 thru 10 plot the expected intercept of the proposed holes BB-2 through BB-16.

A few of the holes on the west end, although collared on Thunder Mountain claims, will terminate on Asarco's Three R claims (in blue on Figure 2A).

James D. Sell

James D. Sell

JDS:mek
Atts.

cc: R.L. Brown

FORM 302-MB (9/79)

New York No. 0042-14

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

June 8, 1990 Originating Office Tucson, SWED

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

No. EA-0042, Thunder Mountain, AZ

Present total Estimated Cost		$ 968,000
Amount previously authorized (date 8-9-88)	EA-042-13	$ 718,000
Balance for which Authorization is now requested		$ 250,000

ADDITIONAL WORK CONTEMPLATED:

Drill 15 diamond drill holes to an average depth of 800'.

EXPLANATION OF INCREASED COST:

To define previously indicated zone that may contain 50 million tons, of 0.35+% copper zone, with a 2/1 stripping ratio.

Reviewed by C. L. Snow
ACC'T. MGR. OR CHIEF ACCN'T.

Recommended by James D. Sell
James D. Sell
SUPERVISOR

Approved by
CONTROLLER

Account Chargeable to
TO BE FILLED IN BY CONTROLLER

Approved by
VICE PRESIDENT

Approved by Advisory Committee
See approved June 21
19

Approved by Board of Directors
19

SECRETARY

PRINTED IN U.S.A.

Thunder Mountain Project

Santa Cruz County, Arizona

Table 1. - Drill Holes, depth to sulfides, length-grade

Drill Hole	Elevation Top of Sulfides	? drill hole ? Vertical Thickness-Grade
TM-8	±5210'	340' at 0.46% Cu
TM-11	±5190'	220' at 0.39% Cu plus 145' at 0.28% Cu below
TM-12	±5190'	28' at 0.66% Cu or 63' at 0.41% Cu or 390' at 0.25% Cu
BB-1	±5270'	100' at 0.43% Cu
TM-9	±4600'	400' at 0.12% Cu
TR-10	±5140'	50' at 0.63 ppm ? Cu
TM-10	only trace of copper in upper level	
TR-11	only trace of copper in upper level	
TR-15	±5580'	70' at 0.12% Cu
TR-14	±5480'	50' at 0.50% Cu

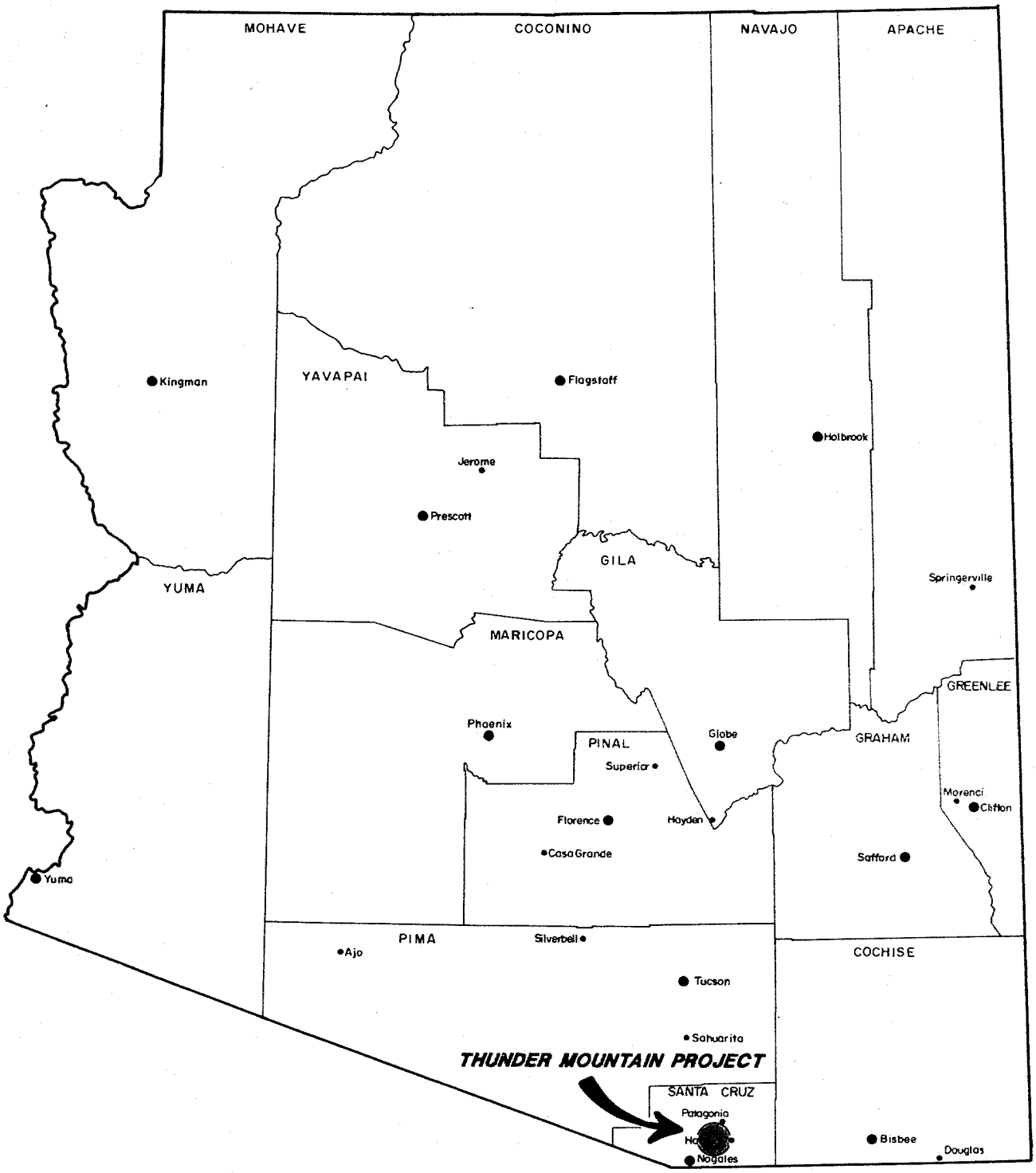
Thunder Mountain Project

Santa Cruz County, Arizona

Table 2. - Proposed Holes, BB-Series

Hole Number	Location - Inclination	See Section	Depth Feet
BB-~~2~~ BB-7	At site BB-1, Vertical	A-A'-2	650
BB-3	At site BB-1, due East, -45°	A-A'-2	850
BB-4	At site BB-1, due North, -60°	C-C'-2	1,400
BB-5	400' SW of BB-1, Vertical	D-D'	700
BB-6	400' SW of BB-1, due West, -45°	D-D'	1,250
BB-7	400' SW of BB-1, due East, -45°	D-D'	850
BB-8	800' SW of BB-1, Vertical	E-E'	700
BB-9	800' SW of BB-1, due East, -45°	E-E'	800
~~BB-10~~	~~600' East of TM-9, due South, -10°~~	~~F-F'~~	~~800~~
BB-~~11~~ 5	At site TM-9, due South, -30°	G-G'	800 ✓
BB-~~12~~ 4	500' NE of TM-8, Vertical	H-H'	~~600~~ 797
BB-~~13~~ 3	At site TM-8, due North, -45°	B-B'-2	~~700~~ 725
BB-14	At site TM-8, due South, -10°	B-B'-2	950
BB-~~15~~ 6	At site TM-8, due East, -45°	I-I'	550
BB-~~16~~ 2	At site TM-8, S45°W, -45°	I-I'	~~550~~ 516
			12,150 feet

FIGURE I



ASARCO Incorporated

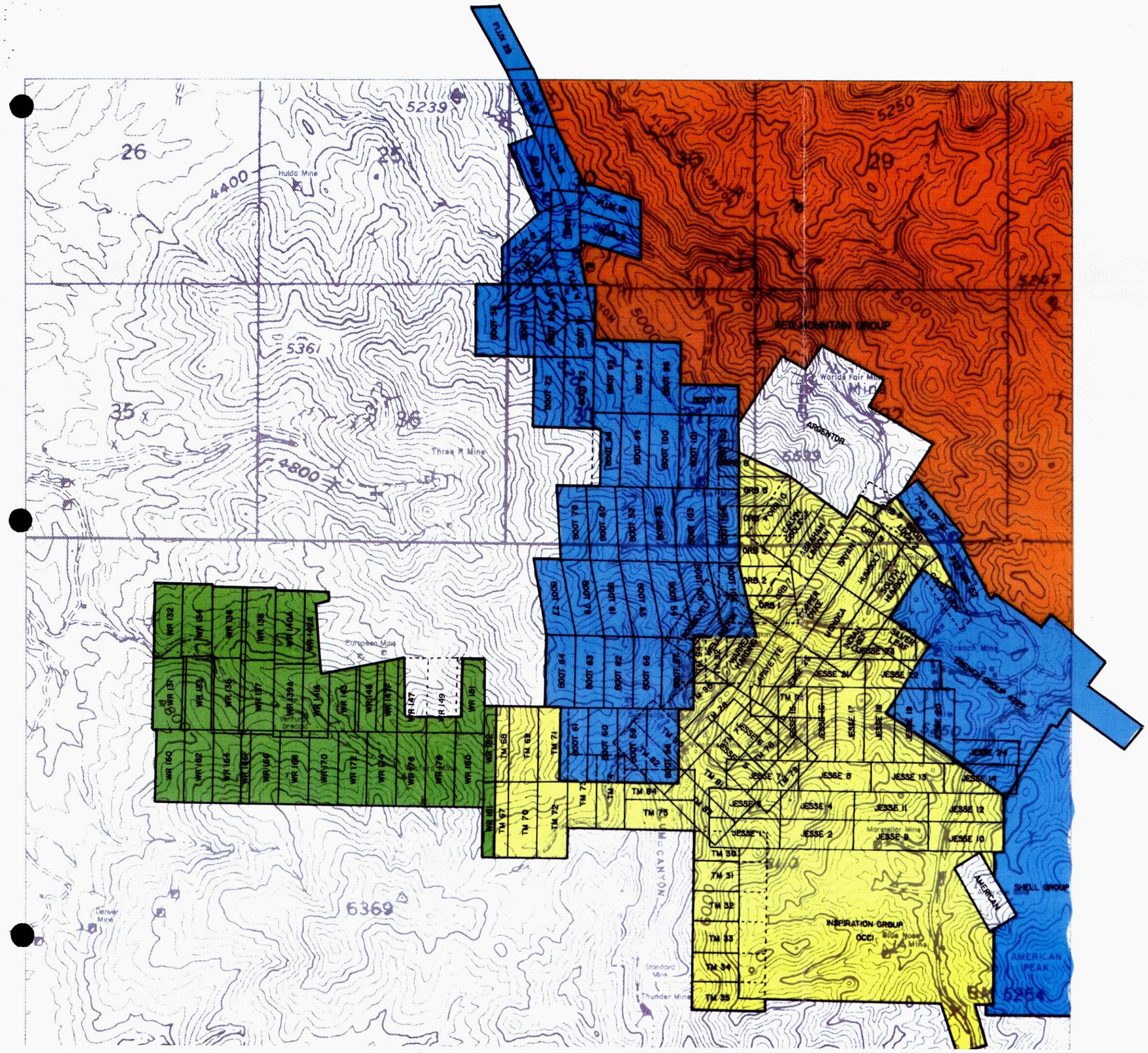
INDEX MAP

THUNDER MOUNTAIN PROJECT
SANTA CRUZ CO.,ARIZONA
J.D.S. 4-88

0 50
MILES

mn6599 JDS/dam tuc 4-88

FIGURE 2A



EXPLANATION

ASARCO / KERR-McGEE JOINT VENTURE

- HUMBOLT GROUP
- INSPIRATION GROUP
- JESSE GROUP
- ORB GROUP
- THUNDER MOUNTAIN GROUP

ASARCO / NORANDA JOINT VENTURE

- WEST RANGE GROUP

ASARCO

- BOOT GROUP
- FLUX GROUP
- SHELL GROUP
- TRENCH GROUP

KERR-McGEE

- RED MOUNTAIN GROUP

ASARCO Incorporated

CLAIM MAP OF THE PATAGONIA MOUNTAINS

SANTA CRUZ CO., ARIZONA

0 2000'

mn6726 JDS/dam.tuc 05-26-89

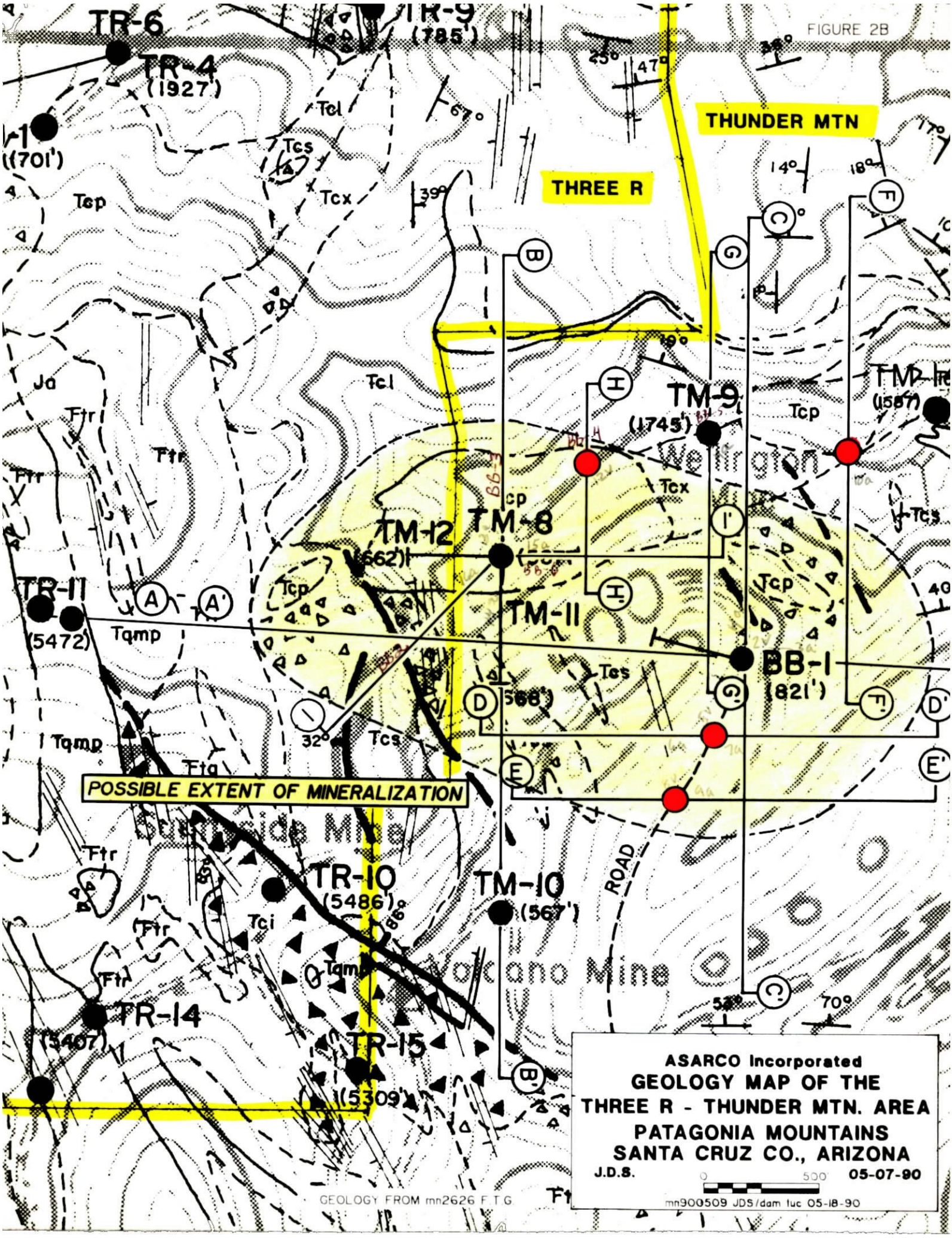
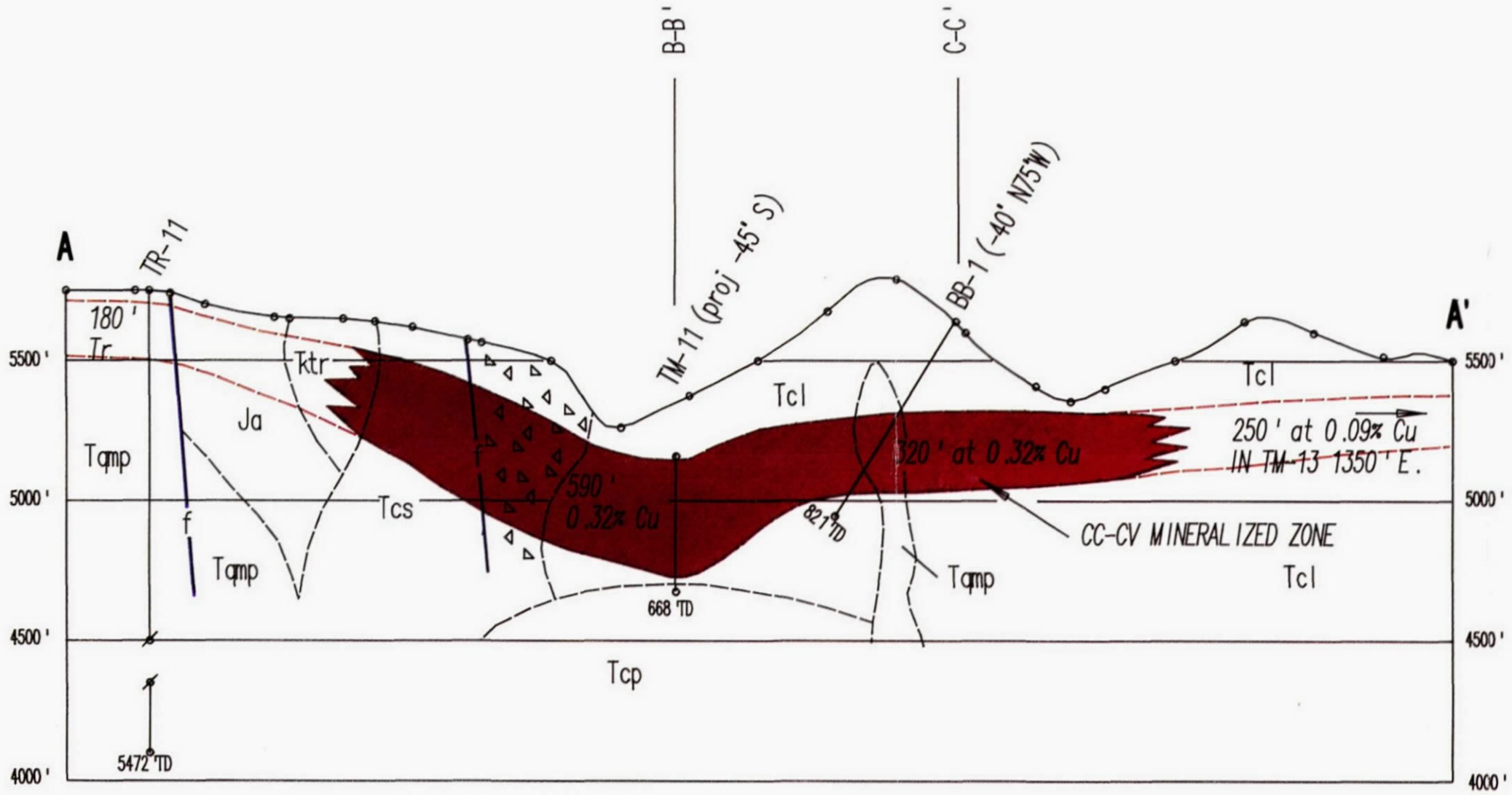


FIGURE 2B
TR-6
TR-9
(785')
TR-4
(1927')
THUNDER MTN
THREE R
TM-9
(1745')
TM-12
(662')
TM-8
TR-11
(5472)
TM-11
BB-1
(821')
POSSIBLE EXTENT OF MINERALIZATION
TR-10
(5486')
TM-10
(567')
ROAD
TR-14
(5407)
TR-15
(5309')
Tcl
Tcs
Tcx
Tcp
Ja
Ftr
Tqmp
Tqm
Tci
Ftg
ASARCO Incorporated
GEOLOGY MAP OF THE
THREE R - THUNDER MTN. AREA
PATAGONIA MOUNTAINS
SANTA CRUZ CO., ARIZONA
J.D.S.
05-07-90
mn900509 JDS/dam luc 05-18-90
GEOLOGY FROM mn2626 F.T.G.

FIGURE 3



EAST-WEST SECTION, LOOKING NORTH

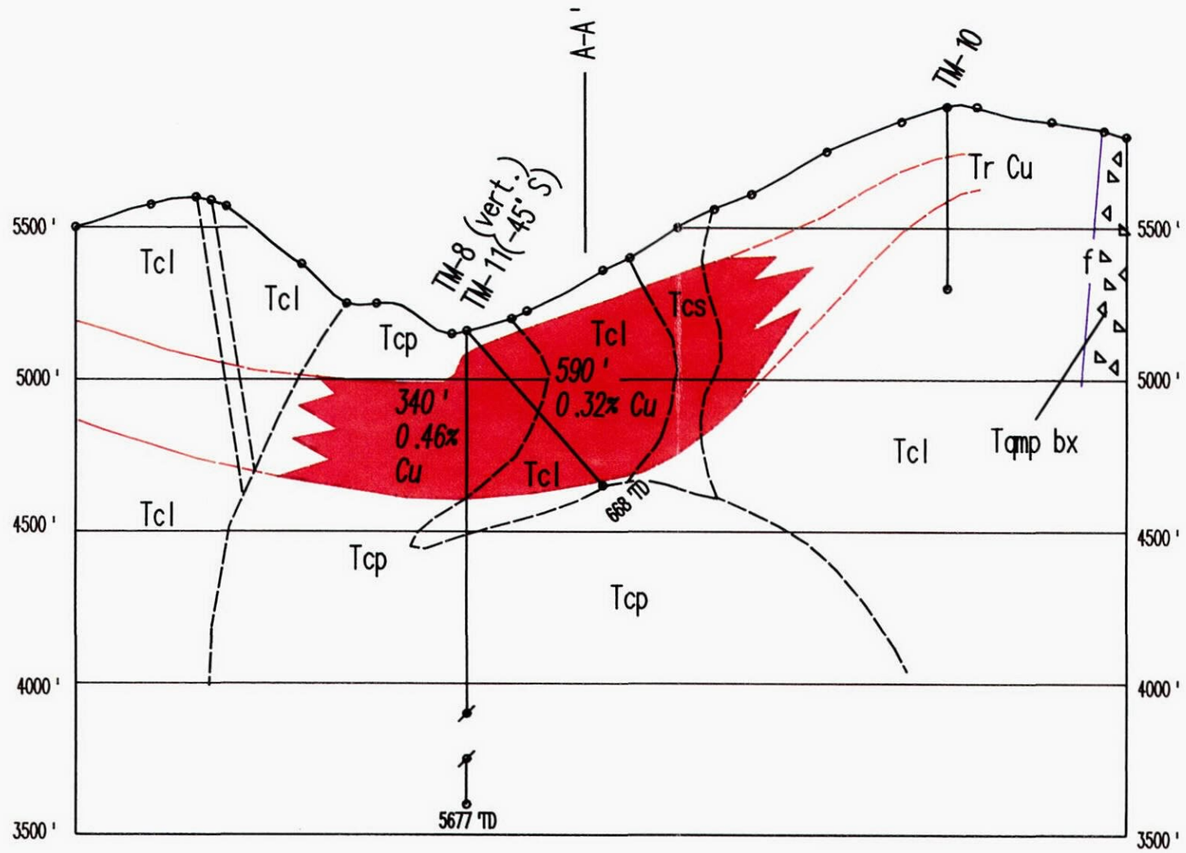
ASARCO Incorporated
THUNDER MOUNTAIN PROJECT
DRILL HOLES, GEOLOGY, ASSAY
SECTION A-A'
BUCKET BRECCIA ZONE
PATAGONIA MTNS., AZ.

J.J.SELL 05-07-90

0 250' 500'

mn900510 JDS/dam tuc 05-21-90

FIGURE 4



NORTH-SOUTH SECTION, LOOKING EAST

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT
DRILL HOLES, GEOLOGY, ASSAY

SECTION B-B'

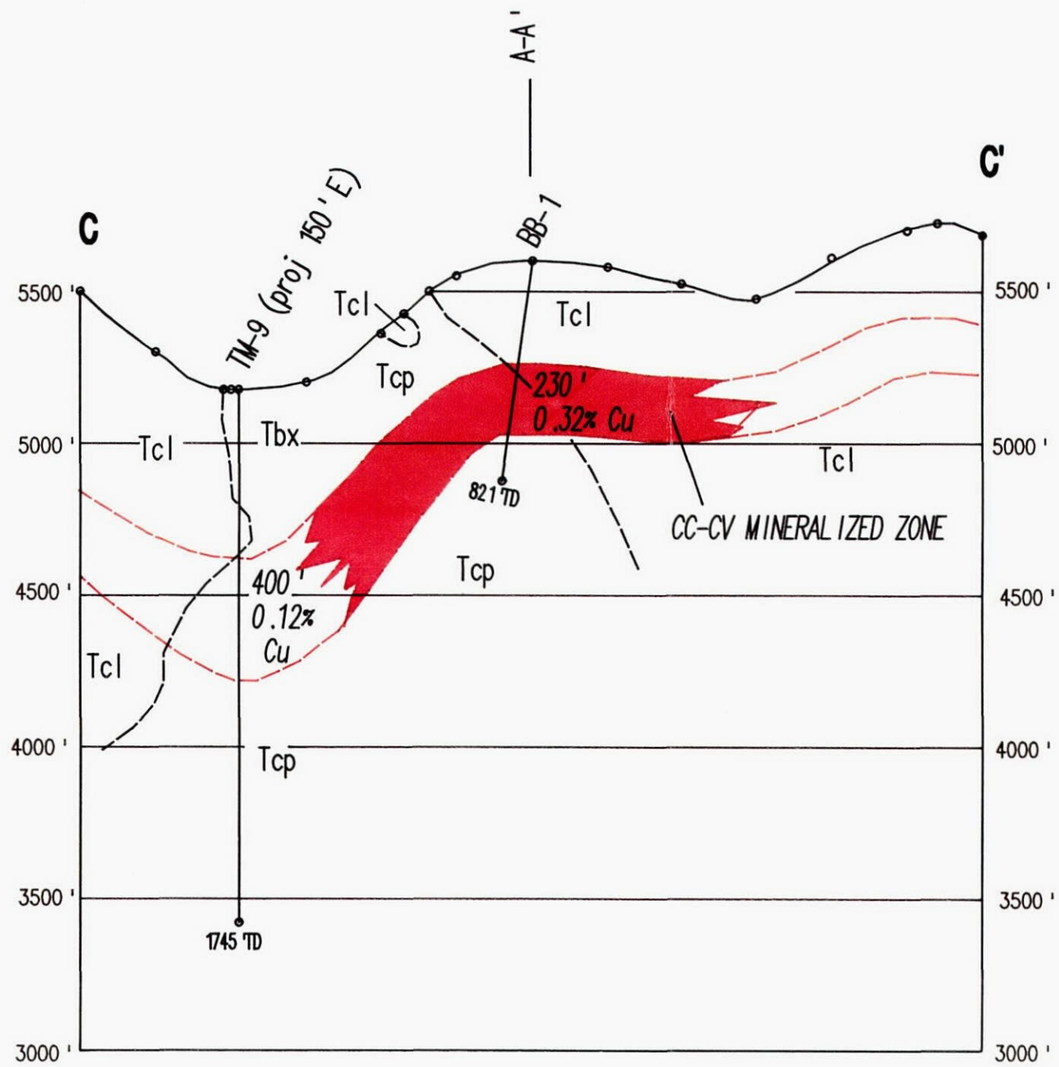
BUCKET BRECCIA ZONE
PATAGONIA MTNS., AZ.

J.J.SELL 05-07-90

0 250' 500'

mn900511 JDS/dam tuc 05-21-90

FIGURE 5



NORTH-SOUTH SECTION, LOOKING EAST

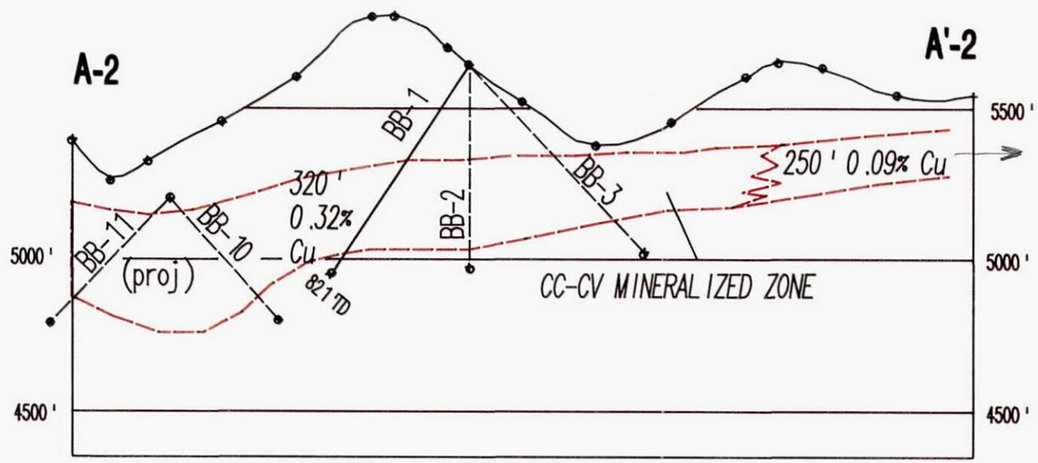
ASARCO Incorporated
THUNDER MOUNTAIN PROJECT
DRILL HOLES, GEOLOGY, ASSAY
SECTION C-C'
BUCKET BRECCIA ZONE
PATAGONIA MTNS., AZ.

J.J.SELL 05-07-90

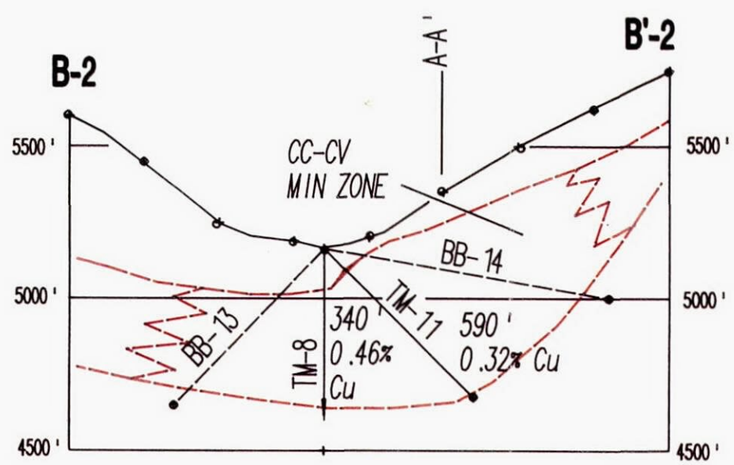
0 250' 500'

mn900512 JDS/dam tuc 05-21-90

FIGURE 6



EAST-WEST SECTION, LOOKING NORTH
PROPOSED DRILL HOLES BB2 AND BB-3



NORTH-SOUTH SECTION, LOOKING EAST

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT
PROPOSED DRILL HOLES

SKETCH SECTIONS A-2 & B-2

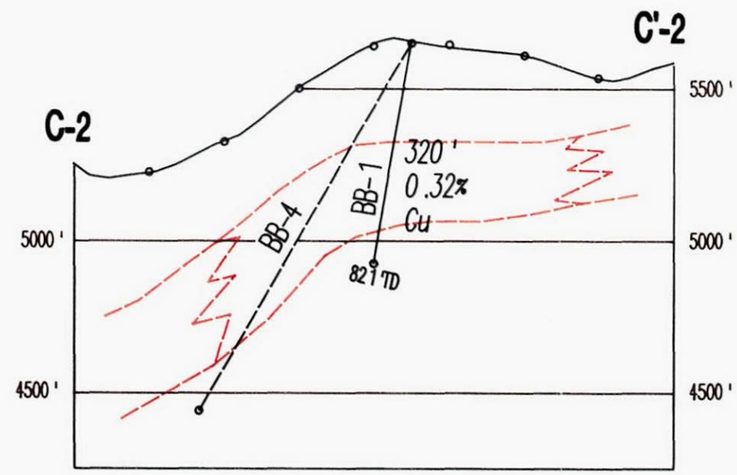
BUCKET BRECCIA ZONE
PATAGONIA MTNS., AZ.

J.D.SELL 05-09-90

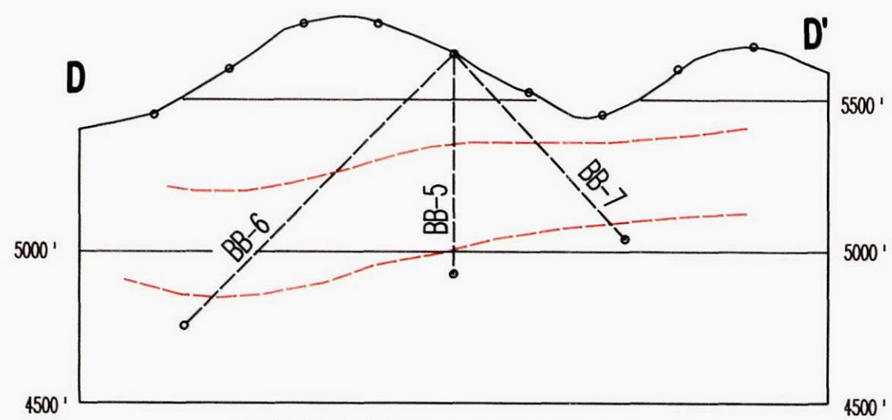
0 250' 500'

mn900513 JDS/dam tuc 05-21-90

FIGURE 7



NORTH-SOUTH SECTION, LOOKING EAST
PROPOSED DRILL HOLE BB-4



EAST-WEST SECTION, LOOKING NORTH
PROPOSED DRILL HOLES BB-5, 6, 7

ASARCO Incorporated

THUNDER MOUNTAIN PROJECT

PROPOSED DRILL HOLES

SKETCH SECTIONS C-2 & D

BUCKET BRECCIA ZONE

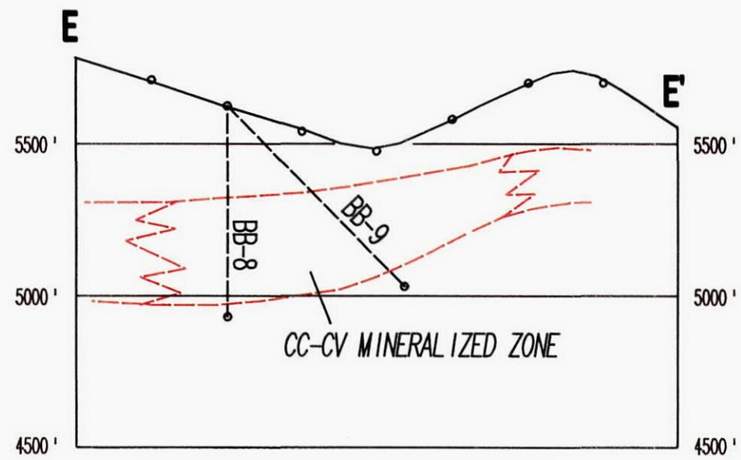
PATAGONIA MTNS., AZ.

J.D.SELL **05-09-90**

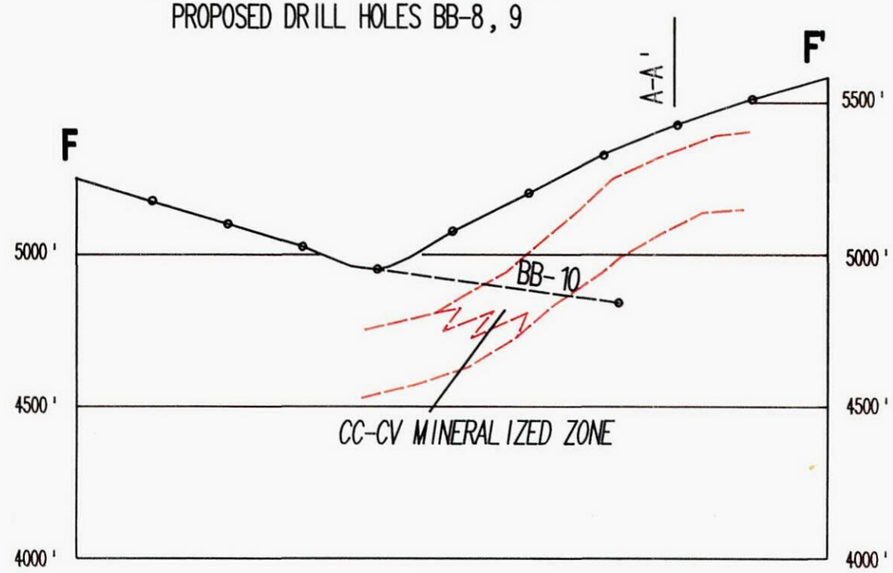
0 250' 500'

mr900514 JDS/dam tuc 05-21-90

FIGURE 8



EAST-WEST SECTION, LOOKING NORTH
PROPOSED DRILL HOLES BB-8, 9



NORTH-SOUTH SECTION, LOOKING EAST
PROPOSED DRILL HOLE BB-10

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT
PROPOSED DRILL HOLES

SKETCH SECTIONS E & F

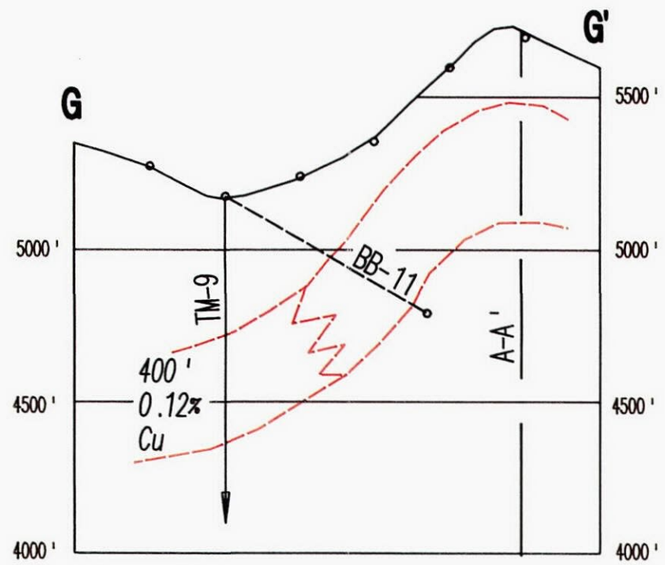
BUCKET BRECCIA ZONE
PATAGONIA MTNS., AZ.

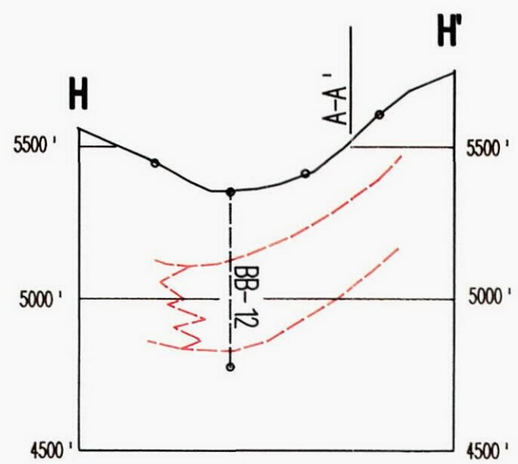
J.D.SELL 05-09-90

0 250 ' 500 '

mn900515 JDS/dcm tuc 09-22-90

FIGURE 9





NORTH-SOUTH SECTION, LOOKING EAST
PROPOSED DRILL HOLE BB-12

ASARCO Incorporated

THUNDER MOUNTAIN PROJECT

PROPOSED DRILL HOLES

SKETCH SECTIONS G & H

BUCKET BRECCIA ZONE

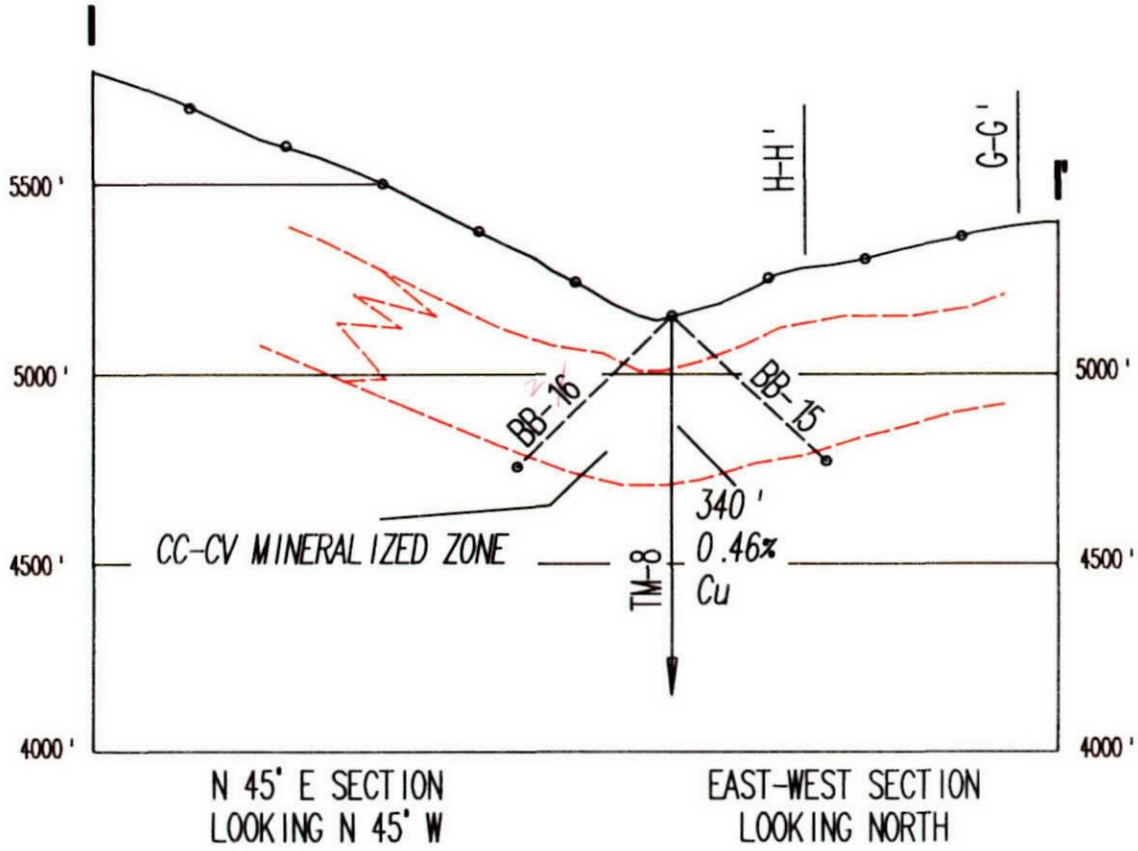
PATAGONIA MTNS., AZ.

J.D.SELL **05-09-90**

0 250 ' 500 '

mr900516 JDS/dcm tuc 05-22-90

FUGURE 10



PROPOSED DRILL HOLES BB-15, 16

ASARCO Incorporated

THUNDER MOUNTAIN PROJECT

PROPOSED DRILL HOLES

SKETCH SECTION I

BUCKET BRECCIA ZONE

PATAGONIA MTNS., AZ.

J.D.SELL **05-09-90**

0 250' 500'

mn900517 JDS/dcm tuc 05-22-90

FILE
JDS

New York, June 15, 1990

MEMORANDUM FOR: T. C. Osborne

ASARCO Incorporated
JUN 20 1990
SW Exploration

Thunder Mtn. Project
Arizona

The Thunder Mtn. Project is a 181 claim property held under a joint venture with Kerr-McGee that was formed in 1972. The agreement was amended eight times, most recently on January 1, 1988. Under that amendment the annual work commitments were suspended until October 1991 (they will be $100,000 annually after that date), and the Humboldt claims were added to the joint venture.

As you know, the exploration target of most recent interest has been the deep precious metal target identified in Hole TM-14. Substantial thought was given to the development of a lead-zinc precious metals target at shallow depth in Paleozoic limestones. No targets of reasonable quality were identified. Attention was then turned to an area in the Bucket Breccia zone where potential for 50 million tons of leachable copper grading about .35% Cu is conceptually possible. This material would also be available to open pit mining at a 2:1 stripping ratio.

Tucson Office geologists recommend that 15 holes be drilled during 1990 at a cost of $250,000. I feel that such an expenditure would be an excessive commitment at this time and am recommending that we drill perhaps 8 or 9 holes at a cost of $100,000, and request authority to spend that amount.

RLBrown

R. L. Brown

RLB:mc
Att.

cc: J. D. Sell
WL Keerty

JDS

ASARCO

Exploration Department
R. L. Brown
Vice President

July 3, 1990

ASARCO Incorporated
JUL 9 1990
SW Exploration

Mr. J. D. Sell
Tucson Office

Thunder Mtn. Project
Arizona

Dear Mr. Sell:

I attach hereto a copy of Form 302-MB and the request for the above-captioned project. Please note that this form has been processed by the Controllers Department and by Messrs. R. deJ. Osborne and T. C. Osborne.

Yours very truly,

R. L. Brown

RLB:mc
Att.

cc: E. J. Franko (w/att.)
C. L. Snow (w/att.)
W. L. Schoonmaker (w/att.)

ASARCO Incorporated 180 Maiden Lane New York, N.Y. 10038 (212) 510-2000
Telex:RCA 232378 Cable: MINEDEPART Fax: (212) 510-1978

I see that "in situ" is now the key word. This project has changed with the times, as needed to keep it alive.

New York, June 15, 1990

MEMORANDUM FOR: T. C. Osborne

Thunder Mtn. Project
Arizona

JUN 21 1990

T. C. O

The Thunder Mtn. Project is a 181 claim property held under a joint venture with Kerr-McGee that was formed in 1972. The agreement was amended eight times, most recently on January 1, 1988. Under that amendment the annual work commitments were suspended until October 1991 (they will be $100,000 annually after that date), and the Humboldt claims were added to the joint venture.

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R. L. Brown

RLB:mc
Att.

cc: J. D. Sell

FORM 302-MB (9/79)

New York No. 0042-14

APPLICATION FOR SUPPLEMENTAL EXPLORATION APPROPRIATION

June 8, 1990 Originating Office Tucson, SWED

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

No. EA-0042, Thunder Mountain, AZ

Present total Estimated Cost		$ 968,000
Amount previously authorized (date 8-9-88)	EA-042-13	$ 718,000
Balance for which Authorization is now requested		$ 250,000

ADDITIONAL WORK CONTEMPLATED:

Drill 15 diamond drill holes to an average depth of 800'.

EXPLANATION OF INCREASED COST:

To define previously indicated zone that may contain 50 million tons, of 0.35+% copper zone, with a 2/1 stripping ratio.

Reviewed by C. L. Brown
ACC'T. MGR. OR CHIEF ACC'N'T.

Recommended by James D. Sell
James D. Sell
SUPERVISOR

Approved by R.J. O'KEEFE
CONTROLLER

Account Chargeable to EXPLORATION EXPENSE
TO BE FILLED IN BY CONTROLLER

Approved by R.H. Brown
VICE PRESIDENT

Approved by Advisory Committee
..... 19.....

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

JUN 21 1990

PRINTED IN U.S.A.

ASARCO

Southwestern Exploration Division

JDS

July 11, 1990

J.J. Malusa

Expenditures
Thunder Mountain Project
Santa Cruz County, Arizona

I have received the authorization to proceed at Thunder Mountain.

It is requested that we keep the expenditures below $100,000 and this may be expended in 4 or so holes.

Keep tabs on the costs, drilling, yours, consultant, assays, etc. and review how we can get the best info for our monies.

James D Sell

J. D. Sell

JDS:mek

cc: W.L. Kurtz

TAB

DRILL INFO

Drilling Info
Maps / Sections
Assays
Forest Service
Leach Tests / Whole Rock Analyses / Thin-Sections

ASARCO

Southwestern Exploration Division

JDS

June 9, 1978

F.T.G.

TO: F. T. Graybeal

FROM: S. R. Davis

Summary of TM-11 and TM-12
Thunder Mountain Project
Patagonia Mountains, Arizona

During late summer of 1977, two shallow angle holes were drilled from the existing TM-8 site. Both holes encountered a zone of low grade copper mineralization dominated by covellite and with minor enargite, chalcocite and chalcopyrite. As in the upper portion of TM-8, alteration typically consists of intense sericitization with subsidiary quartz, clay and alunite. Both TM-11 and TM-12 were terminated prematurely as they encountered nearly impenetrable, very weakly mineralized, brecciated silica tuff (silica breccia).

Drill hole TM-11 is inclined -45° to the south and was bottomed at a depth of 668.5 feet. The drill hole encountered quartz feldspar porphyry and marginal xenolithic quartz feldspar porphyry to a depth of 318 feet, where lapilli tuff of the chief diatreme was penetrated. From 609 to 625 feet a thin dike(?) of quartz feldspar porphyry transitioned with increasing depth to a massive, weakly to moderately silicified breccia and subsequently at 632 feet to a dense, homogeneous silica breccia or brecciated silica tuff.

Alteration is essentially phyllic throughout and is dominated by sericite to a depth of 625 feet, where it gives way to intense silicification. Minor clay and alunite are locally present. Copper mineralization occurs primarily as disseminated and fracture oriented covellite and enargite with lesser chalcopyrite, chalcocite and possible local tennantite/tetrahedrite also noted. Pyrite as disseminations and veinlets is the only other sulfide observed.

Although assays as high as 0.75% copper and 1.39 ounces silver/ton were received (TM-11), average values for any significant intercepts were considerably less. The major interval from 40 to 630 feet (590 feet) averaged 0.325% copper and on the basis of spot assays, approximately $\geq$0.3 ounces silver/ton. The best interval, from 360 to 390 feet (30 feet), averaged 0.62% copper and contained only one silver assay (1.39 ounces Ag/ton).

Drill hole TM-12 is inclined -45° to the west and reached a total depth of 622 feet. The drill hole encountered mainly quartz feldspar porphyry throughout with only two thin remnants of lapilli tuff (164-200 and 581-599). A weakly silicified breccia with a considerable number of exotic fragments was penetrated from 382 to 433 feet, and the hole bottomed in dense silica breccia or brecciated silica tuff (599-622).

Alteration can be classed as phyllic throughout with sericite dominant to $\pm$520 feet, and silica more abundant thereafter. Minor clay and alunite were also noted. Copper mineralization occurs as disseminated and fracture contolled covellite and very minor chalcocite. The only other sulfide noted is pyrite, which occurs both as fine grained disseminations and fracture coatings-veinlets.

ASARCO

Southwestern Exploration Division

July 7, 1980 JDS

FILE MEMORANDUM

Summary of TM-13
Thunder Mtn. Project
Santa Cruz County, Arizona

SUMMARY

Hole TM-13 intersected 971 ft. of Paleozoic limestone starting at 3801 ft. which was concealed below Cretaceous volcanic rocks. The carbonates are believed to be part of the Permian Earp Formation and Colina limestone and exhibit weak, pervasive sanding, recrystallization, and development of lime silicate minerals throughout. At 3977 ft. a 2-ft. section of massive sulfide averaged 2.56% Cu, 8.65% Pb, 11.60% Zn, 3.56 oz. Ag, and 0.016 oz. Au. Vertical alteration and mineralization zoning is poorly developed and appears largely controlled by the distribution of unlike rock types. However, the presence of a long column of hydrothermally altered carbonate rock is favorable and justifies further drilling.

INTRODUCTION

Hole TM-13 was collared roughly 1000 ft. southwest of the Trench mine on the Kerr-McGee Thunder Mtn. property. The purpose was to determine whether or not Paleozoic limestones with replacement ores might underlie the Trench area. The downward projection of the Trench vein which had produced roughly 185,000 tons averaging 7% Pb, 6% Zn, and 6 oz. Ag indicated a favorable environment for massive limestone replacement mineralization if the limestones were present. Interpretation of Paleozoic limestone outcrops roughly one mile to the south and certain relationships in the Hardshell area suggested that the limestones would be present at reasonable depths. Drilling was carried out on the Kerr-McGee ground instead of directly under the Trench mine largely because of various work commitments on the former and because initial geologic projections suggested the limestone section would be substantially shallower on the Kerr-McGee ground.

The hole was drilled with a Joy HD-22 for an aggregate cost of $31.45/ft. At 4250 ft. the hole had deviated rather uniformly to a point 145 ft. S56°E from the collar. This report was supplemented by a study of 28 thin sections. Much of the information contained in the detailed geologic log has been summarized on the attached graphic log and geologic section.

ROCK TYPES

Rock types are largely volcanic from 0-3801 ft. and Paleozoic limestone from 3801-4777 ft. Diabase was cut from 0-217 ft. It is typical of the diabase mapped in the Trench area and contained no evidence as to a flow or intrusive origin.

Underlying the diabase is a 3584 ft. thick section of rhyolitic volcanic rocks similar to those mapped by Steve Davis around the Hardshell mine and south to Corral Canyon along the east flank of American Peak. The upper half of the rhyolitic rocks is dominated by various breccias, lapilli tuffs, and

ANNUAL PROJECT PLANNING SHEET

DISTRICT: Southwest
PROJECT NAME: Thunder Mountain
PROJECT NUMBER: 0042
PROJECT SUPERVISOR: W.D.Payne
PROJECT GEOLOGIST: F.R.Koutz
PREPARED BY/DATE: FRK/6-1-81

EXPENDITURES

1. Month of _____ $_____
2. Current Year Expenses to Date thru _____ $_____
3. Budget for Current Year 19__ $ *
4. Thru previous year, since project began $364,257

TYPE OF PROJECT

	Recon
X	Drilling
	Pre-Development
	Other

COST ESTIMATE & APPROPRIATION REQUEST

		Approvals: Dist. Geol.	Approvals: West. U.S.
Current Yr. Orig. Budget	$?*		
Current Yr. Add. Request @ _____	$		
Current Yr. Add. Request @ _____	$		
New Total	$		

OBJECTIVE: Hold ground for 1981. Work to be done via Trench-Humboldt planning sheet, vis drilling of TCH-2.

Progress for the Month of _____

*Not split out from Trench-Humboldt (1981 budget estimate of 4/8/81 WLK to FTG).

PLANNED TASKS	RESPONSIBILITY/TIME TO COMPLETE	TARGET DATE	% COMPLETE	PROGRESS TO DATE
See project sheet for Trench-Humboldt.				

June 81

WDP

ANNUAL PROJECT PLANNING SHEET

DISTRICT: Southwestern
PROJECT NAME: Thunder Mountain
PROJECT NUMBER: EA-0042
PROJECT SUPERVISOR: W. D. Payne
PROJECT GEOLOGIST: F. R. Koutz
PREPARED BY/DATE: FRK 2/19/82

EXPENDITURES

1. Month of _____ $_____
2. Current Year Expenses to Date thru _____ $_____
3. Budget for Current Year 19__ $_____
4. Thru previous year, since project began $366,172

TYPE OF PROJECT

	Recon
X	Drilling
	Pre-Development
	Other

COST ESTIMATE & APPROPRIATION REQUEST

		Approval Dist. Geol.
Current Yr. Orig. Budget	$	
Current Yr. Add. Request @ _____	$	
Current Yr. Add. Request @ _____	$	
New Total	$	

Progress for the Month of _____

OBJECTIVE: Hold ground for 1982 and complete required work commitment. Drill, or start to drill, one 6000' hole to test Paleozoic limestone/Laramide intrusive contact between TCH-2A & TM-8.

PLANNED TASKS	RESPONSIBILITY/TIME TO COMPLETE	TARGET DATE	% COMPLETE	PROGRESS TO DATE
1. Complete survey of TM/Worlds Fair Boundary	RBC/HMS/J. Yanez - 3 weeks	4/1/82		
2. Fly & topo map of N.Patagonia Mtns. (see Trench planning sheet)	FRK/WDP - 2 weeks	See TCH		
- survey in TM-DDH, claims	HMS/J.Yanez(?) - 2 weeks	6/1/82		
- control points				
3. DDH TM-14: Drill to fulfill work requirement of $44K				
a. Select final drill site	FRK/TCB(USFS) - 2 days	6/1/82		
b. Select contractor (Joy vs. Boyles)	FRK/WDP - 3 days	6/1/82		
c. Start drilling	Contractor	by 8/1/82		
d. Log core	FRK(SAC?) - 4 weeks	11/1/82		
4. File assessment work with Santa Cruz County & BLM	RBC - 2 days	9/1/82		
5. Notify Kerr-McGee of work completion.	RBC/WDP/GMC	10/1/82		

Feb 82

WDP

ANNUAL PROJECT PLANNING SHEET

DISTRICT: Southwestern
PROJECT NAME: Thunder Mountain
PROJECT NUMBER: EA-0042
PROJECT SUPERVISOR: W. D. Payne
PROJECT GEOLOGIST: F. R. Koutz
PREPARED BY/DATE: FRK 2/19/82

EXPENDITURES

1. Month of March $ 2,816
2. Current Year Expenses to Date thru March $ (26,770)
3. Budget for Current Year 19__ $
4. Thru previous year, since project began $ 366,172

TYPE OF PROJECT

	Recon
X	Drilling
	Pre-Development
	Other

COST ESTIMATE & APPROPRIATION REQUEST

		Approval Dist. Geol.
Current Yr. Orig. Budget	$	
Current Yr. Add. Request @ ____	$	
Current Yr. Add. Request @ ____	$	
New Total	$	

OBJECTIVE: Hold ground for 1982 and complete required work commitment. Drill, or start to drill, one 6000' hole to test Paleozoic limestone/Laramide intrusive contact between TCH-2A & TM-8.

Progress for the Month of March

PLANNED TASKS	RESPONSIBILITY/TIME TO COMPLETE	TARGET DATE	% COMPLETE	PROGRESS TO DATE
1. Complete survey of TM/Worlds Fair Boundary	RBC/HMS/J. Yanez - 3 weeks	4/1/82	75%	Having trouble locating & distinguishing old corners, especially on Schee Group (TM)
2. Fly & topo map of N.Patagonia Mtns. (see Trench planning sheet)	FRK/WDP - 2 weeks	See TCH		TCB locating old location posts + repapering No posts remain on OCCI Group
- survey in TM-DDH, claims - control points	HMS/J.Yanez(?) - 2 weeks	6/1/82	10%	Rough estimate obtained from Cooper Aerial Surveys: $4500
3. DDH TM-14: Drill to fulfill work requirement of $44K				
a. Select final drill site	FRK/TCB(USFS) - 2 days	6/1/82	20%	W. corner of Monoca claim to be surveyed
b. Select contractor (Joy vs. Boyles)	FRK/WDP - 3 days	6/1/82	0%	Waiting for GO from NYO
c. Start drilling	Contractor	by 8/1/82	0%	
d. Log core	FRK(SAC?) - 4 weeks	11/1/82	0%	
4. File assessment work with Santa Cruz County & BLM	RBC - 2 days	9/1/82	0%	Could be done with TCH-2A
5. Notify Kerr-McGee of work completion.	RBC/WDP/GMC	10/1/82	0%	

March 82

ASARCO

Southwestern Exploration Division

March 8, 1982

To: W. D. Payne

From: F. R. Koutz

1982 Drilling/Planning
Thunder Mountain Project, EA-0042
Santa Cruz County, Arizona

The following analysis details some facts, figures and options on this year's planning/budget for the Trench-Thunder Mountain area for your use after our conversation of March 4. Because of a $50,000 work commitment to Kerr-McGee by October 1, 1982 the next hole drilled in the Trench area will probably be on Thunder Mountain ground. The work commitment by October 1, 1984 is $1,000,000 of which we have spent approximately $164,000 to date. (There may be about $14,000 carryover from the previous 3 years' work which would reduce this year's necessary expenditures to about $36,000. This will not change the analysis below.) We also have 159 claims to file assessment work on by September 1, 1982 although this might be covered by TCH-2A drilling if all parties agree.

The logical site for the next drill hole ("TM-14") is in the immediate vicinity of the Wellington Mine about 1800' WSW of TCH-2 and 1800' ENE of TM-8. The main target is the Paleozoic carbonate/quartz feldspar porphyry contact zone where Cu > Zn > Pb + Ag skarn deposits are expected. Zn, Pb, Cu, Ag limestone-replacement mineralization, disseminated copper in intrusive rocks, veinlet-controlled Zn, Pb, Cu, Ag mineralization in pyroclastic volcanics and disseminated in epiclastic volcanics and shallow chalcocite-covellite replacements of chalcopyrite-pyrite with enargite either as disseminated blankets or in breccia pipes are known to occur within a 3000 foot radius to the east and west of the proposed hole and are additional targets. The first 500 feet of Paleozoic toward the proposed hole has been partially tested in TCH-2A for the intrusive contact. The proposed hole is nearer to TCH-2A than TM-8 because of the suspected geometry of the QFP stock in TM-8 and inferred from the 1745 feet of ground tested in TM-9 about 1000' ENE of TM-8.

"TM-14" should be budgeted for 6000' TD because the Mesozoic/Paleozoic contact projected from TCH-2, 2A, 1, and TM-13 is not expected until about 5200' depth. Costs for a 6000' hole are estimated at $250,000. If a long section of essentially barren intrusive or other host rocks has been drilled then "TM-14" could be reasonably stopped at about 5500 or even 5000 feet, although a significant thickness of intrusive over Paleozoic is possible and does occur with the monzonite porphyry in TCH-2. There is also a good chance that we will want to test additional ground from a drill-out from TM-14 no matter what is found in the main hole itself. After our experience with TCH-2/2A this would almost certainly involve significant casing purchase/rental costs.

Since funds are tight this year probably only one or two years' (back-to-back) minimum work commitment can be accomplished. A very concerted effort of roadwork (including possibly to a "TR-18" site on 3-R ground 800-1000' NNW of TM-9), geophysics, map making, surveying boundaries with the Argentor Group, repapering, reestablishing claim posts, and geologic studies might be expanded to spend the remaining $36,000 necessary expenditure but this would involve more than several man-months. Drilling is almost certainly a necessity.

"TM-14" should logically be started with NC core (after rock-bitting through over-burden) and drilled to rig-capacity depths or hole conditions force casing and reduction to NX. Such depths under good drilling conditions, which we expect if a major fault (as in TM-9) or silica breccia (as in TM-10) are not encountered, have been estimated at 3500-4000' for the Joy-36 by Jack Lloyd and Rob Gardner or 4000' for a CP-50 (Boyles) by Clark Hirschi. Such depths with NC diameter are necessary if we are to avoid the limitations of BX/AX drilling encountered in the bottoms of TCH-2 and 2A. Costs for these depths would be $25-30/foot (Joy) or a range of $87,500-$120,000 plus $28,000-$32,000 ($8/foot) NX casing purchase if rods are to be left in the hole for 12 months after drilling. Although drilling conditions are good it is very uncertain that the hole would remain open for any length of time without being cased or could be easily drilled back to original TD. This would preclude just expending $36,000 in NC-drilling (say 1400') and continuing NC at a later date from an open hole.

Less expensive rotary or hammer-drilling with 4" casing for a top-hole for TM-14 is one option but a large amount of geologic, structural and mineralization data would be lost. This information would be vital in future exploration planning in the Trench-Sunnyside area. Problems with straight holes after rotary top-holing would also be increased. A rotary top-hole this year would, however, allow the hole(s) to be drilled to completion in one pass when sufficient funds could be made available.

The best solution to this problem, under present conditions, would seem to be to drill the proposed TM-14 as deep as possible with NC core, leaving the hole cased for NX reentry. This would expend a minimum of $115,000 and possibly $150,000 and cover at least 1982 and 1983 work commitments. This would still leave at least $700,000 to be spent by October 1, 1984 if the Kerr-McGee Thunder Mountain agreement cannot be renegotiated. The mineralization encountered in TCH-2/2A certainly justifies several deep holes on Thunder Mountain ground to test for continuity.

F. R. Koutz

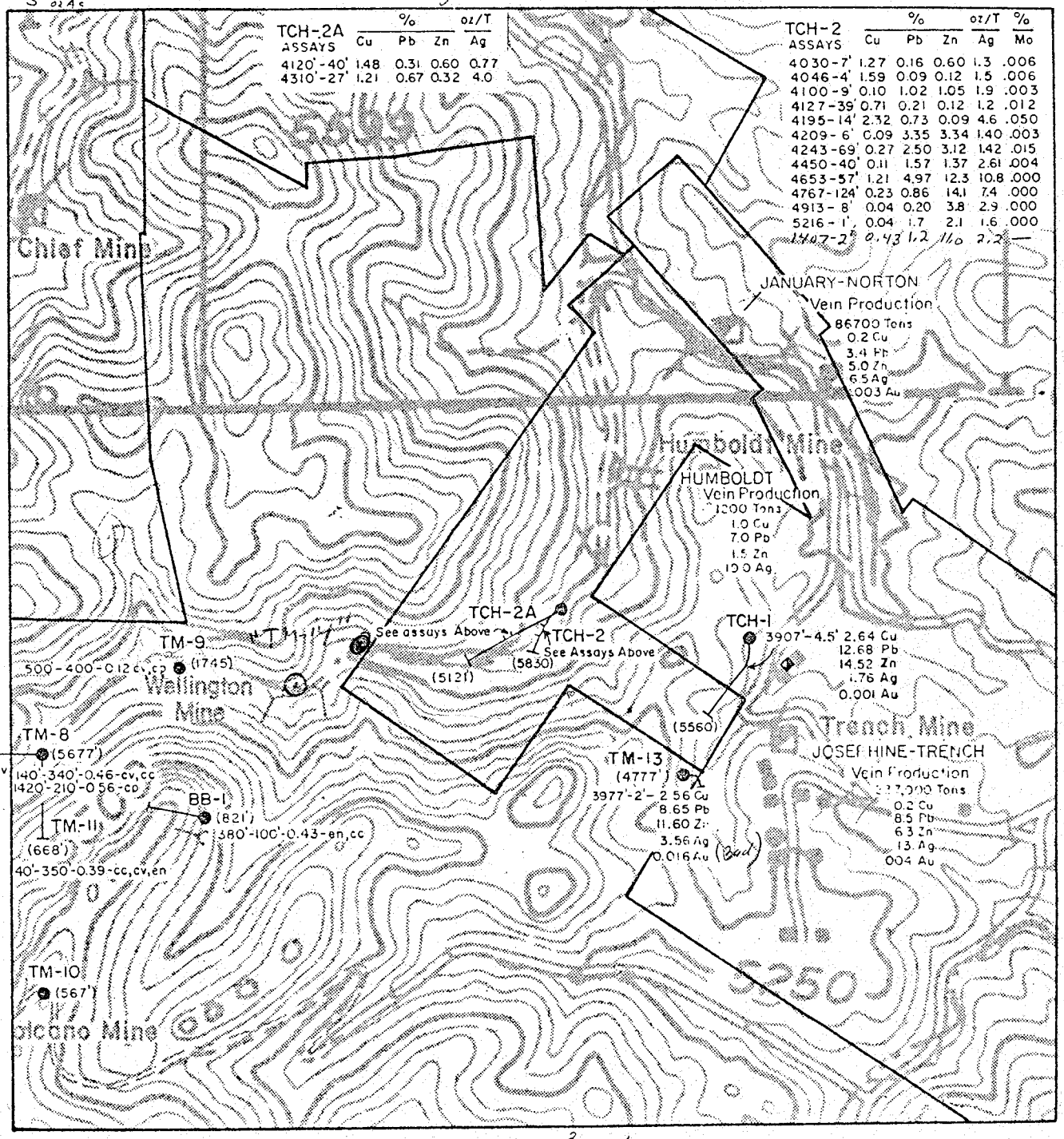
FRK/cg

cc: SACatlin

FLUX 850,000 T
52.5 Cu
5.0 Pb
8.0 Zn
5.02 As

WF Production 13,000 Tons
0.7 Cu
6.6 Pb
3 Zn
58 Ag

FRK -
EXTRA Copy



TM-13 3741-3'.1-.9-6.8 .5 Est.
TCH-1 4846 .8'-.4-6.-.50 .4 Est

EXPLANATION

- ASARCO INC. Trench Group
- ASARCO-Kerr McGee Thunder Mtn. Joint Venture
- ASARCO-Anaconda 3R Joint Venture
- Mendoza-Humboldt Group (ASARCO INC.)
- Kerr-McGee-Red Mtn.
- Lichty-Argentor

(821') BB-1 Drill hole showing depth

⊙ Proposed drill hole

ASSAY DATA KEY

depth-length-%Cu-mineral
3860'-350'-0.59-cp

GEOLOGIC LEGEND

cp-chalcopyrite
cv-covellite
cc-chalcocite
en-enargite

TO ACCOMPANY Monthly Drilling Report
DATED Dec. 30, 1981
BY F.R. Kontz

DRILL MAP
TRENCH PROJECT & THUNDER MTN. PROJECT
PATAGONIA MTNS.
Santa Cruz County, Arizona
SCALE: 1" = 1000'

F.R.K Dec., 1981

ASARCO

Southwestern Exploration Division

March 16, 1982

TO: F. R. Koutz

FROM: S. A. Catlin

Correlation of TM-13 Sedimentary
Rock Sequence
Thunder Mountain Project
Santa Cruz Co., AZ

The TM-13 drill core was logged by Fred Graybeal and reported on in his drill hole summary of July 7, 1980. At that time he tentatively identified the Paleozoic rocks cut from 3801' to the bottom of the hole (4777') as altered Colina Limestone and Earp Formation. He suggested that the quartzite encountered from 3678' to 3801' might be a basal Mesozoic unit or, alternately, might lie in the upper Paleozoic.

Because much new data on the nature of alteration in the Paleozoic sediments of the Patagonia Mountains area was generated during the study of TCH-1, TCH-2, and TCH-2A drill core, it was decided that the TM-13 data deserved a review. A brief examination of Fred's original core log, the ten TM-13 thin sections cut from below 3678', and the drill core itself generated the following conclusions:

1. The quartzite from 3678' to 3801' is probably basal Mesozoic. It is poorly sorted, with a strong feldspar content--including some probable ex-phenocrysts--and thus most likely represents locally eroded and redeposited volcanic material. It closely resembles a sandstone unit cut in TCH-1 at the base of the Mesozoic section.

2. The Paleozoic rocks from 3801' to 4777' apparently include the lowermost Epitaph as well as the Colina and much of the Earp. The section from 3801' to 4027' contains too large a volume of siltstone (approximately 20% of the interval) and of Mg-bearing minerals (chlorite, serpentine, and possibly clay) to represent the Colina, a relatively pure limestone. The thick marble below 4027' probably does belong to the Colina, but the Mg- and silt-rich stretch from 3801' to 4027' better fits the lowermost Epitaph, a silty dolomite. The interbedded marbles and siltstone-quartzites present in the bottom portion of the hole best match the Earp Formation. Exactly where the Colina-Earp contact should be drawn is debatable. Abundant siltstone-quartzite beds start below 4419', but the first one, just 3' thick, appears at 4217'-4220'.

S. A. Catlin

S. A. Catlin

SAC:mek
cc: F.T.Graybeal
W.D.Payne

JDS → work file 1982 Budget
JDS COPY
background material

ASARCO

Exploration Department
Frederick T. Graybeal
Chief Geologist

April 6, 1982

Mr. W. L. Kurtz, Manager
Western Exploration
Tucson Office

1982 Drilling
Thunder Mountain Project
Arizona

Dear Mr. Kurtz:

I have Mr. Koutz' memorandum of March 8, 1982, in which he discusses various options for completing the $50,000 work commmitment due on the Kerr-McGee ground by October 1, 1982. I discussed this subject with Mr. Koutz and Mr. Payne during my recent trip to Tucson and my views follow. The logical site for hole TM-14 is not adjacent to the Wellington Mine portal as shown on the map accompanying Mr. Koutz' memo, but in my mind would be as close as possible to the joint boundary between the Kerr-McGee claims and the Humboldt group in the bottom of Alum Canyon. A location adjacent to the claim boundary and at least 500 ft. east of the location recommended by Mr. Koutz will increase the possibility that the Paleozoic limestone section will not be cut out by the quartz feldspar porphyry stock. The objective of this drilling is to intersect high-grade mineralization in altered carbonate rocks and this objective is enhanced by moving the hole location as far east as possible. There is some likelihood the hole will deviate onto the Humboldt group. The same possibility was discussed with Mr. Jones of Kerr-McGee when we drilled TM-13 and, as I recall, he agreed that, as long as the hole was collared vertically on Kerr-McGee property, the entire cost of that drilling would apply toward the work commitment. It might be useful to confirm this approach with Mr. Jones, perhaps in writing. I am not too worried about the difficulties of drilling in the siliceous rock encountered at the bend in Alum Canyon because I regard this as a root of an old hot spring vent with hopefully limited vertical extent.

My preference would be to collar the hole NC and hopefully complete the $50,000 commitment using that core size. Given reasonable drilling conditions, and I recall that the

RECEIVED
APR 12 1982
EXPLORATION DEPARTMENT

lapilli tufts drill easily and keep an open hole, we should be able to attain a depth of 2000 ft. or more. If the hole is in good condition, I would recommend leaving it open with a heavy mud (of course with a cap over the top of the hole). If the hole is in bad shape, my suggestion would be to drill below the bad zone, case the hole, and go to NX when the hole is re-entered.

northeast?

I am not convinced that any drilling should be considered 800-1000' northwest of TM-9 at the present time. This would entail a phenomenally costly road construction program to an area in which there is presently no geologic justification for such a road building expense.

I think that covers all the significant aspects of Mr. Koutz' memorandum. I would like to be kept advised of further progress on this project.

Very truly yours,

F. T. Graybeal

F. T. Graybeal

JDS

ANNUAL PROJECT PLANNING SHEET

DISTRICT: Southwestern
PROJECT NAME: Thunder Mountain
PROJECT NUMBER: EA-0042
PROJECT SUPERVISOR: W. D. Payne
PROJECT GEOLOGIST: F. R. Koutz
PREPARED BY/DATE: FRK 2/19/82

EXPENDITURES

1. Month of April $ 2,699
2. Current Year Expenses to Date thru April $8,180
3. Budget for Current Year 19__ $
4. Thru previous year, since project began $366,172

TYPE OF PROJECT

	Recon
X	Drilling
	Pre-Development
	Other

COST ESTIMATE & APPROPRIATION REQUEST

		Approval Dist. Geol.
Current Yr. Orig. Budget	$	
Current Yr. Add. Request @ ____	$	
Current Yr. Add. Request @ ____	$	
New Total	$	

Progress for the Month of April

OBJECTIVE: Hold ground for 1982 and complete required work commitment. Drill, or start to drill, one 6000' hole to test Paleozoic limestone/Laramide intrusive contact between TCH-2A & TM-8.

PLANNED TASKS	RESPONSIBILITY/TIME TO COMPLETE	TARGET DATE	% COMPLETE	PROGRESS TO DATE
1. Complete survey of TM/Worlds Fair Boundary	RBC/HMS/J. Yanez - 3 weeks	4/1/82	85%	Having trouble locating & distinguishing old corners, especially on Schee Group (TM)
2. Fly & topo map of N.Patagonia Mtns. (see Trench planning sheet)	FRK/WDP - 2 weeks	See TCH		TCB locating old location posts + repapering; no posts remain on OCCI Group
- survey in TM-DDH, claims	HMS/J.Yanez(?) - 2 weeks	6/1/82	25%	Being paneled for photography by TCB/HMS.
- control points				
3. DDH TM-14: Drill to fulfill work requirement of $44K				
a. Select final drill site	FRK/TCB(USFS) - 2 days	6/1/82	20%	NW sideline of Monoca claim to be surveyed. Routes to other sites being investigated by TCB/USFS.
b. Select contractor (Joy vs. Boyles)	FRK/WDP - 3 days	6/1/82	0%	
c. Start drilling	Contractor	by 8/1/82	0%	
d. Log core	FRK(SAC?) - 4 weeks	11/1/82	0%	
4. File assessment work with Santa Cruz County & BLM	RBC - 2 days	9/1/82	0%	Could be done with TCH-2A
5. Notify Kerr-McGee of work completion.	RBC/WDP/GMC	10/1/82	0%	

April 82

ASARCO

Southwestern Exploration Division

May 3, 1982

To: F. R. Koutz

From: T. C. Benavidez

Proposed Road and Drill Site
Thunder Mountain Project, EA-0042
Santa Cruz County, Arizona

Starting on 27 April I pioneered and flagged three alternate access routes to the proposed drill site to be designated "TM-14" located in or about the center of Jesse #23. Then on the 28th and 29th I was joined by Lee Kuhn and Bill Ambrose of Patagonia Excavating Co. and Dennis Brandolino from the Sierra Vista District Forest Service. We all agreed that the most feasible route would be an extension from "TM-13" north paralleling the drill site road below about 800 feet to the knob at the saddle, thence south 600-700 feet to the pad site as shown on the attachment. Below is a summary of estimated time and costs:

D-7 Dozer (80 Hours @ $80/Hr.)	$ 6,400
150 CFM Compressor & Jackhammer (2 Weeks @ $700/Week)	1,400
Labor and Miscellaneous (Fuel, etc.)	2,500
TOTAL	$10,300

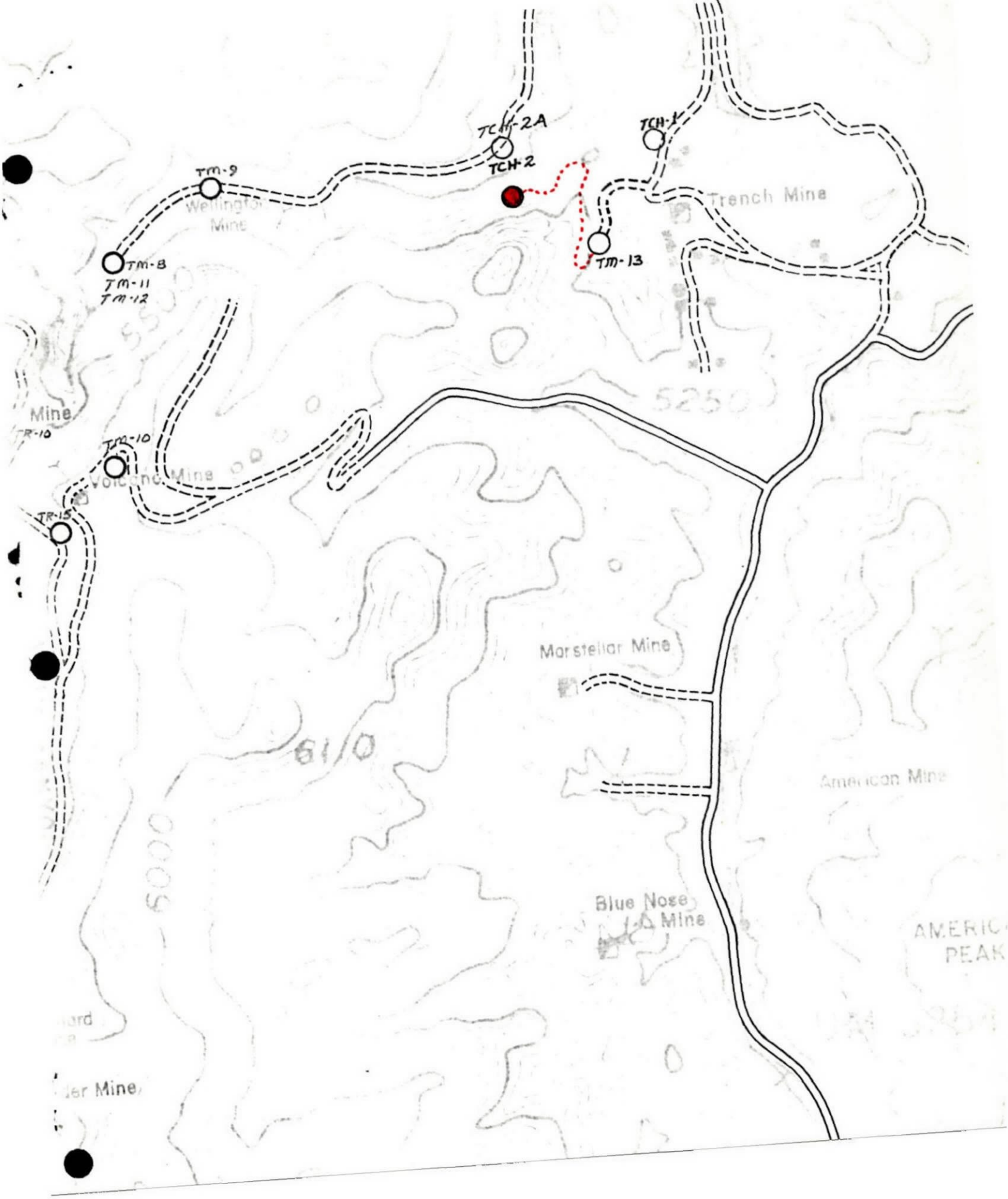
T. C. Benavidez

T. C. Benavidez/cg

TCB/cg

Attachment

cc: JDSell (w/attach)


TCH-2A
TCH-2
TCH-1
TM-9
Wellington Mine
Trench Mine
TM-8
TM-11
TM-12
TM-13
5250
Mine
TR-10
TM-10
Volcano Mine
TR-15
Morstellar Mine
6110
American Mine
5000
Blue Nose Mine
AMERIC
PEAK
ard
ler Mine

ANNUAL PROJECT PLANNING SHEET

DISTRICT: Southwestern
PROJECT NAME: Thunder Mountain
PROJECT NUMBER: EA-0042
PROJECT SUPERVISOR: W. D. Payne
PROJECT GEOLOGIST: F. R. Koutz
PREPARED BY/DATE: FRK 2/19/82

EXPENDITURES

1. Month of MAY $ 6,818
2. Current Year Expenses to Date thru MAY $ 14,858
3. Budget for Current Year 19__ $
4. Thru previous year, since project began $ 366,172

TYPE OF PROJECT

	Recon
X	Drilling
	Pre-Development
	Other

COST ESTIMATE & APPROPRIATION REQUEST

		Approval Dist. Geol.
Current Yr. Orig. Budget	$	
Current Yr. Add. Request @ ____	$	
Current Yr. Add. Request @ ____	$	
New Total	$	

OBJECTIVE: Hold ground for 1982 and complete required work commitment. Drill, or start to drill, one 6000' hole to test Paleozoic limestone/Laramide intrusive contact between TCH-2A & TM-8.

Progress for the Month of MAY 1982

PLANNED TASKS	RESPONSIBILITY/TIME TO COMPLETE	TARGET DATE	% COMPLETE	PROGRESS TO DATE
1. Complete survey of TM/Worlds Fair Boundary	RBC/HMS/J. Yanez - 3 weeks	4/1/82	90%	Yanez to complete in June
2. Fly & topo map of N.Patagonia Mtns. (see Trench planning sheet)	FRK/WDP - 2 weeks	See TCH		TCB located old location posts + repapering; no posts remain on OCCI Group
- survey in TM-DDH, claims	HMS/J.Yanez(?) - 2 weeks	6/1/82	25%	Paneled for photography by TCB/HMS, flown May 23.
- control points				
3. DDH TM-14: Drill to fulfill work requirement of $44K				
a. Select final drill site	FRK/TCB(USFS) - 2 days	6/1/82	20%	NW sideline of Monoca claim to be surveyed. Routes to other sites investigated by TCB/USFS. Decision on road work/drill site needed soon.
b. Select contractor (Joy vs. Boyles)	FRK/WDP - 3 days	6/1/82	0%	
c. Start drilling	Contractor	by 8/1/82	0%	
d. Log core	FRK(SAC?) - 4 weeks	11/1/82	0%	
4. File assessment work with Santa Cruz County & BLM	RBC - 2 days	9/1/82	0%	Could be done with TCH-2A
5. Notify Kerr-McGee of work completion.	RBC/WDP/GMC	10/1/82	0%	

May 82

ASARCO Southwestern Exploration Division JDS

May 24, 1982

To: J. D. Sell

From: F. R. Koutz

Trench Area Exploration
Trench (0200), Three-R (0040),
& Thunder Mountain (0042) Projects
Santa Cruz County, Arizona

Summary, Conclusions and Recommendations

Over the past twenty years a number of companies have completed 24 drill holes (+1000 feet depth) on the subject properties. Asarco has drilled ten of these deep holes in the main Trench-Sunnyside area. A deep sub-marginal porphyry copper deposit of an estimated 450 million tons @ 0.34% Cu (0.25% Cu cut-off) and .012% Mo with apex below 3700 feet depth exists beneath the west side of the Sunnyside diatreme centered to the north of DDH TR-10. Associated skarn alteration and Zn-Ag-Pb-Cu mineralization exists to the northeast with ore grade mineralization consisting of more than 57 and 124 feet of 15-18% Σ(Zn>Pb>Cu) with 7-11 oz. Ag/T intersected in TCH-2. Structural complications are indicated within the skarn zone because Navi-drill hole TCH-2A failed to intersect the favorable units mineralized in TCH-2.

The large size and strength of the hydrothermal system generated by the quartz-feldspar porphyry intrusive justify additional drill holes to follow TCH-2 mineralization and to test the limits of skarn zones around the margin of the mineralizing quartz-feldspar-porphyry.

I recommend two drill-outs from TCH-2, first to the NNW and then to the NNE to test for the continuation of stratigraphy and mineralization encountered in TCH-2 and related to the northeast-trending QFP intrusive zone in Upper Alum Gulch. The next hole on Thunder Mountain ground should be located in Upper Alum Gulch near the Trench (Humboldt-Mendoza) boundary to test deeper Paleozoic rocks nearer to the main QFP boundary. Additional holes on Thunder Mountain ground might be located about 1500 feet SW of TM-13 and 600 feet S to 1500 feet SW of TCH-2 also to test the carbonate section cut by QFP intrusives. A hole 1000-2000 feet north to NNE of TCH-2 should test the outer limits of skarn zones and help to evaluate the carbonate-hosted mineralization potential of competitor ground to the north. Lower priority targets, on Three-R ground, are from 500 to 4000 feet north of TM-9 and beneath the Flux mine. Limestones east of Trench along the January-Norton-Alta-Hardshell zone also deserve deep testing.

General

The geology and mineralization in the subject project areas have been discussed in various company reports by Graybeal and Koutz. The purpose of

ASARCO Southwestern Exploration Division JDS (TM)

June 8, 1982

To: J. D. Sell

From: F. R. Koutz

see for FTG note.

Cu-Mo-Ag "Resources"
Sunnyside Porphyry Deposit
Three-R & Thunder Mtn. Projects
Santa Cruz County, AZ

Although I have heard (I believe from F. T. Graybeal) figures of "several hundred million tons of 0.3-0.4% Cu with minor Mo and Ag credits" for the Sunnyside, igneous-hosted, porphyry copper deposit as intersected in holes TR-10, 11, 14, 15 and TM-8 I have not seen this figure written down anywhere. So I spent a few minutes and made the calculations below--admittedly very rough and non-rigorous but sufficient for general use and something to have in the files.

The 5 polygons below were drawn by the perpendicular bisector method with the outer limits roughed-in by geologic judgement, generally less than the distance from the four outer holes to the TR-10 polygon boundary. Graph paper squares were counted for the polygon area. The footages and grades come from the drill-hole summary reports with cut-offs mostly geologic but generally 0.2 to 0.3% Cu. The TR-10 column was increased and diluted from the drill logs. Tonnage factor was 12.5 ft^3/ton.

DDH	Depth Top Intercept	Footage	Polygon Area x 10^6 ft^2	Million Tons	Average Grades Cu %	Mo %	Ag oz/T
TM- 8	4300'	1200'	1.68	160.8	0.25	0.010	0.10
TR-10	3700'	900'	1.68	120.8	0.44	0.0165	0.12
TR-11	4800'	672'	1.54	82.8	0.37	0.0113	0.16
TR-14	4590'	390'	1.13	35.3	0.46	0.0154	0.20
TR-15	4630'	679'	1.00	54.3	0.23	0.0095	0.15
Totals "About 0.25% Cu cut-off"			c/o	454.0	0.336	0.012	0.13
TR-10 + TR-11 + TR-14 only (about 0.3~~5~~)				238.9	0.419	0.014	0.15

The second total is of higher quality (accuracy). Although a large body of mineralized rock is present the grade and depth definitely places the Sunnyside deposit in the submarginal or resource category.

F. R. Koutz

F. R. Koutz

FRK/cg

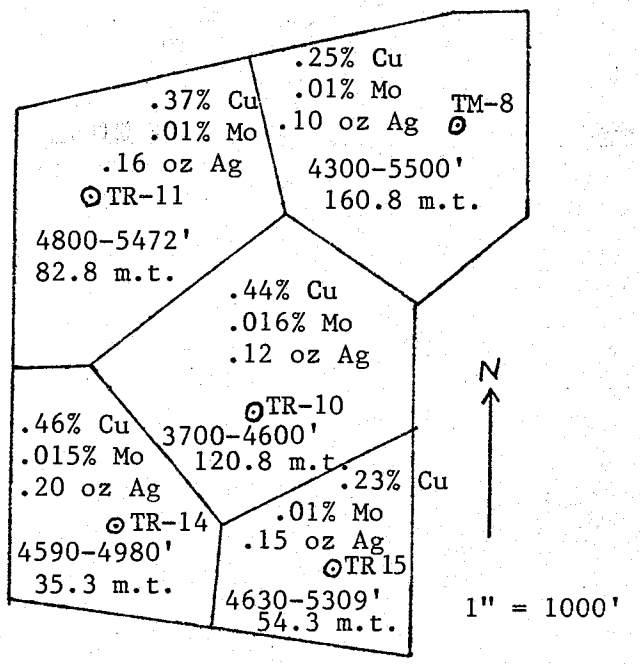
Attachment

cc: WLKurtz
FTGraybeal (any comments or better numbers?)
3-R & TM Files

Sunnyside Porphyry Deposit

Cu-Mo-Ag Resource Polygons

12.5 ft^3/ton



Depths indicated from
individual drill holes

June 8, 1982
F. R. Koutz

ASARCO Southwestern Exploration Division

TM

July 2, 1982

To: F. T. Graybeal

From: J. D. Sell

Patagonia Area
Santa Cruz County, AZ

Your note on the tonnage-grade estimate for the Sunnyside porphyry copper zone is appreciated. These numbers will be very useful as the integration of the area becomes an increasing reality. As you probably feel from some of my cover notes to Fleet's drill hole summaries, I hope to be able to get Fleet to shed some of the verbiage and place our information into the best model(s) of system(s) that we can get for the next approximation of drilling sequence.

Your note and telephone conversation on the Ventura mineral inventory was also well received and I have asked both Pick and Fleet to make note of it. Indeed, it is the continued review and thinking (and testing) which will define the optimum mineral available in the area.

I attach the monthly report of Koutz with the ZERO report. I'm not clear as to how he picks depths from the graphs. Perhaps I can learn prior to them doing further work.

The geophysical work, et al. has taken care of the Ventura assessment work and no drilling is planned prior to September 2, 1982.

James D. Sell

James D. Sell

JDS/cg

Attachment

P.S. Fleet is acquiring a "nomograph" from Zonge which plots Hz-resistivity-depth and based on an inflection point the curves can be resolved. Apparently Zonge is writing a brochure on this so that geologists can believe that geophysical people are also "real people".

To JDS

Date 7-8 Time 9:30

WHILE YOU WERE OUT

M Jim Koontz

of Joy Manufacturing

Phone

Area Code	Number	Extension

TELEPHONED	X	PLEASE CALL	
CALLED TO SEE YOU		WILL CALL AGAIN	X
WANTS TO SEE YOU		URGENT	
RETURNED YOUR CALL			

Message next week

Pr

19 30,000

Operator

AMPAD EFFICIENCY®

23-000 50 SHT. PAD
23-001 250 SHT. DISPENSER BOX

≠ 150' little work & safer

→ Tony Benavidez

6 July 82

You all did A good job of shooting in the ~N39°E NW side line of the MONOCA CLAIM. As you said it looks like the only possible drill site starts about 150' S80°W of your orange flags where the sideline crosses the road. The Silica Rib crosses the road at 250' ~S80°W of orange flags. The road then turns to about S30W and runs 190' to the end of mine dump past the boulderfield and slide area.

The potential site is already 50' wide and could easily be blasted to about 80'x60'. 150' S80W on the road from your flags would put us about 100' from the MONOCA sideline - that is the sideline is about 100' S80°E of the drill site. I looked at the rock and I think if you put the actual collar as far NNE on the site as possible you will avoid the silica. Between the site & your orange flags the rock is less silicified and more tuffaceous - shale not as grit. Bedrock should be between 5 & 15 feet deep. It may be possible to put the site on the west side of the stream toward the panneled SE corner of ORB-1 (?) but this would involve lots of dozing. Also if you moved any closer than 150' NE toward your flags you would have to blast & put into slide material and the shear face of the silica would be just above (the road is narrow & here & about in the stream.

I put 4 fluorescent pink flags up around trees NW of road at potential drill site. Flags are marked "F.R.K." Good luck with the site. - Although a boulder doesn't flatten the area. I took about 10 slides of the site & area looking almost straight down from the silica rib and from the ORB-1 corner - if you need them let me know.

- There was quite a crowd of campers @ the TM-8 (11) site - the kids were having water fights with the NOSR. You can tell the USFS about all the recreational opportunities we are providing.

FRK

cc JDS

WLK 7/14/82
JOS

TM-14 is being drilled in Alum Gulch ~~[illegible]~~ ± 150 along road west of claim line & east of the silica knob. This is ± 100 feet from the claim line in a perpendicular direction.

Fred asked if you would clarify again with Zeb Jones the fact that all expenditures on TM-14 ~~are~~ applicable to the Thunder Mtn contract — regardless that the hole may deviate across the claim boundary. Apparently Zeb has agreed to this before.

Jim

11 AUG 82

JDS →

Please remind FTG THE NEXT TIME you talk to Him THAT WE ARE STILL missing the original Assay Certificates From TR-10 to TR-13 from our general Files. He had returned ALL TM Assays LAST YEAR. Assays ARE ON His Daily Logs But The Gen Files should have the original sheets.

THANKS FRK.

[I've SENT AT least ONE note to FTG ON THIS.]

done letter 8/13/82

Garfield & Lockfile Kerr McGee Thurber Int

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

#5600 collar

PROPERTY Kerr-McGee
MINING DISTRICT Harshaw
COUNTY, STATE Santa Cruz, Ariz.

DRILL HOLE Bucket #1 (60°)
FINAL DEPTH 821 ft. N 75°W

PAGE 1 of 2
DATE 7-25-72
LOG BY FTG & GJS

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
7	24	Lithic tuff breccia	6" wide leached sulfide zones at 11 & 12'. Content 2-3 %. Overall sulfide (dissem) content <1 %. Indigeneous limonite-some after chalcocite	Pervasive. Moderate to strong argillic	Minor quartz eyes
24	85	Fine grained siliceous X-tal tuff	Locally, pervasive reddish, mixed (goethite-hematite) limonite. Fine grained fresh pyrite with minor cc py, cc & eng. Locally bulk of sulfide leached. Overall 2 % plus, dissem. sulfide.	Rock 90 % silica. possibly moderate hydrothermal addition	Rock is a finer grained version of the tuff breccia. Bulk of silica indigeneous to rock. Qtz lined cavities locally. Silica gives grayish cast to rock
85	128	as above	as above. Black limonite staining scratches off color red (hem-goeth mixture)	as above	Local fracture zone at 111.5 to 121.5'
128	177	Fine grained X-tal tuff	Oxidation to 147' Mixed chalcocite, py & ccp at 147-149. At 157-177 nonuniform distrib. of cc & py. Have discontinuous veinlets. Overall 1:1 cc & py. Overall 2-3 % dissem. sulfides	Moderate to locally strong argillization. 0.1-0.25" soft, white alunite seams locally	Locally the tuff has very minor lithic fragments. Mostly argillized feldsp. No qtz. Erratic distribution of oxidation & chalcocite
177	238	Fine grained siliceous X-tal tuff			Same rock type and characteristics as that in 24-85' interval

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

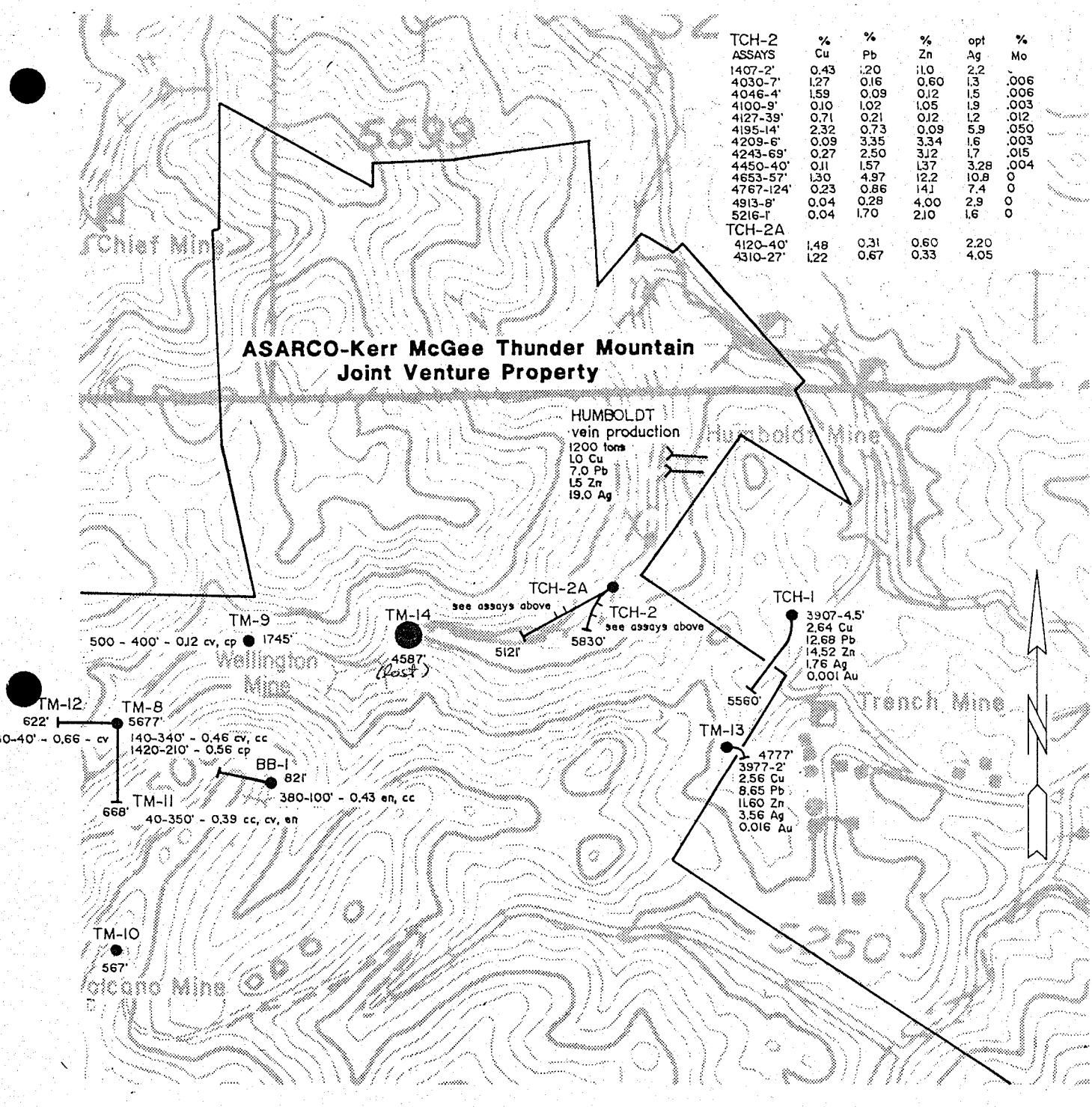
PROPERTY Kerr - McGee
MINING DISTRICT Harshaw
COUNTY, STATE Santa Cruz, Ariz

+5600
-330
5270

DRILL HOLE Bucket #1 (60°)
FINAL DEPTH 821 ft.

DATE 7-25-72
LOG BY FTG & GJS

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
238	391	Qtz. tuff with lithic fragments	Overall 3-4% dissem. sulfide. Py, Cp, cc, & eng. noted. Several fluide fracture zones containing up to 10% leached sulfides noted	weak to locally moderate argillization	10-15% silicified lithic fragments composed of siliceous tuff material. Indigenous limonite confined to fracture zones only. 2 to 3% overall alunite veinlets.
391	514	as above	Chalcocite content falls off at start of sericite zone. No oxidation in sericite zone. 4% av. sulfide content. Mostly dissem. py. Increase in sulfide grain size	Moderate sericite at 391 increases to strong sericite at 446	Less than 1% alunite
514	600	as above	3% overall dissem. sulfide. Py, enargite, & trace chalcocite. Enargite commonly included in pyrite	at 514' sericite drops to moderate and to become strong at 617' (50% or more by vol.)	From 514' qtz is less common in rk. <1% alunite vein
600	821	x-tal tuff with argillized feldspars	overall 3% dissem sulfide. Trace chalcocite some enargite in pyrite	strong sericite to 752' 752'-821' moderate to strong clay & sericite 792 to bottom (821') mixed oxide & primary sulfide. strong leaching 3-4% dissem. sulfide	qtz less common. Much less (<10%) lithic fragments <1% alunite veining



TCH-2 ASSAYS	% Cu	% Pb	% Zn	opt Ag	% Mo
1407-2'	0.43	1.20	11.0	2.2	-
4030-7'	1.27	0.16	0.60	1.3	.006
4046-4'	1.59	0.09	0.12	1.5	.006
4100-9'	0.10	1.02	1.05	1.9	.003
4127-39'	0.71	0.21	0.12	1.2	.012
4195-14'	2.32	0.73	0.09	5.9	.050
4209-6'	0.09	3.35	3.34	1.6	.003
4243-69'	0.27	2.50	3.12	1.7	.015
4450-40'	0.11	1.57	1.37	3.28	.004
4653-57'	1.30	4.97	12.2	10.8	0
4767-124'	0.23	0.86	14.1	7.4	0
4913-8'	0.04	0.28	4.00	2.9	0
5216-1'	0.04	1.70	2.10	1.6	0
TCH-2A					
4120-40'	1.48	0.31	0.60	2.20	
4310-27'	1.22	0.67	0.33	4.05	

EXPLANATION

821' BB-1 — Drill hole showing depth

Proposed or deepened drill hole

ASSAY DATA KEY
depth - length - % Cu-mineral

GEOLOGIC LEGEND
cp - chalcopyrite
cv - covellite
cc - chalcocite
en - enargite

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT

DRILLING PROGRESS

PATAGONIA MOUNTAINS
SANTA CRUZ COUNTY, ARIZONA

0 1000'

mn6692 JDS/dam tuc 04-21-89

~~FTG~~ Excellent report! The data and results procured from this drill core are impressive, and you have related them to your excellent surface mapping and ~~geo~~ surface geochemical work.

please send copy to TCO

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

Perhaps you should plan to give me, especially, and Asarco geologists a short course in fluid inclusions.

August 20, 1974

~~JHC~~
~~JDS~~
~~JRK~~
SRD,
GTS
HKK

TO: W. L. Kurtz

FROM: F. T. Graybeal

Summary of TM-8
Thunder Mtn. Project
Patagonia Mtns., Arizona

SUMMARY

Two zones of near ore-grade copper mineralization were intersected within 1700 ft. of the surface. A study of the geology of these zones indicates that they will probably be confined to the diatreme, mostly south and east of TM-8.

A deep zone of potassic alteration was encountered, but associated copper mineralization was low grade. A zone of copper values which are noticeably higher than background lies just above the potassic alteration and is tentatively correlated with the high grade zone in TR-10. This correlation suggests that the best opportunities for discovery of deep, ore-grade copper mineralization lie west of TM-8.

INTRODUCTION

Hole TM-8 was collared in Alum Canyon, roughly 300 ft. from the edge of the Kerr-McGee Thunder Mtn. claim group, and was bottomed at 5677 ft. The purpose was to test this portion of the property, which lies near the southwest side of the diatreme, for the presence of deep primary copper mineralization. It is located near the center of a strongly altered and mineralized quartz feldspar porphyry plug in an area of weakly anomalous bedrock geochemistry. Core recovery was excellent throughout the hole.

The details of all logging and assay work are contained in the attached drill log. The following discussion is based on information in the log and is supplemented by study of 44 thin sections and 6 polished sections. All log, petrographic, and analytical data are summarized on Figure 1.

ROCK TYPES

The hole encountered quartz feldspar porphyry or related rocks over the entire section. Identification of the exact rock type was not possible due to a pervasive very strong alteration. In the upper 2500 ft. of the hole where original igneous textures are still easily visible, the porphyry contains 45-55% altered phenocryst pseudomorphs of quartz (5-15%),

feldspar (35-50%), and mafic (2-5%). Quartz, the only original igneous mineral remaining in the rock, occurs as rounded eyes 1/32-1/8 in. in diameter which are variably resorbed to about 2000 ft. and altered to sericite below 3000 ft. The feldspar phenocrysts (probably both K-spar and plagioclase in unknown proportions) are defined by tabular aggregates of massive, fine-grained sericite which average about 1/8 in. long and occasionally reach 3/4 in. The mafic, indicated by pseudomorphous aggregates of medium-grained sericite and fine-grained perovskite, was mostly biotite. Alteration below about 3000 ft. tends to destroy the igneous texture and, although remnant textures indicate the rock is still similar to that in the upper part of the hole, a gradual rock type change may occur.

Variations in rock type are relatively minor, as noted on the attached drill log. Several xenolithic zones were noted above 1600 ft. The interval from 1888-2365 ft. is primarily a quartz feldspar porphyry breccia. Finally, several short intervals of possible intrusive breccia are present between 4400-5200 ft. None of the above variations appear to exert a noticeable influence on the alteration.

STRUCTURE

Rare zones of probable flow banding are present at 1750 ft. A few small fault zones were noted and numerous broken, but not obviously faulted, zones are also present. Several weakly vuggy zones, probably breccias, were also logged. Structural features other than veins do not significantly influence the distribution of rock types, alteration, or mineralization.

Figure 1 shows that veins are relatively abundant below about 2000 ft. The strikes and dips of these veins vary widely and, where abundant, impart a weak stockwork appearance to the rock.

ALTERATION

Hydrothermal alteration is uniformly strong throughout the hole, although igneous textures have been pseudomorphically well preserved from 0-2500 ft. The most abundant alteration mineral is fine-grained sericite. In order of abundance it occurs as a massive replacement of former feldspar phenocrysts, as an irregular replacement of the matrix, as a somewhat coarser replacement of former mafics, and as occasional selvages along some sulfide veins below 4000 ft. Sericite is generally white, but occasionally acquires a greenish cast deeper in the hole. Although sericite is most abundant as replacements of former phenocrysts, matrix sericite becomes more abundant with increasing depth. Sericite forms from 35-60% of the rock, and is less abundant in silicified and potassic altered zones. Volume estimates from hand specimens agree well with estimates from thin sections.

Kaolinite is erratically present to a depth of 4800 ft. in amounts generally less than 5%. It is locally abundant where it replaces some or all of the feldspar phenocrysts. Elsewhere it occurs as thin veins or in association with some quartz veins. It cannot be distinguished from sericite in hand specimen, but the numerous vein-associated occurrences seen in thin section led to the logging of all tiny white clots in quartz-sulfide veins as kaolinite.

Disseminated quartz alteration, or silicification, was recognized primarily in hand specimen by a hardening of the matrix of the rock. It is logged from 0-200 ft. and 2000-5677 ft. In the latter interval it is only pervasive from 2900-4150 ft. Silicification adds from 5-20% quartz to the rock above that normally present in the quartz-sericite assemblage, which averages 35-40% (including quartz phenocrysts). The presence of silicification is generally recognized in thin section by a peculiar highly shreddy grain-boundary texture of the individual quartz grains which is only seen in zones where introduced silica exceeds 10%. The estimates of introduced silica assume that the original pre-alteration matrix quartz content of the rock averaged 25-30%. Although the rock probably approaches a rhyolite in composition, this estimate of original matrix quartz may still be high by 5-10%, in part due to silica liberated during conversion of the feldspars to sericite.

Quartz veins are only present below 2000 ft. Individual 10-ft. intervals contain from 0-10% light gray, granular vein quartz. The veins vary from 1/8-1 in. wide with dips similar to those noted for the sulfide veins. The veins occur in sharp contact with the adjacent rock and alteration selvages are mostly absent. In the central part of the vein quartz zone (3500-4500 ft.), small vugs and sulfides are more abundant within the veins than near the top or bottom.

Orthoclase first appears at about 5050 ft. and varies erratically from 1-20% to the bottom of the hole. In hand specimen it has a pinkish-buff color, occurring as vague zones up to 6 in. long in the matrix and as thin selvages along quartz or pyrite veins. In thin section it is fine grained, highly irregular in shape, and is generally a brownish color due to the presence of very abundant iron oxide(?) inclusions. Its identity was confirmed in one section by staining. Much of the orthoclase is partly altered to sericite.

Chlorite occurs from 4870-5630 ft. as finely disseminated grains in the matrix and in coarser aggregates associated with sulfide veins. The identity is somewhat uncertain due to the extremely fine grain size, however the green color and pleochroism are believed to be diagnostic. Similar looking but finer-grained material in TR-10 was (mistakenly?) called serpentine. The aggregates are very massive, irregular, and are sharply terminated against other minerals. Assuming the mineral is chlorite, the interference colors indicate it is an iron-rich variety.

A mineral which may be a carbonate was seen in thin section from 4874-5635 ft. It forms up to 10% of the rock and is tentatively identified by its extreme birefringence. The absence of a recognizable acid reaction (calcite) may be due to its very fine-grained, disseminated occurrence or the mineral may be dolomite, magnesite, or ankerite.

Apatite is uniformly present from 4874-5677 ft. It is only visible in thin section and forms from 1-5% of the rock. The apatite is fine to medium grained, anhedral, often blocky in shape, and contains abundant fluid inclusions. It is generally disseminated and is closely associated with disseminated and vein sulfides.

Small quantities of other possibly significant minerals were also noted during the logging and petrographic work. Alunite is irregularly logged to about 2000 ft. as light pink clots in some feldspar pseudomorphs and in small pods. It is fine grained and forms less than 5% of the rock. Traces of andalusite were noted in most thin sections to about 2800 ft. It is fine grained, often occurs in kaolinite aggregates, and is occasionally replaced by alunite. Topaz was noted in thin section from 788-1874 ft. and at 4225 ft. where it forms from trace-3% of the rock. Hematite is present from 1660-1800 ft. as an oxidation of disseminated pyrite and from 4900-5500 ft. as a selvage along or in pyrite-chalcopyrite veins. At these depths it is clearly a hydrothermal mineral. Barite occurs from 2100-2250 ft. and 4250-4900 ft. It is mostly disseminated and is both yellowish and pinkish in color. Rare occurrences of a purplish mineral were seen around 4900 ft. and may have been anhydrite. A single 6-inch zone of fine-grained, light brown biotite aggregates of almost certain hydrothermal origin was noted at 5438 ft.

A schematic diagram of mineral occurrences is shown on Figure 1. Sericite is clearly the dominant alteration mineral throughout the hole. However, the presence of small amounts of alunite and kaolinite in the upper 2000 ft. suggests a slight overprint of a near-surface advanced argillic assemblage on a phyllic assemblage. From roughly 2000-4850 ft. the alteration is entirely phyllic with short intervals of argillic alteration. From 4850-5677 ft. phyllic alteration is mixed with a potassic alteration assemblage, the latter including orthoclase, chlorite, and apatite. I suspect that chlorite may be an alteration product of pre-existing secondary biotite. Apatite is a common accessory mineral in potassic assemblages elsewhere in the Patagonia Mtns.

The relative age of the phyllic and potassic assemblages deep in the hole is unclear. Pink orthoclase is present in and along quartz veins which cut the rock. However, in several thin sections sericite was observed to rim or replace matrix orthoclase. Given a hydrothermal fluid of relatively constant composition, the formation of late sericite could be accomplished by a fall in temperature. This would result in the outer sericite zone collapsing downward on the underlying potassic zone.

MINERALIZATION

Mineralogy

The most abundant sulfide mineral is pyrite. It forms from 1-8 vol. % of the rock, estimated over 10-ft. intervals, and appears to be somewhat more abundant above 3000 ft. Pyrite veins are clearly more abundant below 2300 ft., although their occurrence is somewhat irregular. The veins vary from 1/64-3 in. thick, average about 1/16 in. thick, and do not show any noticeable variations in thickness with increasing depth. They occur as cores of quartz veins, with or without other sulfides, or simply as thin sulfide veins with no related alteration. Their dips are highly variable, as noted on the log.

Disseminated pyrite is generally medium-grained and is uniformly distributed through the rock. Variations in distribution are occasionally present where pyrite preferentially replaces the cores or occurs as rims around altered feldspar phenocrysts. Pyrite tends to be coarser grained where it is more abundant. Rarely, pods up to 3 in. in diameter are present in the quartz feldspar porphyry breccia intervals from 1888-2365 ft.

Chalcocite is present from 0-400 ft. and its identification was confirmed in several polished sections. It replaces covellite and pyrite and is generally subordinate in abundance to covellite. Covellite is the dominant copper sulfide to 1350 ft. and is present to about 2100 ft. It replaces pyrite and chalcopyrite and its identity is often uncertain. This may be due in part to a rimming of sphalerite which was noted at 1153 ft. Also, trace amounts of tennantite were noted in several polished sections (and confirmed by microprobe) and its presence probably contributes to the problem of sulfide identification.

Chalcopyrite first appears with certainty at 1340 ft. and is the dominant and often the only copper sulfide mineral to the bottom of the hole. It is fine to medium grained and its distribution is similar to pyrite. Below 4000 ft. chalcopyrite is often associated with small kaolinite(?) clots in quartz-pyrite veins, and is clearly more abundant in the flat-dipping veins (less than 20 degrees). The sudden appearance of chalcopyrite at 1340 ft. is reflected by a sharp increase in the copper content of the core, as shown on Figure 1. Several grains of chalcopyrite may occur above 1340 ft. and traces were noted in polished section at 172 ft. However, these shallow occurrences are of no geological or economic importance.

Several other sulfides were noted in the hole. A Cu-Bi sulfide was detected by microprobe at 172 ft. Traces of bornite were logged from 4000-5000 ft. Molybdenite occurs as very small, disseminated grains from 1380-1660 ft., and the lack of associated quartz in this interval is curious. At 2250 ft. it becomes erratically present to the bottom of the

hole. In this deeper zone molybdenite is rather closely associated with quartz veins either as disseminations within the vein or as continuous coatings along the borders. Sphalerite is often present in the interval 0-700 ft., although galena was not recognized below 170 ft.

Zoning of copper sulfide minerals is reasonably well developed, as shown on Figure 1. Above about 1340 ft. covellite, with minor chalcocite and tennantite, are the dominant minerals in order of abundance. Below 1340 ft. chalcopyrite is the dominant sulfide and below about 2100 ft. is essentially the only copper sulfide mineral. The approximate lower limit of significant covellite at roughly 2100 ft. also marks the approximate lower limit of kaolinite and alunite.

Geochemistry

The vertical zoning of Cu, Mo, Pb, Zn, As, and Ag is illustrated on Figure 1 and is coincident with the mineralogy observed in the core. The strongly anomalous, near-surface zones of Pb and Zn overlie and partly overlap the chalcopyrite zone. The rapid decrease of Pb and Zn values below 2000 ft. is accompanied by a gradual increase in Mo values with increasing depth. The pattern for As is similar to, but more subdued than, either Pb or Zn. The irregular pattern exhibited by Cu is a function of mineralogical changes and other factors to be discussed below. Silver varies irregularly, but follows Cu more closely than the other metals. The geochemical data indicate that highly anomalous values of Pb and Zn may partly overlie zones of increased copper concentration. This behavior is similar to that seen in TR-10 and indicates that Pb and Zn geochemistry may be a useful ore guide.

Higher grade copper zones

Two zones of anomalously high copper values were encountered and both are close to ore grade as shown on Table 1.

TABLE 1: Significant assay results in TM-8

140-210 - 70' @ 0.58
210 - 320 - 160' @ 0.25
320 - 480 110' @ 0.68

interval	length	% Cu	% MoS_2	oz. Au	oz. Ag
140-480	340 ft.	0.46	0.002[a)]	0.005	0.23
1420-1630	210 ft.	0.56	0.032	0.004	0.24

a) from geochemical composite

The zone at 140 ft. could not be calculated at a 0.40% Cu cutoff because of a sharp, natural cutoff at 0.50% Cu. Covellite is the dominant copper sulfide and is almost entirely disseminated. The relative amount of covellite and chalcocite cannot be estimated in hand specimen. Therefore, as several polished sections suggested that covellite was dominant the ore mineral ratio shown on the log is approximately accurate. This

interval is characterized by two well-defined, higher grade zones which surround a central lower grade zone, as shown on the log. However, all three zones are of considerably higher grade than the overlying or underlying relatively barren rock. The first 140 ft. of the hole is of particular interest with regard to the origin of the covellite mineralization. As shown on the log, the rock is completely unleached and is also very barren. In addition, veins which might have conducted supergene solutions into the rock, are essentially absent within the ore zone. Finally, the mineralization appears to be sharply confined to the quartz feldspar porphyry. These features permit the interpretation that the covellite ore zone is of hypogene origin. The cross-section shown on Figure 2 emphasizes the flat-lying aspect of the zone, assuming it is continuous between TM-8 and BB-1, and the crude parallelism with the topography might indicate a supergene origin. Again, the highest grade copper in BB-1 is associated with the quartz feldspar porphyry and I presently prefer a hypogene origin for this zone.

of Cu

The zone at 1420 ft. marks the upper limit of abundant chalcopyrite. The zone is characterized by abundant disseminated sulfides and massive 1/8 in. veins with gradational selvages of gray sericite and heavily disseminated pyrite. The occurrence of molybdenite is unusual as it is extremely fine grained, uniformly disseminated, and lacks any associated silicification or quartz veining.

A third copper zone of no economic but considerable geologic importance was intersected as follows:

interval	length	% Cu	% MoS_2	oz. Ag
4300-5500	1200 ft.	0.25	0.017	0.10

The copper values in this zone are clearly higher than in the overlying 2000 ft. as shown on Figure 1, and occur above and within the zone of potassic alteration. Grades vary from 0.03-0.73% Cu as chalcopyrite. Molybdenite is moderately abundant, particularly in quartz veins. The Ag content is roughly half that of the two near-surface zones, perhaps due to the disappearance of tennantite at depth. Although the Cu content of this zone is low from an economic standpoint, the geologic characteristics, including highly saline fluid inclusions (to be discussed below), are very similar to those known to occur in most porphyry copper deposits, and I consider this zone very encouraging with regard to further exploration in the Sunnyside area.

FLUID INCLUSION DATA

Fluid inclusions were studied petrographically in seventeen thin sections. Quartz phenocrysts were found to be the most suitable host mineral due to their formation prior to the start of the mineralization, thus serving as a better overall recorder of the hydrothermal goings-on, and due to their relatively large size, thus serving as a more reliable sample of the various inclusion types. Rather than discuss the various aspects of the fluid inclusion zoning, I will simply present a brief interpretation of the data.

The quartz feldspar porphyry was the genetic source of all hydrothermal fluids in this area. These fluids were evolved mostly at depths presently exceeding 2000 ft., although some degassing may have extended upward to the original top of the quartz feldspar porphyry. The fluids appear to have been boiling during formation, which resulted in the evolution of a highly saline brine below about 2000 ft. The amount of vapor in the boiling zone appears to have increased to the top which occurs at roughly 1400 ft. Above this a sharp reduction in vapor occurred due to mixing with cooler, dilute water formed from the condensation of the vapor and with ground water. Some of this water probably percolated somewhat deeper, diluting the fluids below the top of the boiling zone, and thereby restricting the dense brine to depths exceeding 2000 ft. The salinity of this brine increases noticeably with increasing depth and petrographic studies of its characteristics were found to be a more clear-cut indication of the deep chalcopyrite zone than alteration or geochemical studies.

DISCUSSION

The restriction of the advanced argillic alteration minerals, the covellite-chalcocite-tennantite sulfide mineral assemblage, and the zone of dilute hydrothermal fluids to the upper 2000 ft. of the hole suggests a genetic relationship. This portion of the hole occurs in the upper portions of and above the zone of strong boiling. It is well known that elements such as As, Sb, Bi, and to a lesser extent Pb, Zn, and S, tend to be transported through a boiling zone in the vapor phase more easily than Mo, Fe, NaCl, and Cu. The situation for Cu is more complex and, although boiling may not completely determine the Cu content of the rock, it does appear to be a significant influence on the mineralogy.

It is therefore possible that the vertical mineralogical zoning is a result of boiling of hydrothermal fluids in the diatreme. The boiling was clearly the result of intrusion and crystallization of the quartz feldspar porphyry. The paragenetic evidence suggests that the volatile sulfide assemblage continued to form after the non-volatile sulfide assemblage (covellite rimming chalcopyrite at 2044 ft.) and is probably due to retreat of the boiling zone to greater depths as temperatures fell in the later stages of mineralization. I currently reject the concept of a separate and

later stage for the covellite zone because of its close association with the zoning of primary fluid inclusions in quartz phenocrysts and the general systematic variation of all alteration and sulfide assemblages and the geochemistry over the entire hole.

Further exploration

The above interpretations suggest that the higher grade copper zones at 140 ft. and 1420 ft. are both primary in origin, although little doubt exists for the deeper zone. It is also suggested that these zones may be found to be flat-lying, rather than steeply dome-shaped, as a consequence of their relationship to a presumably flat-lying zone of boiling. The zones may become deeper and lower grade to the east, particularly if the source of the heat and metals lies to the west of TM-8 as has been previously suggested. However, the linear swarm of quartz feldspar porphyry plugs, which extends nearly to the Humboldt mine, may have provided sufficient heat and metal to generate the near-surface, boiling-related mineralization seen in TM-8. The presence of strong As and Pb rock chip anomalies in the eastern portion of the diatreme lend some support to this argument, and, therefore, further intermediate-depth exploration (2500 ft.) is required in Alum Canyon east of TM-8. In addition, the moderately-strong Mo rock chip anomaly between TM-8, BB-1, and the Volcano mine may bear some relationship to the molybdenite cut at 1420 ft. in TM-8 and one drill hole in this topographically rugged area should also be seriously considered. I do not expect to find extensive, shallow, boiling-related zones outside the diatreme because quartz feldspar porphyry-derived fluids were probably channeled through small highly permeable zones in the adjacent wall rocks such as the BX breccia.

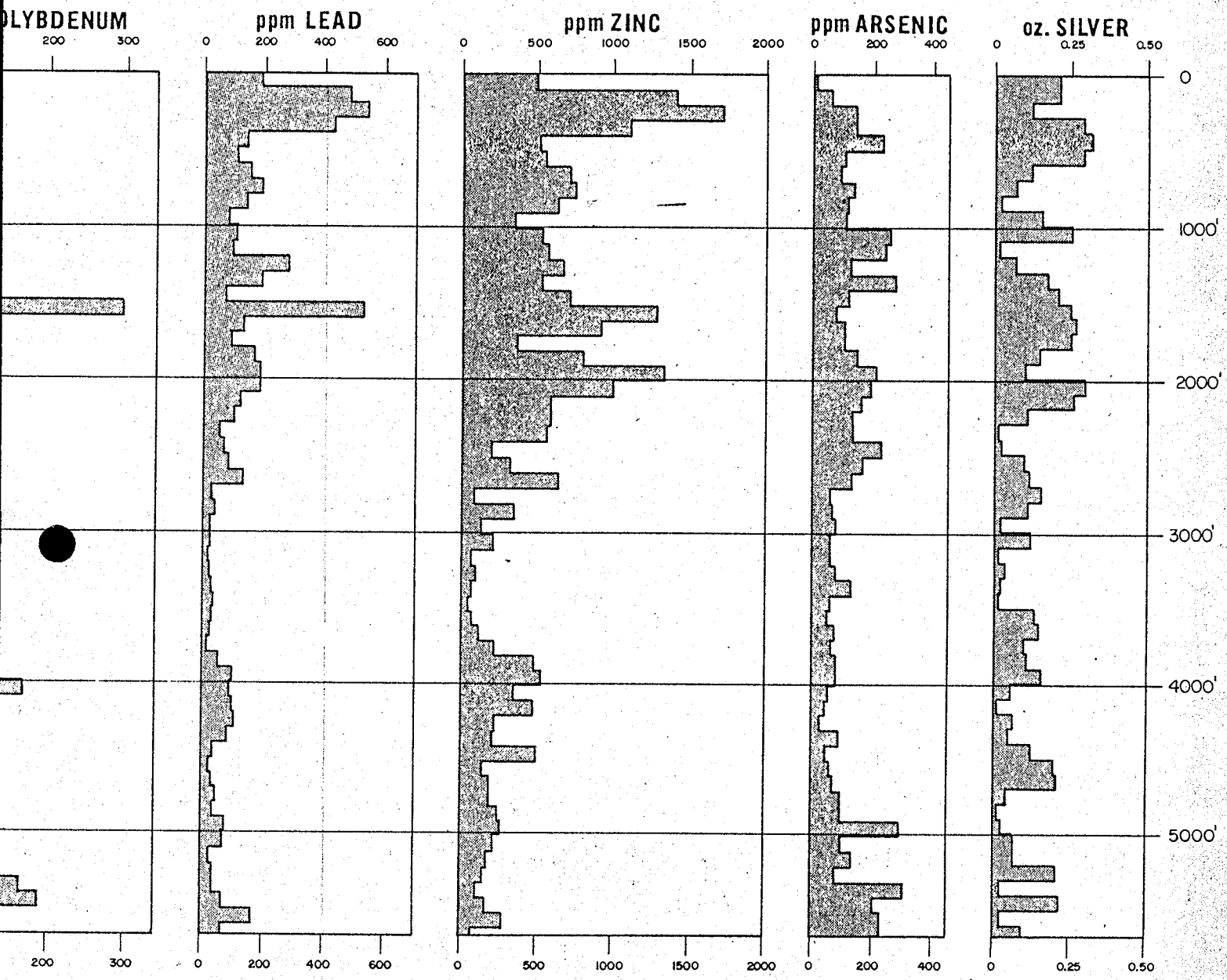
The absence of an ore-grade section of chalcopyrite mineralization in the potassic zone of TM-8 is not fully understood. Deep copper mineralization is most abundant in the interval from 4300-5500 ft. and is thus partly coincident with the zone of potassic alteration. The presence of hematite, which preferentially oxidizes chalcopyrite in the interval from 4900-5600 ft., suggests that some Cu was removed, but the phenomenon does not seem pervasive enough to remove more than 0.10% Cu from the rock. I do not presently believe that a deep, high-grade chalcopyrite zone lies out of reach below the bottom of the hole, although the continuation of strong alteration is worrisome.

Preliminary cross-sections between TM-8 and TR-10 suggest a slight rise of the top of the potassic zone and a significant rise in associated Cu content toward TR-10. This section line deviates considerably from right angles with the axis of the Mo trend surface anomaly shown in my report of August 24, 1973. I suspect that the depth to the potassic zone should decrease considerably more rapidly along a section line drawn due west from TM-8 and, therefore, further deep drilling for potassic-related mineralization should be extended in this direction.

F. T. Graybeal

F. T. Graybeal

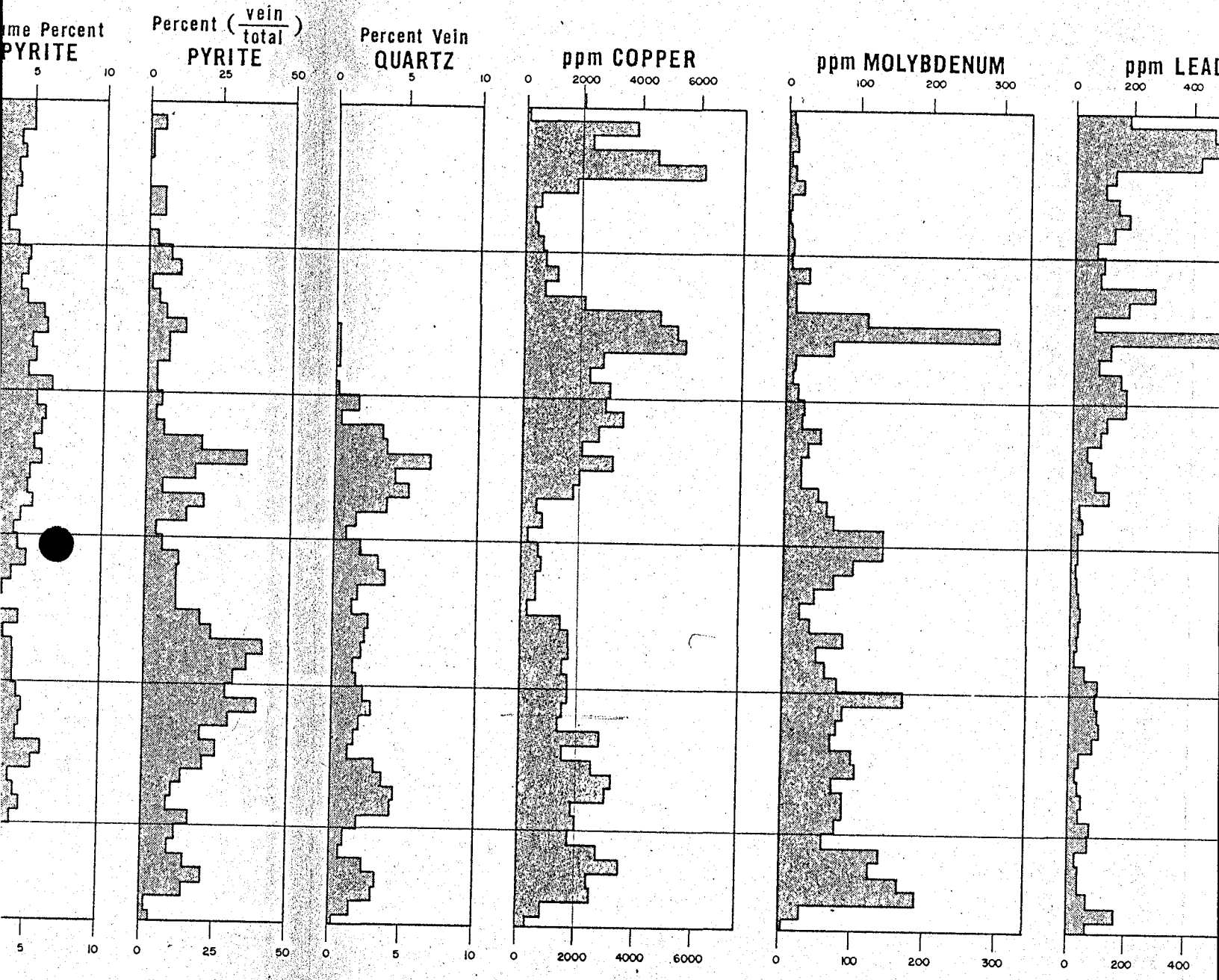
FTG:lb
Attachs.

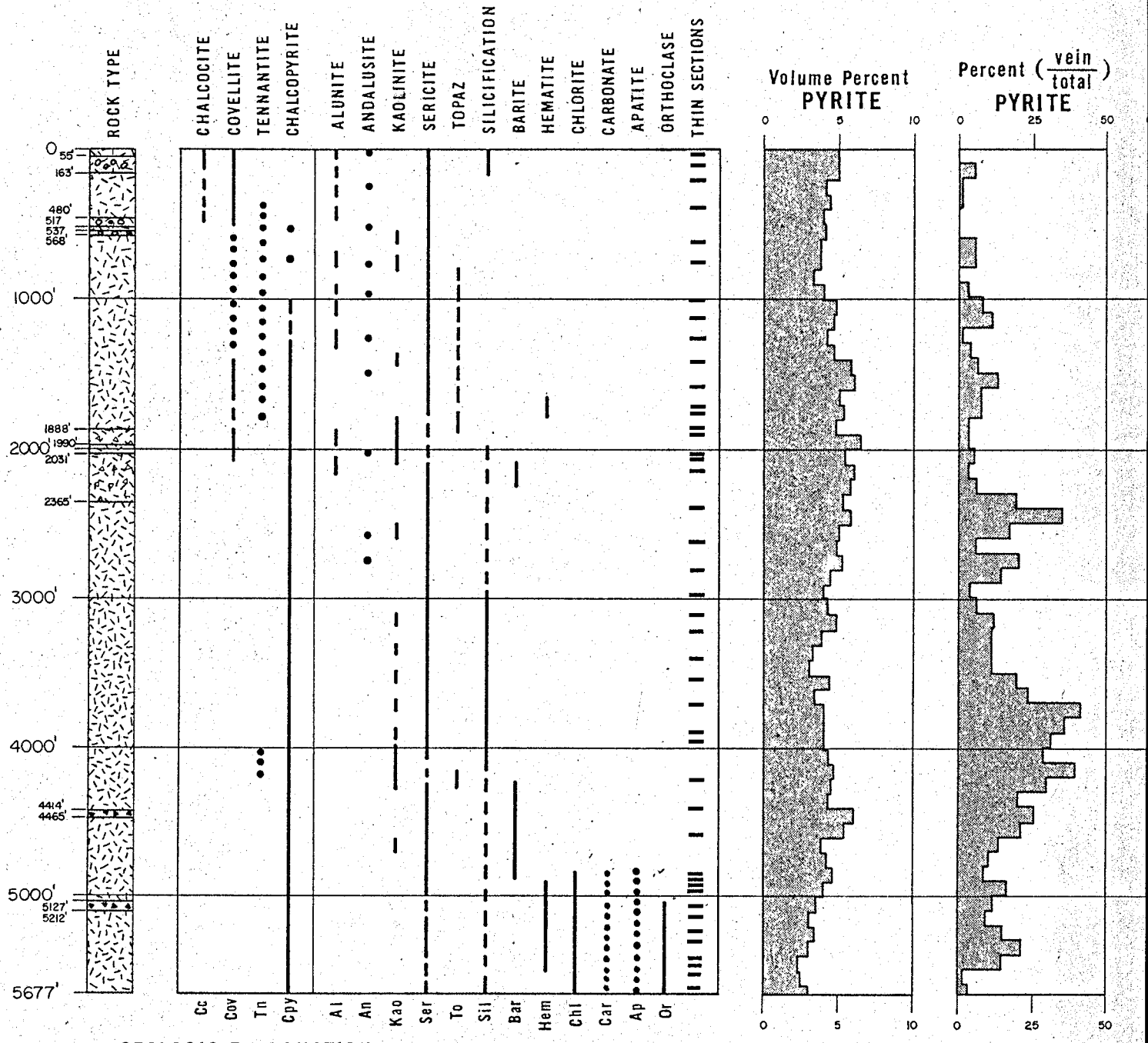


GRAPHIC LOG OF TM-8
THUNDER MTN PROJECT
PATAGONIA MOUNTAINS
SANTA CRUZ COUNTY, ARIZONA

F.T.G. 1"=1000' AUG. 1974

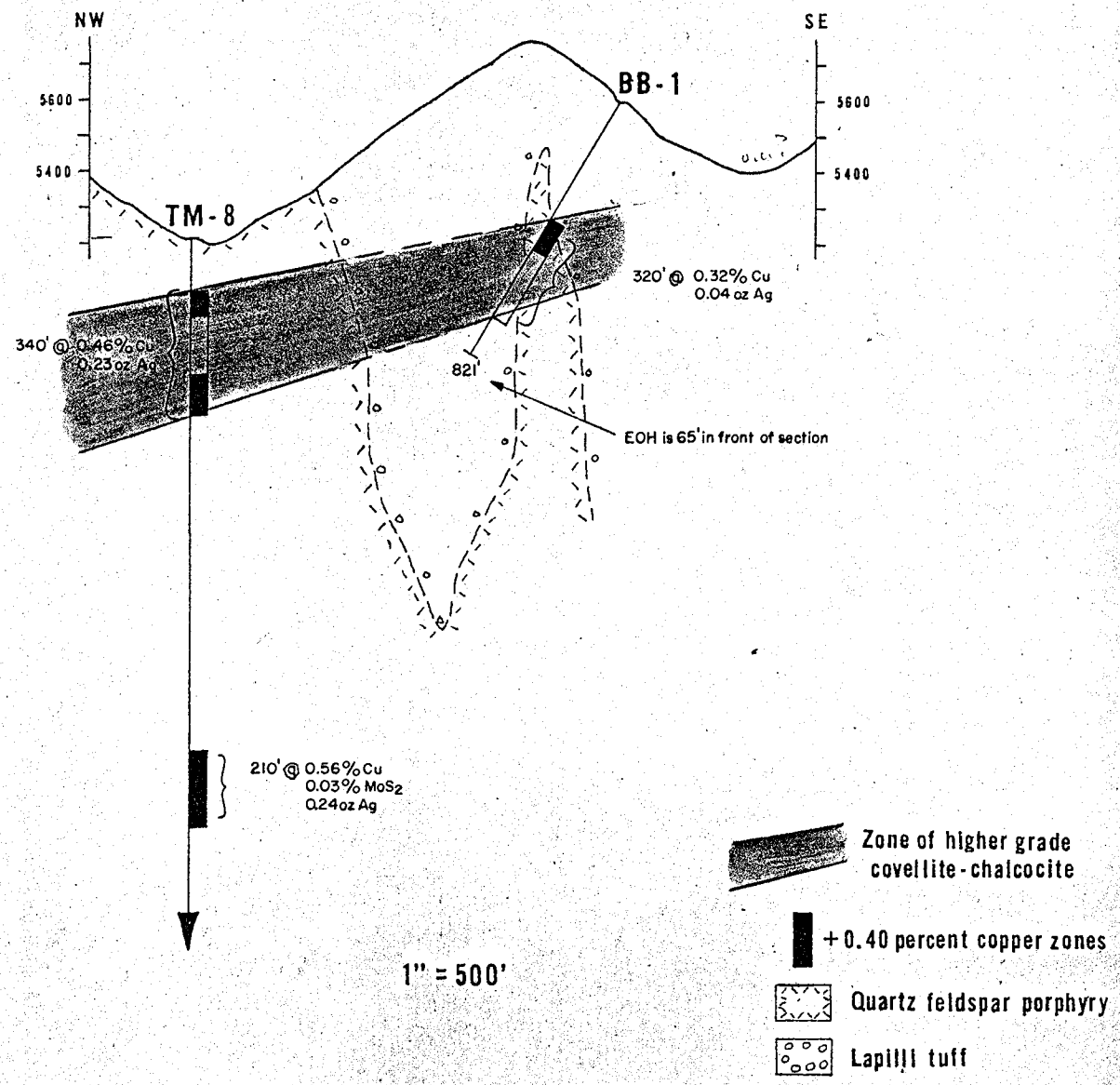
FIGURE 1


me Percent
PYRITE
5
10
Percent (vein/total)
PYRITE
0
25
50
Percent Vein
QUARTZ
0
5
10
ppm COPPER
0
2000
4000
6000
ppm MOLYBDENUM
0
100
200
300
ppm LEA
0
200
400



GEOLOGIC EXPLANATION

- Intrusive breccia
- Quartz feldspar porphyry breccia
- Quartz feldspar porphyry
- Xenolithic quartz feldspar porphyry



GEOLOGIC SECTION

N 65°W (looking NE)

THUNDER MTN PROJECT

PATAGONIA MOUNTAINS

SANTA CRUZ COUNTY, ARIZONA

FIG 2

FTG - see below

JHC

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

AUG 20 1974
W. L. K.
J. H. G.
AUG 20 1974

August 15, 1974

TO: W. L. Kurtz

FROM: F. T. Graybeal

Check assaying of copper zones in TM-8, Thunder Mtn. Project

Check assays were made of five composite samples selected from the two high grade copper intervals in TM-8. Analyses were made by American Analytical (Am), Southwestern Assayers (Sw), and Skyline (Sky) and the results are as follows:

Sample #	% Cu			% MoS_2			oz. Au			oz. Ag		
	Am	Sw	Sky	Am	Sw	Sky	Am	Sw	Sky	Am	Sw	Sky
200-300	.23	.23	.24	NA	.0007	.0008	.003	nil	<.005	.12	.09	tr
300-400	.46	.45	.47	"	.0007	.0008	.008	"	"	.28	.17	.02
400-500	.62	.59	.65	"	.001	.0008	.003	"	"	.31	.20	.16
1400-1500	.44	.46	.48	.020	.013	.020	.004	"	"	.21	.16	.16
1600-1700	.47	.48	.52	.012	.009	.011	.003	"	"	.26	.15	.14

The results for Cu are acceptable. The results for MoS_2 indicate good agreement for American Analytical and Skyline, while Southwestern is too low. The results for Au won't be evaluated due to the low values, although the same range is reported by all three laboratories. The results for Ag indicate that American Analytical is significantly higher than both the other laboratories.

The discrepancy for Ag is worrisome as it contributes significantly to the byproduct credits of the higher grade copper zones. The American Analytical and Skyline analyses were run by fire assay and the Southwestern analyses by atomic absorption. Skyline notes that they use a slightly different fusion technique than other laboratories which I can't evaluate. Pete Flores has tried both atomic absorption and fire assay and has far more confidence in the latter. The difference between American Analytical and the others is roughly constant and I suspect, therefore, that all three labs can check their own work. Further work will be done to determine which lab is the most accurate.

F. T. Graybeal

F. T. Graybeal

FTG:lb

Ag - our work at Silver State has indicated that Flores' low grade Ag work is good — checks Asarco's El Paso lab umpire analyses

PROJECT ASARCO - Thunder Mtn. HOLE NO. TM-9

Collar elev. 5100 Final depth 1745

Coord N. Coord E.

Inclination vertical Page 1 of 5

Logged by F.T. Graybeal

Date start 8/10/74 Date finish 10/15/74

ROCK TYPE and REMARKS

NX →

ILLI TUFF: white near surface, becoming lt gy w. incr. depth; massive. Estimate 40-70% subrnd-ang. lapilli, mostly reddish + gray and prob. mostly volcanic - some show vague por. text. Up to 5% qtz xenocrysts, tr feldspar. Lapilli mostly < ½" dia. Alteration is pervasive sericite w. 1-6" weakly silicif. zones. Pyrite is med gr., uniform dissem. Cov-cc dissem. in near surface zone.

135-174: fault zone: estimate 50% frags - 50% soft gouge, strong crushing of py indic. fault is post-min; possibly some cc enrichment in fault. Dip roughly 75°

ARTZ FELDSPAR PORPHYRY: light gray, massive. Contact at 4" limonite zone is weakly silicif, dips @ 60°. Estimate 10-15% altered feld. pheno, 1-2% round. qtz pheno. Rock is strongly sericitized and silicified(?). Alunite logged as irreg. wht. compact vein filling. Pyrite is dissem and in granular, vein-like zones w. no alt selvage w. diffuse borders to 1" wide. Black sulfide is chalcocite(?). Dark hairline cracks may be veins or crushed sulfides along microfaults. Many veins appear to define weakly shattered zones.

USIVE BRECCIA: med gy, compact, clasts of volc, qtz feldspar to ½", 50% matrix; upper cont. 70°, lower cont. grad., vague flow struct on up. cont.; often clayey

LLI TUFF: light gy, massive, compact; estimate 40-75% volc, ign, sed clasts to 1"; matrix is med gr, equigran. arkosic-looking. Alteration uniform strong - prob sericite; pyrite is uniform dissem and in vague, sometimes offset veins to ⅛" wide w. minor qtz, blackening of vein sulfides indicates later crushing due to slight movement

400: finely-dissem hematite is hydrothermal oxidation of earlier sulfides, rock retains light gray color w. local greenish cast.

LOGGING NOTES:

1) ore minerals: gives % Cu in each mineral, estimated where assay not available; left blank where no ore minerals seen

2) gangue minerals: vol. % present, only alteration minerals were logged

3) sulfide veins: number present, range of dips

DEPTH from	DEPTH to	DEPTH int'vl	% CORE RECOV.		ASSAY % Cu			ppm Mo	oz. Au	oz. Ag	ORE MINERALS covellite	chalcocite		enargite		molybdenite			pyrite-diss
0	10	10	—																
NX→	20		+90		.04	TMG					.03	.01							3
	30				.07							.07							4
	40				.11							.11							4
	50				.03														4
	60				.02														4
	70				.02														4
	80				.04							.04							4
	90				.02							.02							4
90	100				.01	20-100':		9		.10									
	110				.01														
	120				.02														
	130				.02														
	140				.12							.12							
	150				.15							.15							
	160				.08							.08							
	170				.08							.08							
	180				.07							.07		tr(2)					
	190				.06							.06							
190	200				.05	100-200':		10	.001	.06		.05							
	210				.03							.03							
	220				.02							.02							
	230				.03							.03							
	240				.03							.03							
	250				.01														
	260				.01														
	270				.01														
	280				.02														
	290				.21														
290	300				.01	200-300':		13	tr	.01									
	310				.01											tr			
	320				.01														
	330				.01														
	340				.01														
	350				.01														
	360	35			.03														
	370				.04														
	380				.06														
	390				.02														
390	400				.02	300-400':		20	.002	.09									
	410				.04														
	420				.02														
	430				.01														

PROJECT ASARCO - Thunder Mtn HOLE NO. TM-9

Collar elev. 5100 Final depth 1745

Coord N. Coord E.

Inclination vertical Page 2 of 5

Logged by F.T.G.

Date start 8/10/74 Date finish 10/15/74

ROCK TYPE and REMARKS

fro

43

49

500: covellite is very fine gr, both dissem and in veins. Some veins are 1/64" hairline cracks in core w. irreg attitude. Cov mostly occurs as coating on py. Traces cpy w. more abund. cov.
All sulfides are med - fine gr.
Core may become slightly whiter and softer with 1st appear. of covellite.
Veins are 1/64 - 1/8" thick, both straight and wavy, often w. diffuse borders and no alt. selvage - no contained quartz.
→ 570 - 610: pervasively crushed zone; core soft; obvious faults absent.

59

ARTZ) FELDSPAR PORPHYRY: whitish, massive, igneous text. destroyed by alt. but vague ghosts of feldspar visible, tr-nil visible qtz. eyes. Rock appears weakly + irreg. shattered - pre-mineral. Alteration is pervasive intense but very fine-gr. sericite(?). Mineraliz. is f.gr dissem. py-cov-cpy; sulfides also in 1/64-1/2" veins w no alt selvage and in irreg heavy dissem-mass. zones, 1-6", where rock was previously broken. Moly is med gr both in rare qtz-py veins and dissem. w. no assoc. qtz.

69

ICIFIED BRECCIA: dense, gray, extremely hard; silicification very f.gr. Py dissem + in irreg pods. Cut by qtz feld por. - silicif is pre-por. Possib. silicif lapilli tuff

ARTZ) FELDSPAR PORPHYRY: whitish, massive, vague feldspar ghosts; no visible qtz. eyes. Alt. is pervas. v.f.gr. sericite. Py is dissem f.+c.gr, and in rare hairline fractures; fractures occur throughout core and it tends to break easily to many angular fragments
787-803 fault zone w. mixed st.gg and unbroken zones, no slicks

79

Py veins are 1/16 - 1/2" and are often crushed due to post-mineral move. Cov-cpy mostly assoc w. py veins. Rock contains 1-5% xenoliths to 1/2" - is similar to xeno qtz. feld. por.

mn 2555 dm

DEPTH			% CORE RECOV.		ASSAY %			ppm	oz.	oz.	ORE MINERALS						
from	to	int'vl			Cu			Mo	Au	Ag	covellite	chalcocite	chalcopyrite	enargite		molybdenite	
430	440	10			.05						.05						
	450				.08						.08						
	460				.03											tr	
	470				.13												
	480				.06												
	490				.03												
490	500				.03	400-500':		20	.002	.11							
	510				.09						.07		.02				
	520				.13						.13						
	530				.08						.08						
	540				.11						.07		.04				
	550				.12						.12						
	560				.19						.19						
	570				.14						.14						
	580				.11						.10		.01				
	590				.08						.07		.01				
590	600				.04	500-600':		40	.002	.19							
	610				.02											tr	
	620				.03								.03				
	630				.05						.05						
	640				.08						.08						
	650				.12						.12						
	660				.06						.04		.02			tr	
	670				.10						.07		.03			Tr	
	680				.08						.08					tr	
	690				.12						.11		.01				
690	700				.13	600-700':		62	.003	.15	.13						
	710				.84						.80		.04				
	720				.25						.25						
	730				.03						.03						
	740				.13						.13						
	750				.15						.15						
	760				.09												
	770				.10												
	780				.06												
	790				.04								.04				
790	800		70		.04	700-800':		17	.001	.18							
	810				.07						.07					Tr	
	820				.11						.10		.01				
	830				.01						.01						
	840				.16						.15		.01				
	850				.19						.19						
	860				.09												

PROJECT ASARCO - Thunder Mtn. HOLE NO. TM-9

Collar elev. 5100 Final depth 1745

Coord N. Coord E.

Inclination vertical Page 3 of 5

Logged by F.T.G.

Date start 8/10/74 Date finish 10/15/74

ROCK TYPE and REMARKS

fro

8

875: weak but pervasive stockwork fracturing ends; rock massive below 875', but rock type is similar

8 ARTZ) FELDSPAR PORPHYRY: light gray, massive; 5-20% anhedral feldspar ghosts, poss tr qtz eyes. Contact w. xenolithic phase is grad. Alteration is very fine gr., prob. sericite. Py both dissem and in 1/32 - 1/4" veins w. sharp borders and no alt. selvage. Moly in hairline cracks not assoc. w. silica; mod py also in hairline fractures. Qtz. veins are very fine gr., brown w. no suls. Igneous texture is locally very poorly preserved

9

109 PILLI TUFF (?): massive, lt. gray. Texture has med. gr granular aspect but is obscured by alteration; 5-10% zones w lapilli + 1/8"; 5-10% whitish 1/32-1/16" clasts may be feldspar and give a weak igneous aspect to the rock. Rare zones w flat zones of varying grain size are bedding (?). Alteration is pervas., f gr., mixed ser. and silicif (?). Dissem py occas. in zones w. 10-15% sulfides - mostly 2-3%

119 ARTZ FELDSPAR PORPHYRY - (?) dense, mass, lt gray. Estim 5-10% qtz pheno (?), vague remnants of feldspar pheno (?); no lapilli. Slight granular texture not typical - identification uncertain

1228 - 1237: possib. pre-mineral fault w. 5-7% diss. py and med-cgr ser.

mn 2555 dm

DEPTH from	DEPTH to	DEPTH int'vl	% CORE RECOV.		ASSAY % Cu			ppm Mo	oz Au	oz. Ag	ORE MINERALS covellite	black sulfide(?)	chalcopyrite	enargite		molybdenite		
860	870	10			.14						.14							
	880				.15						.15							
	890				.02													
890	900				.11	800-900':		28	.001	.14	.10		.01					
	910				.01											tr		
	920				.06						.06					tr		
	930				.01											tr		
	940				.07								.07			tr		
	950				.05											tr		
	960				.05								.05					
	970				.01													
	980				.07													
	990				.06													
990	1000				.03	900-1000':		44	.001	.05								
	1010				.08						.04		.04					
	1020				.04						.04							
	1030				.07						.07							
	1040				.02													
	1050				.01													
	1060				.01											tr		
	1070				tr													
	1080				.01													
	1090				.01						.01							
1090	1100				.01	1000-1100':		36	tr	.09								
	1110				tr													
	1120				.01													
	1130				.01													
	1140				.01													
	1150				.01													
	1160				.01													
	1170				.01													
	1180				.01											tr		
	1190				.01													
1190	1200				.01	1100-1200'		16		.02								
	1210				.01													
	1220				.01													
	1230				.01													
	1240				.01							.01						
	1250				tr							tr						
	1260				.01							.01						
	1270		60		tr													
	1280				tr													
	1290				.01													

ASARCO

Southwestern Exploration Division

August 18, 1977.

FILE MEMORANDUM

Summary of TM-10
Thunder Mountain Project
Santa Cruz County, Arizona

Hole TM-10 was collared approximately 1000 ft. east of TR-10 and was diamond drilled to 567 ft. to perform 1975-1976 assessment work requirements. The hole was located to provide initial footage for a future deep test of continuity of the mineralization in TR-10. Extremely difficult drilling was encountered below about 350 ft. in strongly broken, vuggy, and completely silicified lapilli tuff. The hole was abandoned at 567 ft. due to severe caving below 350 ft. and was left uncased. Direct drilling costs (hole with minor road work) averaged $30.21/ft.

The geology is described on the attached drill log. The rock types are as noted except that a thin section at 123 ft. revealed the rock to be typical lapilli tuff, rather than a tuffaceous arkose; this may indicate an epiclastic zone in the diatreme rather than one of the earlier Mesozoic clastic rocks common in this area.

Hydrothermal alteration in the intrusive breccia is a pervasive advanced argillic assemblage of fine-grained quartz, kaolinite, and alunite. Alteration in the epiclastic unit from 113-241 is pervasive, but does not alter the rock texture. Strong silicification appears at about 220 ft. and continues to the bottom of the hole. Fluid inclusions are present in 2 percent of the quartz xenocrysts in the lapilli tuffs as abundant Type 2 and Type 3 varieties. The remainder of the quartz xenocrysts were entirely clear. This mixing of fluid inclusion populations in the lapilli tuff has been abundantly observed elsewhere in the Sunnyside area. Fluid inclusions in the silicified zone below 220 ft. were mostly Types 1 and 2.

The massive silica encountered below 220 ft. was not exposed at the surface and its presence was unexpected. It may occur as a southward projection of the massive ledge exposed northeast of TR-10. The rather abrupt appearance of the silica is curious and it may represent the top of a hot spring apron which was subsequently covered by the epiclastic tuffs.

The only significant sulfide mineral present is pyrite which is entirely disseminated; sulfide veins are absent. Pyrite is confined to the upper part of the hole and is absent from the massive silicification below 220 ft. Analyses of 5 ten-foot intervals are reported on the attached log. Although nothing of economic interest was found, the assays show anomalously high silver which appears characteristic of the entire Sunnyside zone.

The advisability of deepening TM-10 is now in doubt in view of the negative results of TR-15, although further geologic studies are planned. If

additional drilling near TM-10 is warranted, it might be advisable to hammer drill a hole to penetrate as much of the concealed silicified zone as possible before converting to diamond drilling.

F. T. Graybeal

F. T. Graybeal

FTG:jlh
attmts

PROJECT THUNDER MTN. HOLE NO. TM-10

Collar elev. 5845 Final depth 567'

Coord N. Coord E.

Inclination vertical Page 1 of 1

Logged by F.T. Graybeal

Date start 7/24/76 Date finish 8/27/76

ROCK TYPE and REMARKS

fr

HQ
to
EDH

T

USIVE BRECCIA: mass - brkn, reddish-gy-wht. Est. 30% clasts size/type like tuff but highly variable texture w. sharp contacts at textural changes suggests intrusive emplacement. Also presence of rounded clasts of massive qtz-py only seen to date in intrusive bx. Rock varies from highly siliceous

1 intervals to compact-massive- but soft zones. Sulfide zones up to 10' long, py is f.gr., dissem. Alt. is ser-clay-alun or silicif; everywhere pervasive.

FACEOUS ARKOSE: mass, gy w brkn hematitic zones; 10% clasts set in med gr granular matrix. High % equigran. matrix with slight bedding (?) @ 40° sugg epiclastic origin. Py is f-med gr, uniform diss. Pervasive ser. alt

1 160-182: brkn, oxidiz zone w. 40% lapilli, strong hem. stain; lapilli tuff bed. Clastic zone below 182' has hypogene (?) oxidiz of suls, no transport hem, is increasingly silicified to 241'

LL TUFF: mod brkn; poros; pervasively leached. Overall grayish w pervas + joint-controlled hem. stain. Est. 40% ang-subrnd lapilli. Silicification is pervasive

2 in matrix and lapilli. Fractures @ 60-80° common 290-320. 5" incl. of typical qmp at 328'. Scattered clasts to 6" in deeper portions of section

345-365: 10% 1/4-1" cavities, poss. former inclusions of massive fgr. py

3

459-567: rock is broken with several zones containing no rock pieces over 1" long; rock is moderately (5-15%?) poros due to leach of mass. sul. clasts (?) Spotty clasts of massive gray silica suggest 2 periods

4 of silicif or intra-silicif age of lapilli tuff.

S notes:

1.) assaying by American Analytical
2.) hole drilled by Longyear
3.) hole not surveyed or cased

mn 2555 dam

	DEPTH from	DEPTH to	int'vl	% CORE RECOV.	Assay Interval	ASSAY % Cu	% MoS_2	% Pb	% Zn	oz. Au	oz Ag	ORE MINERALS enargite						
HQ to EOH	0	8	8															
	8	20	12															
		40	20															
		60	↓									tr						
		80																
	80	100			90-100	.01	.002	.02	.01	.002	.09							
		120																
		140																
		160																
		180																
	180	200			190-200	.02	.002	.02	tr	.003	.16							
		220																
		240																
		260																
		280																
	280	300			290-300	.02	.005	.02	tr	.006	.33							
		320																
		340										tr						
		360																
		380																
	380	400			390-400	.02	.003	.02	tr	.005	.25							
		420																
		440																
		460																
		480		85														
	480	500		85	490-500	.01	.003	.01	.01	.003	.19							
		520																
		540																
		560	20															
	560	567	7															
		EOH																

ASARCO

Southwestern Exploration Division

June 9, 1978

F.T.G.

TO: F. T. Graybeal

FROM: S. R. Davis

Summary of TM-11 and TM-12
Thunder Mountain Project
Patagonia Mountains, Arizona

During late summer of 1977, two shallow angle holes were drilled from the existing TM-8 site. Both holes encountered a zone of low grade copper mineralization dominated by covellite and with minor enargite, chalcocite and chalcopyrite. As in the upper portion of TM-8, alteration typically consists of intense sericitization with subsidiary quartz, clay and alunite. Both TM-11 and TM-12 were terminated prematurely as they encountered nearly impenetrable, very weakly mineralized, brecciated silica tuff (silica breccia).

Drill hole TM-11 is inclined -45° to the south and was bottomed at a depth of 668.5 feet. The drill hole encountered quartz feldspar porphyry and marginal xenolithic quartz feldspar porphyry to a depth of 318 feet, where lapilli tuff of the chief diatreme was penetrated. From 609 to 625 feet a thin dike(?) of quartz feldspar porphyry transitioned with increasing depth to a massive, weakly to moderately silicified breccia and subsequently at 632 feet to a dense, homogeneous silica breccia or brecciated silica tuff.

Alteration is essentially phyllic throughout and is dominated by sericite to a depth of 625 feet, where it gives way to intense silicification. Minor clay and alunite are locally present. Copper mineralization occurs primarily as disseminated and fracture oriented covellite and enargite with lesser chalcopyrite, chalcocite and possible local tennantite/tetrahedrite also noted. Pyrite as disseminations and veinlets is the only other sulfide observed.

Although assays as high as 0.75% copper and 1.39 ounces silver/ton were received (TM-11), average values for any significant intercepts were considerably less. The major interval from 40 to 630 feet (590 feet) averaged 0.325% copper and on the basis of spot assays, approximately $\geq$0.3 ounces silver/ton. The best interval, from 360 to 390 feet (30 feet), averaged 0.62% copper and contained only one silver assay (1.39 ounces Ag/ton).

Drill hole TM-12 is inclined -45° to the west and reached a total depth of 622 feet. The drill hole encountered mainly quartz feldspar porphyry throughout with only two thin remnants of lapilli tuff (164-200 and 581-599). A weakly silicified breccia with a considerable number of exotic fragments was penetrated from 382 to 433 feet, and the hole bottomed in dense silica breccia or brecciated silica tuff (599-622).

Alteration can be classed as phyllic throughout with sericite dominant to $\pm$520 feet, and silica more abundant thereafter. Minor clay and alunite were also noted. Copper mineralization occurs as disseminated and fracture contolled covellite and very minor chalcocite. The only other sulfide noted is pyrite, which occurs both as fine grained disseminations and fracture coatings-veinlets.

Copper assays as high as 0.95% and silver assays of up to 0.78 ounces/ton were received on individual 10 foot assay intervals (TM-12). The main intercept of copper mineralization in TM-12 is from 220 to 510 feet, 290 feet grading 0.28% copper. The best interval is from 30 to 70 feet, 40 feet which averages 0.66% Cu. Again, spot assays tend to indicate silver values of 0.2 to 0.3 ounces/ton.

The intersection of brecciated silica tuff (silica breccia) in both holes gives us some additional control on the geometry of the silica tuff masses. To the south, drill hole TM-11 encountered younger, unsilicified or weakly silicified (more recently active?) breccia followed by massive silica breccia at a horizontal distance of 440 feet. This compares to a mapped surface distance of ±485 feet and indicates a fault contact of near vertical orientation. To the west, TM-12 penetrated the silica breccia at a horizontal distance of 420 feet. This, in comparison to a surface distance of ±675 feet gives an east dipping attitude of approximately 40° in a silica bound (less active) inclined contact.

A copy of the geologic logs for holes TM-11 and TM-12 are attached.

SRDavis/gal

S. R. Davis

SRD:jlh
cc logs attached

3441 East Milber

Thunder Mtn
Phone 889-5787

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS · CHEMISTS · METALLURGISTS

TUCSON, ARIZONA 85714

SAMPLE SUBMITTED BY ASARCO, INC.

DATE Feb. 14, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
TM-11 5-10			0.01					
10-20			0.04					
20-30			0.03					
30-40			0.13					
40-50			0.59	0.09	0.21	.0004		
50-60			0.41					
60-70			0.31					
70-80			0.51					
80-90			0.70					
90-100			0.47	0.12	0.42	.0002		
100-110			0.41					
110-120			0.62	140-180 = 140 = 6.99/14 = 0.49				
123-130			0.51			40-350' = 310' @ 0.39% Cu		
130-140			0.52			inclined @ 45%		
140-150			0.54					
150-160			0.26					
160-170			0.42					
170-180			0.57					
180-190			0.28					
190-200			0.14	0.03	0.10	.0003		
200-210			0.21	180-540 = 360 = 10.25/36 = 0.28				
210-220			0.32					
220-230			0.33	0.05	0.17	.0004		
230-240			0.52					
240-250			0.26					

40-540 = 500' = 17.09/50 = 0.34

CHARGES $ 108.75

INVOICE NO. 15630

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TUCSON, ARIZONA 85714

SAMPLE SUBMITTED BY ASARCO, INC.

DATE Feb. 14, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
M-11 250-260			0.59					
260-270			0.34					
270-280			0.26					
280-290			0.28					
290-300			0.34	0.05	0.02	.0007		
300-310			0.20					
310-320			0.19					
320-330			0.21					
330-340			0.11					
340-350			0.28					
350-360			0.12					
360-370			0.50	0.09	0.28	.0004		
370-380			0.62					
380-390			0.75					
390-400	5.29/19 = 0.28		0.25	0.05	0.11	.0024		
400-410			0.30					
410-420			0.11					
420-430			0.21		340-540 = 180 = 5.27/18 = 0.29			
430-440			0.20		190 wt fl/ts 0.28 145 wetted			
440-450			0.19					
450-460			0.15					
460-470			0.26					
470-480			0.37					
480-490			0.19					
490-500			0.17	0.04	0.03	.0010		

CHARGES $ 108.75

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SAMPLE SUBMITTED BY ASARCO, INC.

DATE Feb. 14, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON
TM-11 500-510			0.29				
510-520			0.21				
520-530			0.19				
530-540			0.31				
540-550			0.16				
550-560			0.10				
560-570			0.09				
570-580			0.05	0.21	0.56	.0005	
580-590			0.18		540-630=90 = 21.05/9 = 0.23		
590-600			0.20	0.04	0.05	.0006	
600-610			0.32				
610-620			0.47				
620-630			0.51	540-630=	19.17/59 = 0.32		
630-640			0.02				
640-650			0.01				
650-660			0.04				
660-668			0.02	0.07	0.02	.0070	

CHARGES $ 76.75

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SAMPLE SUBMITTED BY ASARCO, INC.

DATE Feb. 20, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
TM-11								
40-50	.003	0.40						
90-100	.001	0.26						
190-200	.002	0.27						
220-230	.001	0.31						
290-300	.003	0.27		3.46/10				
360-370	.002	1.39						
390-400	.003	0.07						
490-500	.001	0.10	7 (2.97/.42)					
570-580	.002	0.20						
590-600	.002	0.19						
660-668	.001	0.03						

REGISTERED ASSAYER
CERTIFICATE NO. 4452
PETE S. DONES
Date Signed 2/20/78
Arizona U.S.A.

ASSAYER-CHEMIST

CHARGES $ 52.25

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SAMPLE SUBMITTED BY ASARCO, INC.

DATE March 7, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
TM-12 5-10			0.03					
10-20			0.18					
20-30			0.18					
30-40			0.51					
40-50			0.49	40' inclines @ 0.66% 28' Vert			10-100 90' inclines @ 0.41%	
50-60			0.70				3.70/9 =	
60-70			0.95					
70-80			0.28					
80-90			0.14				100-570' 560'	390' Vert = 0.25% Cu
90-100	.002	0.21	0.27	0.05	0.08	.0008		
100-110			0.07					
110-120			0.17					
120-130	Trace	0.05	0.11	0.28	0.46	.0004		
130-140			0.10					
140-150			0.07			100-220=	120 = 1.02/12 =	0.085 Cu
150-160			0.05					
160-170			0.16					
170-180			0.08					
180-190			0.04					
190-200	.003	0.34	0.09	0.04	0.19	.0005		
200-210			0.04					
210-220			0.04					
220-230			0.58					
230-240			0.18					
240-250			0.50					

REGISTERED ASSAYER CERTIFICATE NO. 0152 PETE S. PORES Date Signed 3/7/78 Arizona U. S. A.

CHARGES $ 113.00

INVOICE NO. 15666

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TUCSON, ARIZONA 85714

SAMPLE SUBMITTED BY ASARCO, INC.

DATE March 7, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
TM-12 250-260			0.12					
260-270			0.07					
270-280	Trace	0.02	0.21	0.07	0.12	.0005		
280-290			0.38					
290-300	.001	0.19	0.27	0.03	0.09	.0007		
300-310			0.24					
310-320			0.08			220-570 =	350 = 9.39/35	= 0.27 %Cu
320-330			0.21					
330-340			0.45					
340-350			0.10					
350-360	Trace	0.03	0.16	0.07	0.25	.0005		
360-370			0.23					
370-380			0.87					
380-390			0.26					
390-400	.003	0.21	0.13	0.08	0.12	.0037		
400-410			0.13					
410-420	.004	0.78	0.30	0.16	0.39	.0024		
420-430			0.06					
430-440			0.37					
440-450			0.41			10-570 =	560 = 14.11/56 =	0.25 %Cu
450-460			0.38					
460-470			0.31					
470-480			0.32					
480-490			0.20					
490-500			0.36					

CHARGES $ 142.50

INVOICE NO. 15666

REGISTERED ASSAYER CERTIFICATE NO. 6542 PETE S. FLORES Date Signed 3/7/78 Arizona U. S. A.

Pete S. Flores

ASSAYER-CHEMIST

1 East Milber

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SAMPLE SUBMITTED BY ASARCO, INC.

DATE March 7, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
TM-12 500-510	.006	0.51	0.28	0.08	0.14	.0020		
510-520			0.07					
520-530	Trace	0.02	0.29	0.05	0.42	.0037		
530-540			0.19					
540-550			0.22					
550-560			0.17					
560-570			0.29					
580-590			0.11					
590-600	.003	0.26	0.11	0.05	0.08	.0045		
600-610			0.02					
610-620			0.03					

REGISTERED ASSAYER CERTIFICATE NO. PETE S. FLORES Date Signed 3/7/78 Arizona U. S. A.

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CHARGES $ 74.50

15666

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SAMPLE SUBMITTED BY ASARCO, INC.

DATE March 7, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PPM COPPER	PPM LEAD	PPM ZINC	PPM MOLYBDENUM	PPM As	
M-12 270-280							21	
500-510							78	

REGISTERED ASSAYER CERTIFICATE NO. 6632 DETC. S. FLOYD S. Date Signed 3/7/78 Arizona U. S. A.

CHARGES $ 7.50

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File TM assays

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ASSAYERS - CHEMISTS - METALLURGISTS

Tucson, Arizona 85714

SAMPLE SUBMITTED BY Asarco, Inc. DATE Sept. 9, 1982

SAMPLE MARKED	GOLD PPM	SILVER PPM	PPM COPPER	PPM LEAD	PPM ZINC	PPM MOLYBDENUM	PPM Arsenic	
TM-14: 21-30	<0.1	1.7	194	52	1700	10	26	
60-70		1.1	76		1960			
70-80		1.3	109		1860			
80-90		1.3	82		1280			
90-100	<0.1	4.0	159	275	+2000 0.41%	10	41	
120-130		4.1	175		+2000 0.34%			
130-140		2.3	140		+2000 0.29%			
190-200	<0.1	1.1	57	54	1560	19	17	
220-230		1.6	143		1500			
230-240		1.9	114		+2000 0.22%			
240-250		3.0	162		+2000 0.26%			
250-260		7.7	1110		+2000 0.35%			
290-300	<0.1	2.1	201	241	1240	16	32	
390-400	<0.1	2.2	203	60	+2000 0.25%	12	3	
490-500	<0.1	1.5	77	80	160	38	9	
550-560		1.0	133		240			
560-570		1.7	518		1540			
590-600	<0.1	1.6	94	18	1090	15	<1	
640-650		1.0	66					
650-660		0.9	73					
690-700	<0.1	0.8	79	18	93	16	88	
720-730		2.6	727					
730-740		2.4	311					
740-750		2.6	166					
750-760		2.6	204					

REGISTERED ASSAYER CERTIFICATE NO. 9072 RICHARD M. ARCS DATE SIGNED 9-9-82 Arizona U.S.A.

CHARGES $

1 copy WLK/JDS
" FRK

INVOICE NO.

ASSAYER-CHEMIST

2141 East Milber

Phone (602) 889-5787

Rec'd Fax 16 SEPT 82 Eureka, UT

AMERICAN ANALYTICAL and METALLURGICAL LABORATORIES, INC.

ASSAYERS - CHEMISTS - METALLURGISTS

Tucson, Arizona 85714

SAMPLE SUBMITTED BY Asarco, Inc.

DATE Sept. 9, 1982

SAMPLE MARKED	GOLD PPM	SILVER PPM	PPM COPPER	PPM LEAD	PPM ZINC	PPM MOLYBDENUM	PPM Arsenic	
TM-14: 760-770		2.0	202					
770-780		2.9	269					
780-790		2.8	259					
790-800	<0.1	6.4	469	35	805	15	9	
800-810		2.6	161					
810-820		3.5	130					
820-830		5.4	146					
830-840		6.0	337					
840-850		2.6	490					
850-860		3.7	270					
860-870		3.7	364					
870-880		2.5	134					
880-890		2.8	285					
890-900	0.32	2.0	58	21	1501	9	3	
900-910		4.8	133					
Av.		2.7	222.		1501			

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CHARGES $

INVOICE NO.

ASSAYER-CHEMIST

PROJECT ASARCO - 3R | HOLE NO. TR-10
Collar elev. | Final depth 4105
Coord N. | Coord E.
Inclination vert | Page 1 of 10
Logged by FTG
Date start 8/17/72 | Date finish 12/1/72

ROCK TYPE and REMARKS

INTRUSIVE BRECCIA: massive, no vugs; frags subang - ang to 6" dia in med - f.gr gritty matrix; clasts 70% silica tuff, minor qtz mz. por, rhy por., sharp contact w. matrix. Frags = 40-75% of breccia. Alteration is pervasive f.gr. ser; alunite in clots to 1/4" and discont. veins, veins incr w. depth (?) Dissem. py - enar is post - bx and is mostly in matrix Enar is med - c.gr. in masses to 1/4" and in 1/16 - 1/4" discont alun. veins, rarely as rims around frags Dissem. enar assoc. w. incr ser. Chalcocite as coatings on py and enar.(?). Silica tuff occas has 5-10% f.gr py of pre-bx age Completely leached intervals at 18-48', 63-65, 123-127, 135-147 Rare 1-3" gougy intervals indicate post-bx faulting

170 - 192: abundance of qtz. monz. por frags increases

QUARTZ MONZONITE PORPHYRY: contact grad. 192-205, qmp has 10-30% 1/16-1/4" anhed-euhed feld. pheno; por. texture often vague due to st. alt. Rock is wkly bx w. 1/16" stockwork-like alunite veins. Alteration pervasive, f.gr. Gray kaolinite (?) veins cut white alunite (?) veins. Py is dissem and coarser than in intrusive bx. Enar. is c.gr., dissem in angular enar-py-alun filled vugs to 1" dia, in enar-alun and enar-py veins. Estim 70% enar is dissem

2 INTRUSIVE BRECCIA: contact grad; mixed ang. frags silica tuff (70%) and qtz mz. por. (30%) all < 6" dia, form 70-95% of rock with 5-30% grit-clay (?) - ser matrix; frag outlines and rock text. often vague. Alt. is pervasive ser. w ang pods + short veins of alunite. Poss silicif (?) of qmp Enar as 1/16 - 1/2" clots in matrix, no veins. Py fgr uniform dissem to 347', then dissem, in irreg. clots and 1/4-3/4" veins. Wk fault 302-309

3 370-465: change to qtz mz. por. - rich intrusive breccia, grad over 20', characteriz. by sharp frag. outlines, incr in % matrix, incr in # rock types. Frags are ang., 1/4-4" dia., 70% qmp, 30% silica tuff + por. volc., form 40-80% of rock; 5% of frags contain up to 80% v.f gr py of pre-bx age. Alt. is pervasive Py is f.gr. where dissem, c.gr. in vein-like aggregates Enar is dissem. Minor shear(?) fracts

LOGGING NOTES:

1.) ore minerals – gives % Cu in each mineral; volume % where no assay available (tr = < 0.1 vol %) left blank where no ore minerals were seen

2.) gangue minerals – gives volume % present; only alteration minerals were logged

3.) sulfide veins – gives number present and range of dips

DEPTH from	DEPTH to	DEPTH int'vl	% CORE RECOV.		ASSAY Cu		ASSAY Mo (ppm)			ASSAY Ag (oz)	ORE MINERALS chalcocite	enargite	chalcopyrite		molybdenite	sphalerite	
0	10	10	—														
	20		80		.49						.10	.39					
	30		80		.05												
	40		80		.02												
	50		90		.06						tr	.06					
	60		100		.28							.28					
	70				.10							.10					
	80				.12							.12					
	90				.05							.05					
90	100				.03							.03					
	110		varies		.05							.05					
110	120		95-		.46					.10	.30	.16		±5250 / −110 / 5140 ? top of sulf. ?			
	130		100%		.65	SD' @				.14	.65	tr					
	140				1.10					.14	1.10	tr					
	150				.27	0.63				.15	.27	tr					
	160				.65					.14	.65						
	170				.04						.04						
	180				.08						.08	tr					
	190				.04						.02	.02					
190	200				.09		11					.09					
	210				.04							.04					
	220				.06							.06					
	230				.08	150' @						.08					
	240				.08							.08					
	250				.18	0.07						.18					
	260				.10							.10					
	270				.11							.11					
	280				.05							.05					
	290				.03							.03					
290	300				.01							.01					
	310				.06							.06					
	320				.37					.19		.37					
	330				.53					.15		.53					
	340				.22	50' @				.20		.22					
	350				.10	0.31						.10					
	360				.31							.31					
	370				.01							.01					
	380				.07	40' @						.07					
	390				.24	0.11						.24					
390	400				.12		21					.12					
	410				.02							.02					
	420				.03							.03					
	430				.01							.01					

PROJECT ASARCO - 3R | HOLE NO. TR-10
Collar elev. | Final depth 4105
Coord N. | Coord E.
Inclination vert | Page 2 of 10
Logged by FTG
Date start 8/17/72 | Date finish 12/1/72

ROCK TYPE and REMARKS

465 – 618: intrusive breccia contains 60-95% silica tuff frags, also spher. rhy., qmp, por volc. Alt. of matrix is wht, wispy - angular patches qtz - ser. Py is dissem and rare veins to ½". Enar all dissem. Locally strong shearing. This section contains zones of st bx, but not mixed, silica tuff – may be large blocks – see 465-488, 562-587, 594-618.

557: ⅛" sphalerite vein
562 - 587: silica tuff breccia(?): st. shatter; patches med-gr sericite

587- 594: intrusive breccia: typical multilithic bx, sharply defined frags
594 - 618: silica tuff breccia (?): vague bx text., hem assoc. w st. py.

618 - 710: typical multilithic intrusive breccia w no vugs, subang - round frags to 5" dia forming 60-90% of rock frags of qmp and mass. v.f.gr py more abundant than above. Contacts top and bottom sharp. Suls irreg. dissem in matrix and frags. Veins + barren joints rare
650 - 660: strong dissem to mass. pyrite, minor faulting, 2 veins at ½", chalcocite as coat on py; rocks on top + bottom wkly silicif.

UARTZ MONZONITE PORPHYRY BRECCIA: gray, mass, w. 30-40% white anhed alt. feld. pheno. Rock is weakly brecciated, frags all angular and show ⅛ - 3" separation, all healed w dk gy. siliceous material and minor angular pods ser(?). Alt. is pervasive, often nearly destroying por. text. Pyrite is uniform dissem and in rare ⅛" veins
738-748: intrusive breccia; sharp irreg. contacts; intrusive character emphasiz. by absence of qmp frags, even though qmp forms upper - lower contacts
756-764: intrusive breccia: py veins at contact cutting both rocks
784 - 818: wk. fault zone; mostly broken w. minor gouge

820: qtz. monz. por. cut by minor gritty zones in irreg. pattern, possible xenoliths

853 - 858: intrusive breccia

DEPTH from	DEPTH to	int'vl	% CORE RECOV.		ASSAY Cu		ppm Mo			oz Ag	ORE chalcocite	enargite			molybdenite	sphalerite			MINERALS
430	440	10			.01							.01							
	450				.01							.01							
	460				tr							tr							
	470				.01							.01							
	480				.01							.01							
	490				.01														
490	500				.12						.08	.04							
	510											tr							
	520											tr							
	530											tr							
	540											tr							
	550											tr				tr			
	560											.01				tr			
	570				.01							tr							
	580											tr							
	590											tr							
590	600				tr		13					tr							
	610											tr							
	620											tr							
	630											tr							
	640											.17							
	650				.17					.13	.40	.40							
	660				.80							tr							
	670				.02						.05	.01							
	680				.06							.02							
	690				.02							.01							
690	700				.01							tr							
	710											tr							
	720											tr							
	730											tr							
	740											tr							
	750																		
	760																		
	770																		
	780																		
	790																		
790	800				.02		6												
	810																		
	820											tr							
	830																		
	840																		
	850																		
	860																		

mn 2555 drm

PROJECT ASARCO - 3R HOLE NO. TR-11

Collar elev. 5700 Final depth 5472

Coord N. Coord E.

Inclination vertical Page 1 of 13

Logged by F T. Graybeal

Date start Jan. 9, 1975 Date finish Oct. 2, 1975

ROCK TYPE and REMARKS

NC → 4

2 ARTZ MONZONITE PORPHYRY: brkn-massive, soft; uniform gray to
3 red in leached intervals; 25% white-altered feld. pheno to 1/4", 3%
lt buff-alt. bio. pheno., uniform texture. Alteration is pervasive - intense,
f.gr. clay-sericite. Leached to 50' w mixed indig. + trans hem, minor lim,
mixed leach. + suls 79-92'. Pyrite 50-79' is uniform diss, med-f.gr w
variable wk coating of chalcocite

ASKITE: contact w. qmp is strongly leached, dip n 50°. Rock is gray with
9 rounded - highly irregular white clots 1/8-1" dia which form 5-40%
of rock. Texture is very characteristic of intense advanced argillic
alteration of alaskite on surface. All evidence of former igneous texture
is destroyed - rock looks like a spherulitic volcanic. Gray matrix is fine gr.
siliceous. Clots also fine gr, contain f.gr. advanced arg. minerals and
qtz-ser. Trace 1/8" white veins. Leaching 112-120, 122-154, 160-163, 199-207
Pyrite uniform diss in gray matrix and in inner portions of white clots.

OLITHIC QUARTZ MONZONITE PORPHYRY: rock massive, grayish.
Texture to 175' extremely vague, occas. tuffaceous(?) At 175' inclusions
of alaskite become abundant, vary 1-20' long with typical wormy-clotlike
19 texture indicating strong adv. arg. alt. Py. occas. forms concentric zone in
intermed. areas of clots. Below 200' qtz monz. por. exhibits 1"-1' zones
of non-porphyritic, med-f.gr texture, rarely with qtz. eye-like grains
suggestive of a tuff or qtz. feld por, only forms 1-5% of rock; these
zones may simply be due to textural variations in qmp (although they
are rare at the surface. Estimate alaskite forms 30-40% of zone
Pyrite is med. gr. dissem and in alunite(?) veins. MoS_2 is dissem. Minor
shearing @ 75° Py veins 1/16-1/4"

29

ASKITE: gray, massive. Clot-like texture typical of advanced arg. alt
common. Alt often cut by 6"-3' zones of qtz monz por and
tuffaceous material. No obvious clasts of qmp. Alaskite forms 70-80%
of core. Pyrite diss-med. gr and in veins (f.gr). Black sul. in elongate
masses along joints is similar to enargite in TR-10, but this is crushed
partly alt. to hem. All veins contain variable alunite (?); no alt. selvage, no qtz,
1/8-1/2" thick.

ARTZ MONZONITE PORPHYRY: pale gray, massive, soft. Uniform text w
39 35% white, alt feld pheno. Alt is uniform pervasive sericite. Tr pinkish
mineral prob. alun. Pyrite very uniform dissem, med gr. Alt-min. often
strong enough to destroy igneous texture
400-405: intrusive breccia w qmp frags

LOGGING NOTES

1.) ore minerals: gives visually estimated wt. % ore metal in each mineral

2.) gangue minerals: vol. % present, only alteration minerals logged

3.) sulfide veins: number present, range of dips

DEPTH from	DEPTH to	int'vl	% CORE RECOV. +90% unless otherwise indicated	geochem or assay interval	+2000 ppm Cu by assay ASSAY ppm Cu	ppm Mo	ppm Pb	ppm Zn	oz. Ag		ORE chalcocite(?)	enargite	covellite			MI molybdenite
NC → 0	21	21														
21	30	9														
30	40	10														
	50										tr					
	60										tr					
	70										tr					
	80										tr					
	90										tr					
90	100			21-100	875	59	700	38	0.10		tr					tr
	110										tr					tr
	120															
	130															tr
	140															
	150															
	160										tr					
	170															
	180															
	190										tr					
190	200			100-200	520	81	203	25	0.06		tr					
	210										tr					
	220										tr					
	230										tr					tr
	240												tr			tr
	250															tr
	260															tr
	270															tr
	280												?			tr
	290															
290	300			200-300	415	103	56	68	0.03			tr?				
	310															
	320															tr
	330											tr				tr
	340											.2				tr
	350											.2				tr
	360											.1				
	370											tr				
	380															
	390															
390	400			300-400	454	74	70	101	0.06			tr				
	410															
	420															tr
	430											tr				tr
	440															

small only

PROJECT ASARCO - 3R HOLE NO. TR-14
Collar elev. 5620 ft. Final depth 5407 ft
Coord N. Coord E.
Inclination vertical Page 1 of 13
Logged by F.T Graybeal
Date start 8/11/76 Date finish 12/11/76

ROCK TYPE and REMARKS

T

YOLITE PORPHYRY: mass., grayish, possib. tuffaceous; 5-10% wht subhed-anhed feld. pheno all < 1/8" dia. Rock highly siliceous - prob. in part alteration leached w. indg > trans. hem. Irreg. alun. vns. Variab text due to bx(?)

ED RHYOLITE PORPHYRY - QUARTZ MONZONITE PORPHYRY: est 80% rhy por.; contacts irreg. and obscured by st. alteration. Typical qmp w 30% wht tab. subh-euhed alt feld. pheno to 1/4" in gy matrix. Pervas. sericite-silicif. Irreg. indig hem. Alun. vns and irreg clots to 1" long. Rhy often looks sheared; % of qmp increases with depth, length qmp 3"-6'
92-96: wkly vuggy breccia w elong. 1/2" vugs (open)

128: traces f.gr. diss cc. first appear, initially confined to qmp, rhy por is 100% leached; prob. repl. py, distrib. irreg w. cc. diss. in dark aggregates - often elongate. Perhaps earlier py replaced inclusions in qmp - elong. wispy shape reminiscent of pumice but could be related to shearing. No suls in feld pheno. Sulfide zone extremely dense, massive, hard.

ARTZ MONZONITE PORPHYRY: rare small xeno of rhy por, cut by numerous vert. shear planes, but rock unbroken.

KED RHYOLITE TUFF (?) - QUARTZ MONZONITE PORPHYRY: dense, very hard, massive; estimate 80% rhy. tuff cut by irreg masses of qmp 6"-3'. White alunite (?) clots up to 2" form 5% of rock. Possib pervas alunite mistakenly logged as sericite. Texture unclear w dk gy highly siliceous zones grading to siliceous w vague, wispy aggreg. and seams of sericite (alun?). Alteration is pervasive, destroys rock texture. Pyrite is med gr, uniform dissem. Silicification mostly confined to rhy. tuff; strong ser (fine-med gr) mostly in qmp

ARTZ MONZONITE PORPHYRY: massive, gray, hard. Nearly 100% destruct of texture; many areas unclear whether qmp or rhy. tuff due to pervas. silicif. Contact selected where somewhat more uniform relict textures appear; alunite abundance reduced. Alteration is pervasive intense grading in/out of siliceous zones. Pyrite uniform dissem - no veins. Poss 2-10% rhy tuff xeno. complicate identification
331-336: gray porphyritic dike cuts qmp; 5-15% subhed pheno all < 1/8" rather blocky

LDSPAR PORPHYRY: same as 331-336; rare pheno to 1/2", mostly < 1/8"; < 15% Rare xeno, possibly related to qtz. feld por

NOLITHIC QUARTZ MONZONITE PORPHYRY: dense, massive, 10-40% rhyo. por - rhy. tuff xeno generally engulfed in qmp; xeno often show strong shearing which is absent in qmp. Alt. is pervasive; py is uniform dissem; % pheno varies 10-35% both grad. + sharp contacts.

LOGGING NOTES:
1.) ore minerals: visually estimated wt. % Cu in each mineral; left blank where no Cu minerals seen
2.) gangue minerals: vol. % present - only alteration minerals
3.) sulfide veins: number present, range of dips
4.) fractures: broken planar surfaces in unsplit core

DEPTH from	DEPTH to	DEPTH int'vl	% CORE RECOV.		ASSAY ppm Cu	ppm Mo	ppm Pb	ppm Zn	% Au	oz Ag	ORE MINERALS chrysocolla	enargite	chalcocite				
0	20	20															
20	30	10															
	40																
	50																
	60																
	70																
	80										tr						
	90																
90	100				87	19	305	.65	.005	0.10							
	110				%												
	120				Cu												
	130				.01								.01			5620	
	140				.07								.07			- 140	
140	150				1.20								1.20			5480	top of sulfide
	160				.67		50' @	0.50	% Cu				.67				
	170				.09								.09				
	180				.07								.07				
	190				.45								.45				
190	200			555 ppm →	.06	9	81	25	.002	.08			.06				
	210				.02								.02				
	220				.03								.03				
	230				.02								.02				
	240				.02								.02				
	250				.02								.02				
	260																
	270				ppm							tr					
	280				Cu							tr					
	290																
290	300				136	36	42	31	.003	.05							
	310																
	320																
	330																
	340																
	350																
	360																
	370																
	380																
	390																
390	400				264	9	744	498	.007	.28							
	410																
	420																
	430																
	440											tr					

PROJECT ASARCO - 3R HOLE NO. TR-14
Collar elev. 5620 ft. Final depth 5407 ft.
Coord N. Coord E.
Inclination VERTICAL Page 2 of 13
Logged by F. T. GRAYBEAL
Date start 8/11/76 Date finish 12/11/76

ROCK TYPE and REMARKS

QUARTZ MONZONITE PORPHYRY: compact massive, good qmp texture w. 15-40% subhed-euhed blocky/tabular white alt. feld pheno to 1/4" long. Variation in pheno abund is both grad. and sharp - latter suggests 2 diff porphyries, former suggests variation in orig. pheno abund; gen pheno in 25-30% range. Alt. is pervasive sericite. Py, enor uniform dissem. Alun in rare 1/8" veins. Spotty leached zones 484-500'.

RHYOLITE TUFF-BRECCIA(?): gray, irreg fractured, variably siliceous rock. Textures obscured by strong alteration. Some sections resemble rhy. por. Other zones have vague tuffaceous-agglom-bx appearance with individual textural zones up to 5' long. Several 6"-5' sections resemble adv argillic of alaskite w. wormy alunite clots @ former feldspars. Pyrite uniformly dissem leached 529-531', 550-561'; st gouge 557-560'.

QUARTZ FELDSPAR PORPHYRY: lt gray, massive. Est 5-15% med gr blocky-rounded qtz phenocrysts and 20-30% med-f gr white, probable phenocrysts of feldspar all severely altered to anhedral aggreg of sericite, mostly less than 1/16". Not obviously a porphyritic rock. Cut by rare 1/16" grayish "veins" of qtz-ser(?). Pyrite is uniform dissem. Sericite occas approach med. gr size.

621-630: brecciated xenolith of qtz m2. por, cut by 1/8-1" zones of gritty fluidized material.

Overall qtz. feld por is mod-strongly jointed. No obvious alt. or min on joints. Rare slightly darker gray, linear, vein-like zones appear to represent silicification out from joints but are not discrete veins.

QUARTZ MONZONITE PORPHYRY: grayish, coarsely porphyritic with uniform 30-40% tabular-blocky, equigranular altered feldspar pheno. in grayish matrix. Alteration is pervasive sericite alt. of pheno; qtz-ser alt in matrix. Py uniform dissem, 3" py aggreg 716-717'.

700-730: strong fault zone, rock soft and pervasively crushed throughout, numerous short gougy zones; crushing has destroyed planar joints.

Below 740' qmp texture becomes vague due to stronger alteration, higher sulfide content. Occas 1/2" mass. pods of pyrite.

770-780: strongly crushed zone, short gougy intervals - dip appears steep, weak crushing to 792'.

785-787: several dark gray, gritty fluidized zones 1/4-3", dip is 80°.

Pyrite veins up to 1/8" wide are 60+% py, <40% qtz; sphalerite in py veins. Some veins no envelope, below 840' some w/ wide grn. ser. envelop.

794-796: vdc(?) xenolith.

806-819: finer-grained, dense, massive qmp - unclear whether text due to alt or due to separate phase (prob. latter).

820-822: white - dk gray massive fluidized breccia.

860-870: 1/16-1/8" mass py veins w f gr. gray ser. envelop to 1/2"

DEPTH			% CORE RECOV.		ASSAY						ORE MINERALS						
from	to	int'vl			ppm Cu	ppm Mo	ppm Pb	ppm Zn	oz Au	oz Ag	unknown Fe black sulfide	enargite	covellite	chalcocite	molybdenite	sphalerite	
440	450	10										tr					
	460											tr					
	470											tr					
	480											tr	tr				
	490											tr					
490	500				509	6	301	59	.006	.22				tr			
	510														tr		
	520												tr	tr			
	530													tr			
	540																
	550													.3			
	560																
	570											tr					
	580																
	590																
590	600				52	19	102	77	.004	.20							
	610																
	620																
	630																
	640																
	650																
	660																
	670										tr				tr		
	680																
	690										tr						
690	700				139	8	214	757	.010	.50							
	710										tr						
	720																
	730										tr						
	740										tr						
	750										tr						
	760										tr						
	770																
	780										tr						
	790																
790	800				106	17	281	1873	.003	.20	tr						
	810																
	820																
	830															tr	
	840																
	850														tr		
	860															tr	
	870																

PROJECT ASARCO - 3R HOLE NO. TR-15
Collar elev. 5620 ft. Final depth 5309 ft.
Coord N. Coord E.
Inclination vertical Page 1 of 13
Logged by F.T. Graybeal
Date start 1/4/77 Date finish 3/22/77

ROCK TYPE and REMARKS

PORPHYRITIC VOLC or QMP: massive, unbroken, uniform lt gray. Rock type uncertain due to strong - intense alteration. Former phenocryst outlines are vague. Spotty 5-20 ft zones with foreign clasts - possible volc breccia or agglomeratic zones. Alteration is pervasive sericite(?) - kaolinite(?) - alunite - silica. Alunite both as coarser matrix/pheno replacement and as fine gr, porcelainous veins which are rarely cut by enargite veins. Silica is f.gr replacement - erratic. Pyrite is mostly dissem - somewhat erratically - gen. med gr, also in py-en-alun veins 1/8 - 1/2" thick. Enargite also locally abundant as dissem. Vein pyrite often much finer gr. than diss. py. Occas. 2-5 ft zones w. angular py clots up to 1/4" across prob. in former open space breccia. Bare zones with stockwork of discontin hairline veins logged as diss suls. Overall sulfide-alteration textures rather erratic throughout except alteration pervasive; often destroys rock texture; sulfides variable over 12" intervals but overall abundant. Estimate 90% alunite is dissem - 10% in veins. "Seams" of pyrite 1/32 - 1/8" thick are discontinuous - not logged as veins.

BRECCIA: origin (intrusive, intrusion, collapse etc.) unclear. Texture clearly defined by angular aggregates of clay(?) up to 1" across averaging 5% of rock. Texture of included rocks obscured by very strong alteration, but por. volc is most abundant; minor clasts of spheroidally alt alaskite. No sols in former vugs. No open spaces. 259-263: buff colored porphyry w. 25% feld pheno. St altered. Cuts the breccia.

PORPHYRITIC ±QMP?: similar as 9-240'. Porphyritic texture well preserved to 350' and suggests possible intrusive origin (coarse abund pheno, no flow text, some resemblance to qmp). Rock overall very strongly altered. Coarse mottling due to 1" - 12" dk gray irregular zones w. higher % py and weak silicification which appear to grow within the light gray rock.
At 350' texture becomes more irregular, suggestion of xenoliths, possible intrusion(?) breccia; 6" buff porphyry dike at 407'; qmp-looking clasts in clastic-like matrix suggests intrusive breccia.

LOGGING NOTES:

1.) ore minerals: visually estimated wt. % Cu in each mineral; left blank where no Cu minerals seen

2.) gangue minerals: vol. % present - only alteration minerals

3.) sulfide veins: number present, range of dips

4.) fractures: broken planar surfaces in unsplit core.

DEPTH			% CORE RECOV.		ASSAY						ORE MINERAL						
from	to	int'vl			% Cu	ppm Mo	ppm Pb	ppm Zn	oz. Au	oz. Ag	enargite	chalcocite			molybdenite	sphalerite	
0	9	9															
9	20	11			.08						.4	tr					
	30	10			.05						.2						
	40				.06						.4		5620				
40	50				.15						.4		- 40 5580	top of seal	?		
	60				.15						.5				?		
	70				.14		70' @	0.12	% Cu		.5						
	80				.16						.4						
	90				.04						.3						
90	100				.10	33	913	1672	.002	.10	.1						
	110				.13						.2						
	120				.04						.3					.1	
	130				.07						.3					tr	
	140				.02						.3						
	150				.03						.4				tr	?	
	160				.01						.2				tr		
	170				.01						.1						
	180				.02						.1						
	190				.05						.1				tr		
190	200				.02	19	211	72	.001	.18	.1						
	210				.07						.1				tr		
	220				.03						.1						
	230				.02						.1						
	240				.02						tr						
	250				.02						tr						
	260				.03						tr						
	270				.03						tr						
	280				.04												
	290				.02												
290	300				.06	22	906	29	.004	.17	tr						
	310										tr						
	320																
	330										tr						
	340										tr						
	350										tr						
	360										tr						
	370										tr						
	380				ppm						tr						
	390				Cu												
390	400				278	20	181	1790	.003	.13	tr					tr	
	410										tr						
	420										tr						
	430										tr						

PROJECT ASARCO - 3R HOLE NO. TR-15
Collar elev. 5620 ft Final depth 5309 ft
Coord N. Coord E.
Inclination VERTICAL Page 2 of 13
Logged by F. T. GRAYBEAL
Date start 1/4/77 Date finish 3/22/77

ROCK TYPE and REMARKS

UARTZ MONZONITE PORPHYRY: strong alteration obscures texture but abundant, large alt plag pheno and alt bio pheno diagnostic
IXED BUFF PORPHYRY DIKES AND INTRUSIVE BRECCIA(?): strong faulting
TRUSIVE BRECCIA(?): origin uncertain but by comparison to other holes and due to mixed rock types identity is probably OK. Cut by 3-6"-1' buff por. dikes
UARTZ MONZONITE PORPHYRY: strong alteration but characteristic texture obvious. Alteration and sulfide distribution very uniform, no vein-like or joint-coating sulfides - 100% disseminated

583 - 615 Textural change in qtz monz por. to smaller and less abundant feld pheno and variable abundance of pheno throughout, mottling of gray - buff gray in matrix; may be a xenolithic zone but inclusions look to be all some type of porphyry.
RK QUARTZ MONZ. POR: clearly different from qtz monz por. Identification obscured by strong alteration. Feld. pheno abundant but much smaller than qmp and matrix is much coarser. Texture very uniform, alt + min very uniform. Alunite entirely as veins, prob. hypogene, may cut py veins
664-666: several 1/4-1/2" py veins, irreg. planes, branching, no envelopes.

UARTZ MONZONITE PORPHYRY: typical texture w 35% med-cgr, euhed, 100% altered plag pheno in f.gr matrix. Former bio/hbld pheno either pale brown pseudomorphs or replaced by pyrite. Alteration pervasive - strong although qmp texture is preserved. Spotty alunite both vn. and as replacement of cores of feld. pheno.

DEPTH			% CORE RECOV.		ASSAY						ORE MINERA					
from	to	int'vl			ppm Cu	ppm Mo	ppm Pb	ppm Zn	oz. Au	oz. Ag	enargite		chalcopyrite		molybdenite	sphalerite
430	440	10									tr					tr
	450															
	460															
	470															
	480															
	490															
490	500				101	4	67	60	.002	.12						
	510															
	520															
	530															
	540															
	550										tr					
	560															
	570										tr					
	580															
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	660															
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	750															tr
	760															tr
	770															
	780															tr
	790															
790	800				615	36	76	136	.001	1.11						
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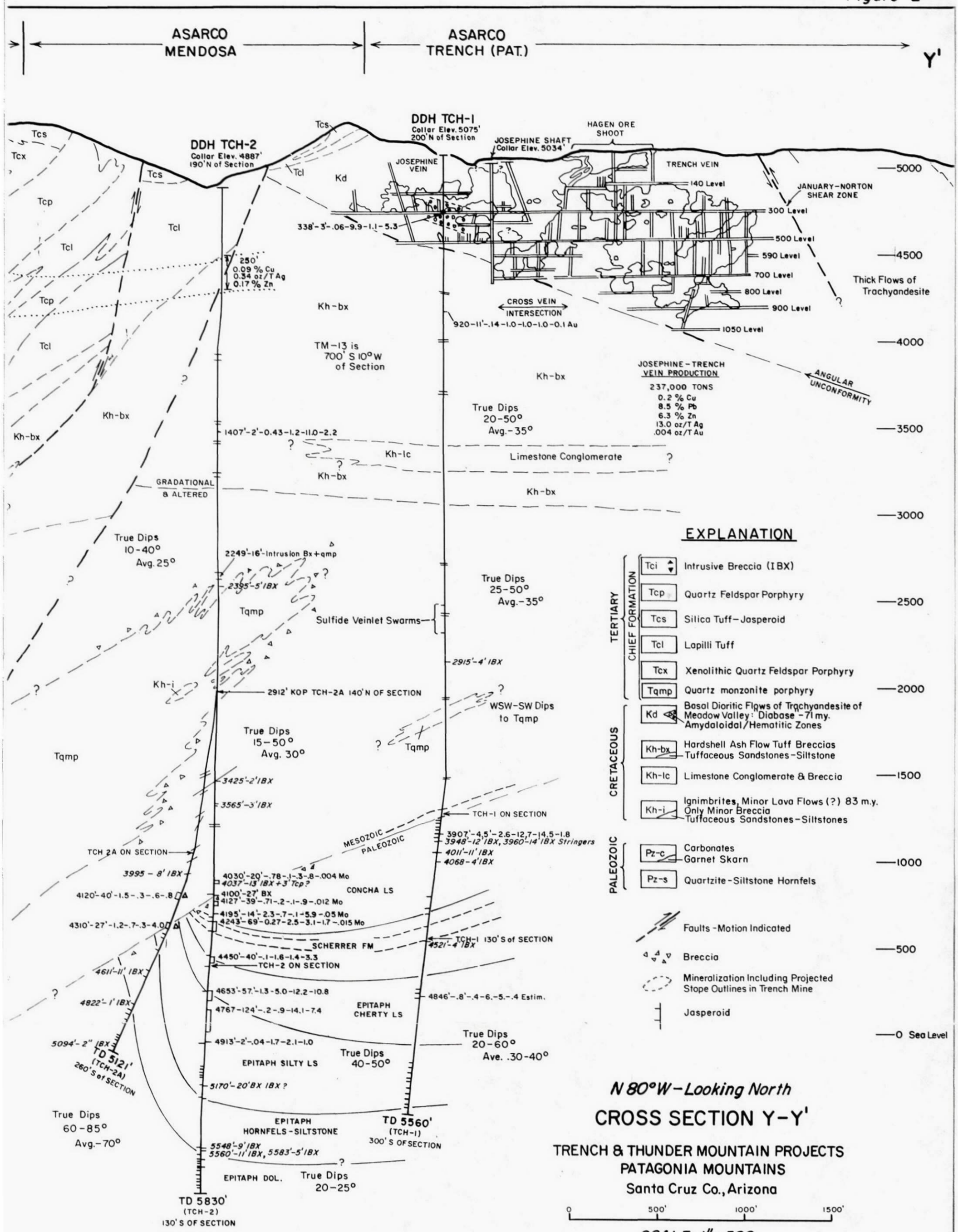
	820										tr					
	830															
	840											tr				
	850										tr				tr	
	860														tr	

Figure 2



N 80° W - Looking North

CROSS SECTION Y-Y'

TRENCH & THUNDER MOUNTAIN PROJECTS
PATAGONIA MOUNTAINS
Santa Cruz Co., Arizona

0 500' 1000' 1500'

SCALE: 1" = 500

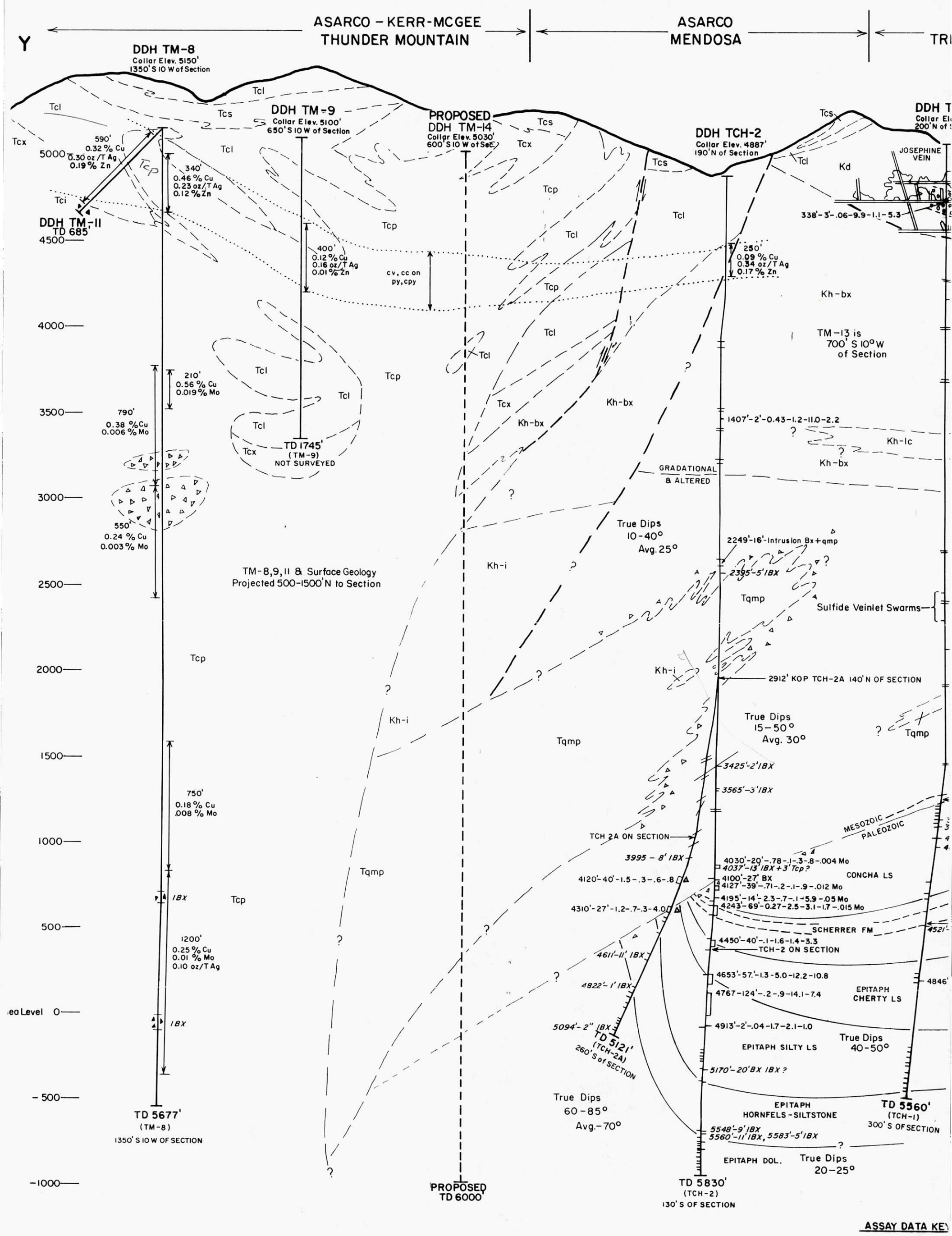
ASSAY DATA KEY

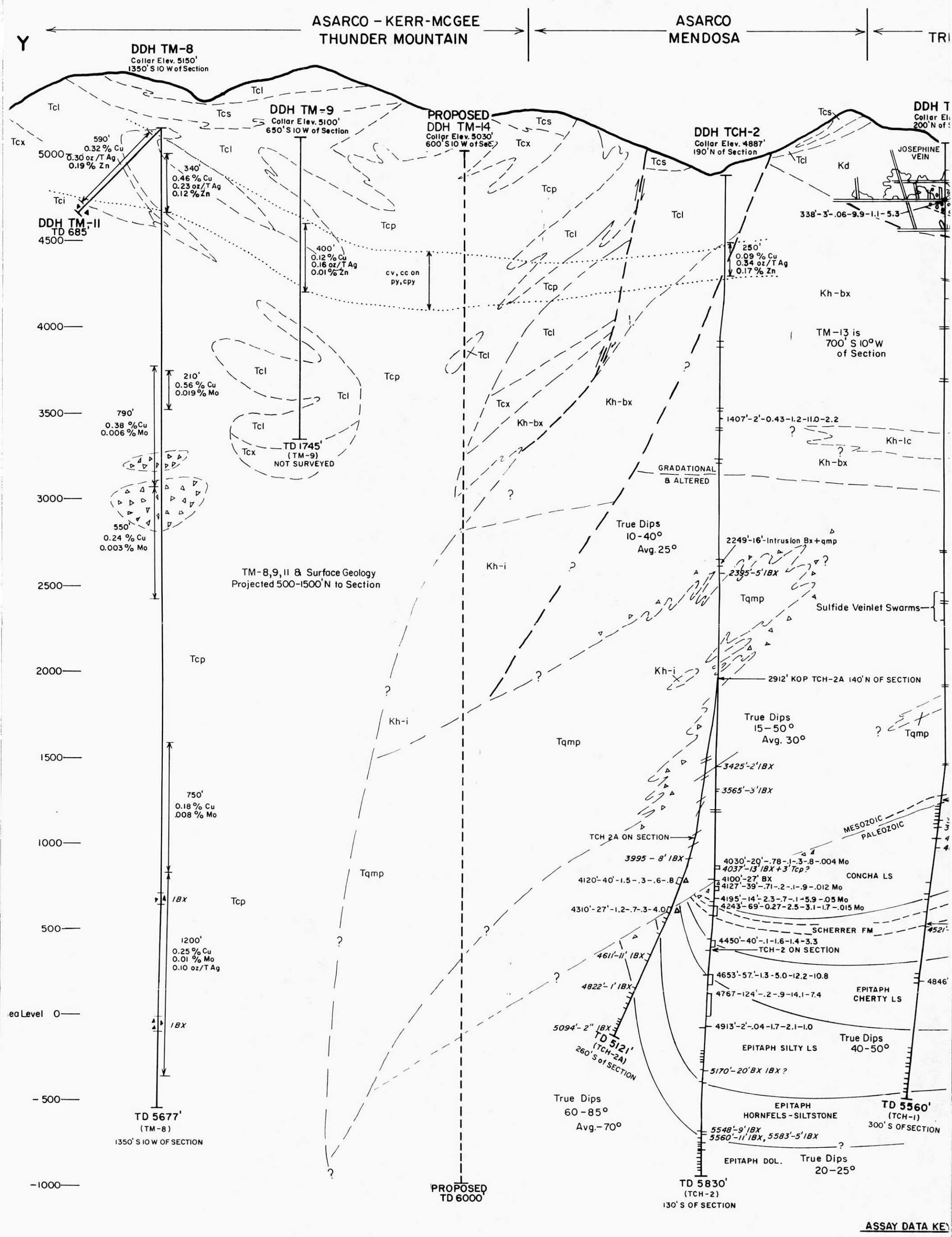
Depth-Length-%Cu-%Pb-%Zn-oz/TAg
3907'-4.5' — 2.6 — 12.7 — 14.5 — 1.8

TM & DIATREME DATA: Graybeal (1973,74)
TRENCH MINE WORKINGS-Trench Unit Files (1939-1949)

F.R. Koutz Jan., 1982

MVK-5334


Y
ASARCO - KERR-MCGEE
THUNDER MOUNTAIN
ASARCO
MENDOSA
DDH TM-8
Collar Elev. 5150'
1350' S 10 W of Section
DDH TM-9
Collar Elev. 5100'
650' S 10 W of Section
PROPOSED
DDH TM-14
Collar Elev. 5030'
600' S 10 W of Sec.
DDH TCH-2
Collar Elev. 4887'
190' N of Section
JOSEPHINE VEIN
DDH TM-11
TD 685'
590'
0.32 % Cu
0.30 oz/T Ag
0.19 % Zn
340'
0.46 % Cu
0.23 oz/T Ag
0.12 % Zn
400'
0.12 % Cu
0.16 oz/T Ag
0.01 % Zn
cv, cc on
py, cpy
250'
0.09 % Cu
0.34 oz/T Ag
0.17 % Zn
338'-3'-.06-9.9-1.1-5.3
TM-13 is
700' S 10° W
of Section
210'
0.56 % Cu
0.019 % Mo
790'
0.38 % Cu
0.006 % Mo
TD 1745'
(TM-9)
NOT SURVEYED
1407'-2'-0.43-1.2-11.0-2.2
GRADATIONAL
& ALTERED
550'
0.24 % Cu
0.003 % Mo
True Dips
10-40°
Avg. 25°
2249'-16'-Intrusion Bx+qmp
2395'-5' IBX
TM-8,9,11 & Surface Geology
Projected 500-1500' N to Section
Sulfide Veinlet Swarms
2912' KOP TCH-2A 140' N OF SECTION
True Dips
15-50°
Avg. 30°
3425'-2' IBX
3565'-3' IBX
750'
0.18 % Cu
.008 % Mo
MESOZOIC
PALEOZOIC
TCH 2A ON SECTION
3995 - 8' IBX
4030'-20'-.78-.1-.3-.8-.004 Mo
4037'-13' IBX + 3' Tcp?
4120'-40'-1.5-.3-.6-.8
4100'-27' BX
4127'-39'-.71-.2-.1-.9-.012 Mo
CONCHA LS
4195'-14'-2.3-.7-.1-5.9-.05 Mo
4243'-69'-0.27-2.5-3.1-1.7-.015 Mo
4310'-27'-1.2-.7-.3-4.0
SCHERRER FM
4450'-40'-.1-1.6-1.4-3.3
TCH-2 ON SECTION
1200'
0.25 % Cu
0.01 % Mo
0.10 oz/T Ag
4611'-11' IBX
4653'-57'-1.3-5.0-12.2-10.8
4822'-1' IBX
4767-124'-.2-.9-14.1-7.4
EPITAPH
CHERTY LS
5094'-2" IBX
4913'-2'-.04-1.7-2.1-1.0
TD 5121'
(TCH-2A)
260' S of SECTION
EPITAPH SILTY LS
True Dips
40-50°
5170'-20' BX IBX ?
True Dips
60-85°
Avg.-70°
EPITAPH
HORNFELS-SILTSTONE
TD 5560'
(TCH-1)
300' S OF SECTION
5548'-9' IBX
5560'-11' IBX, 5583'-5' IBX
EPITAPH DOL.
True Dips
20-25°
TD 5677'
(TM-8)
1350' S 10 W OF SECTION
PROPOSED
TD 6000'
TD 5830'
(TCH-2)
130' S OF SECTION
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
Sea Level 0
-500
-1000
Tcl
Tcs
Tcx
Tcp
Tci
Kd
Kh-bx
Kh-lc
Kh-i
Tqmp
IBX
ASSAY DATA KEY
Depth-Length-%Cu-%Pb-%Z
3907'-4.5'—2.6—12.7—14.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Avg.-70°
EPITAPH
HORNFELS-SILTSTONE
TD 5560'
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300' S OF SECTION
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20-25°
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(TM-8)
1350' S 10 W OF SECTION
PROPOSED
TD 6000'
TD 5830'
(TCH-2)
130' S OF SECTION
ASSAY DATA KEY
Depth-Length-%Cu-%Pb-%Z
3907'-4.5' — 2.6 — 12.7 — 14.
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
Sea Level 0
-500
-1000

JOY MACHINERY COMPANY

707 BOYD BOULEVARD
P. O. DRAWER 489
LaPORTE, INDIANA 46350
Phone: (219) 362-2191

July 12, 1983

Mr. Jim Sell
ASARCO, Incorporated
P.O. Box 5746
Tucson, Arizona 85703

Dear Jim:

Jack Lloyd advised that Tony Benavidez called and said you want to reenter another hole near Patagonia in addition to TM-14. The second hole is 2500-2600' deep NX and needs to be cleaned out and deepened 200-300 ft.

My January 18, 1983 quotation should be applicable to the work on both holes with the addition of "Reentry" at $55.00 hour plus materials used. This was left off in error on my part.

We can provide one or two rigs as your time table requires.

We would look forward to working with you on these projects.

Yours very truly,

JOY MANUFACTURING COMPANY

J. H. Koontz
General Manager
Contract Core Drill Division

JHK:ks

xc: TCB
JDS
FRK

RECEIVED
JUL 18 1983
S. W. U. S. EXPL. DIV.

21 FEB 84

FTG VISIT

JDS

Both the V74-1(D) + TM-14(D) core is laid-out in the Ventana warehouse - Although you will have to move some boxes to get to the lower portion of TM-14. (V-74-1 is ready for splitting + can be put on cart, etc). I will leave you my files on these holes (including WDP's V74-1 log above 1944' + last years TM-14 log report)

Detailed logging of V74-1 does not show much more than I mentioned after my quick-log - Seattle report. I still feel that the milky + vuggy Qtz stringers from ±2160-2205 are a favorable sign in spite of the lack of major MoS_2-cpy-py or mica's in the vugs - We need to go another 300-500' to determine if core Bx is present. I marked a number of interesting features on the core w/ red pen. - see the log.

Detailed logging of TM-14 is not done YET (leave the core out). I briefly looked at it again as I laid it out and find that the Seattle description was very good. - I am still bothered by the failure to reach the QFP YET (The target is the QFP/PZ contact) - or at least the HDS-tuff Bx or lower volcanics - and by the apparent decrease in si-cpy-cv veinlets + dissemin. as in the 1st 900' of TM-14 (perhaps the QFP dike in the upper part of TM-14 had something to do with this) You might have FTG write down any comments he has on the rock types noted as Bx clasts in the Chief lapilli-lithic tuff Bx - he's seen more of these units than I have. The upper portion (0-900') of TM-14 is on the shelf behind the core tables if you want to pull any specific intervals (QFP dike - IBX 555-650') above this years work. You might bring up with FTG our discussion (on way back from Steelman) about whether we should complete TM-14, define additional drill-outs from TCH-2; for details see my May 24, 82 "TCH Area Exploration Report" - now that Kerr-McGee has again let us off the hook.

I am enclosing prints of slides of my Dec 82 Denver talk which have Ventana + TCH updated. You should note that on section 0-0' (Ventana) I have re-interpreted GWP's Mo-Cu grade x-section a little more liberally (hopefully) as to the extent of +0.25% Cu + +0.1% Mo within +0.075% Mo contours. As I believe FTG remembers the highest grade MoS_2 is just below top (HW) of the core breccia but also at base. Note the symmetry + the lack of drilling below high grade MoS_2 in FW of Bx - hence "hole C" on one beneath V-4 to V-7 is a good idea (Thanks Fred). I can make copies of these slides for NYO-FTG if he wants. I'm also enclosing 8 prints of Leadville x-sections + maps that FTG wanted copies of - I have not printed up Kerr-Addison - Asarco, etc slides YET - It is on the list of things to do.

highest grade MoS_2 in Skeans, largest open space Bx + with red-brown - rhyol. (QFP) dikes

FTG to talk to Fleet at AIME Feb, Los Angeles

HDS (Hermosa) 88-91 drill chips are in microscope room (SAC's old office) I have just started to log them when AIME/Waterloo came up. - Not much to say beyond the Sept 19 report - summary - except I was a little disappointed in HDS-90 & 91 (the holes C & D (1993) - now. 1984 - B & A) which had higher priority. If we are going to continue to drill @ Hermosa (rather than under HDS-manto) I guess I would tend to move closer into the mine area & / or follow up HDS-88, 89, & 86 thick Ag zones - even to NE of HDS-86. Ask FTG if he still wants to cooperate w/ Hazen Denver on HDS - metallurgy - if so the samples are any of the buckets that HMS-TCB made up.

Might let FTG know about what Exxon's been up to on old UV - Mowry ground & ask about staking the block N of Mowry. I will get more info out of Chuck Douthitt ex-Exxon in the near future.

You might also let FTG know about the core storage (old Vechna, 4-metals (Noranda - W. Range), Shamrock & Grateville) mess & what might be done - new building, ocean-containers, Mission, (Laypool or whatever).

- By the way the areas that I think deserve more work in the Patagonias include under HDS, HDS-ALTA-RH zone, North Mowry area & other areas (e.g. Exxon) where juicy intrusives get in or near the Paleozoic - And under Flux & January mines.

I'm sure I'll think of some other things for FTG - I guess I'll see him @ the AIME meeting (staying @ Bonaventure). Since I was signed up to give the Waterloo tour - maybe you would enjoy giving the West HDS tour! Will call & let you know how geowizards are doing.

RK

ASARCO

Southwestern Exploration Division

JDS

March 6, 1984

To: T. C. Benavidez

From: J. D. Sell

Thunder Mountain Drilling
EA-0042
Santa Cruz County, AZ

I am asking you to please handle the drilling expenditures and paperwork at Thunder Mountain hole TM-14 to be deepened from 1705 feet. Attached is the Joy Contract for Thunder Mountain-Ventura.

You have $57,000 to spend, which includes road clean-up, Joy, casing, surveying, capping hole for reentry, etc. You might get to around 4000 feet of depth. Logging charges by F. R. Koutz, if done during the drilling, should be charged to the project.

J. D. Sell

James D. Sell /cg

JDS/cg

xc: FRK

JDS → (on other geologist looking @ TM-14)

FR Route
30 April 84
10PM

Notes: TM-14 Quick LOGGE

TCB didn't get core in until this afternoon but didn't come in office

1705-1943 Lapilli tuff (chief) 3-5% pyrite w/ Local 5% pyrite zones & veins, 1' IBX fluid zone (all local clasts) @ 1836 Local several tenths % cpy, sl + other grey sulfides - some COV.

1943-2307 - TCB HASN'T BROUGHT CORE IN.

2307-2375 Monzonite Porphyry (?) 20-40% phenos. (NO QTZ phenos) 10-30% wh. ser-clay 3-5% pyrite Dissem., Local 0.1-1% gy sulfide mostly sl.

2375-2518: TCB HAS NOT brought in YET

2518-2661: (NC→NX @ 2613) Monz Φ 2528-2571 xenolithic ghosts in MP

2518-28: 80-90° Fx w/ strong wh clay (20%) + 8-15% pyr. VN (MP)

2571-84 10-15% pyr. in 60-80° VN ½-4" wide (MP)

2661-2858 (NX): hole @ 2830 end today shift 30 April 84 According to driller

Monz Φ, 20-30% Euhed. → subhed. Feldspar, Lt → m. gy Q-S flooded granulmass 4-6% Dissem pyrite few tenths grey s= mostly sl some COV. Below 2830 core a little more f.g. (chilled contact near?)

NOTE: NO Handshell group Bx or ignimbrites hit YET - in MP sill which is much more altered (Q-S-Py) than in TCH-2

See MVK 5334 TCH-2 report cross section Y-Y'

T.D.

27 SEPT 84

TM Assays | For you 3/4 report

JDS

Prelim. Assays on TAT-383 (Thunder MIN DDH TM-14) on Character Assays (10' every 100') From 200-3075 (1983-84 Drilling) shows ALL Au < 0.02 ppm

+Ag: 20 values < 0.2 ppm. Range of REST (32) 0.2 - 2.4 ppm

Mo: 22 values total 4 values < 2 ppm Range of rest (18) = 2-14 ppm

*Cu + 52 values 25-1100 ppm MEAN 280 ppm

*Zn + 52 values 50-3200 ppm MEAN 657 ppm

*Pb 22 values 5-185 ppm MEAN 75 ppm

possible errors Being rechecked.

+ includes 30 intervals - several continuous up to 100 feet which include the + 0.1% Zn + higher Cu assays above

---

These are halo - disseminations over Ls rept mineraliz. to be encountered in NEXT 1000 - 1500'

~~HGK~~ J.D.S

J Kuntz 6/10

I talked to Kuntz and he says they (Joy) are ready & willing to drill at Potosi. Continue your thoughts w/ Nino, Forest Service etc. Both Gardner will probably be the drillers. By-gones are by-gones as far as his concerned & I told Kuntz this.

Jim.

J.D.S. 6-11-87

Jim Koontz called and said Joy's bid for above will be here next week. The cost will be the same as 1985 but $15/day/man out-of-town per diem will be added to cost. Nino will probably drill 2 shifts/day but will go to 3 if hole is bad. In 1985 it took 15 hrs to reenter TM-14.

H.G.K.

ASARCO

Southwestern Exploration Division

JDS

June 19, 1987

W.D. Gay/D.A. Melhado

Activities - Hole TM-14
Patagonia District
Santa Cruz County, AZ

SWED has received and approved the attached drilling contract by Joy Manufacturing for the reentry and continued drilling in hole TM-14. See attached contract.

Both J. Koontz (La Porte) and Nino Trujillo (Tucson) of Joy have been verbally notified of the acceptance. Joy says they will move down, probably within the week, after completion of some drilling at Jerome.

Joy will supply the pipe and connect for the water supply, and that should appear on the monthly billing. Soon after they have reached bottom and started coring, you should check things out and collect costs to that point in order to estimate the further work.

A Supplemental Exploration Authorization in the amount of $20,000 has been requested. We will expend some $18,000 through Joy.

The core trailer, boxes, core blocks, marker pens, etc., should be taken down shortly after they get on site, along with lock & key.

Costs, including Asarco's, should be kept up to date so as to anticipate their termination depth.

James D. Sell

James D. Sell

JDS:mek
Att.

cc: H.G. Kreis
W.L. Kurtz

884-5845
66

JOY MANUFACTURING COMPANY
707 BOYD BOULEVARD
P. O. DRAWER 489
LaPORTE, INDIANA 46350
Phone: (219) 362-2191

June 12, 1987

ASARCO Incorporated

JUN 15 1987

SW Exploration

Mr. Jim Sell
Asarco, Incorporated
P.O. Box 5746
Tucson, AZ 85703

Dear Jim:

We appreciated receiving the invitation to bid on the additional drilling in hole TM-14. This hole has NX casing set to 2,613 feet, and the bottom is at 3,500 feet NX.

Please consider the following:

Mobilization		$500.00/rig
Demobilization		$500.00/rig
Road Truck Trips to Jobsite from Tucson for hole reduction if and when required		$150.00/each
Core Drilling	NX Wireline	BX Wireline
3500 to 4000 feet	$29.20/foot	$29.00/foot
4000 to 4500 feet	$33.10/foot	$33.30/foot

Rig Time & Hourly Work

Setting and Pulling Casing and Pipe	$46.00/hour + materials used
Cementing and/or Plugging Drill Holes (two man crew). Includes all time required to maintain good hole conditions while drilling. Also includes time required to close or complete hole as required.	$46.00/hour + materials used
Reaming, If necessary	$46.00/hour + materials used

(continued)

Rig Time & Hourly Work (continued)

Re-entering Previously Drilled Holes (two man crew). Includes all time worked entering previously drilled hole until wireline core bit is cutting in solid rock formation on true bottom of hole. This will also include:	$55.00/hour + materials used including bits at actual cost
(a) Time which is required to line up drill over previously drilled hole.	
(b) Time required to set casing in pre-drilled hole before starting to drill with wireline tools.	
(c) All time required to correct any problems encountered with existing casing or pipe in hole.	
Survey	$46.00/hour + Asarco supplies instrument
Standby Time for Your Convenience	$30.00/hour
Overtime Premium in Excess of 88 hours per two-week period (if requested)	$6.00/man hour

Supplies

Casing ordered left in place - BX	$7.00/foot
Casing lost through normal drilling operations	At 70% of list price
Diamond Bit loss in excess of $2.50/foot	At Actual Cost
Drilling Mud and Additives	At Jobsite Cost + 20%
Weather-treated Core Boxes which hold ten feet of core	$2.50/each

Water Pumping or Hauling

Water Truck Usage	$600.00/month
Mileage	$.75/mile
Water Truck Driver (if required)	$2,000.00/month
Per Diem (excluding local help)	$15.00/man/work day

(continued)

The above prices are firm if accepted within 30 days and will remain in effect until 9/25/87. Our terms are Net 30 Days on monthly progress invoices.

We understand Asarco will build and maintain all-weather or passable access roads, level drill sites, dig mud pits and provide water, on surface, free of cost to Joy. We further understand that Asarco will provide all rights of ingress and egress to all lands that may be required to enable Joy to carry out the specified work. Also, you will arrange for the necessary drilling permits.

We propose doing this work with a Joy 22 Truck Mounted Drill and Joy Wireline Equipment. We will probably work two shifts per day unless hole conditions require three shifts. Nino Trujillo will be in touch with you in advance of a rig and crews becoming available.

We will look forward to working with you on this project.

Yours very truly,

JOY MANUFACTURING COMPANY

J. H. Koontz
General Manager
Contract Drill Division

JHK/ts

ASARCO PD 1
REVISED 1/1/58

PURCHASE ORDER

American Smelting And Refining Co.

TUCSON OFFICE
P. O. BOX 5747

1150 NORTH 7TH AVENUE
TUCSON, ARIZONA 85703

DATE June 19, 1987

ORDER NO. T-141-7

JDS

PLANT JOB NO.

APPROPRIATION NO.

REQUISITION NO.

To:
Joy Manufacturing Company
P. O. Drawer 489
La Porte, Indiana 46350

FINAL DESTINATION — PLEASE NOTE CONSIGNMENT BELOW

DATE REQUIRED AT DESTINATION:

CONSIGNMENT — SELLER WILL SHIP TO

SHIPPING INTERVAL PROMISED

SELLER WILL SHIP BEFORE:

POINT OF SHIPMENT

TERMS:

— RENDER BILLS AS PER ATTACHED SHIPPING INSTRUCTIONS —

F.O.B. POINT

SHIP VIA

QUANTITY	UNIT	SPECIFICATIONS	ITEM NO.	UNIT PRICE
		JOY MANUFACTURING COMPANY, hereinafter referred to as CONTRACTOR, will reenter, case, and deepen an exploration hole at ASARCO Incorporated's Thunder Mountain, Santa Cruz County, Arizona, the final depth of which will be specified by ASARCO's representative(s) at the jobsite. Payment for work performed will be in accordance with CONTRACTOR's letter of proposal dated June 12, 1987, a copy of which is attached hereto and made a part of this order.		
		CONTRACTOR will provide a drill and water truck complete with crews and accessories.		
		Mobilization of CONTRACTOR's equipment will commence on or about late June, 1987.		
		It is understood by both parties to this order that CONTRACTOR will perform all work in a diligent and workmanlike manner and in accordance with recognized standard drilling practices. ASARCO will not be charged for delays caused by failure of CONTRACTOR's equipment or personnel.		
		CONTRACTOR and his personnel will make every effort to minimize disturbance of the natural environment, and drill crews will establish and maintain sanitation systems which are acceptable to ASARCO and which comply with standards set by any government agency whether federal, state, county, or municipal which has jurisidction over the site area.		
		CONTRACTOR's particular attention is called to Clause Eleven (11) on the reverse of this order. Before entering upon ASARCO"s property to perform this work, CONTRACTOR will submit acceptable evidence of compliance with the Workmen's Compensation Laws of the State of Arizona and, on ASARCO's standard insurance form, acceptable evidence of other required insurance.		

ACCEPTED FOR: JOY MANUFACTURING COMPANY
By: _____ Title

☞ *IMPORTANT*

Attached Acknowledgment Card must be completed and returned promptly.

Orig: Joy Manufacturing Company
cc: " " " , for acceptance
JDSell, WDGay, Accounting Dept., File

PLEASE ENTER OUR ORDER FOR THE ITEMS SPECIFIED ABOVE, SUBJECT TO ALL INSTRUCTIONS AND PROVISIONS ON REVERSE SIDE.

/s/ J. D. Sell
Manager, Southwestern United States Divisic

884-5845
66

A.J.R.

JUN 19 1987

JOY MANUFACTURING COMPANY
707 BOYD BOULEVARD
P. O. DRAWER 489
LaPORTE, INDIANA 46350
Phone: (219) 362-2191

June 12, 1987

ASARCO Incorporated

JUN 15 1987

SW Exploration

Mr. Jim Sell
Asarco, Incorporated
P.O. Box 5746
Tucson, AZ 85703

Dear Jim:

We appreciated receiving the invitation to bid on the additional drilling in hole TM-14. This hole has NX casing set to 2,613 feet, and the bottom is at 3,500 feet NX.

Please consider the following:

Mobilization		$500.00/rig
Demobilization		$500.00/rig
Road Truck Trips to Jobsite from Tucson for hole reduction if and when required		$150.00/each
Core Drilling	NX Wireline	BX Wireline
3500 to 4000 feet	$29.20/foot	$29.00/foot
4000 to 4500 feet	$33.10/foot	$33.30/foot

Rig Time & Hourly Work

Setting and Pulling Casing and Pipe	$46.00/hour + materials used
Cementing and/or Plugging Drill Holes (two man crew). Includes all time required to maintain good hole conditions while drilling. Also includes time required to close or complete hole as required.	$46.00/hour + materials used
Reaming, If necessary	$46.00/hour + materials used

(continued)

Rig Time & Hourly Work (continued)

Re-entering Previously Drilled Holes (two man crew). Includes all time worked entering previously drilled hole until wireline core bit is cutting in solid rock formation on true bottom of hole. This will also include:	$55.00/hour + materials used including bits at actual cost
(a) Time which is required to line up drill over previously drilled hole.	
(b) Time required to set casing in pre-drilled hole before starting to drill with wireline tools.	
(c) All time required to correct any problems encountered with existing casing or pipe in hole.	
Survey	$46.00/hour + Asarco supplies instrument
Standby Time for Your Convenience	$30.00/hour
Overtime Premium in Excess of 88 hours per two-week period (if requested)	$6.00/man hour

Supplies

Casing ordered left in place - BX	$7.00/foot
Casing lost through normal drilling operations	At 70% of list price
Diamond Bit loss in excess of $2.50/foot	At Actual Cost
Drilling Mud and Additives	At Jobsite Cost + 20%
Weather-treated Core Boxes which hold ten feet of core	$2.50/each

Water Pumping or Hauling

Water Truck Usage	$600.00/month
Mileage	$.75/mile
Water Truck Driver (if required)	$2,000.00/month
Per Diem (excluding local help)	$15.00/man/work day

(continued)

The above prices are firm if accepted within 30 days and will remain in effect until 9/25/87. Our terms are Net 30 Days on monthly progress invoices.

We understand Asarco will build and maintain all-weather or passable access roads, level drill sites, dig mud pits and provide water, on surface, free of cost to Joy. We further understand that Asarco will provide all rights of ingress and egress to all lands that may be required to enable Joy to carry out the specified work. Also, you will arrange for the necessary drilling permits.

We propose doing this work with a Joy 22 Truck Mounted Drill and Joy Wireline Equipment. We will probably work two shifts per day unless hole conditions require three shifts. Nino Trujillo will be in touch with you in advance of a rig and crews becoming available.

We will look forward to working with you on this project.

Yours very truly,

JOY MANUFACTURING COMPANY

J. H. Koontz
General Manager
Contract Drill Division

JHK/ts

VDS

JOY MANUFACTURING COMPANY
707 BOYD BOULEVARD
P. O. DRAWER 489
LaPORTE, INDIANA 46350
Phone: (219) 362-2191

June 23, 1987

Asarco
Attn: Mr. James D. Sell
P.O. Box 5747
Tucson, AZ 85703

Dear Jim:

Attached is your T-141-7 Order Acknowledgement for the work near Patagonia, Arizona.

Also attached is a Certificate of Insurance.

Thanks for awarding this work to Joy.

Yours very truly,

JOY MANUFACTURING COMPANY

J. H. Koontz
General Manager
Contract Drill Division

JHK/ts

Enclosures:

ASARCO Incorporated
JUN 26 1987
SW Exploration

cc: W.D. Gay
D.A. Melhado
A.J. Robles

ASARCO PD 1
REVISED 1/1/58

PURCHASE ORDER

American Smelting And Refining Co.

TUCSON OFFICE
P. O. BOX 5747

1150 NORTH 7TH AVENUE
TUCSON, ARIZONA 85703

DATE June 19, 1987

ORDER NO. T-141-7

PLANT JOB NO.

APPROPRIATION NO.

REQUISITION NO.

To:
Joy Manufacturing Company
P. O. Drawer 489
La Porte, Indiana 46350

FINAL DESTINATION — PLEASE NOTE CONSIGNMENT BELOW

DATE REQUIRED AT DESTINATION:

CONSIGNMENT — SELLER WILL SHIP TO

SHIPPING INTERVAL PROMISED

SELLER WILL SHIP BEFORE:

POINT OF SHIPMENT

TERMS:

— RENDER BILLS AS PER ATTACHED SHIPPING INSTRUCTIONS —

F.O.B. POINT

SHIP VIA

QUANTITY	UNIT	SPECIFICATIONS	ITEM NO.	UNIT PRICE
		JOY MANUFACTURING COMPANY, hereinafter referred to as CONTRACTOR, will reenter, case, and deepen an exploration hole at ASARCO Incorporated's Thunder Mountain, Santa Cruz County, Arizona, the final depth of which will be specified by ASARCO's representative(s) at the jobsite. Payment for work performed will be in accordance with CONTRACTOR's letter of proposal dated June 12, 1987, a copy of which is attached hereto and made a part of this order.		
		CONTRACTOR will provide a drill and water truck complete with crews and accessories.		
		Mobilization of CONTRACTOR's equipment will commence on or about late June, 1987.		
		It is understood by both parties to this order that CONTRACTOR will perform all work in a diligent and workmanlike manner and in accordance with recognized standard drilling practices. ASARCO will not be charged for delays caused by failure of CONTRACTOR's equipment or personnel.		
		CONTRACTOR and his personnel will make every effort to minimize disturbance of the natural environment, and drill crews will establish and maintain sanitation systems which are acceptable to ASARCO and which comply with standards set by any government agency whether federal, state, county, or municipal which has jurisidction over the site area.		
		CONTRACTOR's particular attention is called to Clause Eleven (11) on the reverse of this order. Before entering upon ASARCO"s property to perform this work, CONTRACTOR will submit acceptable evidence of compliance with the Workmen's Compensation Laws of the State of Arizona and, on ASARCO's standard insurance form, acceptable evidence of other required insurance.		

ACCEPTED FOR: JOY MANUFACTURING COMPANY
By: [signature] 6/22/87 GEN. MGR.
Title

IMPORTANT

Attached Acknowledgment Card must be completed and returned promptly.

Orig: Joy Manufacturing Company
cc: " " " for acceptance
JDSell, WDGay, Accounting Dept., File

PLEASE ENTER OUR ORDER FOR THE ITEMS SPECIFIED ABOVE, SUBJECT TO ALL INSTRUCTIONS AND PROVISIONS ON REVERSE SIDE.

/s/ J. D. Sell
Manager, Southwestern United States Divisic

884-5845
cc

A.J.R.

JUN 19 1987

JOY MANUFACTURING COMPANY
707 BOYD BOULEVARD
P. O. DRAWER 489
LaPORTE, INDIANA 46350
Phone: (219) 362-2191

June 12, 1987

ASARCO Incorporated

JUN 15 1987

SW Exploration

Mr. Jim Sell
Asarco, Incorporated
P.O. Box 5746
Tucson, AZ 85703

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Cementing and/or Plugging Drill Holes (two man crew). Includes all time required to maintain good hole conditions while drilling. Also includes time required to close or complete hole as required.	$46.00/hour + materials used
Reaming, If necessary	$46.00/hour + materials used

(continued)

Rig Time & Hourly Work (continued)

Re-entering Previously Drilled Holes (two man crew). Includes all time worked entering previously drilled hole until wireline core bit is cutting in solid rock formation on true bottom of hole. This will also include:	$55.00/hour + materials used including bits at actual cost

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Survey	$46.00/hour + Asarco supplies instrument
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Per Diem (excluding local help)	$15.00/man/work day

(continued)

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We will look forward to working with you on this project.

Yours very truly,

JOY MANUFACTURING COMPANY

J. H. Koontz
General Manager
Contract Drill Division

JHK/ts

CERTIFICATE OF INSURANCE

June 23, 1987

PRODUCER

Fred S. James & Company of New York, Inc.
[illegible] Water Street
New York, NY 10041

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED

Joy Manufacturing Company
Contract Drill Division
707 Boyd Boulevard
LaPorte, IN 46350

COMPANIES AFFORDING COVERAGE

COMPANY LETTER	A	National Union Fire Insurance Company of Pittsburgh, PA
COMPANY LETTER	B	Birmingham Fire Insurance Company
COMPANY LETTER	C	
COMPANY LETTER	D	
COMPANY LETTER	E	

COVERAGES

THIS IS TO CERTIFY THAT POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS, AND CONDITIONS OF SUCH POLICIES.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIABILITY LIMITS IN THOUSANDS	EACH OCCURRENCE	AGGREGATE
A	GENERAL LIABILITY X COMPREHENSIVE FORM X PREMISES/OPERATIONS X UNDERGROUND EXPLOSION & COLLAPSE HAZARD PRODUCTS/COMPLETED OPERATIONS X CONTRACTUAL X INDEPENDENT CONTRACTORS X BROAD FORM PROPERTY DAMAGE X PERSONAL INJURY	GLA 9424071	1/1/87	1/1/88	BODILY INJURY	$	$
					PROPERTY DAMAGE	$	$
					BI & PD COMBINED	$2,000	$ 6,000
					PERSONAL INJURY		$ incl.
A	AUTOMOBILE LIABILITY X ANY AUTO X ALL OWNED AUTOS (PRIV. PASS.) X ALL OWNED AUTOS (OTHER THAN PRIV. PASS.) X HIRED AUTOS X NON-OWNED AUTOS GARAGE LIABILITY	BA 9194503	1/1/87	1/1/88	BODILY INJURY (PER PERSON)	$	
					BODILY INJURY (PER ACCIDENT)	$	
					PROPERTY DAMAGE	$	
					BI & PD COMBINED	$2,000	
	EXCESS LIABILITY UMBRELLA FORM OTHER THAN UMBRELLA FORM				BI & PD COMBINED	$	$
A	WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY	RNWC 4958154	1/1/87	1/1/88	STATUTORY		
A		RNWC 4958153(CA only)	1/1/87	1/1/88		$ 2,000 EACH ACCIDENT)	
B		RNWC 4958155(AZ,ID,MD&OR)	1/1/87	1/1/88		$ 2,000 DISEASE-POLICY LIMIT)	
						$ 2,000 DISEASE-EACH EMPLOYEE)	
A	OTHER PRODUCTS/COMPLETED OPERATIONS	RN GLA 1980564 Claims Made Form	1/1/87	1/1/88	BI $3,000/occ. PD $2,000/occ. CSL$6,000/aggregate		

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS

For core drilling and related services for Asarco on their P.O. T-141-7 on Thunder Mountain Project.

CERTIFICATE HOLDER

Asarco
P.O. Box 5747
Tucson, AZ 85703

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO MAIL SUCH NOTICE SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE COMPANY, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE John Lyons

© IRI/ACORD CORPORATION 1984

Wen

~~Bob Dahl~~ 303 988 6456

884-5865 , July 6th → July 25th

ASARCO

Southwestern Exploration Division

JDS

April 25, 1988

Mr. R.L. Brown
Vice President of Exploration
New York Office

Assessment Drilling Request
Thunder Mountain Project
EA-0042
Santa Cruz County, Arizona

SWED will fulfill the assessment work on the Thunder Mountain Project by drilling back-to-back for the assessment years ending August 31, 1988 and August 31, 1989. The work will be to deepen hole TM-14 which is presently cased at a depth of 3500 feet, and last year was taken to 3599 feet with BX core. The last 99 feet are open hole.

The drilling will be for the benefit of 181 claims held in the Patagonia package--this includes 93 Thunder Mountain (Kerr-McGee), 32 Ventura (Noranda), 49 Three R (Asarco), and 7 Trench (Asarco).

Thunder Mountain is a joint venture option with Kerr-McGee to earn an interest in the claims covering a deep disseminated copper zone and related high grade Cu-Pb-Zn-Ag carbonate replacement zone.

At the present time, the accounting records (NY Office/Wallace) indicate that the Thunder Mountain EA-0042-12 has $52,047 in the account.

As the back-to-back expenditure to hold the claim package by assessment work for the two years amounts to some $37,000, the EA-0042-12 balance is sufficient to cover the anticipated expenditures.

This next phase of drilling at BX size should deepen the hole to be within the 5100 foot expected carbonate target zone. A long 1500 foot plus of open BX hole at the end of drilling this year will be highly unstable and future entry is questionable. Plans will be to complete the hole to the target depth and continue if favorable results justify additional expenditure.

Attached are maps showing the location of the Thunder Mountain Project and the location of TM-14 and adjacent holes.

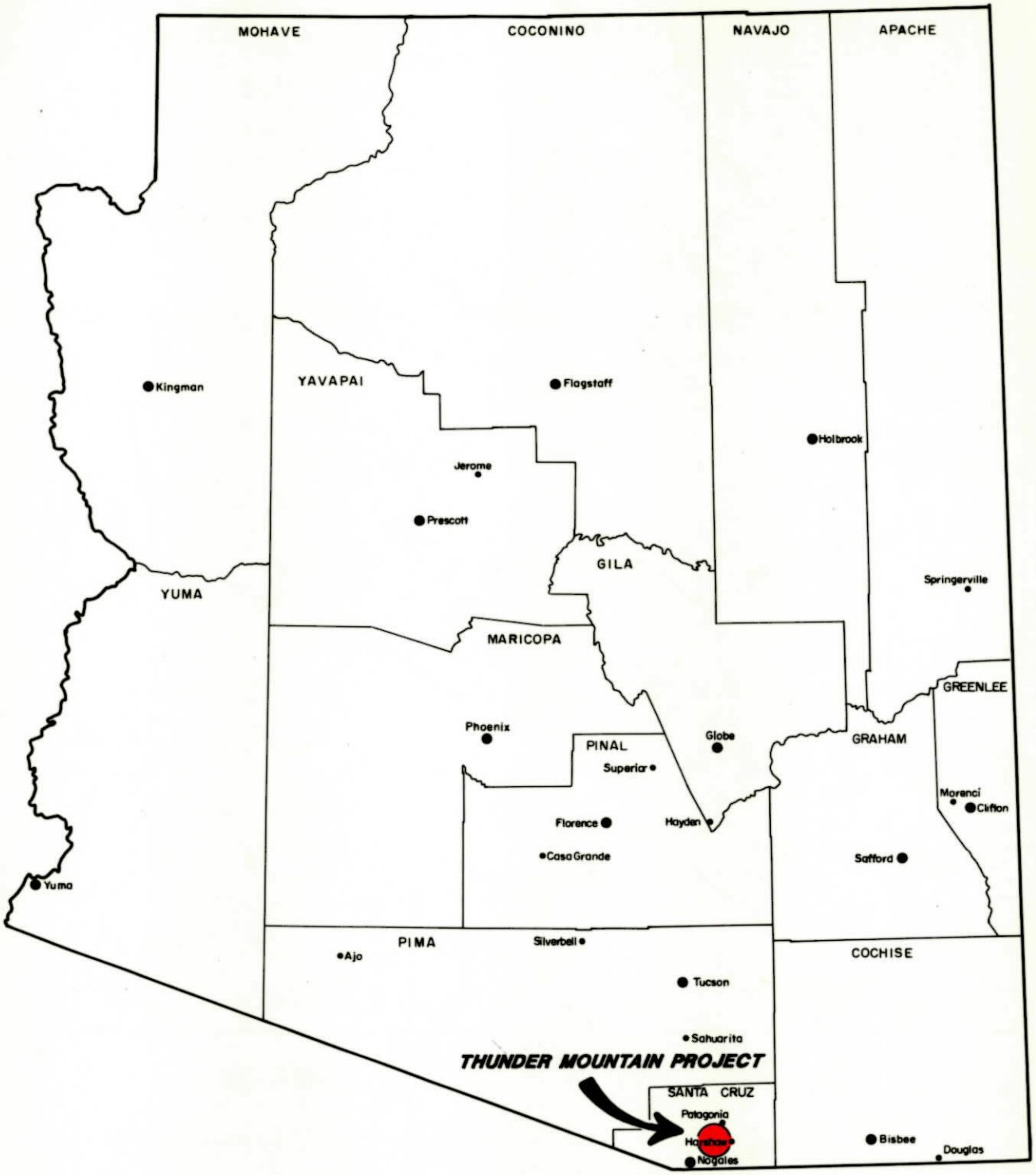
If you agree to the expenditure to complete TM-14 by expending the balance of EA-0042-12 then please advise.

James D. Sell

James D. Sell

JDS:mek
Att.

cc: W.L. Kurtz, W.D. Gay, C.L. Snow



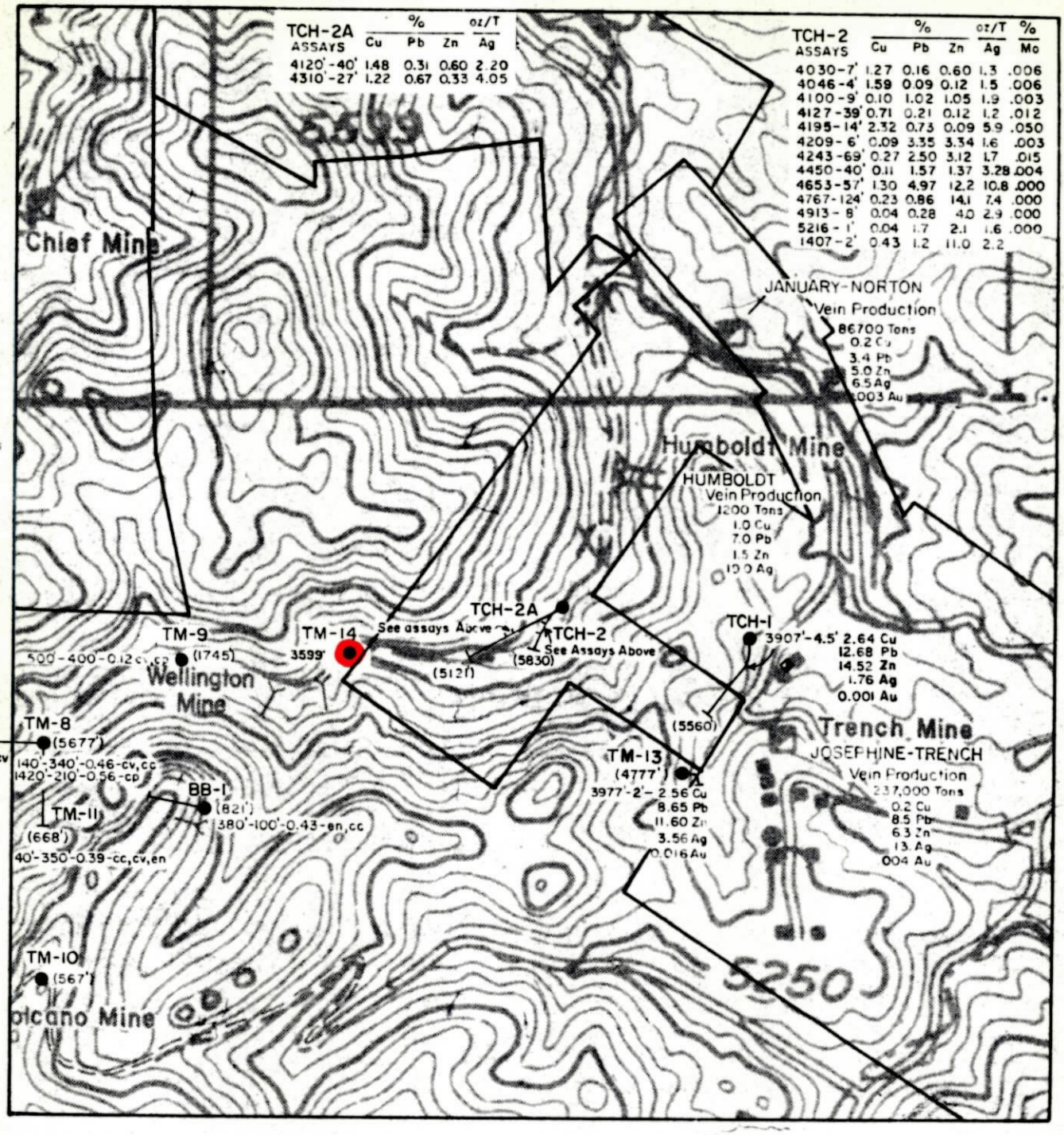
ASARCO Incorporated

INDEX MAP

THUNDER MOUNTAIN PROJECT
SANTA CRUZ CO., ARIZONA
J.D.S. 4-88

0 50
MILES

mn6599 JDS/dam tuc 4-88



EXPLANATION

- ASARCO INC. Trench Group
- ASARCO-Kerr McGee Thunder Mtn. Joint Venture
- ASARCO-Anaconda 3R Joint Venture
- Mendoza-Humboldt Group (ASARCO INC.)
- Kerr-McGee-Red Mtn.
- Lichty-Argentor

(821') BB-1 — Drill hole showing depth

Proposed drill hole, deepen

ASSAY DATA KEY

depth-length-%Cu-mineral

3860'-350'-0.59-cp

GEOLOGIC LEGEND

cp-chalcopyrite
cv-covellite
cc-chalcocite
en-enargite

DRILL MAP

TRENCH PROJECT

&

THUNDER MTN. PROJECT

PATAGONIA MTNS.

Santa Cruz County, Arizona

SCALE: 1" = 1000'

F.R.K

MVK 4048

JDS

JOY-CBC DRILLING

707 BOYD BOULEVARD
P.O. DRAWER 489
LAPORTE, INDIANA 46350
PHONE: (219) 362-2191

ASARCO Incorporated

MAY 3 1988

SW Exploration

May 3, 1988

Mr. Jim Sell
Asarco, Incorporated
P.O. Box 5747
Tucson, AZ 85703

Dear Jim:

We appreciated receiving the invitation to bid on the additional drilling in hole TM-14 near Patagonia, Arizona. This hole has NX casing set to 2,613 feet and BX casing from 2,600 to 3,500 feet. We will reinstall BX casing from surface to 2600' with a sleeve at 2600' to maintain annulus continuity and then wash and resume BX drilling from 3599'. There will be no allowance for any casing recovered that was set prior to 1988.

Please consider the following:

Mobilization	$750.00/rig
Demobilization	$750.00/rig
Extra Road Truck Trips (if required)	$150.00 each
<u>Core Drilling</u>	<u>BX Wireline</u>
3500 to 4000 feet	$29.00/foot
4000 to 4500 feet	$33.30/foot
4500 to 5000 feet	$38.50/foot
<u>Rig Time & Hourly Work</u>	
Setting and Pulling Casing and Pipe	$50.00/hour + materials used
Cementing and/or Plugging Drill Holes (two man crew). Includes all time required to maintain good hole conditions while drilling. Also includes time required to close or complete hole as required.	$50.00/hour + materials used

FORMERLY JOY CONTRACT DRILL DIVISION

MAY 3 '88 12:34 JOY MFG CO AAPORTE IN PAGE.02

Rig Time & Hourly Work (continued)

Reaming, if necessary	$50.00/hour + materials used
Re-entering Previously Drilled Holes (two man crew). Includes all time worked entering previously drilled hole until wireline core bit is cutting in solid rock formation on true bottom of hole. This will also include:	$60.00/hour + materials used
(a) Time which is required to line up drill over previously drilled hole.	
(b) Time required to set casing in predrilled hole before starting to drill with wireline tools (0-2600 BX).	
(c) All time required to correct any problems encountered with existing casing or pipe in hole.	
Survey	$50.00/hour + Asarco supplies instrument
Standby Time for Your Convenience (two man crew)	$35.00/hour
Overtime Premium in Excess of 88 hours per two-week period (if required)	$6.00/man hour

Supplies

Casing ordered left in place - BX	$7.00/foot
Casing lost through normal drilling operations	At 70% of List Price
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Supplies (continued)

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Water Pumping or Hauling

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We propose doing this work with a Joy 22 Truck Mounted Drill and Joy Wireline Equipment. We will probably work two shifts per day unless hole conditions require three shifts. Nino Trujillo will be in touch with you in advance of a rig and crews becoming available.

We will look forward to working with you on this project.

Yours very truly,

JOY-CBC DRILLING

J. H. Koontz
Vice President &
General Manager

JHK/ts

ASARCO

Exploration Department
Southwestern United States Division

June 28, 1988

Mr. J.H. Koontz, Vice President & General Manager
Joy-CBC Drilling
707 Boyd Boulevard
P.O. Drawer 489
La Porte, Indiana 46350

Thunder Mountain
Santa Cruz Co., AZ

Dear Mr. Koontz:

Enclosed is a purchase order for the drilling you responded to in your bid dated May 3, 1988 for hole TM-14.

We will work out the mobilization date and other details with Mr. Trujillo.

Sincerely yours,

William D. Gay

William D. Gay
Land Engineer, SWED

WDG:mek
enc.

cc: J.D. Sell
C.W. Snow

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010

ASARCO PD 1
REVISED 1/1/58

PURCHASE ORDER

ASARCO Incorporated
~~American Smelting And Refining Co.~~

TUCSON OFFICE
P. O. BOX 5747

1150 NORTH 7TH AVENUE
TUCSON, ARIZONA 85703

PLANT JOB NO.

APPROPRIATION NO.

DATE: 6/27/88

ORDER NO.: T-180-8

REQUISITION NO.

To: JOY-CBC DRILLING
707 Boyd Boulevard
P.O. Drawer 489
La Porte, Indiana 46350

FINAL DESTINATION — PLEASE NOTE CONSIGNMENT BELOW

DATE REQUIRED AT DESTINATION:

CONSIGNMENT — SELLER WILL SHIP TO

SHIPPING INTERVAL PROMISED

SELLER WILL SHIP BEFORE:

POINT OF SHIPMENT

TERMS:

— RENDER BILLS AS PER ATTACHED SHIPPING INSTRUCTIONS —

F.O.B. POINT

SHIP VIA

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☞ *IMPORTANT*

Attached Acknowledgment Card must be completed and returned promptly.

Orig: JOY-CBC DRILLING
cc: " " " , for acceptance
JDSell, WDGay, Acctg Dept., File

PLEASE ENTER OUR ORDER FOR THE ITEMS SPECIFIED ABOVE, SUBJECT TO ALL INSTRUCTIONS AND PROVISIONS ON REVERSE SIDE.

W. D. Gay for J. D. Sell
Manager, Southwestern Exploration

INSTRUCTIONS

INVOICE: Priced invoices in the requisite number giving the correct purchase order and requisition numbers, together with required Bills of Lading, must be forwarded on day of each shipment AS PER SPECIAL SHIPPING INSTRUCTIONS ACCOMPANYING THIS ORDER, otherwise delay in payment of account may result.

TERMS: As previously arranged or specified on this order. Care must be exercised to show cash discount, if allowed, on face of invoice.

PROVISIONS

1. **ACCEPTANCE:** Acceptance of this order constitutes acceptance of all terms herein stated. All representations and warranties by the seller relating to the subject-matter of this order or its performance shall be binding on the seller as if fully set forth herein, and shall survive inspection and acceptance of the goods ordered. No acknowledgment or acceptance of this order or any other communication by the seller shall vary or add any terms or conditions to those contained herein and any such attempted modification or addition which is not accepted in writing by the buyer, shall be void and may be disregarded without further notice or disclaimer.

2. **PRICES:** This order must not be filled at higher prices than last quoted without authority of the buyer.

3. **SHIPMENTS:** All materials must be forwarded by the route designated and seller will be held strictly accountable for any deviation therefrom.

When the material covered by this order shall aggregate a carload shipment or more, the seller must forward in carload lots, unless duly authorized in writing by the buyer to ship in less than carloads. If this order aggregates less than a minimum carload, seller must forward the entire quantity at one time unless otherwise authorized in writing by the buyer.

When blocking or dunnage, etc., not constituting a part of the car are used to protect and make shipments secure in transit, seller must show on Bills of Lading, separately, the weights of such materials, provided the lading shall aggregate a minimum carload or more, and will be held responsible for failure to comply with this rule.

Shipments will not be considered as completed until Bill of Lading, or express or mail receipt is received.

4. **PACKING AND CARTAGE CHARGES:** No charge will be allowed for packing, boxing or cartage, unless agreed upon at the time of purchase; damage to any material not properly packed to insure adequate protection in transit will be charged to the seller. All packing must conform with tariff or classification requirements so as to secure lowest possible freight rates. It is understood the buyer will receive the benefit of any decrease in freight charges between time of quotation and date of shipment, where freight enters into the price originally quoted.

5. **QUALITY AND INSPECTION:** All material furnished must be as specified and will be subject to inspection and approval of buyer after delivery. The right is reserved to reject and return at the risk and expense of the seller such portion of any shipment which may be defective or fail to comply with the specifications without invalidating the remainder of the order. If rejected it may be held for disposition at the expense and risk of the seller.

6. **QUANTITY:** The specific quantity ordered must not be changed without buyer's permission in writing.

7. **NON-PERFORMANCE:** Buyer reserves the right to cancel this order or any portion of same if delivery is not made when and as specified, time being of the essence of this order, and charge seller for any loss entailed.

8. **PATENTS:** The seller hereby guarantees the buyer against all losses of profits, damages, or both, resulting from any patent infringement by reason of purchasing or using goods covered by this order, or by reason of any loss suffered in not being able, without liability, to use such goods. This guarantee also includes the reimbursement to the buyer of all litigation costs which it may suffer as the result of any suit respecting the purchase or use of such goods, in addition to the recoveries which may be secured against it of profits and/or damages.

GENERAL:

9. The material on this order must be furnished only by the person or firm to whom the order is addressed unless otherwise authorized by the buyer.

10. No drafts for purchases made will be honored unless by agreement.

11. If it becomes necessary for the seller or any agent, contractor, or employee thereof to enter upon the property of the buyer in order to construct, inspect or deliver hereunder, the seller hereby agrees to protect the buyer's property and all persons thereon from injury, damage or loss, and the seller shall save harmless and indemnify the buyer from and against any expense, loss or damage on account of any claim, demand or suit made by any person whomsoever, including any employee of the buyer, which is in any way caused by or connected with or grows out of the performance hereunder by the seller or any agent, contractor or employee thereof; provided however that the seller shall not be required to indemnify the buyer against any loss caused solely by the negligence or willful fault of the buyer or its employees. If the seller performs any work hereunder knowing it to be contrary to any local law, ordinance, rule and regulation, the seller shall bear all costs arising therefrom. Seller to carry Liability Insurance and to carry Workmen's Compensation Insurance as provided by the laws of the State in which the work is performed and further, is to obtain a certificate for same, which is to be furnished for the file of the buyer. If for any reason the seller's or any subcontractor's employees or agents may acquire a status imposing liability on the buyer for employer's contributions or taxes under the Federal Social Security Act or under any State Unemployment Insurance, Old Age Benefit, or similar Acts, the seller shall be exclusively liable for, and shall indemnify the buyer against, the same and does agree to comply with all laws and regulations so as to relieve the buyer from any and all liability therefor or the responsibility of making any reports or keeping any records with respect thereto.

12. In accepting this order the seller certified that these goods were produced in compliance with all applicable requirements of Sections 6, 7 and 12 of the Fair Labor Standards Act of 1938, as amended, and of the regulations and orders of the United States Department of Labor issued under Section 14 thereof. It will be necessary in order for us to honor your future invoices to us that the above clause or a substantial equivalent thereof appear on your invoices.

13. By acceptance of this order, seller warrants that the prices specified do not exceed the maximum prices established under any applicable United States law or regulation thereunder.

ACKNOWLEDGMENT

ASARCO PD 1
REVISED 1/1/58

PURCHASE ORDER

ASARCO Incorporated
~~American Smelting And Refining Co.~~

TUCSON OFFICE
P. O. BOX 5747

1150 NORTH 7TH AVENUE
TUCSON, ARIZONA 85703

PLANT JOB NO.	DATE 6/27/88
APPROPRIATION NO.	ORDER NO. T-180-8
	REQUISITION NO.

To: JOY-CBC DRILLING
707 Boyd Boulevard
P.O. Drawer 489
La Porte, Indiana 46350

FINAL DESTINATION — PLEASE NOTE CONSIGNMENT BELOW

DATE REQUIRED AT DESTINATION:

CONSIGNMENT — SELLER WILL SHIP TO

SHIPPING INTERVAL PROMISED | SELLER WILL SHIP BEFORE:

POINT OF SHIPMENT | TERMS:

— RENDER BILLS AS PER ATTACHED SHIPPING INSTRUCTIONS —

F.O.B. POINT

SHIP VIA

QUANTITY	UNIT	SPECIFICATIONS	ITEM NO.	UNIT PRICE
		JOY-CBC DRILLING, hereinafter referred to as CONTRACTOR, will reenter and deepen an exploration hole at ASARCO Incorporated's Thunder Mountain, Santa Cruz County, Arizona, the final depth of which will be specified by ASARCO's representative(s) at the jobsite. Payment for work performed will be in accordance with CONTRACTOR's letter of proposal dated May 3, 1988, a copy of which is attached.		
		CONTRACTOR will provide a drill and water truck complete with crews and accessories.		
		Mobilization of CONTRACTOR's equipment will commence in late August, 1988.		
		It is understood by both parties to this order that CONTRACTOR will perform all work in a diligent and workman like manner and in accordance with recognized standard drilling practices. ASARCO will not be charged for delays caused by failure of CONTRACTOR's equipment or personnel.		
		CONTRACTOR and his personnel will make every effort to minimize disturbance of the natural environment, and drill crews will establish and maintain sanitation systems which are acceptable to ASARCO and which comply with standards set by any government agency whether federal, state, county, or municipal which has jurisdiction over the site area.		
		CONTRACTOR's particular attention is called to Clause Eleven (11) on the reverse of this order. Before entering upon ASARCO's property to perform this work, CONTRACTOR will submit acceptable evidence of compliance with the Workmen's Compensation Laws of the State of Arizona and, on ASARCO's standard insurance form, acceptable evidence of other required insurance.		

ACCEPTED FOR: JOY-CBC DRILLING

By: _____ TITLE

☞ *IMPORTANT*

Attached Acknowledgment Card must be completed and returned promptly.

Orig: JOY-CBC DRILLING
cc: " " " , for acceptance
JDSell, WDGay, Acctg Dept., File

PLEASE ENTER OUR ORDER FOR THE ITEMS SPECIFIED ABOVE, SUBJECT TO ALL INSTRUCTIONS AND PROVISIONS ON REVERSE SIDE.

W. D. Gay for J. D. Sell
Manager, Southwestern Exploration

INSTRUCTIONS

INVOICE: Priced invoices in the requisite number giving the correct purchase order and requisition numbers, together with required Bills of Lading, must be forwarded on day of each shipment AS PER SPECIAL SHIPPING INSTRUCTIONS ACCOMPANYING THIS ORDER, otherwise delay in payment of account may result.

TERMS: As previously arranged or specified on this order. Care must be exercised to show cash discount, if allowed, on face of invoice.

PROVISIONS

1. **ACCEPTANCE:** Acceptance of this order constitutes acceptance of all terms herein stated. All representations and warranties by the seller relating to the subject-matter of this order or its performance shall be binding on the seller as if fully set forth herein, and shall survive inspection and acceptance of the goods ordered. No acknowledgment or acceptance of this order or any other communication by the seller shall vary or add any terms or conditions to those contained herein and any such attempted modification or addition which is not accepted in writing by the buyer, shall be void and may be disregarded without further notice or disclaimer.

2. **PRICES:** This order must not be filled at higher prices than last quoted without authority of the buyer.

3. **SHIPMENTS:** All materials must be forwarded by the route designated and seller will be held strictly accountable for any deviation therefrom.

When the material covered by this order shall aggregate a carload shipment or more, the seller must forward in carload lots, unless duly authorized in writing by the buyer to ship in less than carloads. If this order aggregates less than a minimum carload, seller must forward the entire quantity at one time unless otherwise authorized in writing by the buyer.

When blocking or dunnage, etc., not constituting a part of the car are used to protect and make shipments secure in transit, seller must show on Bills of Lading, separately, the weights of such materials, provided the lading shall aggregate a minimum carload or more, and will be held responsible for failure to comply with this rule.

Shipments will not be considered as completed until Bill of Lading, or express or mail receipt is received.

4. **PACKING AND CARTAGE CHARGES:** No charge will be allowed for packing, boxing or cartage, unless agreed upon at the time of purchase; damage to any material not properly packed to insure adequate protection in transit will be charged to the seller. All packing must conform with tariff or classification requirements so as to secure lowest possible freight rates. It is understood the buyer will receive the benefit of any decrease in freight charges between time of quotation and date of shipment, where freight enters into the price originally quoted.

5. **QUALITY AND INSPECTION:** All material furnished must be as specified and will be subject to inspection and approval of buyer after delivery. The right is reserved to reject and return at the risk and expense of the seller such portion of any shipment which may be defective or fail to comply with the specifications without invalidating the remainder of the order. If rejected it may be held for disposition at the expense and risk of the seller.

6. **QUANTITY:** The specific quantity ordered must not be changed without buyer's permission in writing.

7. **NON-PERFORMANCE:** Buyer reserves the right to cancel this order or any portion of same if delivery is not made when and as specified, time being of the essence of this order, and charge seller for any loss entailed.

8. **PATENTS:** The seller hereby guarantees the buyer against all losses of profits, damages, or both, resulting from any patent infringement by reason of purchasing or using goods covered by this order, or by reason of any loss suffered in not being able, without liability, to use such goods. This guarantee also includes the reimbursement to the buyer of all litigation costs which it may suffer as the result of any suit respecting the purchase or use of such goods, in addition to the recoveries which may be secured against it of profits and/or damages.

GENERAL:

9. The material on this order must be furnished only by the person or firm to whom the order is addressed unless otherwise authorized by the buyer.

10. No drafts for purchases made will be honored unless by agreement.

11. If it becomes necessary for the seller or any agent, contractor, or employee thereof to enter upon the property of the buyer in order to construct, inspect or deliver hereunder, the seller hereby agrees to protect the buyer's property and all persons thereon from injury, damage or loss, and the seller shall save harmless and indemnify the buyer from and against any expense, loss or damage on account of any claim, demand or suit made by any person whomsoever, including any employee of the buyer, which is in any way caused by or connected with or grows out of the performance hereunder by the seller or any agent, contractor or employee thereof; provided however that the seller shall not be required to indemnify the buyer against any loss caused solely by the negligence or willful fault of the buyer or its employees. If the seller performs any work hereunder knowing it to be contrary to any local law, ordinance, rule and regulation, the seller shall bear all costs arising therefrom. Seller to carry Liability Insurance and to carry Workmen's Compensation Insurance as provided by the laws of the State in which the work is performed and further, is to obtain a certificate for same, which is to be furnished for the file of the buyer. If for any reason the seller's or any subcontractor's employees or agents may acquire a status imposing liability on the buyer for employer's contributions or taxes under the Federal Social Security Act or under any State Unemployment Insurance, Old Age Benefit, or similar Acts, the seller shall be exclusively liable for, and shall indemnify the buyer against, the same and does agree to comply with all laws and regulations so as to relieve the buyer from any and all liability therefor or the responsibility of making any reports or keeping any records with respect thereto.

12. In accepting this order the seller certified that these goods were produced in compliance with all applicable requirements of Sections 6, 7 and 12 of the Fair Labor Standards Act of 1938, as amended, and of the regulations and orders of the United States Department of Labor issued under Section 14 thereof. It will be necessary in order for us to honor your future invoices to us that the above clause or a substantial equivalent thereof appear on your invoices.

13. By acceptance of this order, seller warrants that the prices specified do not exceed the maximum prices established under any applicable United States law or regulation thereunder.

F/L

ASARCO Incorporated

MAY 5 1988

SW Exploration

JOY-CBC DRILLING

707 BOYD BOULEVARD
P.O. DRAWER 489
LAPORTE, INDIANA 46350
PHONE: (219) 362-2191

May 3, 1988

Mr. Jim Sell
Asarco, Incorporated
P.O. Box 5747
Tucson, AZ 85703

Dear Jim:

We appreciated receiving the invitation to bid on the additional drilling in hole TM-14 near Patagonia, Arizona. This hole has NX casing set to 2,613 feet and BX casing from 2,600 to 3,500 feet. We will reinstall BX casing from surface to 2600' with a sleeve at 2600' to maintain annulus continuity and then wash and resume BX drilling from 3599'. There will be no allowance for any casing recovered that was set prior to 1988.

Please consider the following:

Mobilization	$750.00/rig
Demobilization	$750.00/rig
Extra Road Truck Trips (if required)	$150.00 each
<u>Core Drilling</u>	<u>BX Wireline</u>
3500 to 4000 feet	$29.00/foot
4000 to 4500 feet	$33.30/foot
4500 to 5000 feet	$38.50/foot
<u>Rig Time & Hourly Work</u>	
Setting and Pulling Casing and Pipe	$50.00/hour + materials used
Cementing and/or Plugging Drill Holes (two man crew). Includes all time required to maintain good hole conditions while drilling. Also includes time required to close or complete hole as required.	$50.00/hour + materials used

Rig Time & Hourly Work (continued)

Reaming, if necessary	$50.00/hour + materials used
Re-entering Previously Drilled Holes (two man crew). Includes all time worked entering previously drilled hole until wireline core bit is cutting in solid rock formation on true bottom of hole. This will also include:	$60.00/hour + materials used

(a) Time which is required to line up drill over previously drilled hole.

(b) Time required to set casing in predrilled hole before starting to drill with wireline tools (0-2600 BX).

(c) All time required to correct any problems encountered with existing casing or pipe in hole.

Survey	$50.00/hour + Asarco supplies instrument
Standby Time for Your Convenience (two man crew)	$35.00/hour
Overtime Premium in Excess of 88 hours per two-week period (if required)	$6.00/man hour

Supplies

Casing ordered left in place - BX	$7.00/foot
Casing lost through normal drilling operations	At 70% of List Price
Diamond Bit loss in excess of $2.50/foot	At Actual Cost
Drilling Mud and Additives	At Jobsite Cost + 20%

Supplies (continued)

Weather-treated Core Boxes which hold ten feet of core	$2.50 each

Water Pumping or Hauling

Water Truck Usage	$600.00/month
Mileage	$.75/mile
Water Truck Driver (if required)	$20.00/man hour
Per Diem (excluding local help)	$15.00/man/work day

The above prices are firm if accepted within 30 days and will remain in effect until 9/25/88. Our terms are Net 30 Days on monthly progress invoices.

We understand Asarco will build and maintain all-weather or passable access roads, level drill sites, dig mud pits and provide water, on surface, free of cost to JOY-CBC Drilling. We further understand that Asarco will provide all rights of ingress and egress to all lands that may be required to enable JOY-CBC Drilling to carry out the specified work. Also, you will arrange for the necessary drilling permits.

We propose doing this work with a Joy 22 Truck Mounted Drill and Joy Wireline Equipment. We will probably work two shifts per day unless hole conditions require three shifts. Nino Trujillo will be in touch with you in advance of a rig and crews becoming available.

We will look forward to working with you on this project.

Yours very truly,

JOY-CBC DRILLING

J. H. Koontz
Vice President &
General Manager

JHK/ts

cc: WD Gay
DA Melhado

Formerly Joy Contract Drill Division

707 BOYD BOULEVARD / LAPORTE, IN 46350 / PHONE & FAX: (219) 362-2191

July 5, 1988

Mr. W. D. Gay
Asarco
P.O. Box 5747
Tucson, AZ 85703-5747

Dear Bill:

Attached is the signed Acknowledgement Order T-180-8.

Two Certificates of Insurance will be mailed directly to you from our insurers. One is for Workers' Comp. and the other is for General Liability and Auto.

I understand you will make arrangements with Nino Trujillo for startup.

Thanks for awarding this work to JOY-CBC Drilling.

Yours very truly,

JOY-CBC DRILLING

J. H. Koontz
Vice President &
General Manager

JHK/ts

Attachment:

ASARCO Incorporated
JUL 8 1988
SW Exploration

cc: C.L. Snow (7/8/88)
J.D. Sell (7/8/88)

ASARCO PD 1
REVISED 1/1/58

ACKNOWLEDGMENT

PURCHASE ORDER

ASARCO Incorporated
~~American Smelting And Refining Co.~~
TUCSON OFFICE
P. O. BOX 5747
1150 NORTH 7TH AVENUE
TUCSON, ARIZONA 85703

PLANT JOB NO.

APPROPRIATION NO.

DATE: 6/27/88

ORDER NO.: T-180-8

REQUISITION NO.

To: JOY-CBC DRILLING
707 Boyd Boulevard
P.O. Drawer 489
La Porte, Indiana 46350

FINAL DESTINATION — PLEASE NOTE CONSIGNMENT BELOW

DATE REQUIRED AT DESTINATION:

CONSIGNMENT — SELLER WILL SHIP TO

SHIPPING INTERVAL PROMISED

SELLER WILL SHIP BEFORE:

POINT OF SHIPMENT

TERMS:

— RENDER BILLS AS PER ATTACHED SHIPPING INSTRUCTIONS —

F.O.B. POINT

SHIP VIA

QUANTITY	UNIT	SPECIFICATIONS	ITEM NO.	UNIT PRICE
		JOY-CBC DRILLING, hereinafter referred to as CONTRACTOR, will reenter and deepen an exploration hole at ASARCO Incorporated's Thunder Mountain, Santa Cruz County, Arizona, the final depth of which will be specified by ASARCO's representative(s) at the jobsite. Payment for work performed will be in accordance with CONTRACTOR's letter of proposal dated May 3, 1988, a copy of which is attached.		
		CONTRACTOR will provide a drill and water truck complete with crews and accessories.		
		Mobilization of CONTRACTOR's equipment will commence in late August, 1988.		
		It is understood by both parties to this order that CONTRACTOR will perform all work in a diligent and workman like manner and in accordance with recognized standard drilling practices. ASARCO will not be charged for delays caused by failure of CONTRACTOR's equipment or personnel.		
		CONTRACTOR and his personnel will make every effort to minimize disturbance of the natural environment, and drill crews will establish and maintain sanitation systems which are acceptable to ASARCO and which comply with standards set by any government agency whether federal, state, county, or municipal which has jurisdiction over the site area.		
		CONTRACTOR's particular attention is called to Clause Eleven (11) on the reverse of this order. Before entering upon ASARCO's property to perform this work, CONTRACTOR will submit acceptable evidence of compliance with the Workmen's Compensation Laws of the State of Arizona and, on ASARCO's standard insurance form, acceptable evidence of other required insurance.		

ASARCO Incorporated
JUL 8 1988

RECEIVED
JUL 01 1988

ACCEPTED FOR: JOY-CBC DRILLING
By: [signature]
TITLE: President

IMPORTANT

SW Exploration

Attached Acknowledgment Card must be completed and returned promptly.

Orig: JOY-CBC DRILLING
cc: " " " , for acceptance
JDSell, WDGay, Acctg Dept., File

PLEASE ENTER OUR ORDER FOR THE ITEMS SPECIFIED ABOVE, SUBJECT TO ALL INSTRUCTIONS AND PROVISIONS ON REVERSE SIDE.

W. D. Gay for J. D. Sell
Manager, Southwestern Exploration

INSTRUCTIONS

INVOICE: Priced invoices in the requisite number giving the correct purchase order and requisition numbers, together with required Bills of Lading, must be forwarded on day of each shipment AS PER SPECIAL SHIPPING INSTRUCTIONS ACCOMPANYING THIS ORDER, otherwise delay in payment of account may result.

TERMS: As previously arranged or specified on this order. Care must be exercised to show cash discount, if allowed, on face of invoice.

PROVISIONS

1. **ACCEPTANCE:** Acceptance of this order constitutes acceptance of all terms herein stated. All representations and warranties by the seller relating to the subject-matter of this order or its performance shall be binding on the seller as if fully set forth herein, and shall survive inspection and acceptance of the goods ordered. No acknowledgment or acceptance of this order or any other communication by the seller shall vary or add any terms or conditions to those contained herein and any such attempted modification or addition which is not accepted in writing by the buyer, shall be void and may be disregarded without further notice or disclaimer.

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Shipments will not be considered as completed until Bill of Lading, or express or mail receipt is received.

4. **PACKING AND CARTAGE CHARGES:** No charge will be allowed for packing, boxing or cartage, unless agreed upon at the time of purchase; damage to any material not properly packed to insure adequate protection in transit will be charged to the seller. All packing must conform with tariff or classification requirements so as to secure lowest possible freight rates. It is understood the buyer will receive the benefit of any decrease in freight charges between time of quotation and date of shipment, where freight enters into the price originally quoted.

5. **QUALITY AND INSPECTION:** All material furnished must be as specified and will be subject to inspection and approval of buyer after delivery. The right is reserved to reject and return at the risk and expense of the seller such portion of any shipment which may be defective or fail to comply with the specifications without invalidating the remainder of the order. If rejected it may be held for disposition at the expense and risk of the seller.

6. **QUANTITY:** The specific quantity ordered must not be changed without buyer's permission in writing.

7. **NON-PERFORMANCE:** Buyer reserves the right to cancel this order or any portion of same if delivery is not made when and as specified, time being of the essence of this order, and charge seller for any loss entailed.

8. **PATENTS:** The seller hereby guarantees the buyer against all losses of profits, damages, or both, resulting from any patent infringement by reason of purchasing or using goods covered by this order, or by reason of any loss suffered in not being able, without liability, to use such goods. This guarantee also includes the reimbursement to the buyer of all litigation costs which it may suffer as the result of any suit respecting the purchase or use of such goods, in addition to the recoveries which may be secured against it of profits and/or damages.

GENERAL:

9. The material on this order must be furnished only by the person or firm to whom the order is addressed unless otherwise authorized by the buyer.

10. No drafts for purchases made will be honored unless by agreement.

11. If it becomes necessary for the seller or any agent, contractor, or employee thereof to enter upon the property of the buyer in order to construct, inspect or deliver hereunder, the seller hereby agrees to protect the buyer's property and all persons thereon from injury, damage or loss, and the seller shall save harmless and indemnify the buyer from and against any expense, loss or damage on account of any claim, demand or suit made by any person whomsoever, including any employee of the buyer, which is in any way caused by or connected with or grows out of the performance hereunder by the seller or any agent, contractor or employee thereof; provided however that the seller shall not be required to indemnify the buyer against any loss caused solely by the negligence or willful fault of the buyer or its employees. If the seller performs any work hereunder knowing it to be contrary to any local law, ordinance, rule and regulation, the seller shall bear all costs arising therefrom. Seller to carry Liability Insurance and to carry Workmen's Compensation Insurance as provided by the laws of the State in which the work is performed and further, is to obtain a certificate for same, which is to be furnished for the file of the buyer. If for any reason the seller's or any subcontractor's employees or agents may acquire a status imposing liability on the buyer for employer's contributions or taxes under the Federal Social Security Act or under any State Unemployment Insurance, Old Age Benefit, or similar Acts, the seller shall be exclusively liable for, and shall indemnify the buyer against, the same and does agree to comply with all laws and regulations so as to relieve the buyer from any and all liability therefor or the responsibility of making any reports or keeping any records with respect thereto.

12. In accepting this order the seller certified that these goods were produced in compliance with all applicable requirements of Sections 6, 7 and 12 of the Fair Labor Standards Act of 1938, as amended, and of the regulations and orders of the United States Department of Labor issued under Section 14 thereof. It will be necessary in order for us to honor your future invoices to us that the above clause or a substantial equivalent thereof appear on your invoices.

13. By acceptance of this order, seller warrants that the prices specified do not exceed the maximum prices established under any applicable United States law or regulation thereunder.

F/L

ASARCO Incorporated

MAY 5 1988

SW Exploration

JOY-CBC DRILLING

707 BOYD BOULEVARD
P.O. DRAWER 489
LAPORTE, INDIANA 46350
PHONE: (219) 362-2191

May 3, 1988

Mr. Jim Sell
Asarco, Incorporated
P.O. Box 5747
Tucson, AZ 85703

Dear Jim:

We appreciated receiving the invitation to bid on the additional drilling in hole TM-14 near Patagonia, Arizona. This hole has NX casing set to 2,613 feet and BX casing from 2,600 to 3,500 feet. We will reinstall BX casing from surface to 2600' with a sleeve at 2600' to maintain annulus continuity and then wash and resume BX drilling from 3599'. There will be no allowance for any casing recovered that was set prior to 1988.

Please consider the following:

Mobilization	$750.00/rig
Demobilization	$750.00/rig
Extra Road Truck Trips (if required)	$150.00 each
<u>Core Drilling</u>	<u>BX Wireline</u>
3500 to 4000 feet	$29.00/foot
4000 to 4500 feet	$33.30/foot
4500 to 5000 feet	$38.50/foot
<u>Rig Time & Hourly Work</u>	
Setting and Pulling Casing and Pipe	$50.00/hour + materials used
Cementing and/or Plugging Drill Holes (two man crew). Includes all time required to maintain good hole conditions while drilling. Also includes time required to close or complete hole as required.	$50.00/hour + materials used

Rig Time & Hourly Work (continued)

Reaming, if necessary	$50.00/hour + materials used
Re-entering Previously Drilled Holes (two man crew). Includes all time worked entering previously drilled hole until wireline core bit is cutting in solid rock formation on true bottom of hole. This will also include:	$60.00/hour + materials used

(a) Time which is required to line up drill over previously drilled hole.

(b) Time required to set casing in predrilled hole before starting to drill with wireline tools (0-2600 BX).

(c) All time required to correct any problems encountered with existing casing or pipe in hole.

Survey	$50.00/hour + Asarco supplies instrument
Standby Time for Your Convenience (two man crew)	$35.00/hour
Overtime Premium in Excess of 88 hours per two-week period (if required)	$6.00/man hour

Supplies

Casing ordered left in place - BX	$7.00/foot
Casing lost through normal drilling operations	At 70% of List Price
Diamond Bit loss in excess of $2.50/foot	At Actual Cost
Drilling Mud and Additives	At Jobsite Cost + 20%

Supplies (continued)

Weather-treated Core Boxes which hold ten feet of core	$2.50 each

Water Pumping or Hauling

Water Truck Usage	$600.00/month
Mileage	$.75/mile
Water Truck Driver (if required)	$20.00/man hour
Per Diem (excluding local help)	$15.00/man/work day

The above prices are firm if accepted within 30 days and will remain in effect until 9/25/88. Our terms are Net 30 Days on monthly progress invoices.

We understand Asarco will build and maintain all-weather or passable access roads, level drill sites, dig mud pits and provide water, on surface, free of cost to JOY-CBC Drilling. We further understand that Asarco will provide all rights of ingress and egress to all lands that may be required to enable JOY-CBC Drilling to carry out the specified work. Also, you will arrange for the necessary drilling permits.

We propose doing this work with a Joy 22 Truck Mounted Drill and Joy Wireline Equipment. We will probably work two shifts per day unless hole conditions require three shifts. Nino Trujillo will be in touch with you in advance of a rig and crews becoming available.

We will look forward to working with you on this project.

Yours very truly,

JOY-CBC DRILLING

J. H. Koontz
Vice President &
General Manager

JHK/ts

cc: WD Gay
DA Melhado

JCB
Have Sept 1-88 thru Aug 31-88
assessment validation
sent in.

Non
do you agree with all this?!
JHS
he does

Formerly Joy Contract Drill Division

707 BOYD BOULEVARD / LAPORTE, IN 46350 / PHONE & FAX: (219) 362-2191

November 10, 1988

Mr. Jim Sell
Asarco Inc.
P.O. Box 5747
Tucson, AZ 85703

ASARCO Incorporated
NOV 14 1988
SW Exploration

Dear Jim:

Don Mulhado, Nino Trujillo and I had numerous discussions concerning Hole TM-14 beginning on 9/26/88. The attached invoice reflects the daily course of action agreed upon and taken and who would be responsible for bearing the cost.

This hole at depth has given both Asarco and JOY-CBC some headaches. There was (1) A hole problem at 4586' while drilling, (2) A hole problem at 4021' which prematurely sheared the wedge and (3) A casing separation during the retrieval of the BX Casing on 10/8/88.

An Arizona DWR Hole Log will not be filed for this work since Asarco's information is that it is not required.

Yours very truly,

JOY-CBC DRILLING

J. H. Koontz
Vice President &
General Manager

JHK/ts

Attachment:

CC: Mr. Don Mulhado

JOY - CBC DRILLING

Formerly Joy Contract Drill Division

707 BOYD BLVD.
LA PORTE, IN 46350

DUPLICATE

PLEASE REMIT TO
P.O. BOX 30777
SALT LAKE CITY, UTAH 84130

CUSTOMER'S ORDER NO.	DATE	REQ. NO.	OUR ORD'R NO.	DATE	AT REC. POINT	B.O.NO.
T-180-8						
CONTRACT	CODE			DATE	AT SHIP POINT	
					03-0007-24	

03007

SOLD TO

ASARCO INC.
ATTN: MR. JIM SELL
P.O. BOX 5747
TUCSON, AZ 85703

TERMS NET 30 DAYS
NO CASH DISCOUNT
PAST DUE ACCTS. SUBJECT
TO 18% PER ANNUM

PLEASE REMIT TO
JOY - CBC DRILLING
P.O. BOX 30777
SALT LAKE CITY, UTAH 84130

ANY QUESTIONS ON INVOICE
PLEASE CALL 219-362-2191

INVOICE NO. AZ1094

INVOICE DATE 11/10/88

DATE SHIPPED

SHIPPED VIA

SHIPPED TO

PATAGONIA, ARIZONA

P. O. ADDRESS

MARKS

REQUESTED ROUTING

SHIPPED FROM

ORIGINAL QUANTITY ORDERED	PART NUMBER	DESCRIPTION	CODE	UNIT PRICE	QUANTITY BACK ORDERED	QUANTITY SHIPPED	AMOUNT

For 17.' core drilling near Patagonia, Arizona for period ending 10/22/88 as per agreement.

(586-1004)	HOLE NO.	SIZE	FROM	TO	TOTAL FEET	UNIT COST	TOTAL COST
	TM-14(90°)	BX	4570.	4587.	17.	38.50	654.50

(586-1008) WATER HAUL

September 26 through October 7

1 Truck @ $600.00/month (12/30) 240.00

(586-1009) PER DIEM

Sellars	19 Days
Mitchel	3 Days
McConnell	17 Days
Sheridan	9 Days
Taylor	8 Days
	56 Days @ $15.00/day 840.00

F. O. B. SHIPPING POINT UNLESS OTHERWISE SPECIFIED
NO RETURNS ALLOWED UNLESS AUTHORIZED BY THIS OFFICE
GOODS COVERED BY THIS INVOICE WERE PRODUCED IN COMPLIANCE WITH THE REQUIREMENTS OF THE FAIR LABOR STANDARDS ACT OF 1938, AS AMENDED, INCLUDING SECTION 12(A).

FORM
INV-88-1

JOY - CBC DRILLING

Formerly Joy Contract Drill Division

DUPLICATE

PAGE NO. 2

SOLD TO ASARCO INC.
MR. JIM SELL

OUR ORDER NO.	AT REC. POINT	AT SHIP POINT	B.O. NO.	INVOICE NO.
				AZ1094

ORIGINAL QUANTITY ORDERED	UNIT	PART NUMBER	DESCRIPTION	CODE	UNIT PRICE	QUANTITY BACK ORDERED	QUANTITY SHIPPED	AMOUNT

(586-1009) RECOVERING TOOLS AND WEDGING @ 50%

Sep. 26	5 Hours
Sep. 27	20 Hours
Sep. 28	16 Hours
Sep. 29	16 Hours
Sep. 30	16 Hours
Oct. 3	12 Hours
Oct. 4	16 Hours
Oct. 5	16 Hours
Oct. 6	14½Hours
Oct. 7	16 Hours

147½ Hours @ $50.00/hour X 50% 3,687.50

(587-1104) TOOLS LOST & WEDGE

1	10' BXWL Core Barrel (Used)	600.43
1	10' BXWL Drill Rod (Used)	80.50
1	BXWL Wedge Assy. (New)	738.00

1,418.93 @ 50% 709.47

(587-1104) EXCESS BIT COST

Bit Cost did not exceed $2.50/foot -

(586-1005) DEMOBILIZATION

Rig 9151 750.00

TOTAL INVOICE: $6,881.47

FORM
INV-88-2

ASARCO

Southwestern Exploration Division

-JDS

November 11, 1988

J.D. Sell

TM-14 1988 Logging

TM-14 was logged from 3500-4580' to its final depth of 4580' by M.A. Miller and H.G. Kreis. Very little change was noted throughout the hole with regard to alteration/structure and mineralization. Several zones were noted with .1-.2% chalcocite coating pyrite. Quartz/sericite alteration is very pervasive and consistent throughout the hole. There seems to be a noticeable increase in the amount of pyrite + pyrite veining from 4360-4580' from 4-7% pyrite with 4-10 pyrite veins/ft.
* The hole will be assayed every 100' for 10' intervals for Cu, Pb, Zn Au, Ag, as time permits.

MAM:mek

Mark A. Miller

* To be split by "Steve" and MAM 5/12/89

To JDS

Date 2/14/89 Time 11:47

WHILE YOU WERE OUT

M Greg Taylor

of Mari Drill

Phone 801-972-3333

Area Code Number Extension

TELEPHONED		PLEASE CALL	✓
CALLED TO SEE YOU		WILL CALL AGAIN	
WANTS TO SEE YOU		URGENT	
RETURNED YOUR CALL			

Message

Mary

Operator

AMPAD EFFICIENCY®

23-000 50 SHT. PAD
23-001 250 SHT. DISPENSER BOX

2/14/89 PM

Wanted to know what we were going to do with Robinson hole (after talking w/ Fleetwood.

Any other jobs, he asks?

Will send out new brochure.

JDS
Thunder Mtn

C·B·C DRILLING
Formerly Joy Contract Drill Division

707 BOYD BOULEVARD / LaPORTE, INDIANA 46350 / PHONE & FAX: (219) 362-2191

May 23, 1990

ASARCO Incorporated
MAY 25 1990
SW Exploration

Mr. James D. Sell
Asarco Inc.
P.O. Box 5747
Tucson, AZ 85703

Dear Jim:

We appreciated receiving the invitation to bid on your core drilling in the Patagonia, Arizona area. We understand there may be 15 holes totaling 10,000 feet. The holes will not exceed 2000 feet each and will be drilled NC/NX both vertical and angle. One area near Holes TM-8 and TM-14 is in Flux Canyon. Water is readily available from an artesian well. The second area is near an old Hole BB-1. Water will have to be hauled from the Flux Canyon well or 12 miles one way from Patagonia.

Please consider the following:

Mobilization (For NC Drilling)	$500.00/rig
Demobilization (For NC Drilling)	$500.00/rig
Extra Road Truck Trips (To resupply job if required or for hole reduction.)	$75.00/round trip
Move Between Holes (Angle Holes Only)	$500.00/move
Overburden Drilling (two man crew)	$60.00/hour + materials used

Vertical Core Drilling	NCE Wireline	NXE Wireline
0 - 500 Feet	$17.40/foot	$15.40/foot
500 - 1000 Feet	$18.20/foot	$16.20/foot
1000 - 1500 Feet	$19.20/foot	$17.20/foot
1500 - 2000 Feet	$20.50/foot	$18.50/foot

Note: Add $1.50/foot for Angle Hole Drilling.

Rig Time & Hourly Work

Setting and Pulling Casing and Pipe (two man crew)	$55.00/hour + materials used

Rig Time & Hourly Work (continued)

Cementing and/or Plugging Drill Holes (two man crew). Includes all time required to maintain good hole conditions while drilling. Also includes time required to close or complete hole as required.		$55.00/hour + materials used
Reaming, if necessary (two man crew)		$55.00/hour + materials used
Survey (two man crew)		$55.00/hour + Asarco Inc. supplies instrument
Standby Time for Your Convenience		$50.00/hour
Extra Labor authorized by Asarco, Inc. (if required)		$25.00/man hour
Overtime Premium in Excess of 88 Hours per two week period		$6.00/man hour

Supplies

Casing Ordered Left in Place	NC NX	$12.00/foot $10.00/foot
Casing Lost through Normal Drilling Operations		70% of Above Price
Diamond Bit Loss in Excess of $2.50/foot		At Actual Cost
Drilling Mud and Additives		At Jobsite Cost + 20%
Weather-treated Core Boxes which hold ten feet of core	NC NX	$3.00 each $2.75 each
Materials Used and Special Purchases authorized by Asarco Inc. (if required)		At Cost + 20%

Water Pumping or Hauling

Water Truck Usage	$600.00/month
Mileage	$.75/mile
Full-time Water Truck Driver (if required)	$25.00/man hour

Per Diem $15.00/man/work day

The above prices are based on our standard non-union wage rates and are firm if accepted within 60 days and will remain in effect until December 25, 1990. Our terms are Net 30 Days on invoices and with approved credit. In the event that payment is not made within this period, a late payment charge of 1½ percent per month, or the maximum amount permitted by law, whichever is less, will be charged, to be computed from the due date to the date payment is received by CBC, together with all costs and expenses incurred in collection, including reasonable Attorney fees and court costs.

We understand Asarco, Inc. will build and maintain all-weather or passable access roads, level drill sites, dig mud pits and provide water, on surface, free of cost to CBC Drilling. We further understand that Asarco, Inc. will secure and maintain all necessary and required permits and will provide all rights of ingress and egress to all lands that may be required to enable CBC Drilling to carry out the specified work.

We propose using vertical and angle hole drills. We will work two shifts per day.

You should contact Nino Trujillo (602-884-5866) to discuss crew and equipment availability.

We would look forward to working with you on this project.

Yours very truly,

CBC DRILLING

J. H. Koontz
Vice President &
General Manager

JHK/ts

TM-14

Feb 84 1705

June 85 3075

87 3500 — last assays ppm Cu Pb Zn Au Ag

88 3599

10-88 4587 lost last 7 feet of core w/barrelette.

7-23-90

FROM: J. D. SELL

TO: JJ Malusa

In your "spare" time
Thunder Mtn hole
TM-14.
need 10' split from
3600-3610
3700-3710
3800-3810
etc
4500-4510
4550-4560
4570-4580 T.D.
Geochem. ppm, for
Cu, Pb, Zn, Au, Ag

ASARCO

Southwestern Exploration Division

November 11, 1988

J.D. Sell

TM-14 1988 Logging

TM-14 was logged from 3500-4580' to its final depth of 4580' by M.A. Miller and H.G. Kreis. Very little change was noted throughout the hole with regard to alteration/structure and mineralization. Several zones were noted with .1-.2% chalcocite coating pyrite. Quartz/sericite alteration is very pervasive and consistent throughout the hole. There seems to be a noticeable increase in the amount of pyrite + pyrite veining from 4360-4580' from 4-7% pyrite with 4-10 pyrite veins/ft. The hole will be assayed every 100' for 10' intervals for Cu, Pb, Zn Au, Ag, as time permits.

MAM:mek

Mark A. Miller

GEOLOGIC LOG

PROJECT Thunder Mountain
HOLE NO. TM-14
Collar elev.
Coord N.
Coord E.
Final depth 3500 (1985)
Inclination
Page 5 of
Logged by F.R. Koutz, Marina H.G. Kreis
Date start
Date finish

From	To	Int'l (NX)	Core Recovery	Unit notes:	Cu (All PPM)	Pb	Zn	Au	Ag	Mo		Faults (Crushing / Shattering)	Rock Type and Remarks (Detail ⇒ Generalized Comments)
3400	3420	20	100	3416 ±1' relatively fresh							3400.75	→	3418-3419 sh. @ 70-75° 15% ank. str.-gg / 20% Aplitic Groundmass
	3440	↑	97	3344 Mo. Py. Vn. Py @ 85-90°								— ↗	70% Aplitic Grndmass.
56-90	3460		100									→	3452' 1" mauve qtz py & seric @ 70° / 20% Aplitic Grndmass
	3480	↓	100	3482-1.2" @ 60°								—	20% Aplitic Grndm. / 30% Aplitic.
3480	3500	20	99	shr. shear 3480-3500	385	240	1300	<0.2	1.6			→	3495-3500 shattered 35% @ 75° 80° + Rw. scale flows (Fit 2068)
1985	B.O.H.												
3500	3520	20	100									→	Fine Diss. Pale grey seric? None obvious.
3520	3540	20	100									→	No faults.
3540	3560	20	100									→	3566 1/2" shr 60° Breccia / crushed zone
3560	3580	20	100	Bx'd and sericite vlts 60-85° Rix								→	Mod. Low cont. Bx. Py + Mo. See Vlt's as desert bed.
3580	3600											→	Tourmaline? @ 3593'
3600	3620	20	100									→	Vs + selvages variable 2x → 10mm. Vn thickness.
3620	3640	20	100									→	Vn selvages dec. in intensity. Change in alt style?
3640	3660	20	100									→	2" Gouge 3663
3660	3680	20	100	1" TKR vn @ 65° @ 3665								→	
3680	3700	20	100									→	Alteration decreasing, mask selvages
3700	3720	20	100									→	Intense Py Vn. / no strong shattered core from surface diversion?
3720	3740	20	100									→	
3740	3760	20	100									→	
3760	3780	20	100									→	
3780	3800	20	100									→	
3800	3820	20	98									→	Poss. Bx. & jetting? in vlts?
3820	3840	20	100									→	
3840	3860	20	100									→	
3860	3880	20	100									→	
3880	3900	20	100									→	3904-05, 1" Cal 30% Py in Vn. Small Pseudo cal. zone @ 3904-06. Pink K-spar on Fract @ 3988
3900	3920	20	100									→	Vert 1" wide Qz Py Vn @ 3925'
3920	3940	20	100									←	Inc in K-spar? (?) Fspar x's 3950-53. 3952-55 Broken core
3940	3960	20	100									→	Loc varied Inc in Plag. x's.
3960	3980	20	100									→	
3980	4000	20	100									→	Apparent Feldspar (Plag) grinding to 3 links in 4010. Spacing Bx inc. over 30 ft intervals
4000	4020	20	100									→	Qz Vn w/ Py - 4037-4040 (?) Py t.c.c.
4020	4040	20	100									→	4041-4042, 4051-4052 - Qz Vn. (?) Shear zone, Mod Lo. wht clay (?) crossings
4040	4060	20	100									→	Loc 3-5 Bx zone? 4079-4080 (Epiclastic & 2' mush)
4060	4080	20	100									→	Pink K-spar on Fract.
4080	4100	20	100									→	Greenish Mat. gouge/clay 4116-4126 (?) 10% Py (?) (?)
4100	4120	20	100									→	AA Poss 3' inc in clay / Ser (?)
4120	4140	20	100									→	
4140	4160	20	100									→	Selvages / Mod + strongly defined Bx (?) Bx Vn thickness.
4160	4180	20	100									→	
4180	4200	20	100	4180 (?)								→	
4200	4220	20	100									→	

MINERALOGY AND STRUCTURE (Vol %)

From	To	Chalcopyrite	Chalcocite	Covellite	Sphalerite	Sphal. (SS)	Pyrite-Marcasite	Pyrite-Vein	Hematite	Magnetite	Epidote/Chlorite	Alunite	K-feldspar	Qtz Dissem.	Qtz Vn	Clay	Sericite	Chlorite	Epidote	Calcite	Kaolin	Gouge/Fract.		Bx	Fx/Ft		Sulfide Vn/Ft	Width Vn / Selv.	Faults
3400	3420	T	–	T-	.2	.2	4	1.5	–	–	5	–	2	12	7	8	35	T-	–	T-	–	2		–	1-10	–	2-3 / 3-60	1/2-2 / 5-50	→
	3440	T-	T+	–	.2	.2	3.5	2	–	–	5	–	3	15	10	8	22	T-	–	–	–	2	–	–	1/2-1	–	1-4 / 60-70	1/2-2 / 5-30	—
	3460	–	–	T-	.1	.2	3	1.5	–	–	8	T?	3	12	12	5	22	T-	–	T-	–	2	–	–	1/2-1	–	1/2-2 / 70-80	1/2-10 / 5-20	→
	3480	T-	–	T	.1	.2	3	1.5	–	–	0	–	2	12	10	3	20	–	–	–	–	1	–	–	1/2	–	1/2-2 / 30, 70-80	1/2-2 / 5-15	—
3480	3500	T-	–	T-	.2	.2	3.5	1	–	–	3	T	1	12	12	5	35	–	–	–	–	2	–	1-2	1-5	1/2	1/2-2 / 30, 60-80	1/2-2 / 5-30	→
3500	3520	T-	–	T-	T-	T-	3	4	?	–	–	–	1	19	12	3	25	–	–	–	–	1-2	–	–	2-3	–	1-3, 50-70°	1-2, .010	→
3520	3540	T-	–	?	Vn		3	2	?	–	–	–	1	10	5	4	35	–	–	–	–	1-2	–	–	3/4	–	2, 60-80°		→

for F.T.G. mn2555 A dom

(6)

GEOLOGIC LOG

PROJECT Thunder Mtn — HOLE NO. TM-14
Collar elev. — Final depth 4580
Coord N. — Inclination V
Coord E. — Page 6 of
Logged by MAMILLER, FR & HGRIMIS
Date start — Date finish

DEPTH From	DEPTH To	DEPTH Int'vl	Core Recovery	VISIT NOTES	ASSAY Cu	Pb	Zn	Au	Ag	MO
4220	4240	20	100							
4240	4260	20	100							
4260	4280	20	100							
4280	4300	20	100							
4300	4307.5	7.5	100							
4307	4320	13	100							
4320	4340	20	100							
4340	4360	20	100							
4360	4380	20	100							
4380	4400	20	100							
4400	4420	20	100							
4420	4440	20	100							
4440	4460	20	100							
4460	4480	20	100							
4480	4500	20	100							
4500	4520	20	100	some vuggy calcite						
4520	4540	20	100							
4540	4560	20	100							
4560	4580	20	100							

TD @ 4580'

MINERALOGY AND STRUCTURE

Depth	Vol % Quartz	Carbonate	Chlorite	Epidote	Sericite	Clay	Hematite	Magnetite	Cobaltite	Pyrite	K-feldspar	Sp. Dispersion	Gl. Vn	Calcite	Sericite	Chlorite	Epidote	Calcite	Chlorite	Pyrite	Acid Leach	Pb. Pitting	Int. Fr.	Dip Rating	Solution Cavity Fill	Vuggy Vn	Vuggy Vn Alteration	Fractures Filled Crystals	ROCK TYPE AND REMARKS
T	T	-		-	-		5-7	4		-		-	-	-	1	10	0	-	35%	-	-	-	5%		-	2-3			4223-4233 V 14 [illegible] Pyrite [illegible] Lessy Zone 4238-34
T	7-3	-		-	-		4	4-5		-		-	-	-	1	10	-	-	35%	-	-	-	1	-	-	2-3	60°	34/60°	1-4 - AA.
T	7-1	-		-	-		3	3-4		-		-	-	-	1	10	-	-	35%	-	-	-	1	-	-	4	-	3/40-60°	AA Sericite [illegible]
T	?	-		-	-		4-5	Lt. Green Sericite		-		-	-	-	1	10	2	1	25	-	-	-	1	-	-	3	-	[illegible]/40-50	AA
-	-	-		-	-		1	-		-		-	-	-	?	?	-	-	-	-	-	-	-	1/2"	25	-	-	—	—
-	-	-		-	-	-	2	3		-		-	-	-	1-2	10	1-15	1	35%	-	-	-	-	-	-	3	>	1-2/40-60°	1-2mm/ft. 1-1mm
-	T	-		-	T+ H.S		4	4-5		-		-	-	-	2	10	1-2	<1	35%	-	-	-	-	-	-	-		3/40-60	[illegible]
-	T	-		-			1-15	[illegible]		-		-	-	-	1-2	10	1	<1	35%							2-3	-	2-3/40-60	1-2, [illegible]
2	T	-		-	-		2-4	4		-		-	-	-	1	12	2	1	33%	-	-	-	-	-	-	1	-	4/20-60	1-2 [illegible]
T	T+	-		-	-		2-4	3	-	-		-	-	-	1-2	0-15	<1	1	33%	-	-	-	-	-	-	2-3	-	4-5/20-60	1-3 [illegible]
T+	T+ [illegible]	-		-	-		5	3	-	-		-	-	-	1	10	<1	1	35%							1-2	-	4-5/20-60	1-3 [illegible]
T	T			-	-		3-5	3	-	-		-	-	-	1	10	<1	1	35%	-	-	-	-	-	-	2		3-4/20-60 Some [illegible]	A A above
T	T+ [illegible]	-		-	-		4	3-4							1	10	<1	1	35%	-	-	-	-	-	-	2	-	AA	[illegible]
	As Above			As Above												As Above							-	-	-	2	-	As Above	Few [illegible]
	As Above						5-6	4	-	-		-	-	-	1													6-7/40-60	[illegible]
T	[illegible]						5	1	-	-		-	-		-	As Above				-	-	-	-	-		1	-	3/40-60°	[illegible]
T	T						5-7	3	-	-		-	-	-	-	As Above				-	-	-	-	-	-	1-2		4-5/40-70	As Above
T	T+	-		-	-		5-7	5								As Above												[illegible]	As Above
T	T	-		-	-		4-5	5								As Above										3		As Above	As Above Some sericite 50%

for F.T.G. mn 2555 A dam

JDS

ASARCO Incorporated

JAN 16 1992

SW Exploration

CBC DRILLING
750 East Evans Blvd.
Tucson, Arizona 85713
Telephone 602-884-5865/Fax 602-622-0866

January 9, 1992

Mr. James D. Sell
ASARCO Inc.
P. O. Box 5747
Tucson, Az. 85703

Dear Jim:

I have talked to Jeff Gordon from ARIS Helicopter in Los Angeles, Ca. . They will use a Sikorsky 558T which can pickup to 5000# at sea level.

At the elevation where the job site will be in Patagonia will be 5400. At this elevation they will be capable of only picking up close to 4000#. There will be a staging point where all equipment will be picked up from and flown to the job site.

There will be (4) moves involved if you decide to drill (4) holes a total of 1500 feet plus or minus will be drilled.

There will be 3 or 4 holes ranging from 400 feet to 600 feet. The holes will be vertical.

Please consider the following:

Estimated helicopter costs, four (4) sites $48,000.00 + 10% Handling

This helicopter cost is bid on a 4 week maximum drilling program. Should the completion date go beyond this time frame, helicopter costs, estimated at $1000.00 per week, plus a 10% handling fee will be charged to your account, as per the invoices from ARIS Helicopter Company.

Should you prefer to handle Helicopter charges through ASARCO this would eliminate the 10% handling charges. Copy of the price breakdown sheet is included w/bid.

			1990
Mobilization - Demobilization from Tucson to Helicopter take off point. (NX Tools to 700 feet)	$	600.00 Lump Sum	500 each way
Extra Road Trip (To resupply job if required)	$	75.00 Round Trip	same
Overburden Drilling (2 man crew)	$	60.00/hour + materials used	same

Vertical Core Drilling	NCEWL		NXEWL	
0 to 500 feet	17.40	same	16.40	15.40
500 to 1000 feet	18.20		17.20	16.20

*Note - Add $1.50/foot for Angle Hole Drilling same

Rig Time & Hourly Work		1990
Setting & Pulling Casing and Pipe (two man crew)	$60.00/hour + materials used	55.00
Cementing and/or Plugging Drill Holes (two man crew). Includes all time required to maintain good hole conditions while drilling. Also includes time required to close or complete hole as required to close or complete hole to our specifications	$60.00/hour + materials used	55.00
Reaming, if necessary (two man crew)	$600.00/hour + materials used	55.00
Survey (two man crew)	$60.00/hour + ASARCO INC. Supplies Instrument	55.00
Standby Time for Your Convenience	$55.00/hour	50.00
Extra Labor Authorized by ASARCO Inc. (If Required)	$25.00/man hour	same
Overtime Premium in Excess of 88 Hours (per two week period)	$6.00/man hour	same
Supplies		
Casing Ordered Left in Place	NC $12.00/foot NX $10.00/foot	same
Casing Lost through Normal Drilling Operations	70% of List Price	same
Diamond Bit Loss in Excess of $2.50/ft. same	At Actual Cost	same
Drilling Mud & Additives	At Jobsite Cost + 20%	same
Weather-treated Core Boxes which hold ten feet of core	NC $3.00 each NX $2.75 each	same
Materials Used and Special Purchases authorized by ASARCO Inc. (If Required)	At Cost + 15%	+ 20%

Water Pumping or Hauling

Supply Pump Rental (435 Bean)	$450.00/Month
between sites Labor For Assisting in Helicopter Transport to and frm take off Point to drill site also for drill setup Move and Dismantle, also for pipeline work, also for any other tasks requested and authorized by ASARCO	$25.00/man hour
Per Diem	$15.00/man/work day

Bad Rock Clause: If footage drilled per shift (excluding chargeable time) times the appropriate footage rate drops below $480.00 per eight hour shift revenue for five or more consecutive shifts, drilling prices will revert from a per foot rate to an hourly rate of $60.00 per hour plus bit and other in hole supplies at actual cost.

The above prices are based on our standard Non-Union wage rates and are firm if accepted within 60 days.

Our terms ar net 30 days on Invoices and with approved credit. In the event that payment is not made within this period, a late payment charge of 1½ percent per month or the maximum amount permitted by law, whichever is less will be charged, to be computed from the due date to the date payment is received by CBC, together with all costs and expenses incurred in collection, including reasonable attorney fees and court costs.

We understand ASARCO will build pads for CBC to set the drill, also provide pads to set tanks for water to re-circulate dirlling fluids, free of cost CBC Drilling.

We expect ASARCO to furnish some form of disposing of used and contaminated drilling fluids.

We propose using a Joy 22HD Skid Rig with a 435 Bean Pump. We will work two shifts per day.

You should contact me at (602-884-5865) to discuss crew and equipment availability.

We would look forward to working with you on this project.

Yours very truly,

CBC DRILLING

Nino Trujillo

Nino Trujillo
District Manager

NT/dt

ARIS HELICOPTERS LTD.

CBC Drilling
750 E. Evans Blvd.
Tucson, AZ. 85713
Attn. Nino ~~[illegible]~~ Trujillo

January 9, 1992

Dear Nino,

Thank you for calling **ARIS Helicopters LTD.** regarding the Drill rig project in the Patagonia area.

The price breakdown for the Sikorsky S-58T is as follows:

•Mobilization of helicopter from San Jose California to Nogales Arizona and return: 16 hrs. ferry time @ $ 1500.00 per hour = $ 24,000,00
•Placement of drill rig on sites. (includes ferry time from Nogales) need to get rig off hill! x5 = 25K
2 hrs. each site X 4 sites @$ 2500,00 hr. = $20,000,00
•Pilot, crew, rigging ,fuel support vehicle and perdiem:
$ 1,000,00 per week for 4 weeks = $4,000,00 3mo! =
The helicopter will be based at Nogales Airport unless otherwise noted.

If there are any changes in the scope of this job or you would like more information please call me at (310) 216-2747. We look forward to hearing from you soon.

Sincerely,

Jeff Gordon
Airlift Operations

Enclosures

JGG/ebs

P.O. BOX 998-697 EL SEGUNDO, CALIFORNIA 90245 310-216-2747 Fax (310) 216-9158
PHOENIX: 602-267-7441 SAN JOSE: 408-998-3266 SACRAMENTO: 916-645-8917

JDS File

Thunderbird Pro
Santa Cruz Co; AZ

ASARCO Incorporated

JAN 24 1992

SW Exploration

CBC DRILLING

Southwestern District
750 East Evans Blvd.
Tucson, Arizona 85713
602-884-5865
FAX 602-622-0866

JANUARY 23,1992

Mr.Jim Sell:
Asarco Inc.
P.O.Box 5747
Tucson,AZ.85703

Dear Jim:

As we discussed on the telephone,here is a copy of the breakdown of costs for the helicopter from South Coast Helicopters Inc.
This bid is some what cheaper than the first bid.The ten percent would still apply if we handle the invoicing.
As you stated the holes may take up to a month to drill if they go to a depth of 700 feet.You should probably consider the additional cost for the helicopter service even if the holes take (3) weeks to complete.

We will wait for your reply.

Yours Very Truly
CBC DRILLING
Nino Trujillo
Nino Trujillo
District Manager

Rec 1-22-12

SOUTH COAST HELICOPTERS INC.

1400 E. 33rd Street
Signal Hill, California 90807
(310) 492-8955
FAX (310) 988-9566

C B C Drilling Co.
750 East Evans Road
Tuscon, ~~OR~~ AZ 85713
ATTN: Nino Trujillo

Dear Nino:

The following is a breakdown of costs for your proposed drill movements in the Patagonia area, east of Nogales. Variables to be considered would be:

1. If the actual number of work hours exceeded 15 flight hours, the additional work hours would be billed at $1200.00 per flight hour.

2. Any extension of time over your estimated 30 day work period would have to be negotiated.

3. Additional days due to work delays would add to the per diem costs and possibly aircraft costs.

Please keep in mind that I will try to work with you should any unforseen delays occur.

ITEM	COST
10 hours ferry time(round trip) Long Beach to Nogales @ $1000 per flight hour	$ 10,000
Three hours minimum per work day @ $1200 per hour X 5 work days	$ 18,000
15 days per diem @ $65.00 per day X 2 (pilot and driver)	$ 1,950
Airfare for two X 5 trips	$ 1,200
Rental car	$ 850
Total cost for the 30 day period Considering no variables	$ 32,000

If you have any questions, please feel free to call. For any future needs, we have aircraft capable of lifting from 1000 to 7000 lbs. and the associated ground support equipment.

Respectfully,

Chris Saunders
Director of Operations

1/29/92

FROM: W. L. KURTZ

TO: F. T. Graybeal

I add to JDSell last sentence ,,,, will be expensive and in my opinion not justified

cc Note only to JDSell

JDS

ASARCO

Southwestern Exploration Division

January 23, 1992

F.T. Graybeal
Chief Geologist
New York Office

Helicopter-Supported Bid
Bucket Breccia Zone
Thunder Mountain Project
Santa Cruz County, Arizona

In my Greater Patagonia Exploration memo, January 7, 1992, I stated on page 3 of the Addendum that I have flagged four holes upslope from hole TM-8.

Attachment A locates the four holes along the 5400 foot elevation contour.

Mr. Bill Gay will show the Forest Service the sites on January 27, and at that time request a road building plan for site access.

I had requested CBC Drilling (Joy) to secure a helicopter support cost figure and have received the charge bid (Attachment B).

Mr. Gay estimates a cost of $12,000-$15,000 to hand build the four sites. Estimated helicopter costs for the four sites are plus $50,000.

Although the road, if permitted, will also be expensive, the road would be used for additional sites.

A third alternative is to drive an adit in from the TM-8 site at about the 5200' elevation and be in the upper mineralization from the start. Mr. Dave Skidmore estimates costs of $100 per foot for a contract mines 6' x 8' opening. No dump space would be available and the removed material would need to be placed elsewhere.

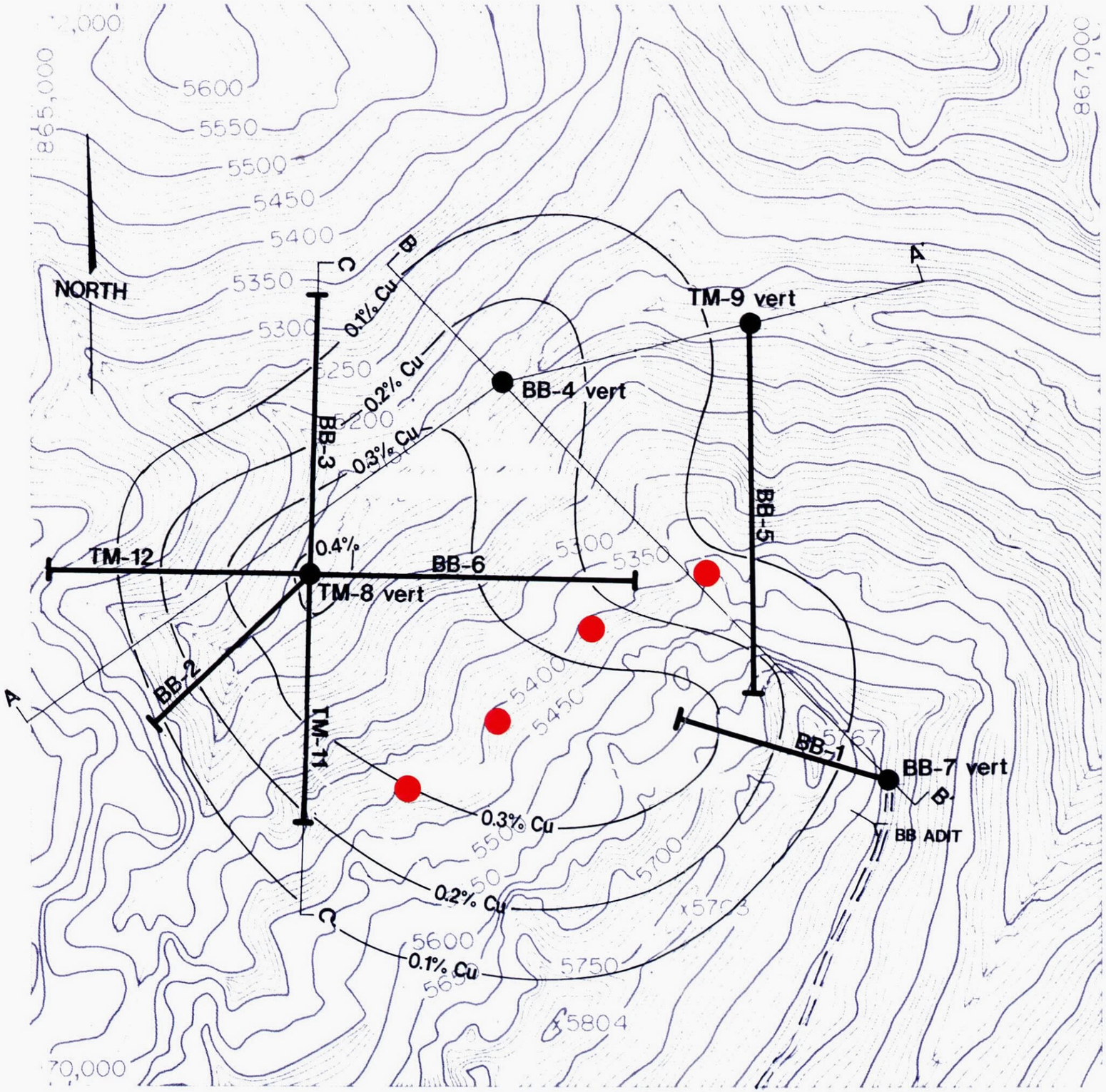
The bottom line is that any further definition of the Bucket Breccia high-level chalcocite zone will be expensive.

James D. Sell

James D. Sell

JDS:mek
Att.

cc: W.L. Kurtz
W.D. Gay



PROPOSED 1992 DRILL HOLE

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT

TOTAL ZONE % COPPER

SANTA CRUZ CO., ARIZONA

J.D.S. 1"=200' 12-91

mn TM920110 JDS/DAM 01/28/92

ATTACHMENT B

ASARCO Incorporated

JAN 16 1992

SW Exploration

CBC DRILLING
750 East Evans Blvd.
Tucson, Arizona 85713
Telephone 602-884-5865/Fax 602-622-0866

January 9, 1992

Mr. James D. Sell
ASARCO Inc.
P. O. Box 5747
Tucson, Az. 85703

Dear Jim:

I have talked to Jeff Gordon from ARIS Helicopter in Los Angeles, Ca. . They will use a Sikorsky 558T which can pickup to 5000# at sea level.

At the elevation where the job site will be in Patagonia will be 5400. At this elevation they will be capable of only picking up close to 4000#. There will be a staging point where all equipment will be picked up from and flown to the job site.

There will be (4) moves involved if you decide to drill (4) holes a total of 1500 feet plus or minus will be drilled.

There will be 3 or 4 holes ranging from 400 feet to 600 feet. The holes will be vertical.

Please consider the following:

Estimated helicopter costs, four (4) sites $48,000.00 + 10% Handling

This helicopter cost is bid on a 4 week maximum drilling program. Should the completion date go beyond this time frame, helicopter costs, estimated at $1000.00 per week, plus a 10% handling fee will be charged to your account, as per the invoices from ARIS Helicopter Company.

Should you prefer to handle Helicopter charges through ASARCO this would eliminate the 10% handling charges. Copy of the price breakdown sheet is included w/bid.

Mobilization - Demobilization from Tucson to Helicopter take off point. (NX Tools to 700 feet)	$	600.00 Lump Sum
Extra Road Trip (To resupply job if required)	$	75.00 Round Trip
Overburden Drilling (2 man crew)	$	60.00/hour + materials used

Vertical Core Drilling	NCEWL	NXEWL
0 to 500 feet	17.40	16.40
500 to 1000 feet	18.20	17.20

*Note - Add $1.50/foot for Angle Hole Drilling

Rig Time & Hourly Work

Setting & Pulling Casing and Pipe (two man crew)	$60.00/hour + materials used
Cementing and/or Plugging Drill Holes (two man crew). Includes all time required to maintain good hole conditions while drilling. Also includes time required to close or complete hole as required to close or complete hole to our specifications	$60.00/hour + materials used
Reaming, if necessary (two man crew)	$600.00/hour + materials used
Survey (two man crew)	$60.00/hour + ASARCO INC. Supplies Instrument
Standby Time for Your Convenience	$55.00/hour
Extra Labor Authorized by ASARCO Inc. (If Required)	$25.00/man hour
Overtime Premium in Excess of 88 Hours (per two week period)	$6.00/man hour

Supplies

Casing Ordered Left in Place	NC $12.00/foot NX $10.00/foot
Casing Lost through Normal Drilling Operations	70% of List Price
Diamond Bit Loss in Excess of $2.50/ft.	At Actual Cost
Drilling Mud & Additives	At Jobsite Cost + 20%
Weather-treated Core Boxes which hold ten feet of core	NC $3.00 each NX $2.75 each
Materials Used and Special Purchases authorized by ASARCO Inc. (If Required)	At Cost + 15%

Water Pumping or Hauling

Supply Pump Rental (435 Bean)	$450.00/Month
Labor For Assisting in Helicopter Transport to and frm take off Point to drill site also for drill setup Move and Dismantle, also for pipeline work, also for any other tasks requested and authorized by ASARCO	$25.00/man hour
Per Diem	$15.00/man/work day

Bad Rock Clause: If footage drilled per shift (excluding chargeable time) times the appropriate footage rate drops below $480.00 per eight hour shift revenue for five or more consecutive shifts, drilling prices will revert from a per foot rate to an hourly rate of $60.00 per hour plus bit and other in hole supplies at actual cost.

The above prices are based on our standard Non-Union wage rates and are firm if accepted within 60 days.

Our terms ar net 30 days on Invoices and with approved credit. In the event that payment is not made within this period, a late payment charge of 1½ percent per month or the maximum amount permitted by law, whichever is less will be charged, to be computed from the due date to the date payment is received by CBC, together with all costs and expenses incurred in collection, including reasonable attorney fees and court costs.

We understand ASARCO will build pads for CBC to set the drill, also provide pads to set tanks for water to re-circulate dirlling fluids, free of cost CBC Drilling.

We expect ASARCO to furnish some form of disposing of used and contaminated drilling fluids.

We propose using a Joy 22HD Skid Rig with a 435 Bean Pump. We will work two shifts per day.

You should contact me at (602-884-5865) to discuss crew and equipment availability.

We would look forward to working with you on this project.

Yours very truly,

CBC DRILLING

Nino Trujillo

Nino Trujillo
District Manager

NT/dt

ARIS HELICOPTERS LTD.

CBC Drilling
750 E. Evans Blvd.
Tucson, AZ. 85713
Attn. Nino [redacted] Trujillo

January 9, 1992

Dear Nino,

Thank you for calling **ARIS Helicopters LTD.** regarding the Drill rig project in the Patagonia area.

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•Mobilization of helicopter from San Jose California to Nogales Arizona and return: 16 hrs. ferry time @ $ 1500.00 per hour = $ 24,000,00
•Placement of drill rig on sites. (includes ferry time from Nogales)
2 hrs. each site X 4 sites @$ 2500,00 hr. = $20,000,00 retainer & finishing point x 5 = $25,000.
•Pilot, crew, rigging ,fuel support vehicle and perdiem:
$ 1,000,00 per week for 4 weeks = $4,000,00
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If there are any changes in the scope of this job or you would like more information please call me at (310) 216-2747. We look forward to hearing from you soon.

Sincerely,

Jeff Gordon
Airlift Operations

Enclosures

JGG/ebs

P.O. BOX 998-697 EL SEGUNDO, CALIFORNIA 90245 310-216-2747 Fax (310) 216-9158
PHOENIX: 602-267-7441 SAN JOSE: 408-998-3266 SACRAMENTO: 916-645-8917

To JDS

Date 1/31 Time 8:43 ☐ AM ☐ PM

WHILE YOU WERE OUT

M F. Graybeal

of NYOJ

Phone ( ) _____
Area Code Number Extension

TELEPHONED	✓	PLEASE CALL	✓
CALLED TO SEE YOU		WILL CALL AGAIN	
WANTS TO SEE YOU		URGENT	
RETURNED YOUR CALL			

Message Re Gold Hill
& Ted Theodore

Mary
Operator

AMPAD EFFICIENCY®

REORDER #23-000

1. Ted still in Mexico?
Yes, I do believe

2. Will not close out Gold Hill until Jim satisfied no more choses to Project.

3. No to any thoughts on helicopter work at TM!!

Hector

BB-2 July 13 → July 31 = 19 days ; 514' = 27'/day
move (12)
BB-3 Aug 13 → ~~Aug 23~~ Sept 4? = 23 ; 725 = 32'/day
move (2)
Vat. BB-4 Sept 7 → Sept 26 = 20 ; 797 = 40'/day
move (5)
BB-5 Oct. 1 → Oct 31 = 31 ; 800 = 26'/day
move (1)
BB-6 Nov 2 → Nov 25 = 24 ; 800 = 33'/day
move (7)
BB-7 Dec 1 → Dec 29 = 29 ; 735 = 25'/day

146 4373 = 30'/day.
+ 12 move
158 days for 4373'

if 3250', then 117 days for the 4 holes @ 30'/day
81 + 18 = 99
36

@ 40'/day
81 days

June	30
July	31
Aug	31
Sept	15
	107

FAX 470 5078 FS Midfield

1990 Drilling

$144,137 in 4 holes, totally 4375' = $37.52 per foot drilling, assay, supervision, report etc.

From East to West, Roadway

Depth of Drag Holes

using $38/ft costs: Per $100,000 = 2635' of drilling

900
850
750
700 3200'
700
650
~~550~~ 400 3250
~~450~~ 400
~~450~~ 2800'

roadway holes

rotary, double amount of drilling; i.e., catch most of road drilling

Hellride hole

850
700
750
700 3000'

9,000' all vertical.

Angle holes to be drilled at each location, x 2.

Based on rotary costs, probably drill all of present roadway for $100,000 to establish continuity & grade distribution of 700' ave +0.30 ~~zone~~ zone.

Based on total Thickness - % Copper Contours, inside 0.20 % copper cut off:

	Thick	bar	high	÷12.5 =	tons	grade
Upper Zone:	153'	× 800	× 1000	÷ 12.5 =	9.8 mill	- 0.38
Middle Zone:	254'	× 800	× 1000	÷ 12.5 =	16.3 mill	- 0.23
Lower Zone	169'	× 800	× 1000	÷ 12.5 =	10.8 mill	- 0.24
	576' Thick				36.9 mill	- 0.28

99% sulfide copper.

Leach Tests: bottle roll, sulfuric acid 24 hr, 3 gpl ferric acid

Hole #	upper zone footage	oxidized est % Cu	Cong. head	metallic calc head	% Cu recovery	acid consumption # / ton ore
BB-2	40-140	0.47	0.37	0.41	20.3 %	38
BB-3	14-90	0.40	0.25	0.27	26.0 %	34
BB-4	10-190	0.47	0.35	0.36	42.0 %	39
					27% ave.	37 #

Composite: 0.33% Cu, 0.004 NSCu, 2.8% Fe, <0.002 oz Au, 0.19 oz Ag, <0.01 Mo

Composite 6-day bottle-roll, sulfuric - 5 gpl ferric acid leach

0.34	29 %	123 #

Conclusion: acid refractory - no leachable sulfide ~~oxide~~

All Three - Total - Zones:

Thickness: 800' from TM-9 → 600' BB-4 → 410' TM-8 and 400' outward to south end of zone toward BB-1. Ave 575

Grade: 0.40 around TM-8, with large 0.30 toward BB-4 and BB-1, 0.20 contour covers most of prog. drilling except eastern most holes. Overall grade 0.28% Cu.

Upper Zone:

Thickness: 50' of holes over proposed zone with highs (up to 250') with extending from TM-9 toward TM-8, which makes up about half the target + 150' thick. (150')

Grade: 0.40 around TM-8, & south along BB-2, TM-11, then ballooning to BB-4 & BB-3 northward. Also 0.40 around BB-1, may join toward TM-8 (?). Rest mostly above 0.20. (0.38)

Middle Zone.

Thickness: Low 100' trough extending N from center of BB-5 toward TM-8; with values increasing outward to 200+ at BB-1, to 300+ at mid BB-3 & N of BB-4, (250)

Grade: 0.4 Bullseye highs at midpt of BB-4 radiating outward to 0.2 at BB-1, end of TM-11, mid TM-12, near mid BB-3 and at BB-4. (0.23)

Lower Zone

Thickness: 100+ overall with 250' approaching TM-9 BB-5 area. (170')

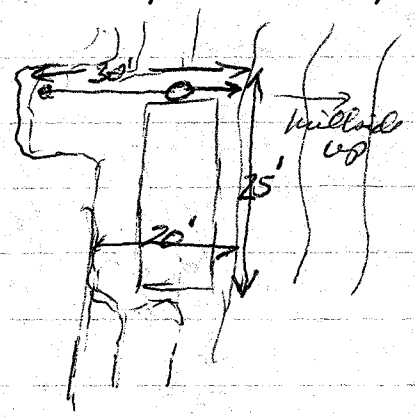
Grade: 0.50 Bullseye at TM-8, radiating outward to 0.20 at BB-4 & ends of TM-11 & TM-12, midpt of BB-6. (0.24)

Metals Week
Oct 7, 1991
p. 1
Pb Hill Alaska, 250 million lbs @ 0.11-0.15% Mo

Jay skidding NC-NX pipe to 1000 feet.

Vertical holes, need pad 20' wide x 25' long.

flat holes, need 20' behind head to pull rods, then 30' wide by 25' long.



Don Robbins
801-262-2459

ASARCO SLC Environmental P Molly friend

9/25/91

FTG Thunder Mtn

1) CC
2) does potential where is Demetrio?

Ventura
3) does work consulting forgiving ~~60-40~~ 51-49

write script

get landman call for name & person to call.
discuss w/ Kurtz

4) When to drill if we can't get reduction.

(ch 3R reserve)

Get Leff
Oel

JDS

ASARCO

Southwestern Exploration Division

October 30, 1990

J.D. Sell

Thunder Mtn Proj.

BB-5 Diamond Drill Hole
Patagonia Project

Bob Johnson, Joy Drilling called and explained that he was out of film for his camera and could not complete the down-hole survey on the completed drill hole. I called H. Downey and his opinion was that we should pull out of the hole since no more film was available, and hole deviation has not been a problem in past holes. In John Malusa's absence I told the driller to pull out of the hole. The drill has been on standby since the beginning of the shift (approx. 3 hours).

MAM:mek

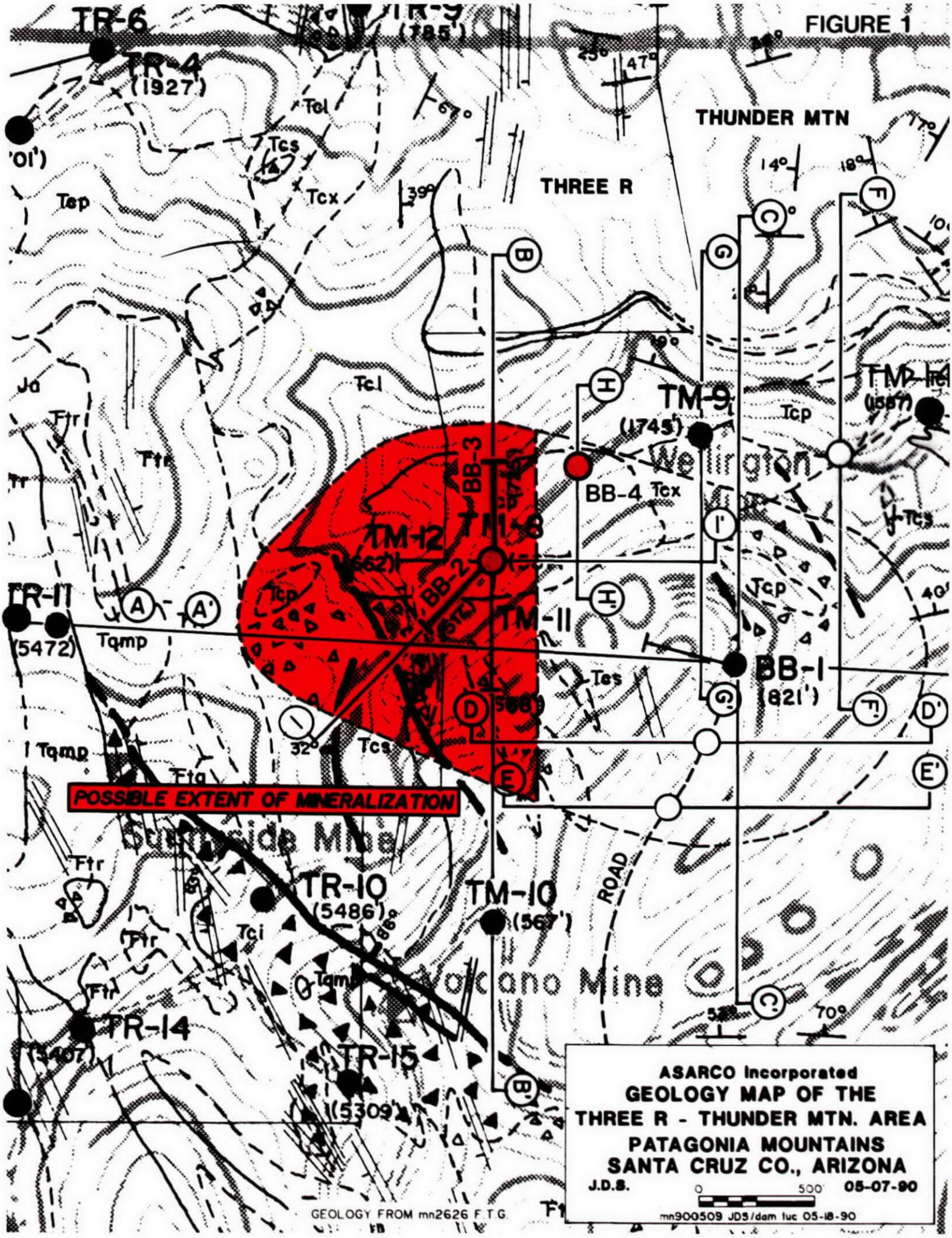
Mark A. Miller

cc: J.J. Malusa

TAB

MAPS

FIGURE 1



GEOLOGY FROM mn2626 F.T.G.

ASARCO Incorporated

GEOLOGY MAP OF THE

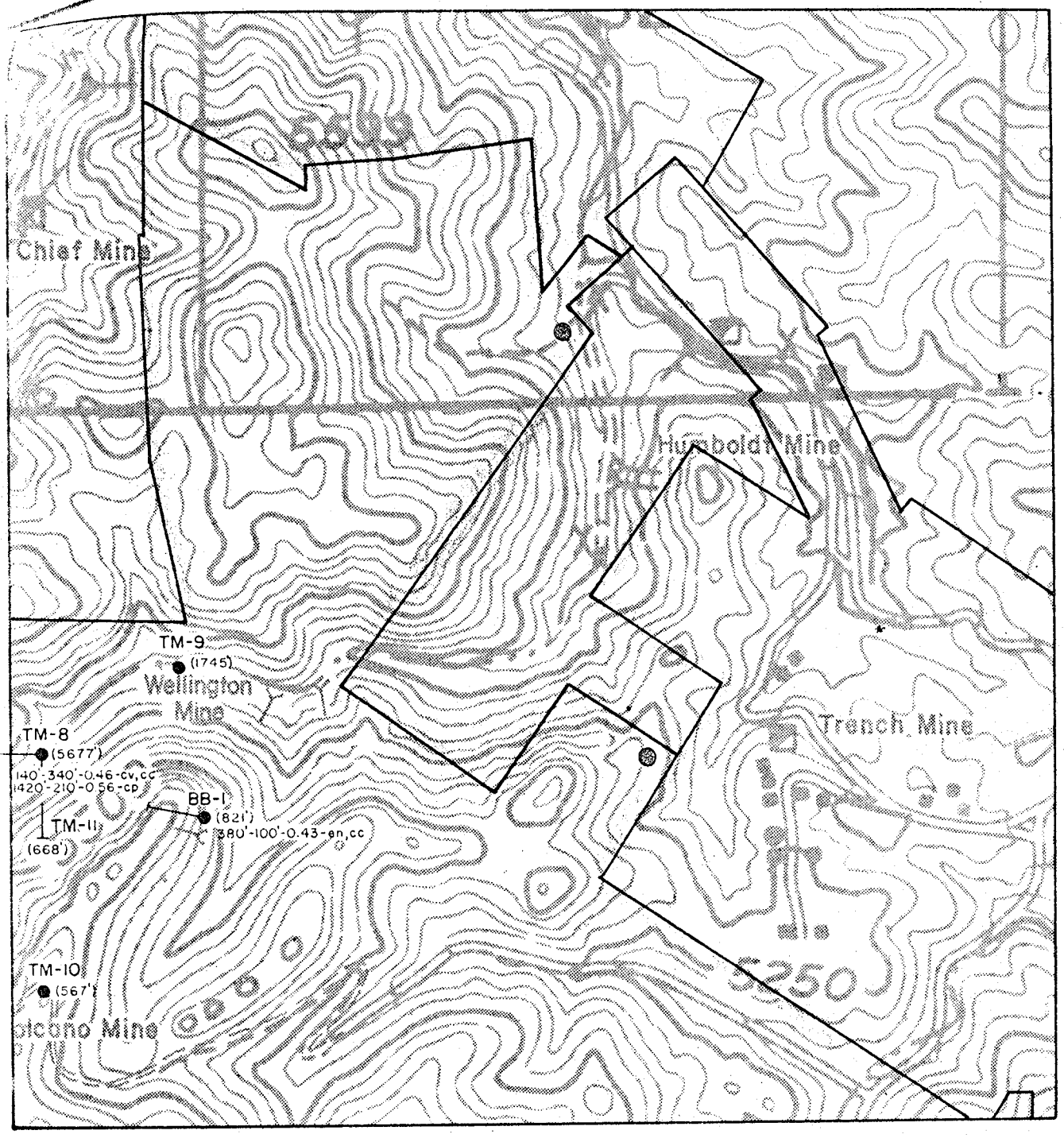
THREE R - THUNDER MTN. AREA

PATAGONIA MOUNTAINS

SANTA CRUZ CO., ARIZONA

J.D.S. 0 500' 05-07-90

mn900509 JDS/dam luc 05-18-90



EXPLANATION

- ASARCO INC.
- Kerr-McGee – Thunder Mtn.
- Anaconda-3R
- Mendoza-Humboldt
- Kerr-McGee-Red Mtn.
- Lichty-Argentor

(821') BB-1 — Drill hole showing depth

Proposed drill hole

ASSAY DATA KEY

depth-length-%Cu-mineral

3860'-350'-0.59-cp

GEOLOGIC LEGEND

cp- chalcopyrite
cv- covellite
cc- chalcocite
en- enargite

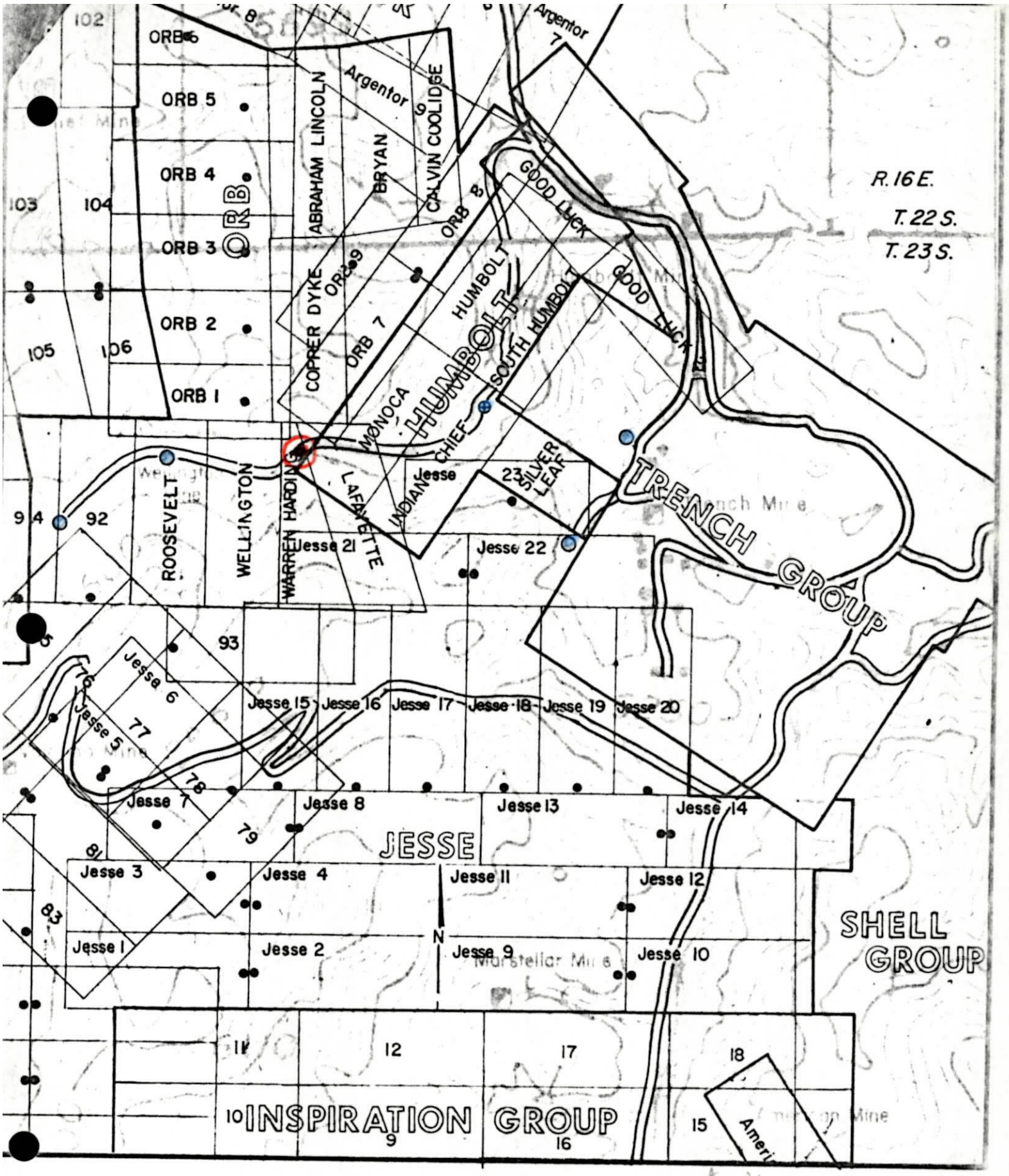
TO ACCOMPANY Supplemental Exploration Authorization Request DATED 2-3-78
BY F.T. Graybeal

DRILL MAP
THUNDER MTN. PROJECT
PATAGONIA MTNS.
Santa Cruz County, Arizona

SCALE: 1" = 1000'

F.T.G. Feb. 1978

MVK 404P



Existing road

Drill site (1982)-1983

Drill site (Old)

TO ACCOMPANY Letter to U.S. Forest Service

DATED July 1, 1982

BY P.C. Lowry

Sent to Forest Service

Proposed Drill Site

PATAGONIA MOUNTAINS
SANTA CRUZ CO., ARIZONA
1" = 1000'

THUNDER MTN AREA

5/15/86

NEED A MAP 1" = one mile or 1" = 2,000

showing following land holdings: (nothing else needed on map)

1) Thunder Mountain group (ASARCO - Kerr McGee remaining JV ground)

2) Mendoza (Humboldt Group)

3) 3R ground (do not include Flux, Trend patent, Hardshell)

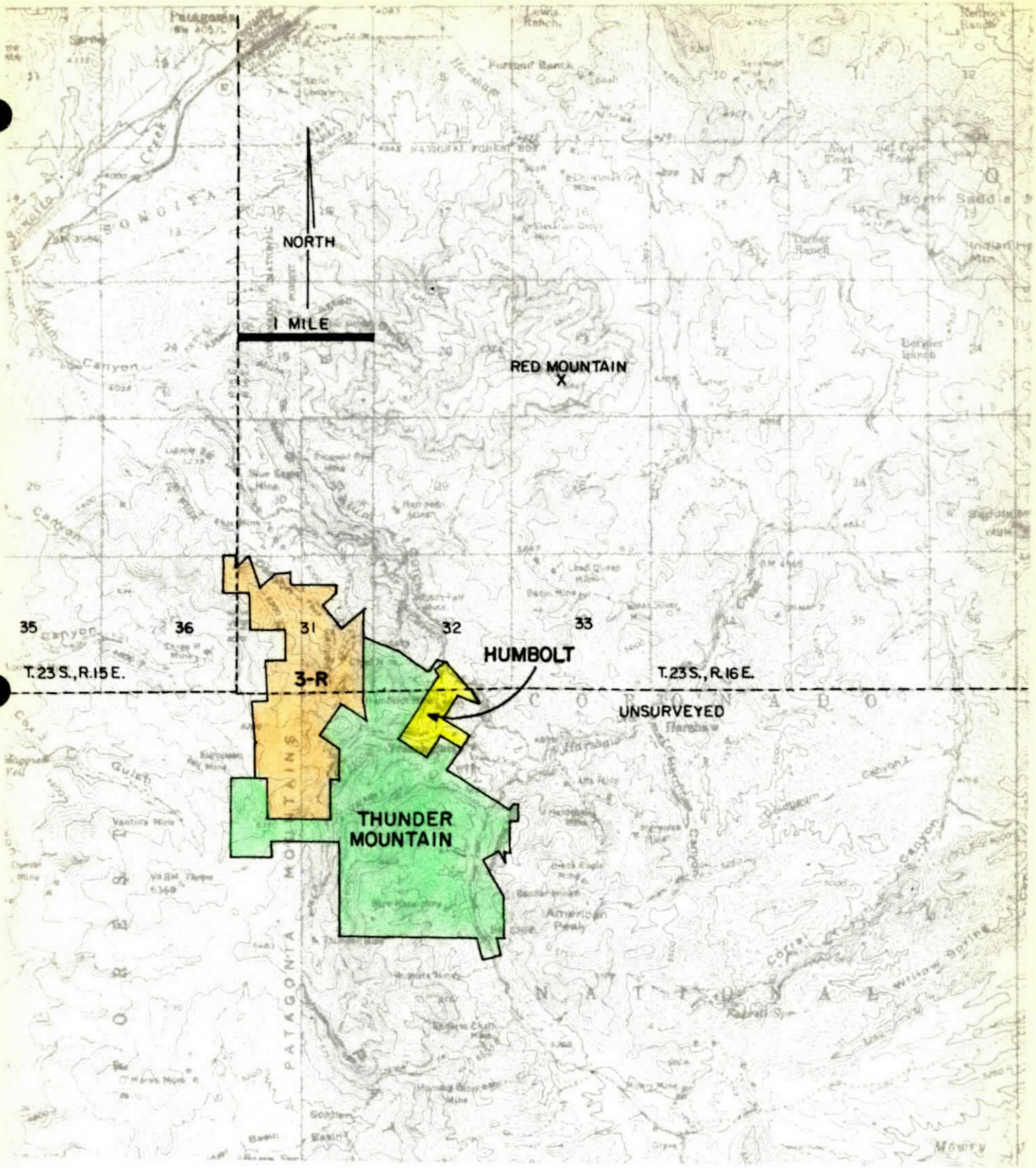
color the 3 parcels ~~differently~~ separately and label: Thunder Mtn group — KM-Asarco JV

Humboldt group — Asarco

3R group — ASARCO

please color 3 copies and send to Ft Graysteal

Ezekiel
Nogales



THUNDER MOUNTAIN PROPERTY (ASARCO-KERR McGEE)

3-R PROPERTY (ASARCO)

HUMBOLT PROPERTY (ASARCO)

CLAIM MAP OF THE 3-R, HUMBOLT and THUNDER MOUNTAIN AREAS

PATAGONIA MOUNTAINS
SANTA CRUZ COUNTY, ARIZONA

mn 6381 JDS/dam 5-86

88 a 5865

ASARCO – KERR-MCGEE
THUNDER MOUNTAIN

ASARCO
MENDOSA

DDH TM-8
Collar Elev. 5150'
1350' S of Section

DDH TM-9
Collar Elev. 5100'
650' S 10 W of Section

PROPOSED
DDH TM-14
Collar Elev. 5030'
600' S 10 W of Sec.

DDH TCH-2
Collar Elev. 4887'
190' N of Section

Tcl
Tcs
Tcp
Tcx
Kd
Kh-bx
Kh-i
Tqmp

340'
0.46 % Cu
0.23 oz/T Ag
0.12 % Zn

400'
0.12 % Cu
0.16 oz/T Ag
0.01 % Zn

cv, cc on
py, cpy

250'
0.09 % Cu
0.34 oz/T Ag
0.17 % Zn

210'
0.56 % Cu
0.019 % Mo

750'
0.18 % Cu
.008 % Mo

1200'
0.25 % Cu
0.01 % Mo
0.10 oz/T Ag

TD 1745'
(TM-9)
NOT SURVEYED

NX CASING

BX CASING

BX CASING TO 3599' (8/18/88)

1760'

840' BX casing?
(can't spell-speared into it-no go!
as per Nino
3/10/89

TM-8,9,11 & Surface Geology
Projected 500-1500' N to Section

GRADATIONAL
& ALTERED

True Dips
10-40°
Avg. 25°

True Dips
15-50°
Avg. 30°

True Dips
60-85°
Avg.-70°

Recovered Casing

BX	
10-8-88	720'
10-10-88	20'
10-11-88	300'
10-12-88	160'
10-13-88	220'
10-14-88	160'
10-17-88	160'
10-18-88	20' WEDGE SET
TOTAL RECOVERED	1760'
LOST ~~7000'~~ BX	840

WEDGE (BX) IS STILL @ 4021'

LOST HOLE

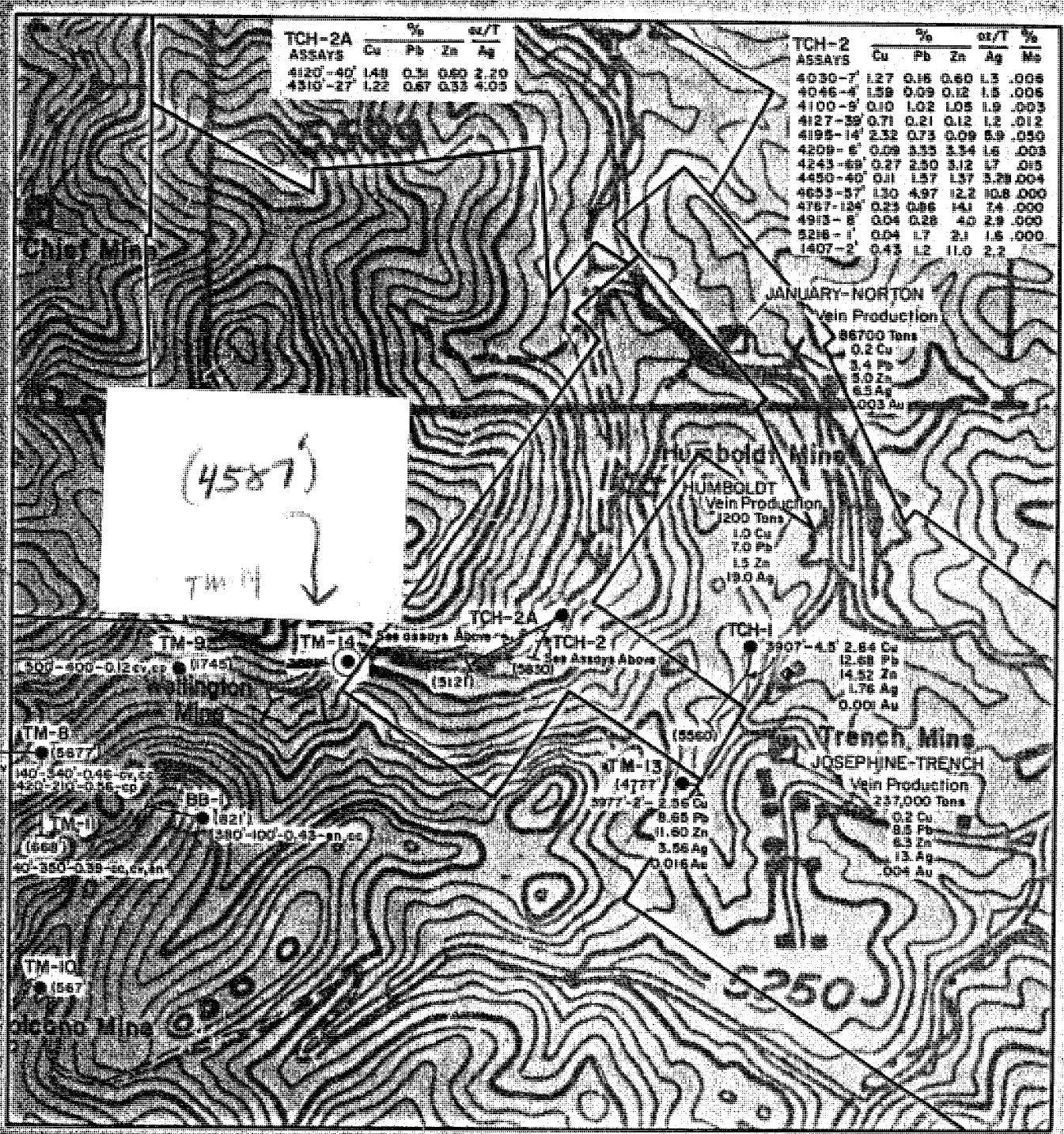
50,000.00

T.D. 4587'

2650	8/19/88 qmp
3110	8/23/88 (8AM) qmp
3795	8/25/88 (8AM) qmp
3918	8/27/88 qmp
4099	9/2/88 qmp
4289	9/10/88 qmp
4390	9/15/88 qmp

2249'-16'-Intrusion Bx+qmp
2395'-5' IBX
2912' KOP TCH-2A 140
3425'-2' IBX
3565'-3' IBX
TCH 2A ON SECTION
3995 - 8' IBX
4030'-20'-.78-.1-.3-.8-.004 Mo
4037'-13' IBX + 3' Tcp?
4100'-27' BX
4120'-40'-1.5-.3-.6-.8
4127'-39'-.71-.2-.1-.9-.012 Mo
4195'-14'-2.3-.7-.1-5.9-.05 Mo
4243'-69'-0.27-2.5-3.1-1.7-.015 Mo
4310'-27'-1.2-.7-.3-4.0
4450'-40'-.1-1.6-1.4-3.3
TCH-2 ON SECTION
4611'-11' IBX
4653'-57'-1.3-5.0-12.2-10.8
4822'-1' IBX
4767'-124'-.2-.9-14.1-7.4
4913'-2'-.04-1.7-2.1-1.0
5094'-2" IBX
TD 5121'
(TCH-2A)
260' S of SECTION
5170'-20' BX IBX?
5548'-9' IBX
5560'-11' IBX, 5583'-5' IBX

1407'-2'-0.43-1.2-11.0-2.2
338'-3'-.06-S
TM-13 i
700' S
of S
Sulfide V
SCHERRER
EPITAPH SILTY LS
EPITAPH
HORNFELS-SILTSTONE
5000
5500'
D 5677'
(TM-8)
O W OF SECTION



EXPLANATION

- ASARCO INC. Trench Group
- ASARCO-Kerr McGee Thunder Mtn. Joint Venture
- ASARCO-~~Anaconda~~ 3R Joint Venture
- Mendoza-Humboldt Group (ASARCO INC.)
- Kerr-McGee-Red Mtn.
- Lichty-Argentor

(821') BB-1 — Drill hole showing depth

Proposed drill hole, deepen

ASSAY DATA KEY

depth-length-%Cu-mineral

3860'-350'-0.59-cp

GEOLOGIC LEGEND

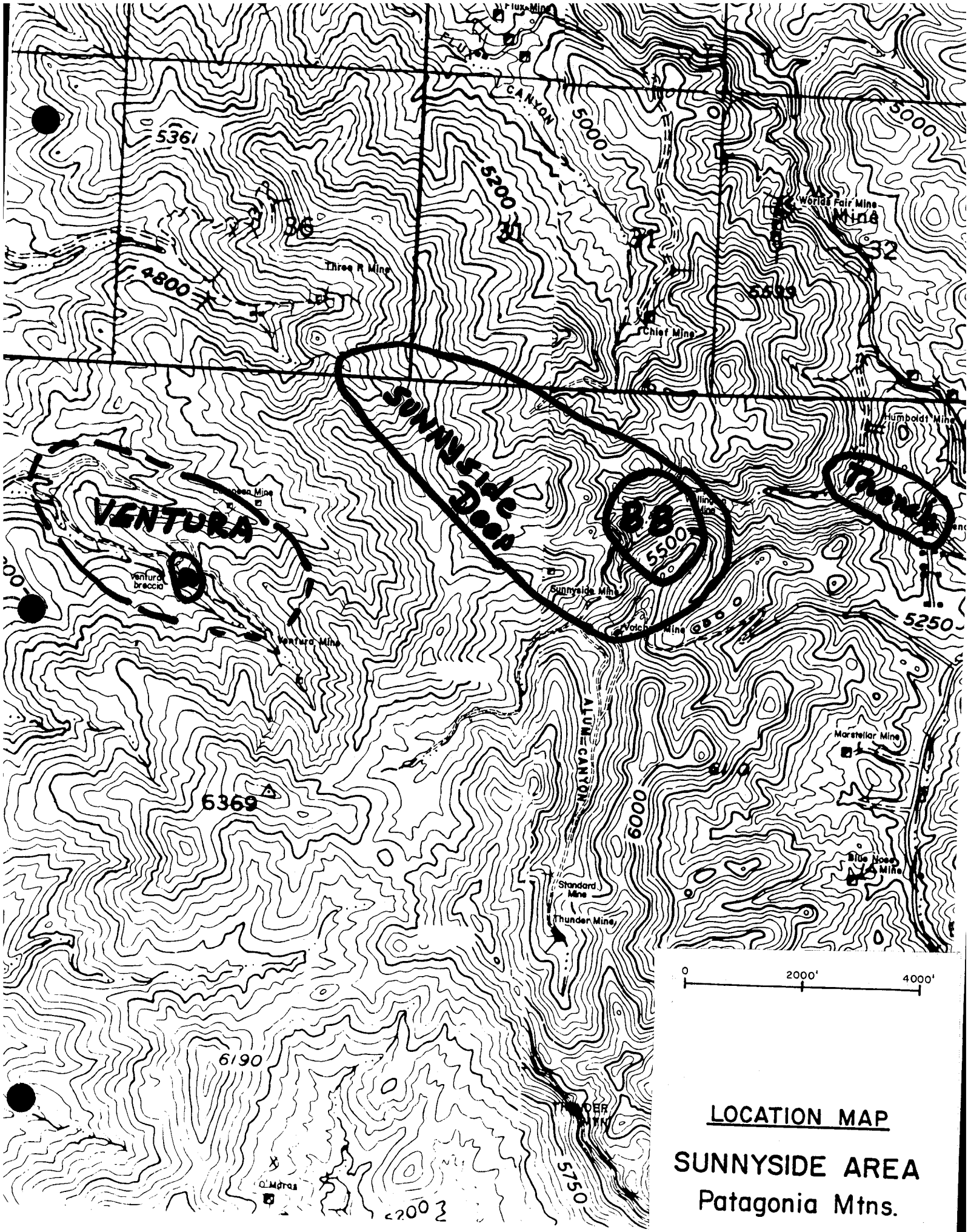
cp-chalcopyrite
cv-covellite
cc-chalcocite
en-enargite

DRILL MAP
TRENCH PROJECT & THUNDER MTN. PROJECT
PATAGONIA MTNS.

Santa Cruz County, Arizona

SCALE: 1" = 1000'

E.R.K



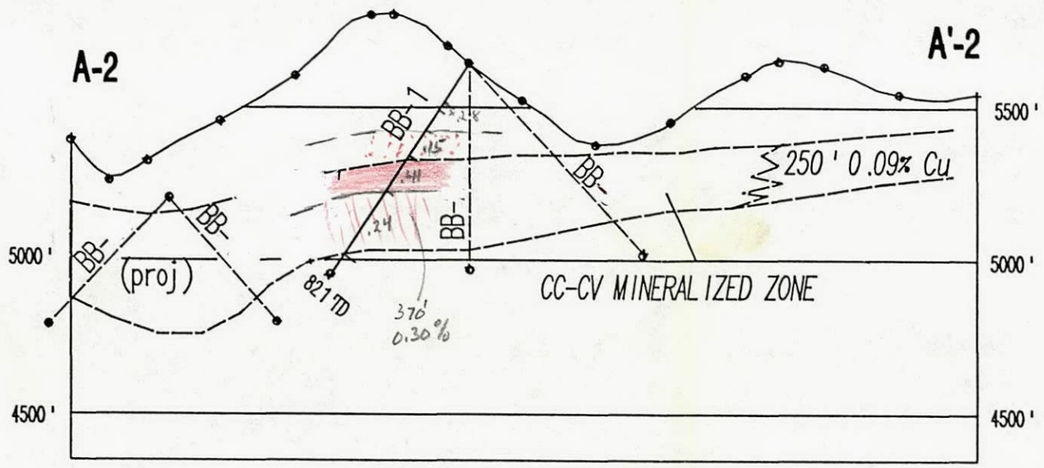
LOCATION MAP

SUNNYSIDE AREA

Patagonia Mtns.

Santa Cruz Co., Arizona

FIGURE ~~6~~ 2



EAST-WEST SECTION, LOOKING NORTH
PROPOSED DRILL HOLES + DRILL HOLE BB-1

BB-1

145-177.3 = 0.28
177.3-250.6 = 0.02
250.6-350 = 0.15
390' (350-490 = 0.41, 490-740 = 0.24) 0.30
740-821 = 0.06

0.10-0.19 % Cu
0.20-0.39 % Cu
+0.40 % Cu

BB-3

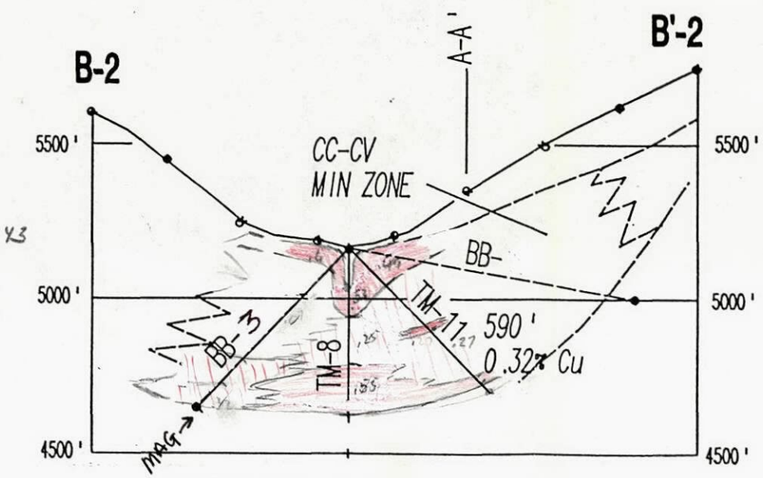
704' (14-90 = 0.60 %Cu, 90-500 = 0.07, 500-720 = 0.24) 0.18
~~600-720 = 0.32~~

14-720 = 0.04 oz/t Ag

TM-8

0-130 = 0.02 %Cu
416 (130-210 = 0.53, 210-370 = 0.25, 370-540 = 0.55) 0.43

130-540 = 0.27 oz/t Ag



NORTH-SOUTH SECTION, LOOKING EAST
PROPOSED DRILL HOLE
+ DRILL HOLES TM-8, TM-11, BB-3

TM-11

0-40 = 0.05 %Cu
590' (40-180 = 0.49, 180-630 = 0.27) 0.32

40-630 = 0.35 oz/t Ag

210-270 = 0.39
360-390 = 0.62
600-630 = 0.43

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT
PROPOSED DRILL HOLES

SKETCH SECTIONS A-2 & B-2

BUCKET BRECCIA ZONE
PATAGONIA MTNS., AZ.

J.D.SELL 05-09-90

0 250' 500'

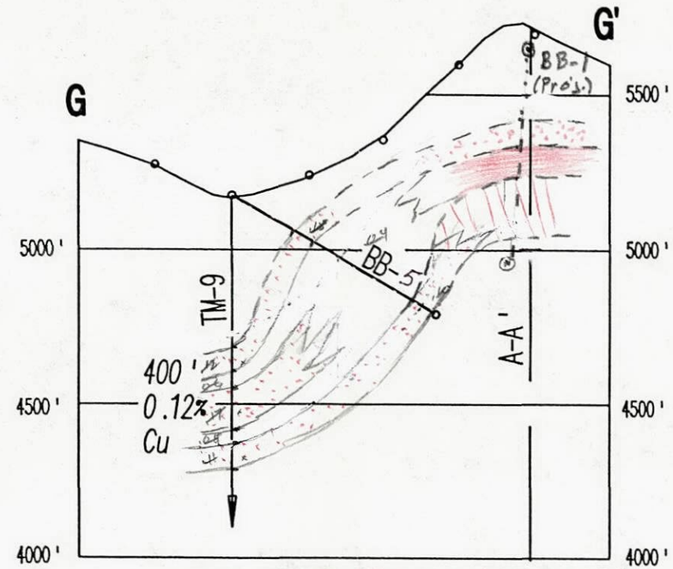
mn900513 JDS/dam tuc 05-21-90

TM901121

Save sheets for JDS

corrected 11/90

FIGURE ~~8~~ 3



NORTH-SOUTH SECTION, LOOKING EAST
DRILL HOLES TM-9, BB-1, -5.

TM-9

10-500 = 0.04 % Cu
500-900 = 0.12
(best is 640-770 = 0.17)

500-900 = 400' at 0.17 & opt Ag

BB-5

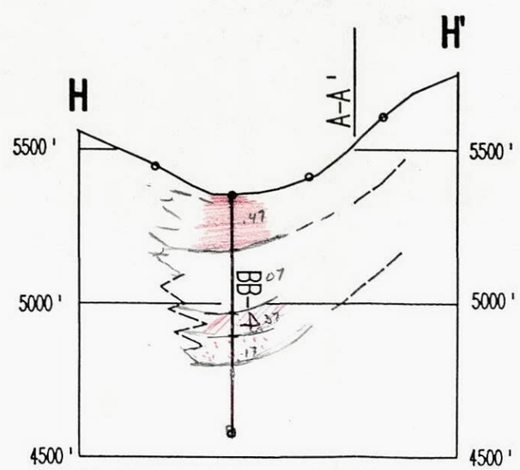
10-230 = 0.04 % Cu
230-310 = 0.15
310-800 = 0.04
(includes 690-780 = 0.10)

230-310 = < 0.01 opt Ag
310-800 = < 0.01 opt Ag

BB-1

250-350 = 0.15 % Cu
390 (350-490 = 0.41 / 490-740 = 0.24) 0.30
No Ag available.

0.10-0.19 % Cu
0.20-0.39 % Cu
+0.40 % Cu



NORTH-SOUTH SECTION, LOOKING EAST
DRILL HOLE BB-4

BB-4

180' (10-190 = 0.47 % Cu)
190-390 = 0.07
390-470 = 0.37
470-610 = 0.17

10-190 = 180' at 0.037 opt Ag

TM901122

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT
PROPOSED DRILL HOLES

SKETCH SECTIONS G & H

BUCKET BRECCIA ZONE
PATAGONIA MTNS., AZ.

J.D.SELL 05-09-90

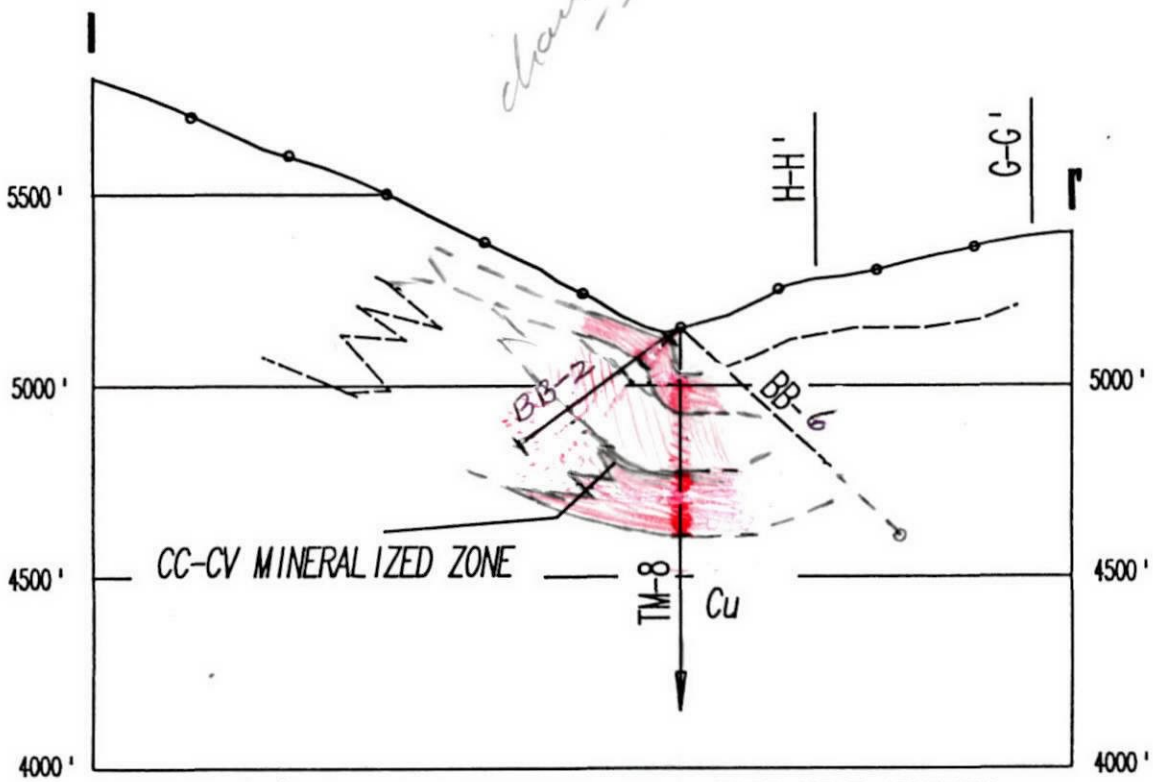
0 250' 500'

mn900516 JDS/dam tuc 05-22-90

corrected 11/90

FIGURE ~~10~~ 4

change BB-2 -370



N 45° E SECTION
LOOKING N 45° W

EAST-WEST SECTION
LOOKING NORTH

DRILL HOLES BB-2,-6
TM-8

TM-8
0-130 = 0.02 %Cu
410' (130-210 = 0.53, 210-370 = 0.25, 370-540 = 0.55) 0.43
130-540 = 0.27 oz Ag

BB-2
0-40 = 0.03 %Cu
460 (320 (40-140 = 0.47, 140-180 = 0.04, 180-360 = 0.27) 0.30, 360-500 = 0.13) 0.25
500-516 = 0.01
40-360 = 0.22 oz Ag
40-500 = 0.18 oz Ag

ASARCO Incorporated

THUNDER MOUNTAIN PROJECT

PROPOSED DRILL HOLES

SKETCH SECTION I

BUCKET BRECCIA ZONE

PATAGONIA MTNS., AZ.

TM901123

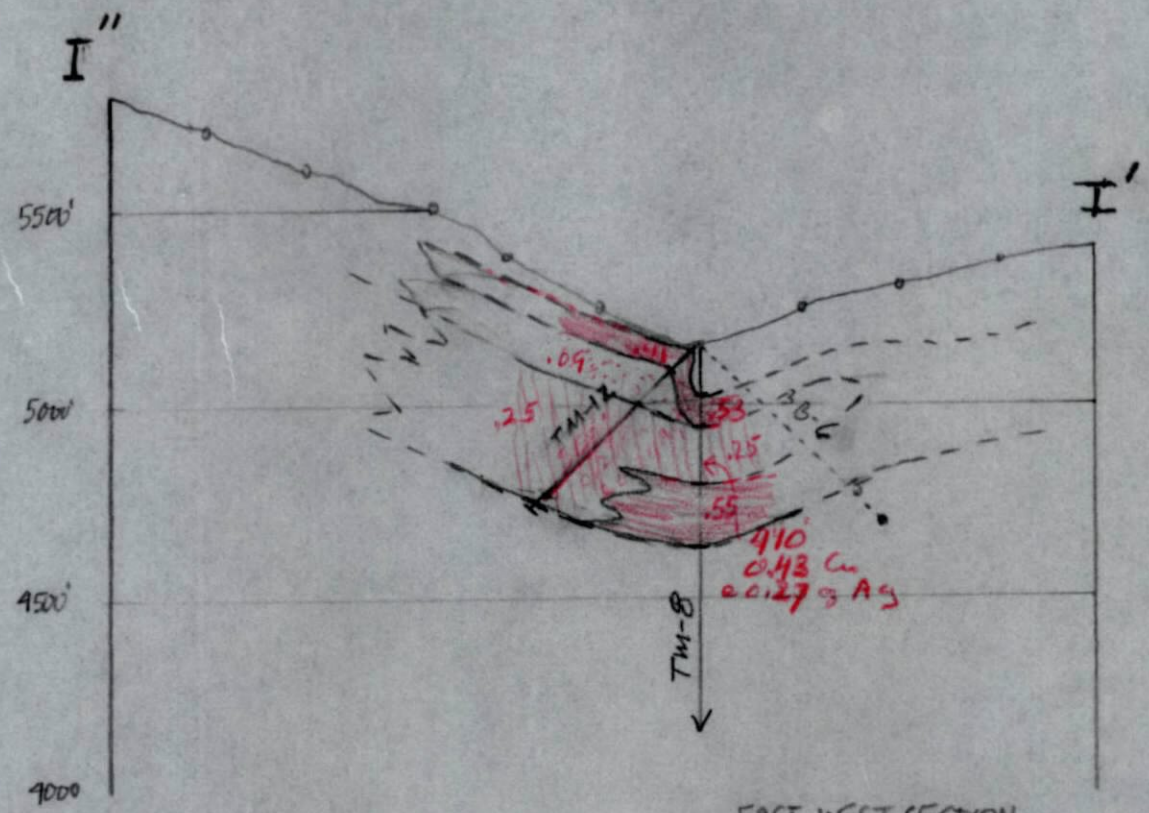
J.D.SELL **05-09-90**

0 250' 500'

mn900517 JDS/dcm tuc 05-22-90

corrected 11/90

Figure 5



EAST-WEST SECTION
LOOKING NORTH
DRILL HOLES TM-8,
TM-12, & BB-6

TM-12

590' (10-100 = 0.41% Cu; 100-220 = 0.09; 220-600 = 0.25) 0.24

10-600 = 590' = 0.24 oz/t Ag

TM-8

0-130 = 0.02% Cu

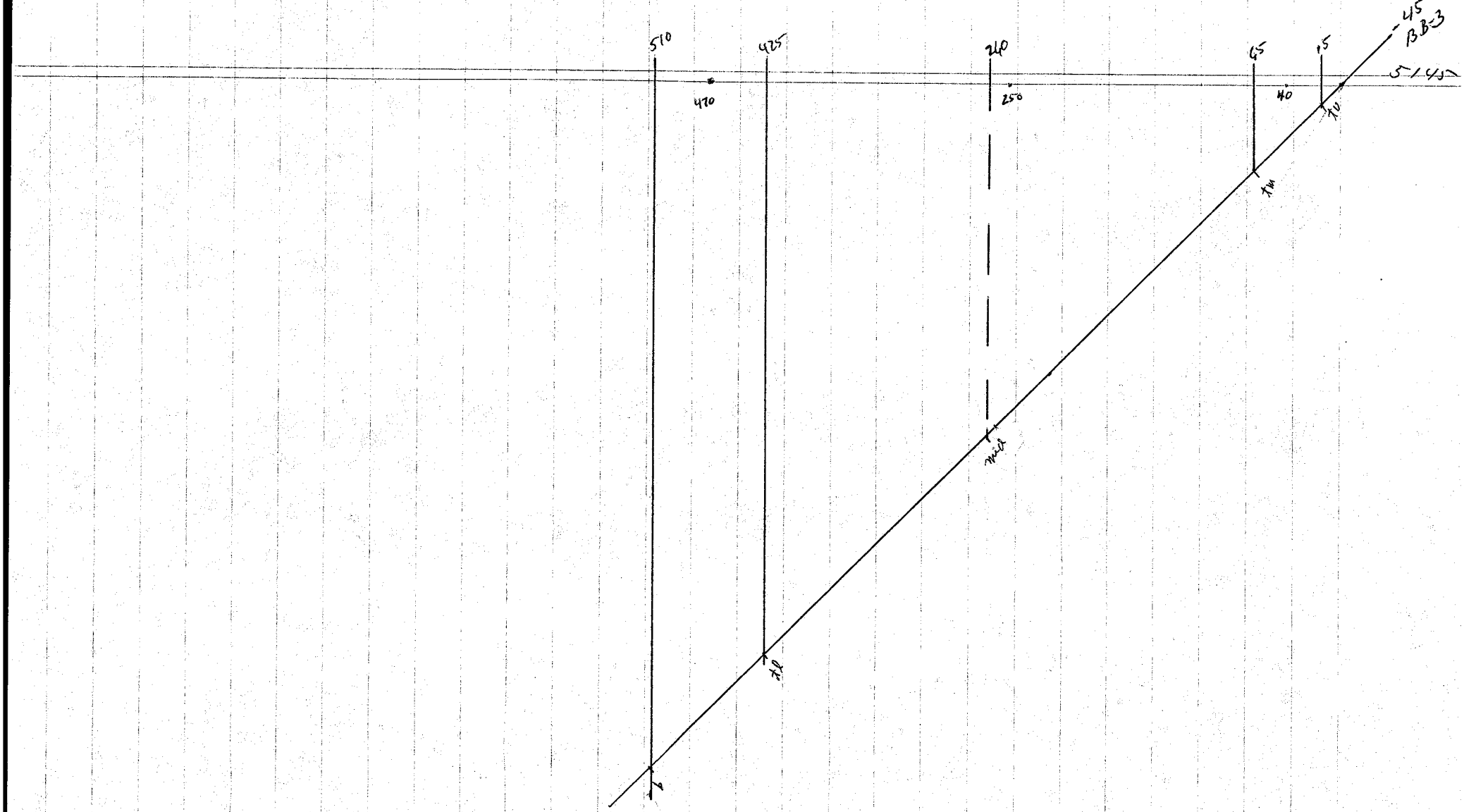
410' (130-210 = 0.53; 210-370 = 0.25; 370-540 = 0.55) 0.43

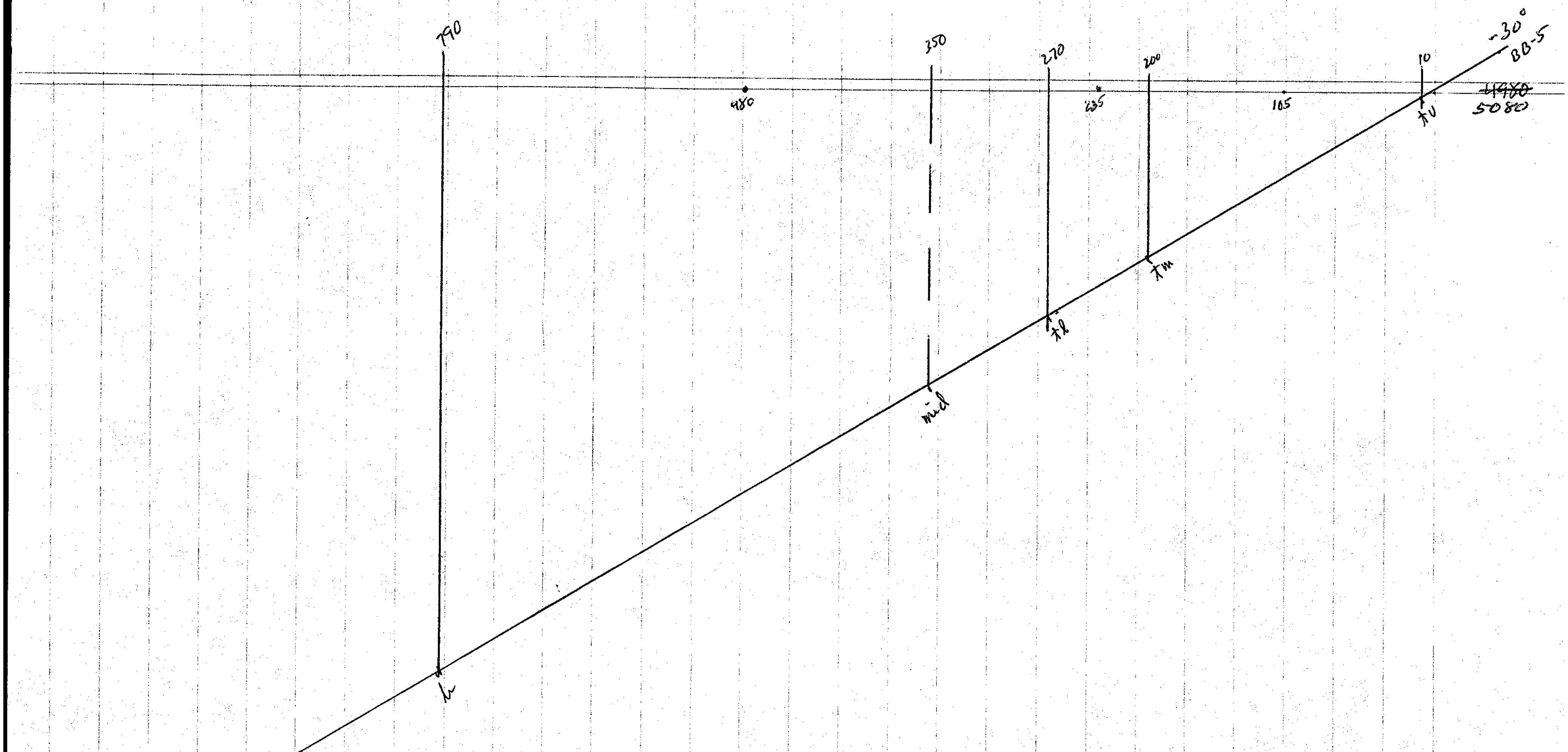
130-540 = 0.27 oz/t Ag

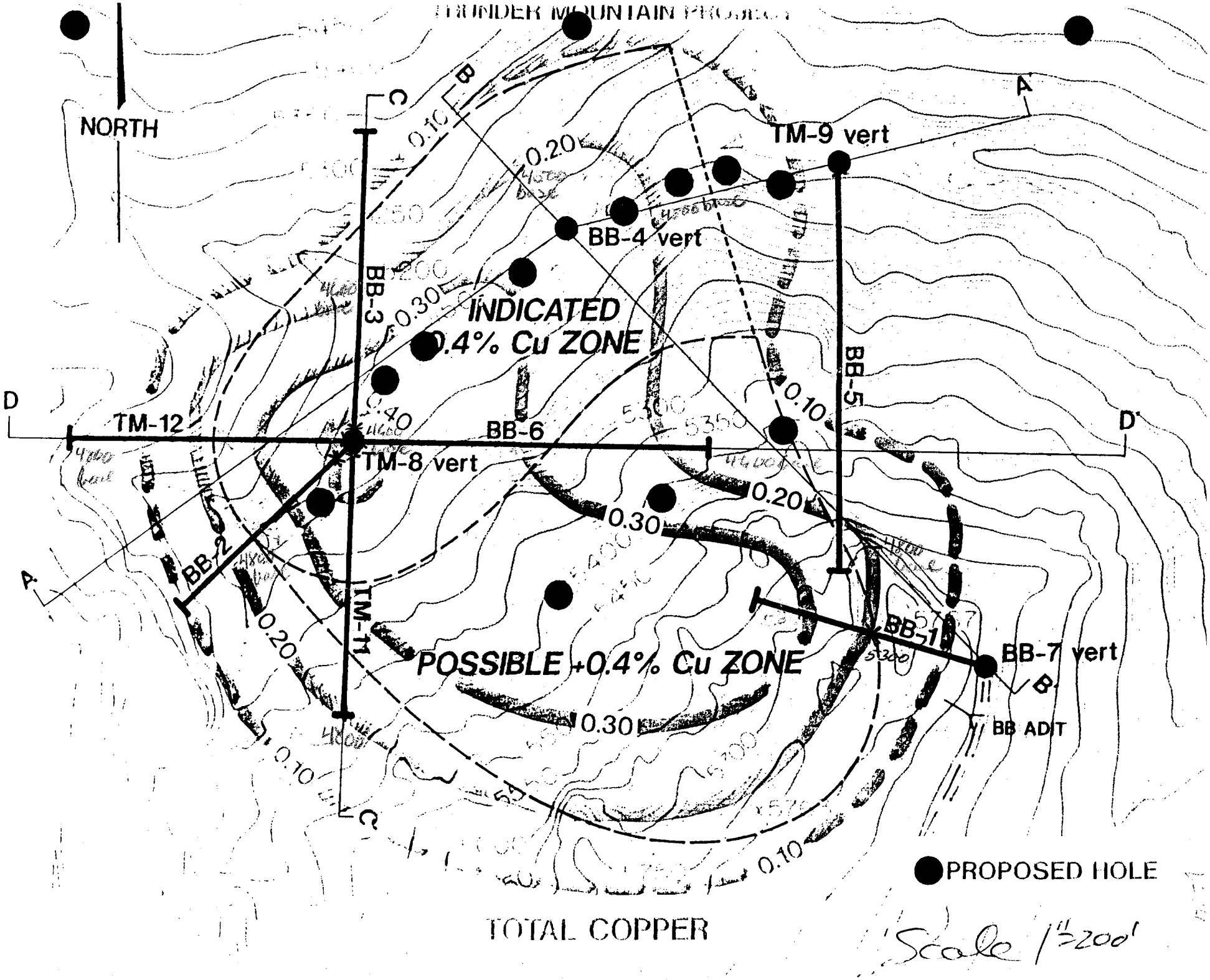
TM 901124

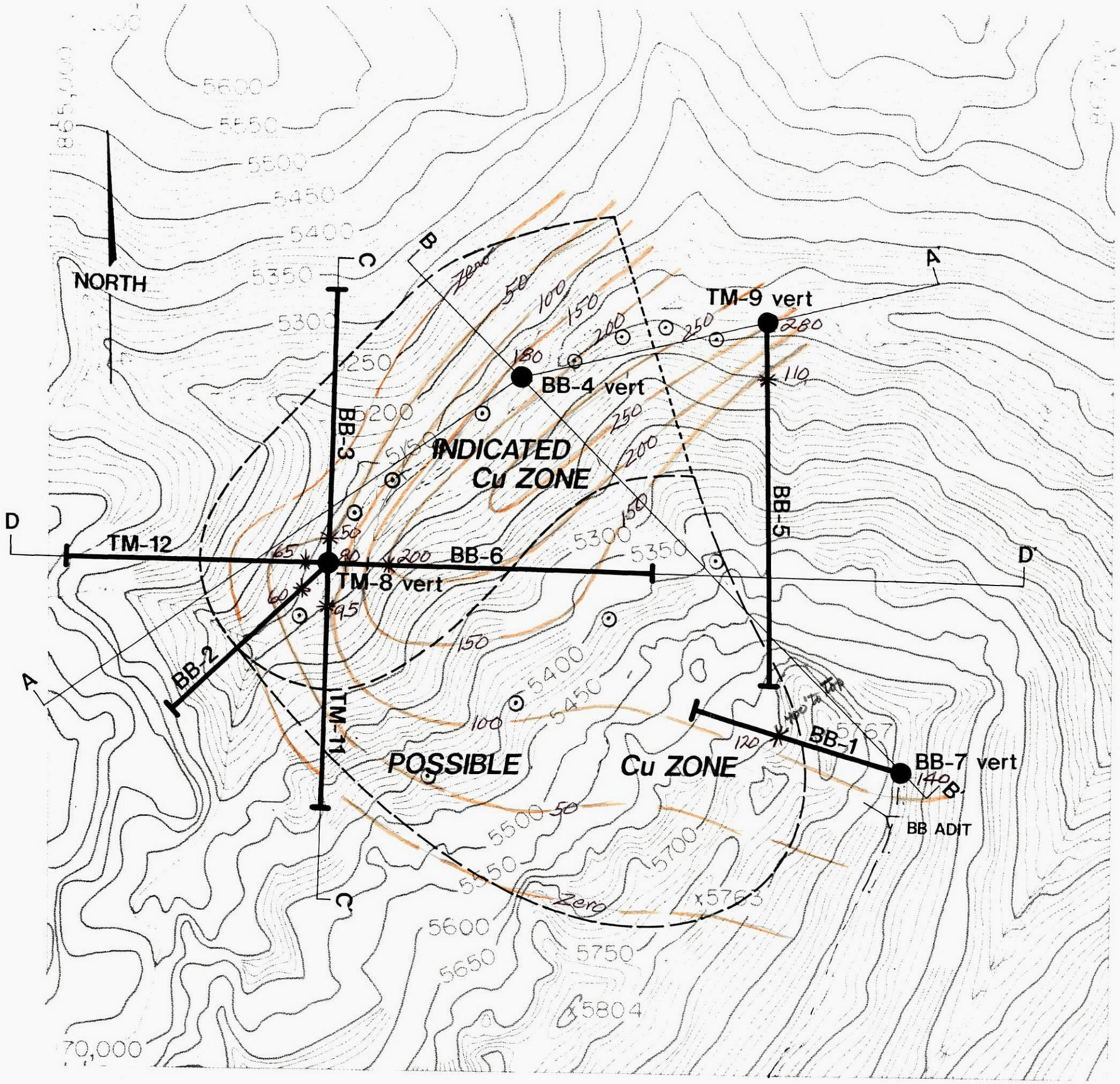
midpt intercept

-37.98-2
S/US
1
30
40
10
25
25
100
40
70°
70°
C
m
d
b
mid
tp
tm
tu


510
425
240
65
15
470
250
40
10
45
BB-3
5/6/97
Tp
Tl
Tmid
Tm
Tu


-30°
BB-5
5080
10
105
200
235
270
350
480
790
mid


THUNDER MOUNTAIN PROJECT
NORTH
A
A'
B
B'
C
C'
D
D'
TM-9 vert
BB-4 vert
BB-3
BB-5
INDICATED
0.4% Cu ZONE
TM-12
BB-6
TM-8 vert
BB-2
TM-11
BB-1
BB-7 vert
BB ADIT
POSSIBLE +0.4% Cu ZONE
0.10
0.20
0.30
0.40
PROPOSED HOLE
TOTAL COPPER
Scale 1"=200'



Upper Zone
Thickness, ft

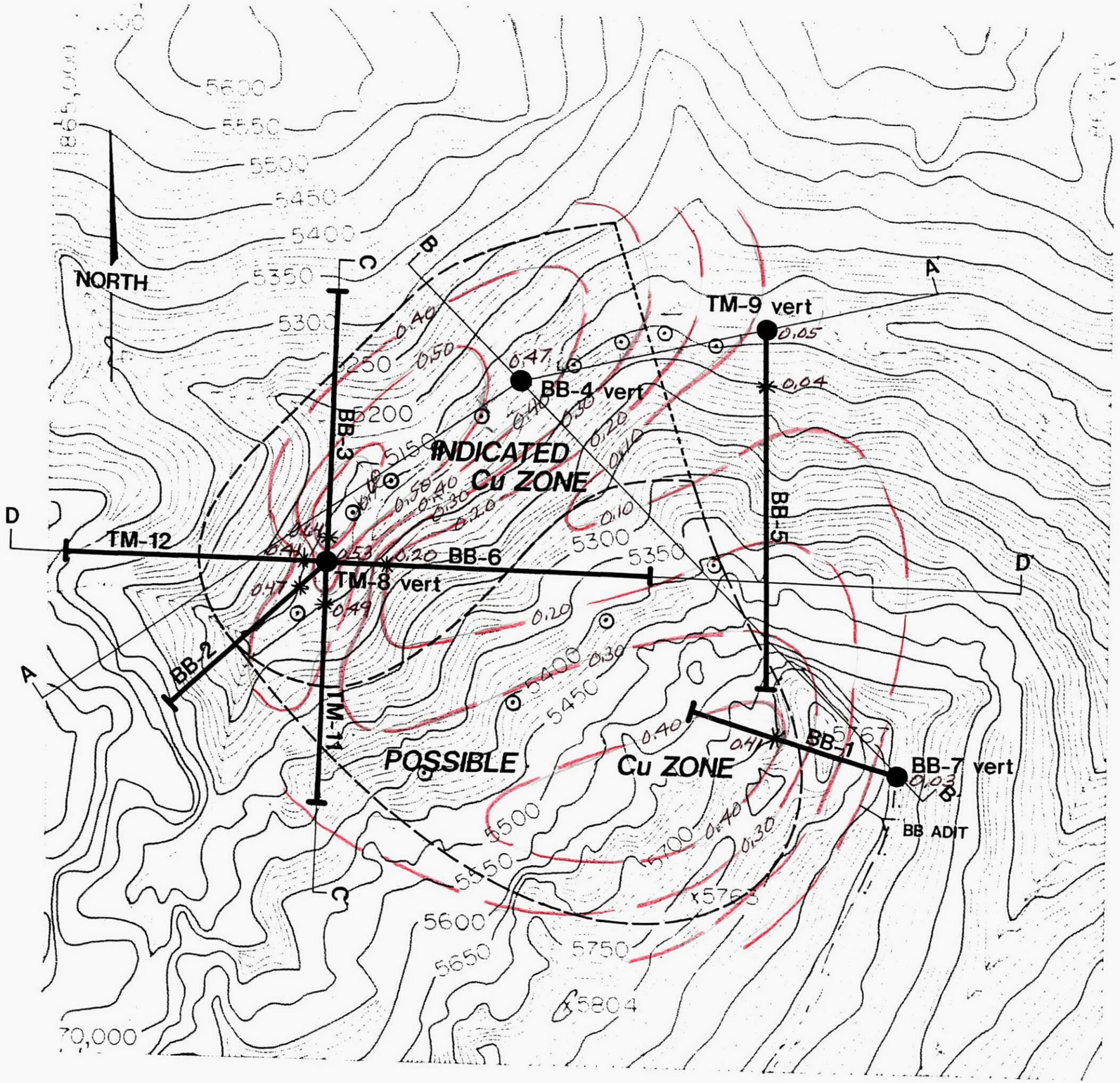
ASARCO Incorporated
THUNDER MOUNTAIN PROJECT

1990 BB-DRILLING MAP

SANTA CRUZ CO., ARIZONA

HJD 1"=200' 01/91

ATTACHMENT B



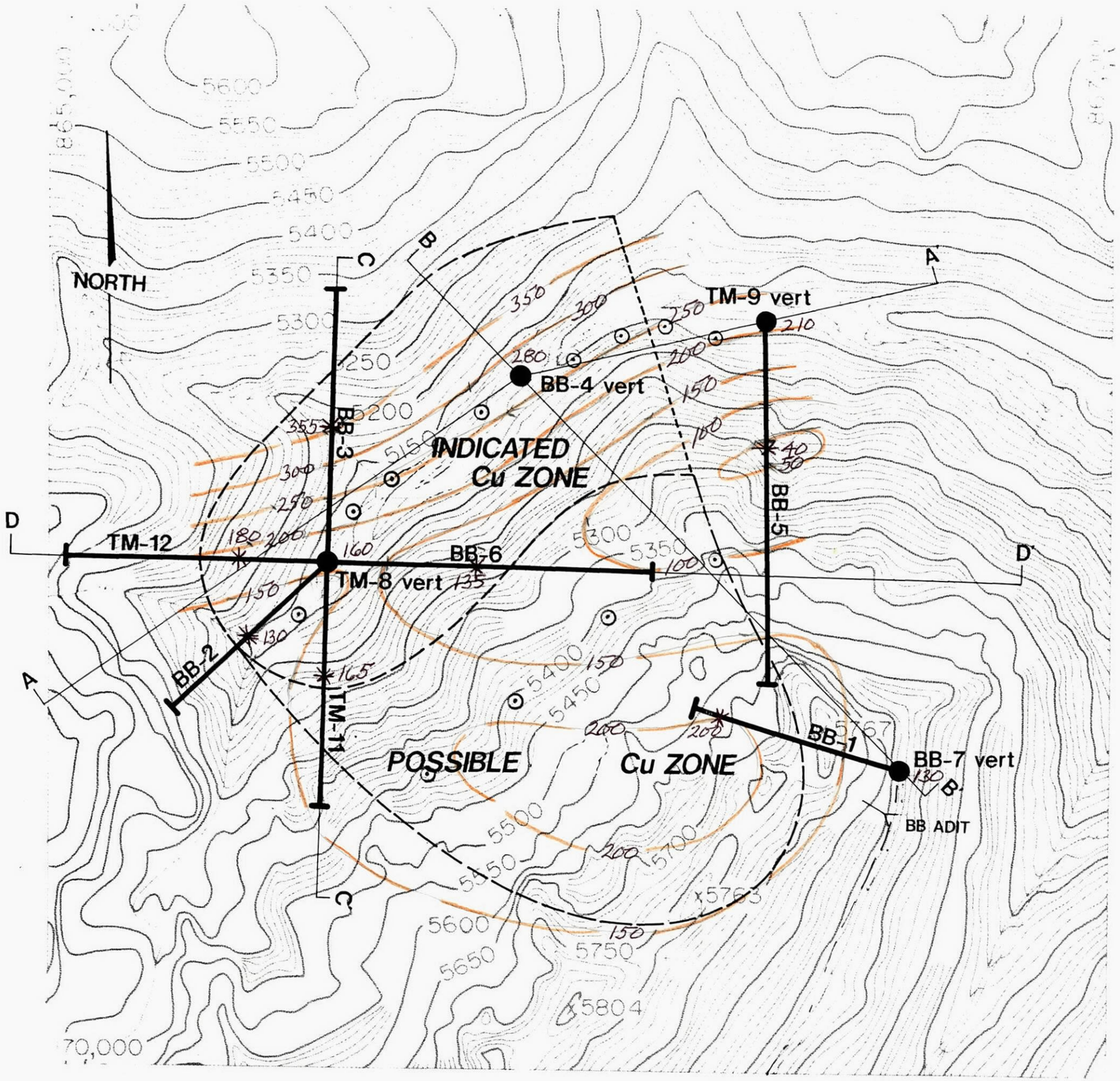
Upper Zone
% Copper

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT

1990 BB-DRILLING MAP

SANTA CRUZ CO., ARIZONA

HJD 1"=200' 01/91



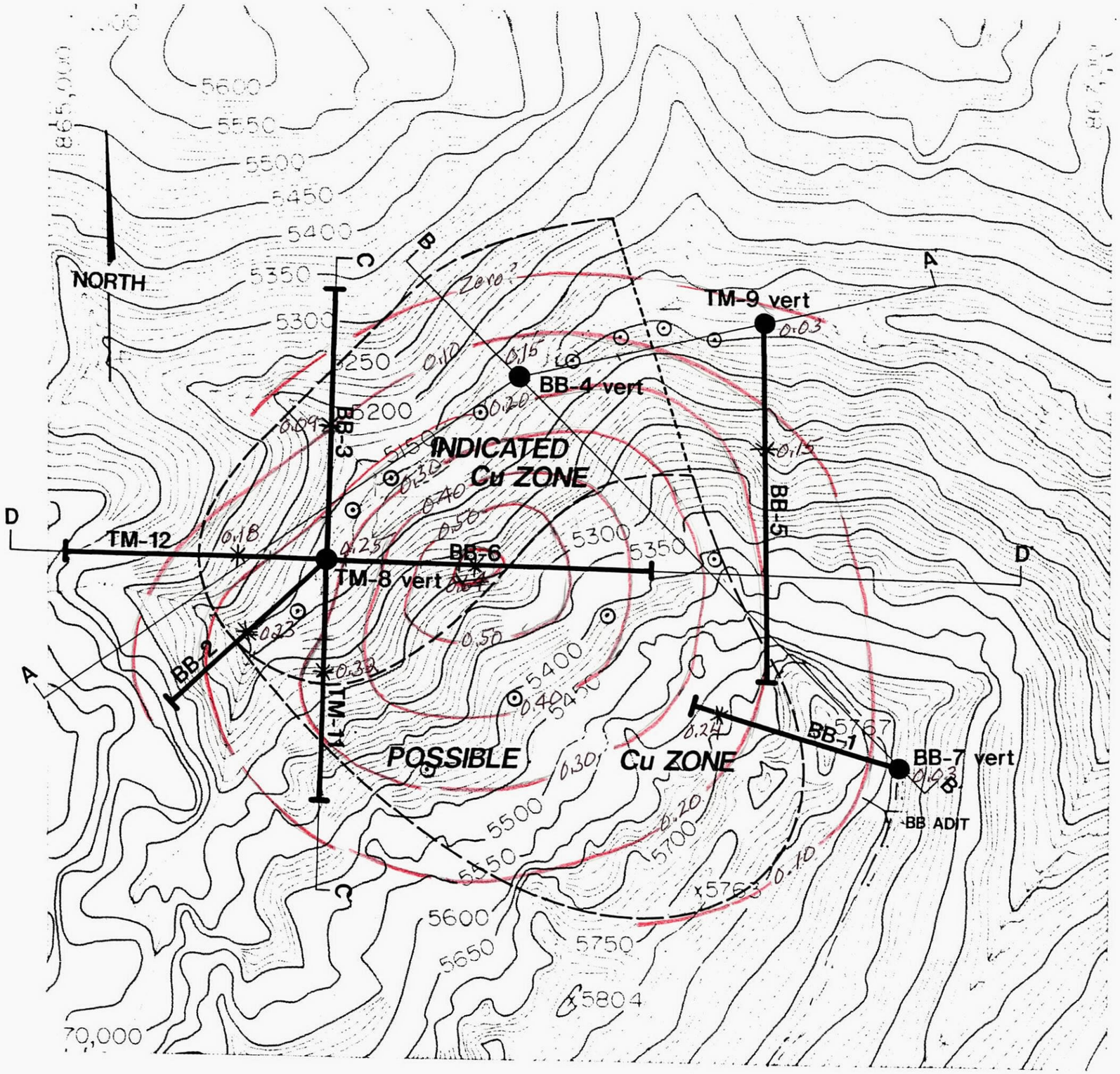
Middle Zone
Thickness, ft.

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT

1990 BB-DRILLING MAP

SANTA CRUZ CO., ARIZONA

HJD 1"=200' 01/91



Middle Zone
% Copper

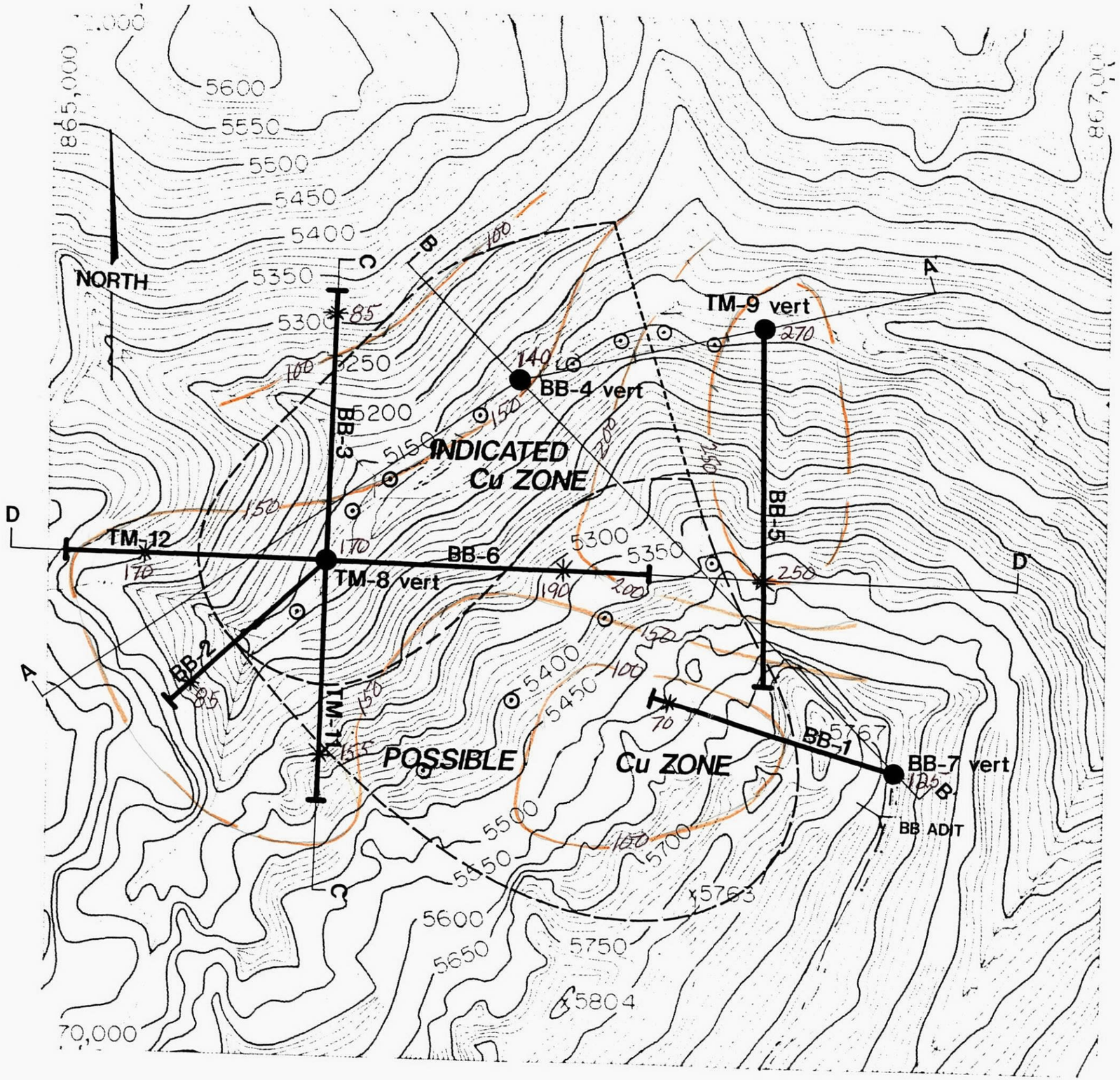
ASARCO Incorporated
THUNDER MOUNTAIN PROJECT

1990 BB-DRILLING MAP

SANTA CRUZ CO., ARIZONA

HJD 1"=200' 01/91

ATTACHMENT B



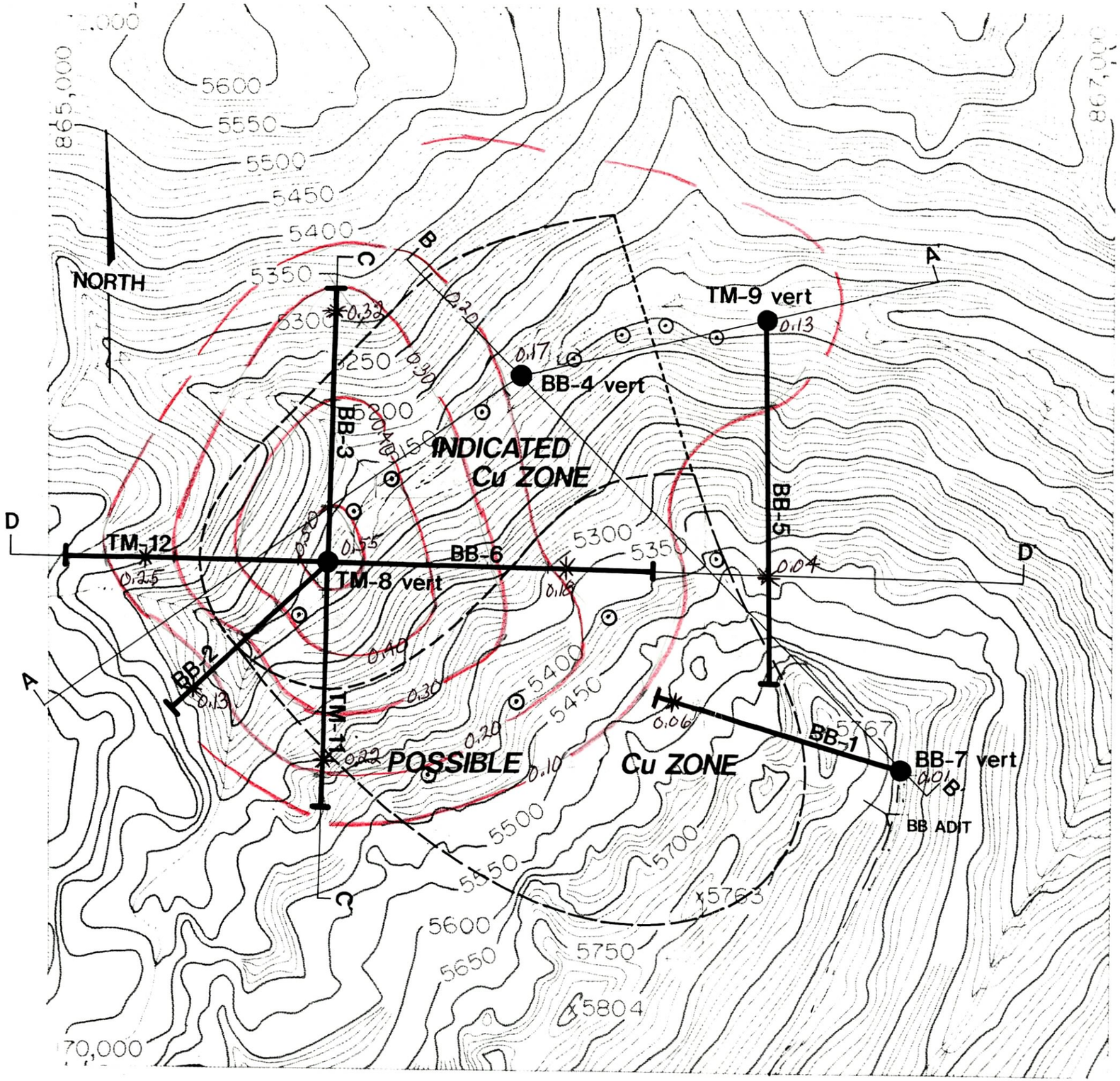
Lower Zone
Thickness, ft.

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT

1990 BB-DRILLING MAP

SANTA CRUZ CO., ARIZONA

HJD 1"=200' 01/91



Lower Zone
% Copper

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT

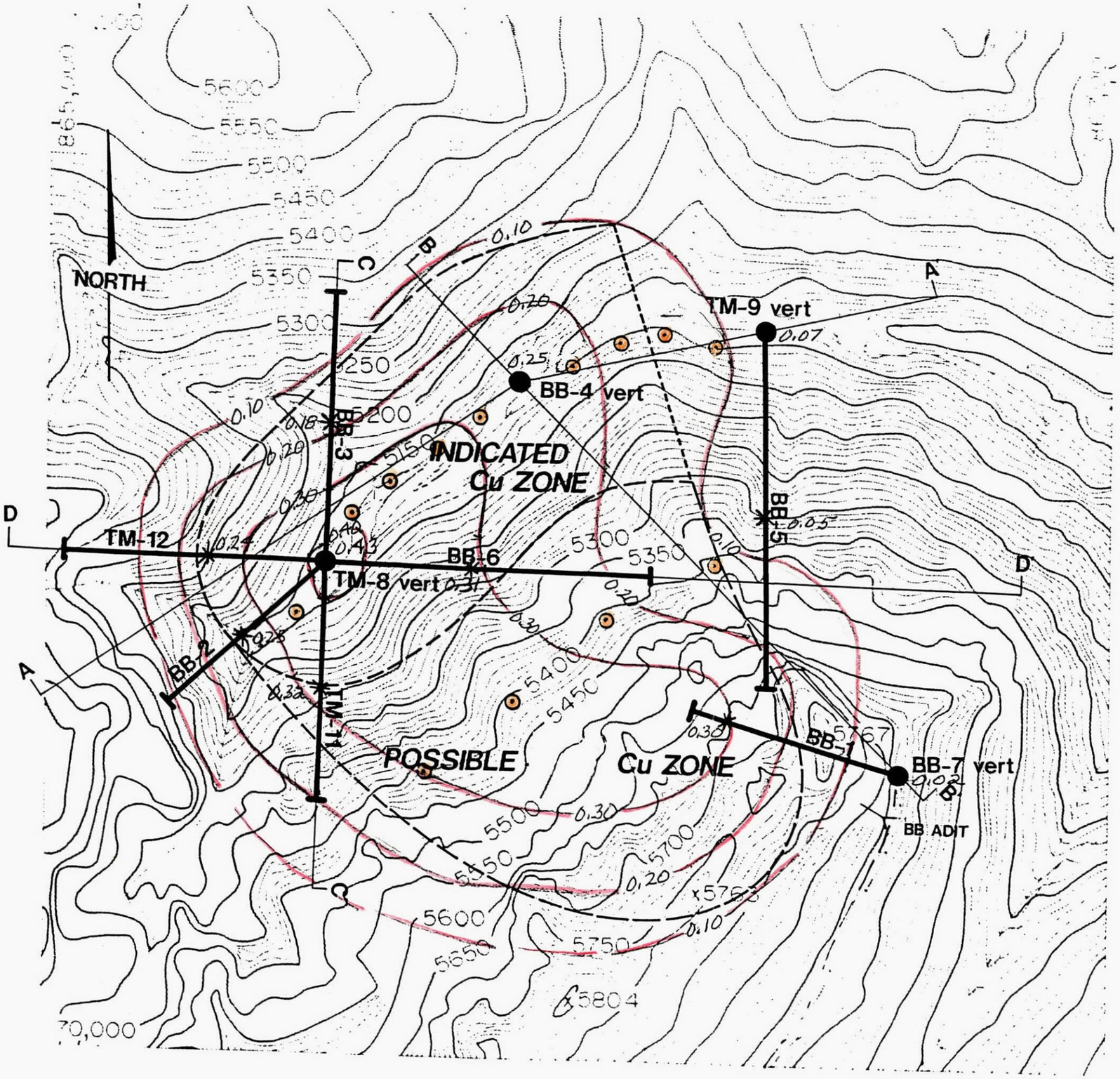
1990 BB-DRILLING MAP

SANTA CRUZ CO., ARIZONA

HJD 1"=200' 01/91

mn TM910201 HJD/DAM TUC 02/04/91

ATTACHMENT B



Total Zone
% Copper

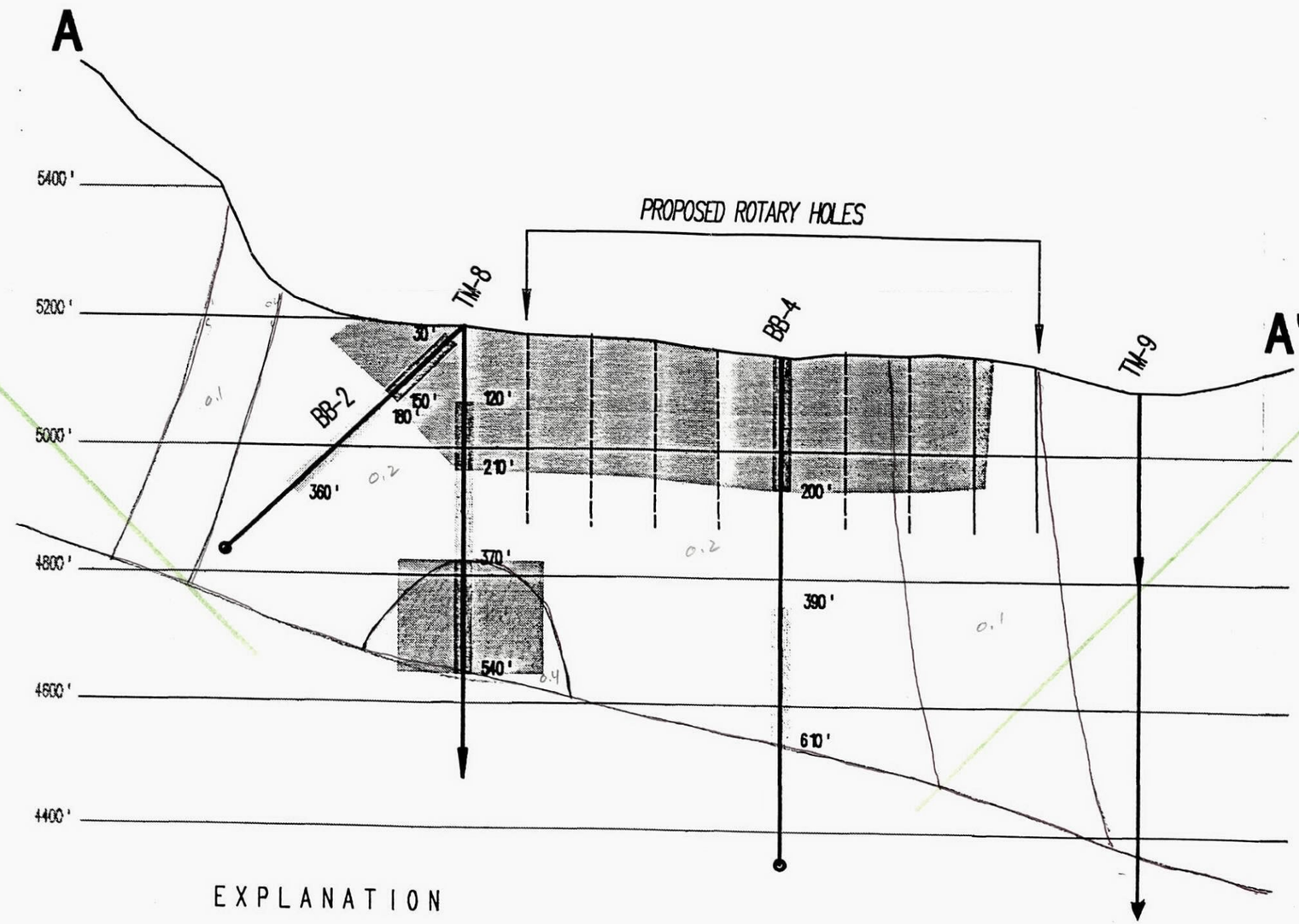
ASARCO Incorporated
THUNDER MOUNTAIN PROJECT

1990 BB-DRILLING MAP

SANTA CRUZ CO., ARIZONA

HJD 1"=200' 01/91

ATTACHMENT C-1



Total Zone

EXPLANATION

<0.4% COPPER

0.2-0.4% COPPER

0.1 + % Copper

ASARCO SOUTHWESTERN EXPLORATION

THUNDER MOUNTAIN PROJECT

SECTION A-A'

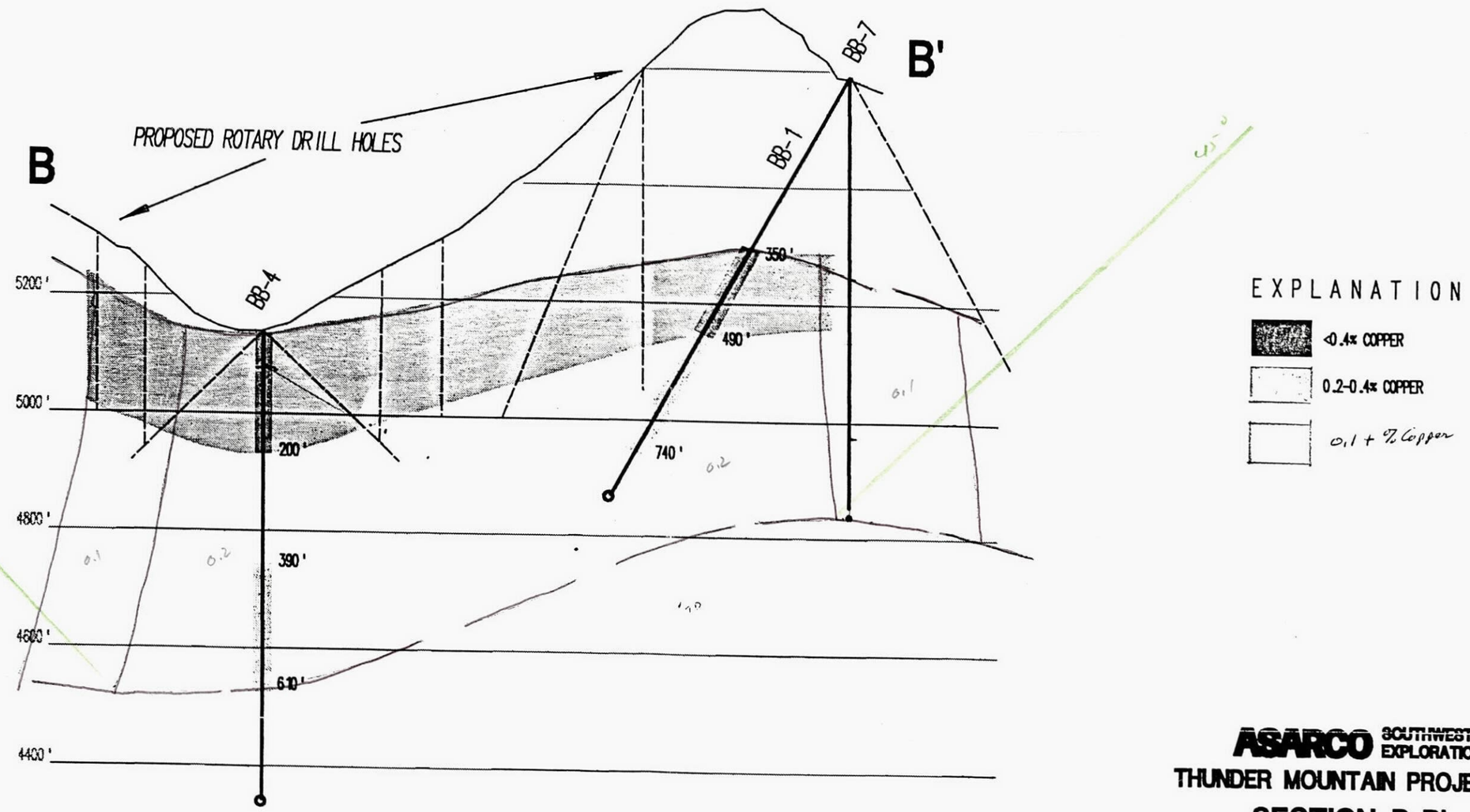
PATAGONIA MOUNTAINS, ARIZONA

H.J.D. 0 100' 200' 01-91

TM910110 HJD/DAM TUC 01/15/91

To drafting

ATTACHMENT C-2



ASARCO SOUTHWESTERN EXPLORATION

THUNDER MOUNTAIN PROJECT

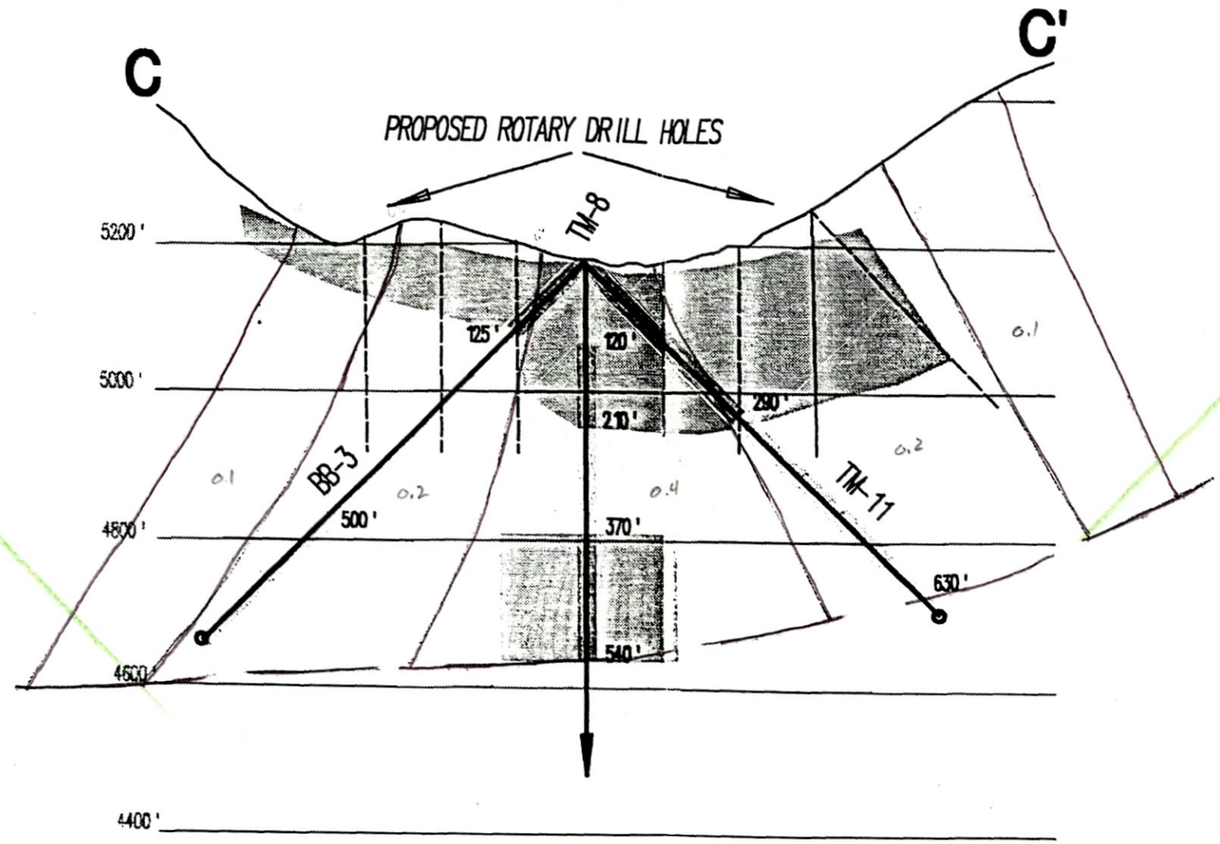
SECTION B-B'

PATAGONIA MOUNTAINS, ARIZONA

H.J.D. 0 100' 200' 01-91

mn TM910111 HJD/DAM TUC 01/15/91

ATTACHMENT C-3



EXPLANATION

- <0.4% COPPER
- 0.2-0.4% COPPER
- 0.1+% Copper

Total Zone

ASARCO SOUTHWESTERN EXPLORATION

THUNDER MOUNTAIN PROJECT

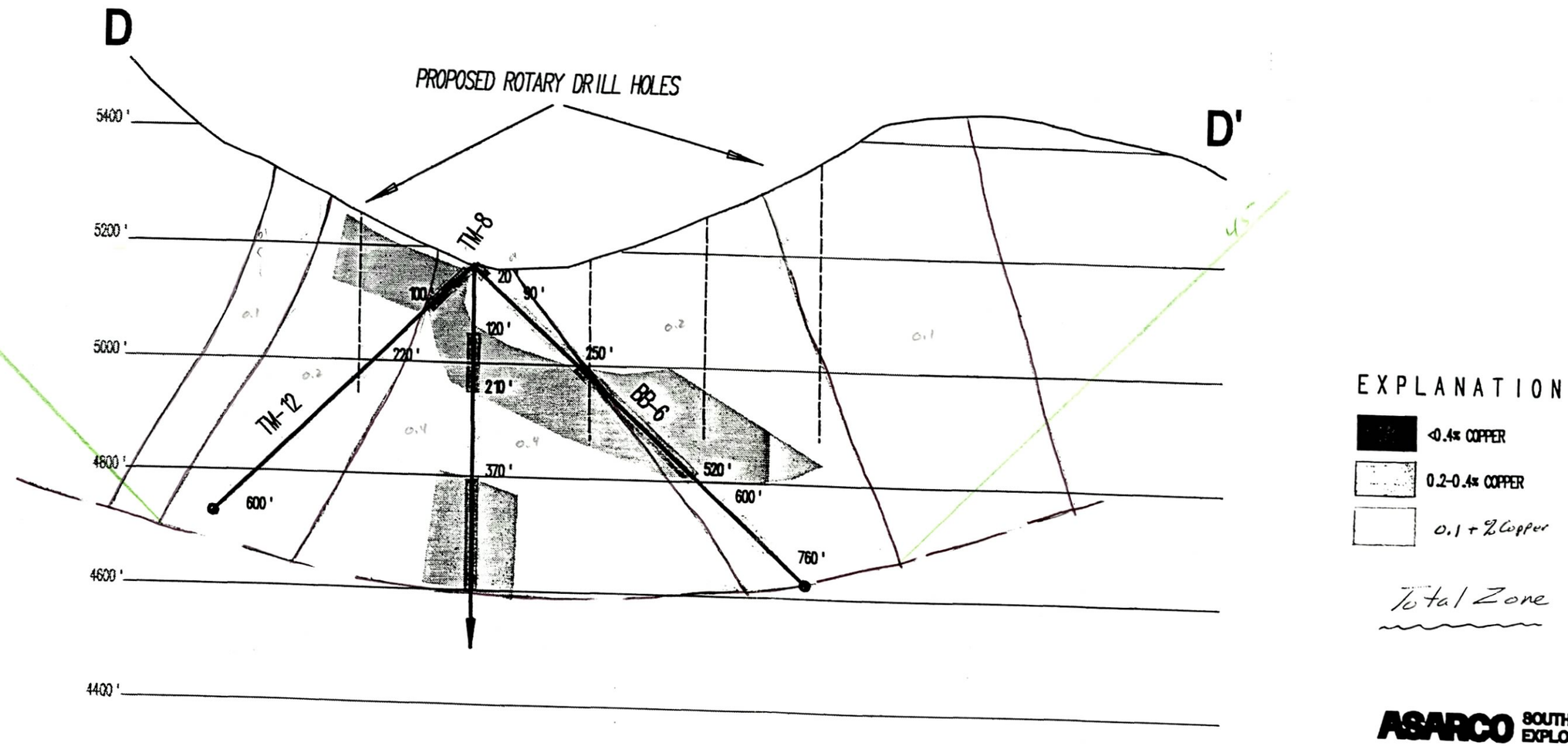
SECTION C-C'

PATAGONIA MOUNTAINS, ARIZONA

H.J.D. 0 100' 200' 01-91

TM910112 HJD/DAM TUC 01/15/91

ATTACHMENT C-4



ASARCO SOUTHWESTERN EXPLORATION

THUNDER MOUNTAIN PROJECT

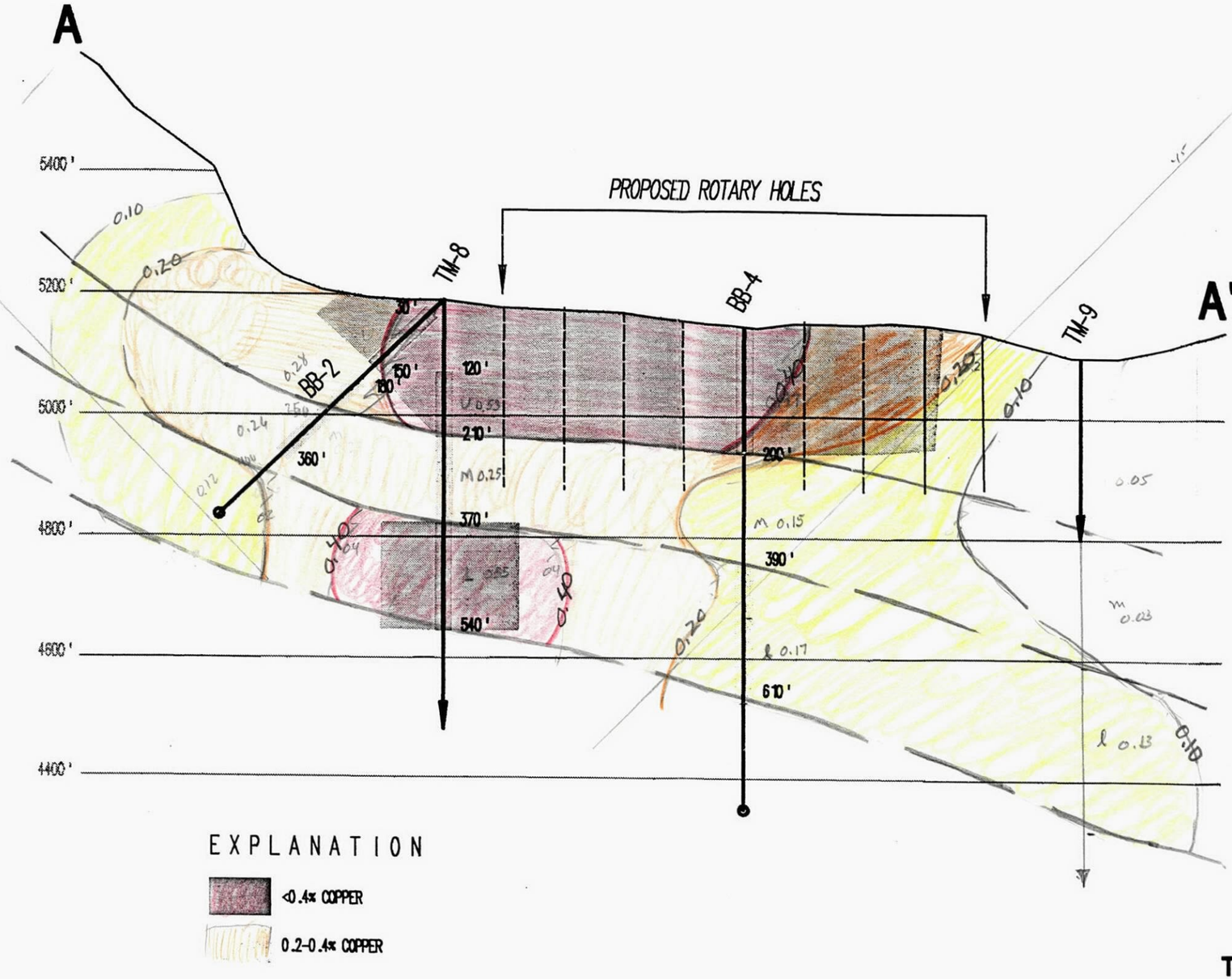
SECTION D-D'

PATAGONIA MOUNTAINS, ARIZONA

H.J.D. 0 100' 200' 01-91

TM910113 HJD/DAM TUC 01/15/91

ATTACHMENT C-1



ASARCO SOUTHWESTERN EXPLORATION

THUNDER MOUNTAIN PROJECT

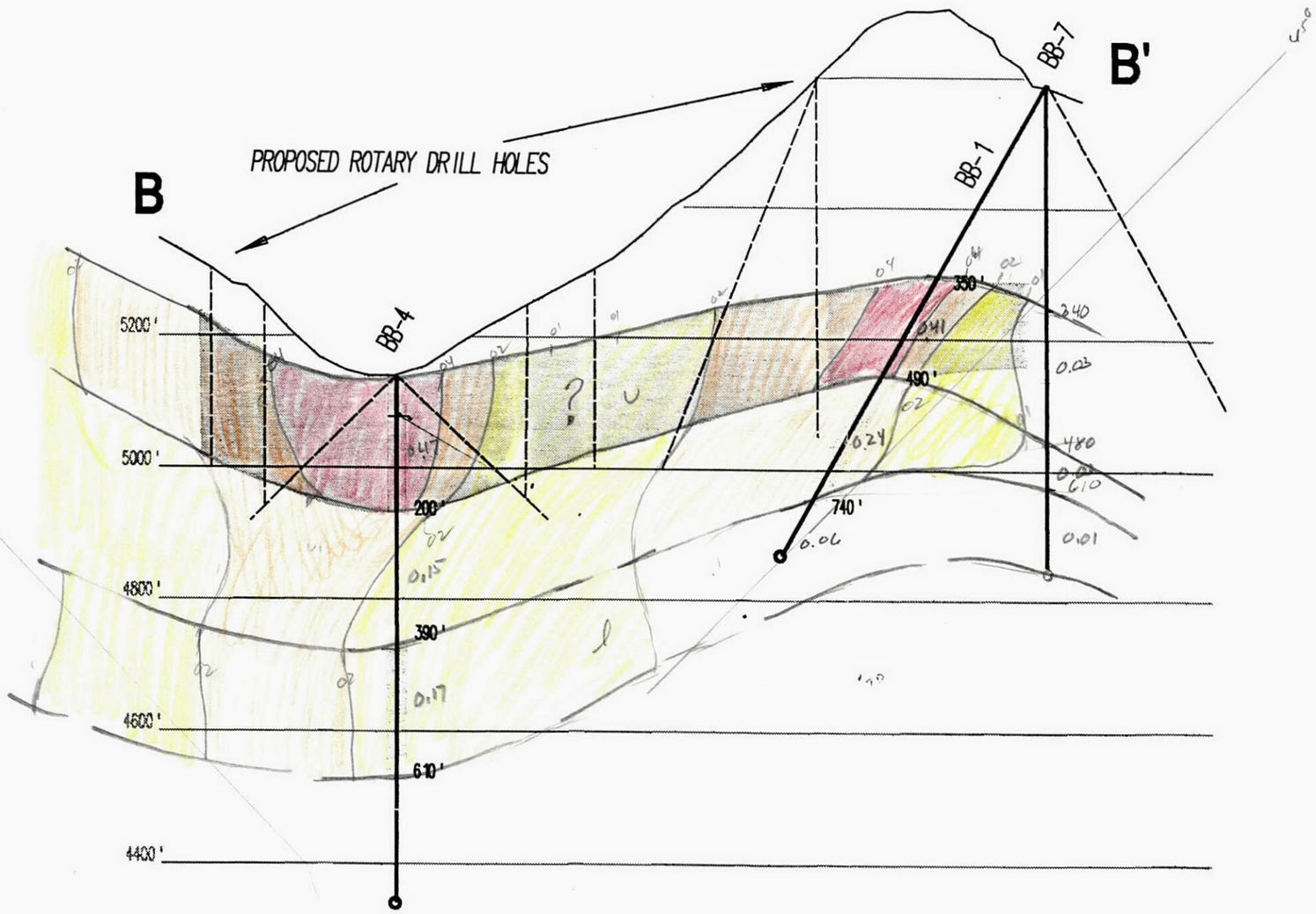
SECTION A-A'

PATAGONIA MOUNTAINS, ARIZONA

H.J.D. 0 100' 200' 01-91

mn TM910110 HJD/DAM TUC 01/15/91

ATTACHMENT C-2



EXPLANATION

<0.4% COPPER

0.2-0.4% COPPER

ASARCO SOUTHWESTERN EXPLORATION

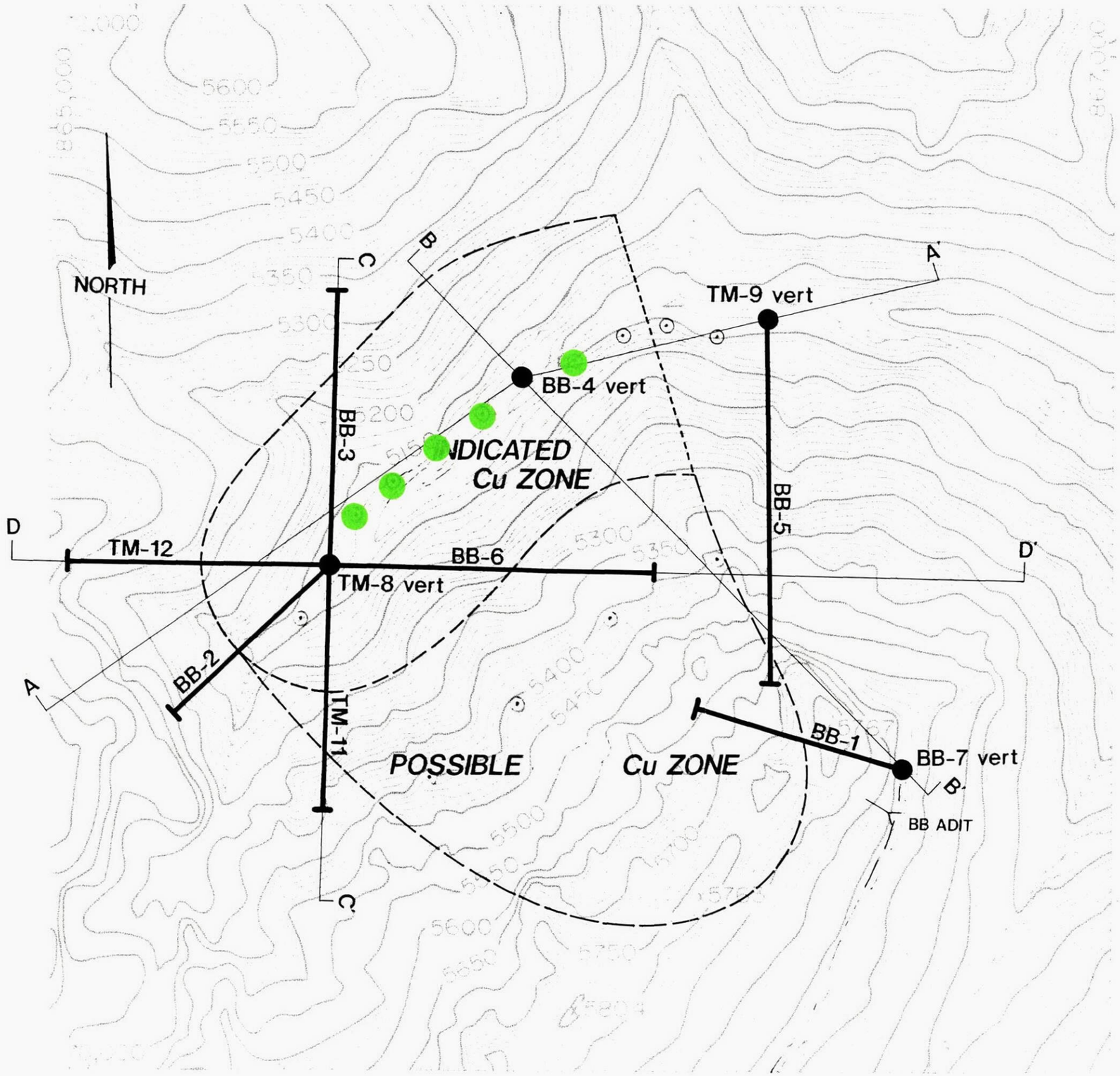
THUNDER MOUNTAIN PROJECT

SECTION B-B'

PATAGONIA MOUNTAINS, ARIZONA

H.J.D. 0 100' 200' 01-91

mn TM910111 HJD/DAM TUC 01/15/91



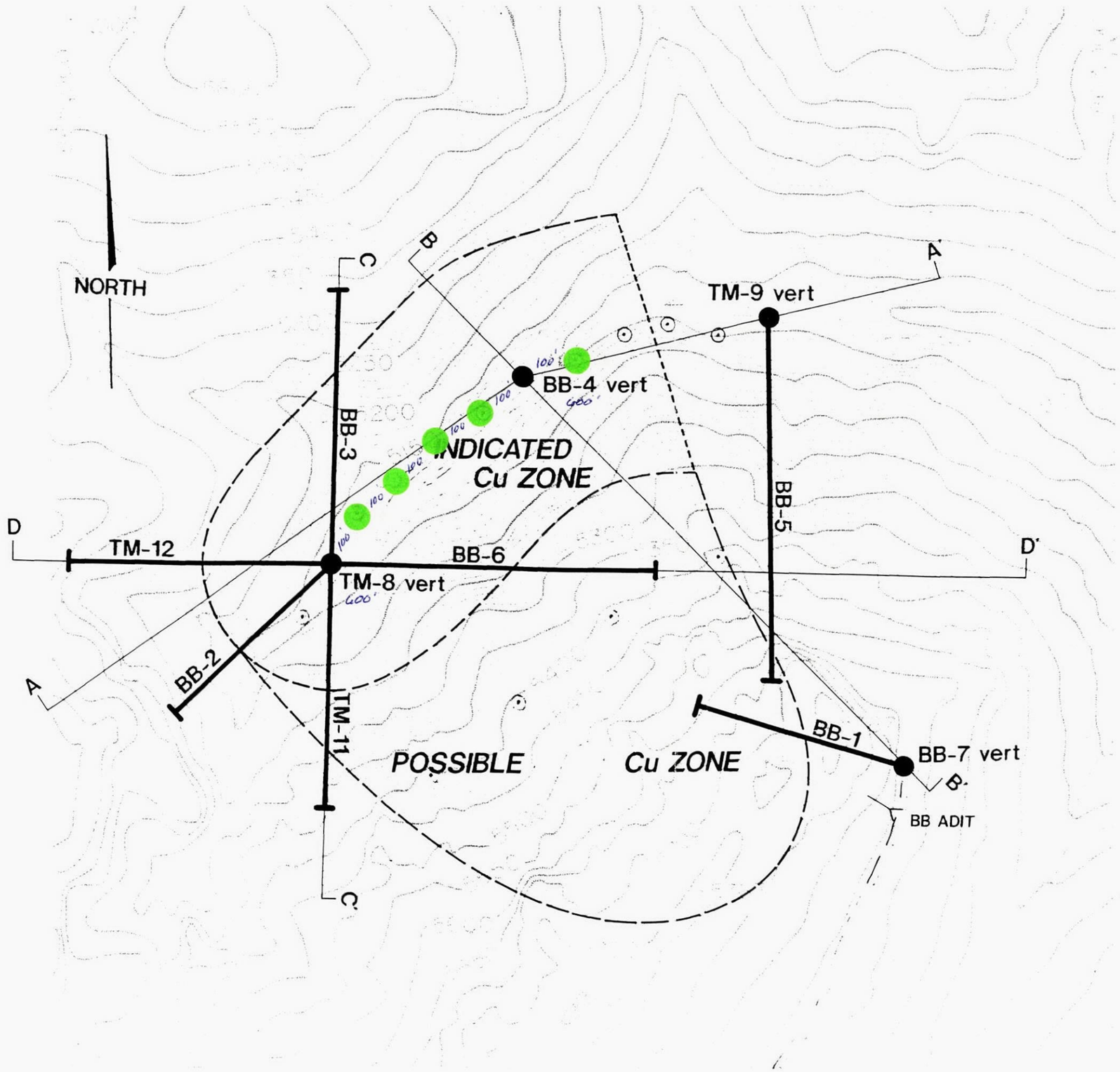
PROPOSED 1992 DRILLING

ASARCO Incorporated
THUNDER MOUNTAIN PROJECT

1990 BB-DRILLING MAP

SANTA CRUZ CO., ARIZONA

HJD 1"=200' 01/91



PROPOSED 1992 DRILLING

all Holes 600 ft depth.

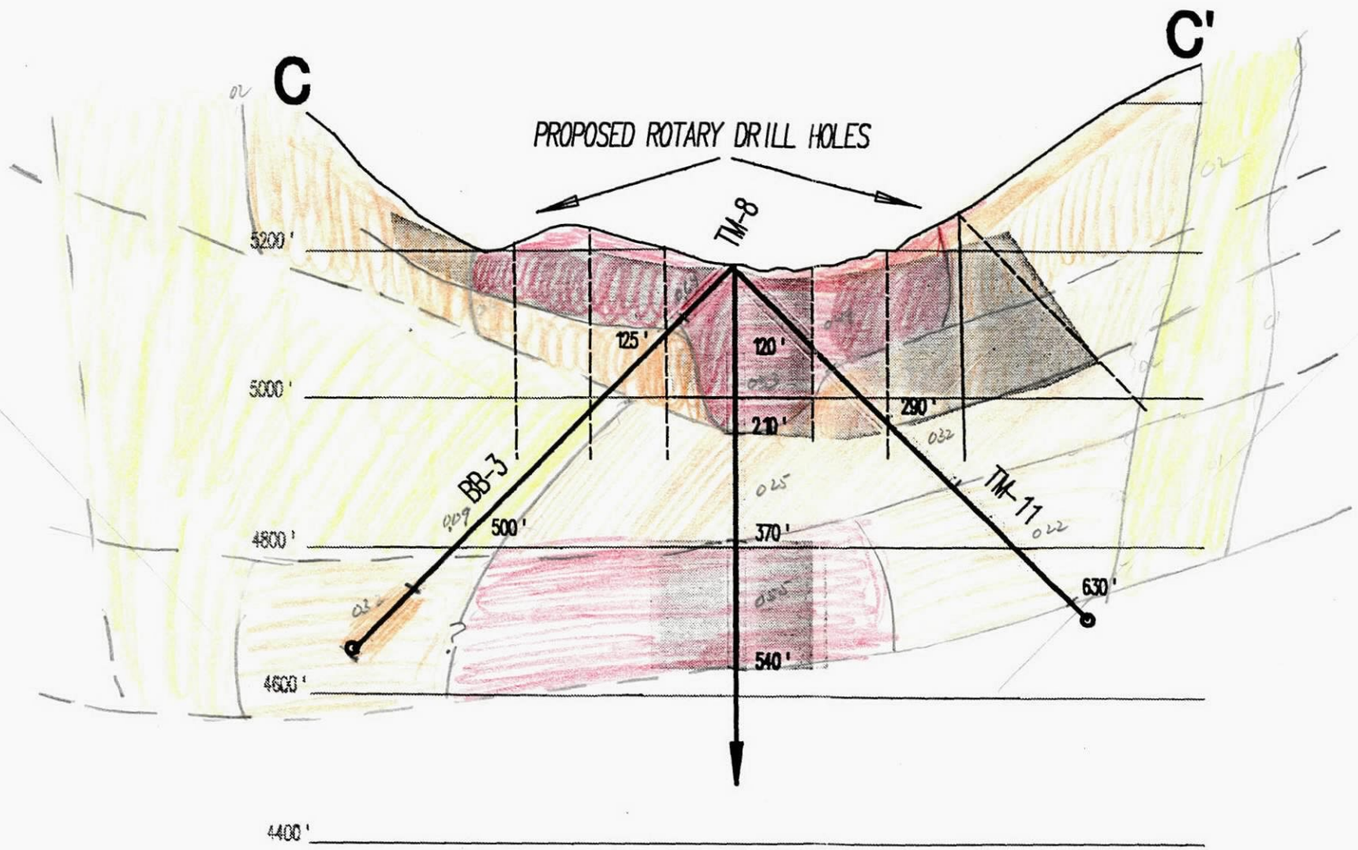
ASARCO Incorporated
THUNDER MOUNTAIN PROJECT

1990 BB-DRILLING MAP

SANTA CRUZ CO., ARIZONA

HJD 1"=200' 01/91

ATTACHMENT C-3



EXPLANATION

<0.4% COPPER

0.2-0.4% COPPER

ASARCO SOUTHWESTERN EXPLORATION

THUNDER MOUNTAIN PROJECT

SECTION C-C'

PATAGONIA MOUNTAINS, ARIZONA

H.J.D. 0 100' 200' 01-91

mn TM910112 HJD/DAM TUC 01/15/91

JDS

ASARCO

Southwestern Exploration Division

December 27, 1990

J.D. Sell

Thunder Mountain Project
Drill Hole Location Map
Santa Cruz County, Arizona

The location of core holes BB-2, -3, -6 and TM-8, -11 shown on Figure 1 have been mapped on the drill pad for greater detail on Figure 2. Note that BB-3 and -6 have no casing above the ground; however, BB-6 does have 8 feet of casing approximately 3 feet below the surface.

Also, the BB holes have been marked with a piece of rebarb capped with a plate stamped with the appropriate hole number.

John J. Malusa

JJM:mek

John J. Malusa

JJM
try & find TM-12 — talk to the drillers of TM-11 & 12 - Rob Gordon ??
Put arrows on holes to show their direction & inclination, & depth
1/2/91 JDS

FIGURE 1

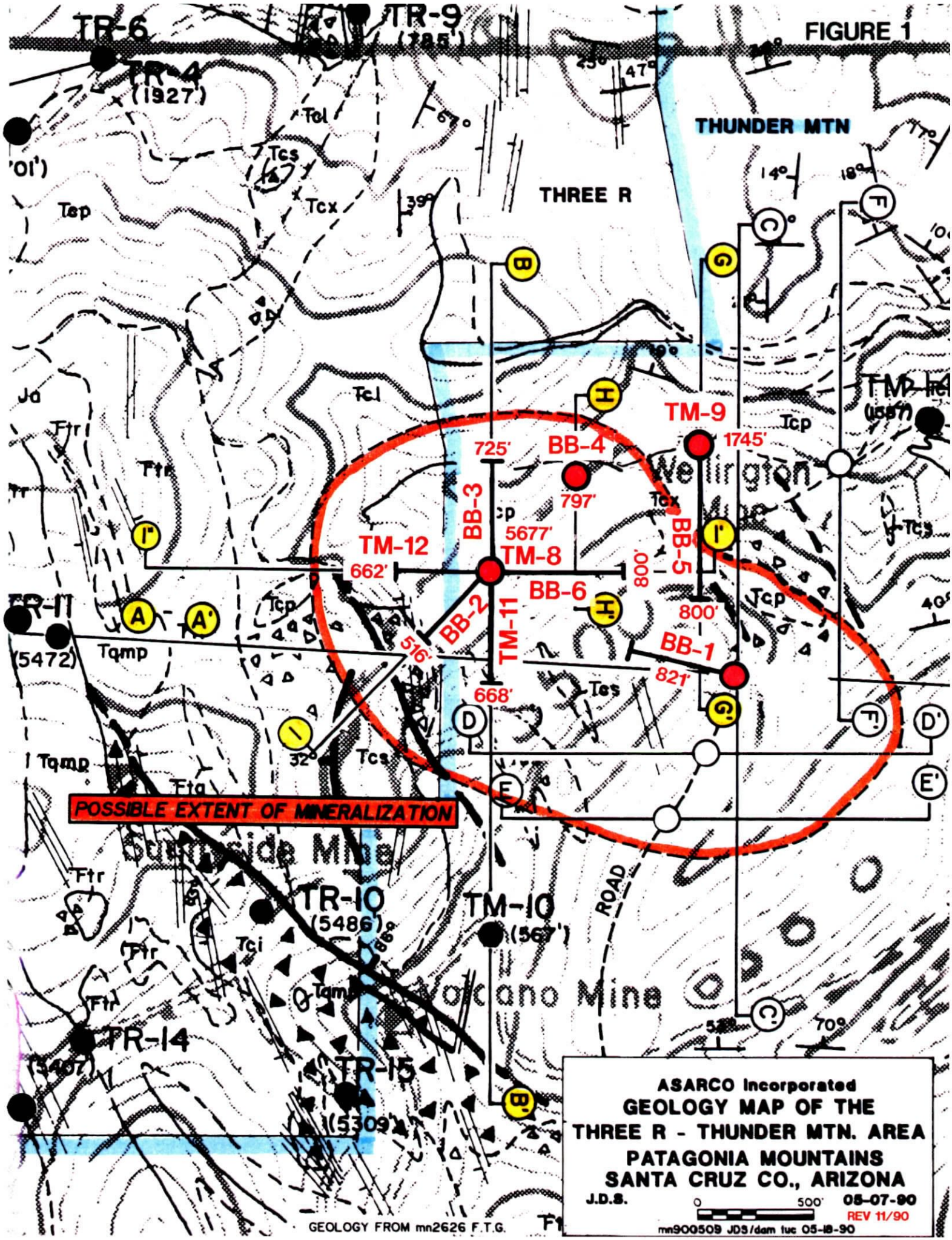
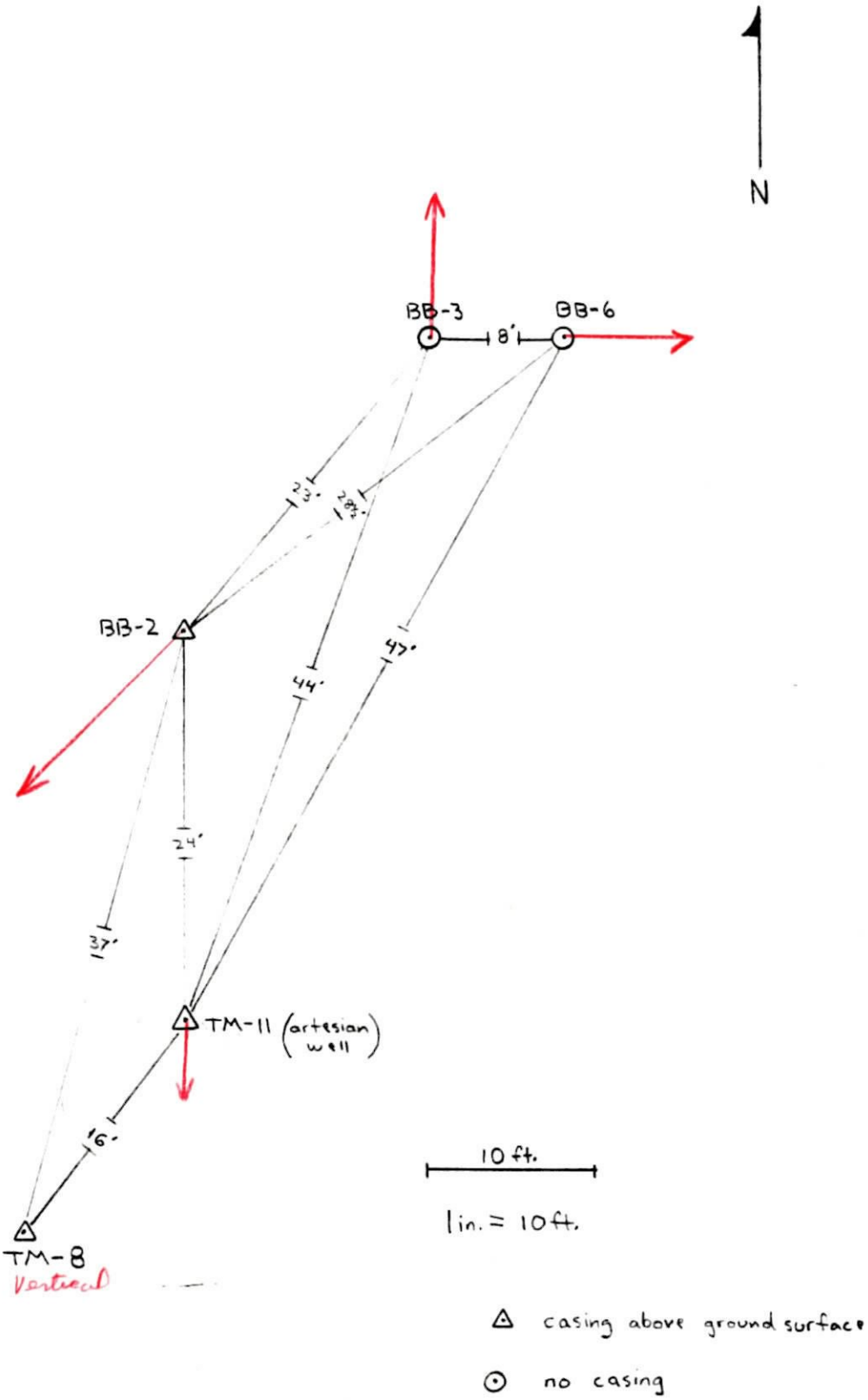

TR-6
TR-9
(785')
TR-4
(1927')
THUNDER MTN
THREE R
Tcl
Tcs
Tcx
Tcp
Ja
Ftr
Tqmp
Tes
TM-9
1745'
BB-4
797'
725'
BB-3
5677'
TM-8
TM-12
662'
BB-5
800'
BB-6
800'
BB-2
516'
TM-11
668'
BB-1
821'
TR-11
(5472')
POSSIBLE EXTENT OF MINERALIZATION
Sunnyside Mine
TR-10
(5486')
TM-10
(567')
ROAD
Volcano Mine
TR-14
(5407')
TR-15
(5309')
GEOLOGY FROM mn2626 F.T.G.
ASARCO Incorporated
GEOLOGY MAP OF THE
THREE R - THUNDER MTN. AREA
PATAGONIA MOUNTAINS
SANTA CRUZ CO., ARIZONA
J.D.S.
0 500'
05-07-90
REV 11/90
mn900509 JDS/dam tuc 05-18-90

Figure 2

Thunder Mtn. Drill Hole Location Map



22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

JDS

ASARCO

Southwestern Exploration Division

January 17, 1990

J.D. Sell

Thunder Mountain Project
Drill Hole Location Map
Santa Cruz County, AZ

The location of core holes BB-2, -3, -6 and TM-8, -11 shown on Figure 1 have been mapped on the drill pad for greater detail on Figure 2. Hole TM-12 is not visible on the drill pad and is therefor not included on the map. Holes BB-3 and -6 have no casing above the ground; however, BB-6 does have 8 feet of casing in place approximately 3 feet below the surface. Also, the BB holes have been marked with a piece of rebarb capped with a plate stamped with the appropriate hole number.

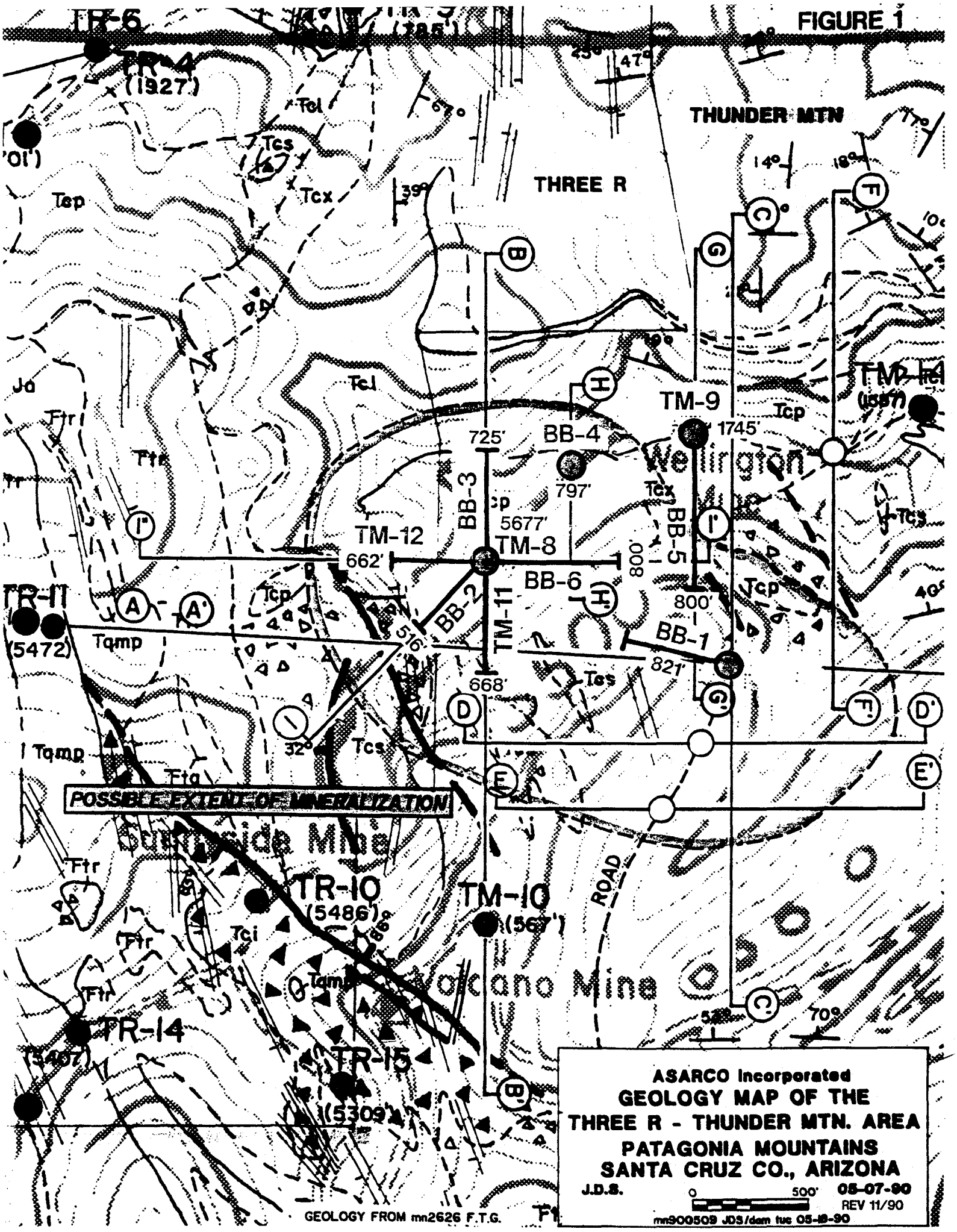
John J. Malusa

JJM:mek

John J. Malusa

cc: W.L. Kurtz

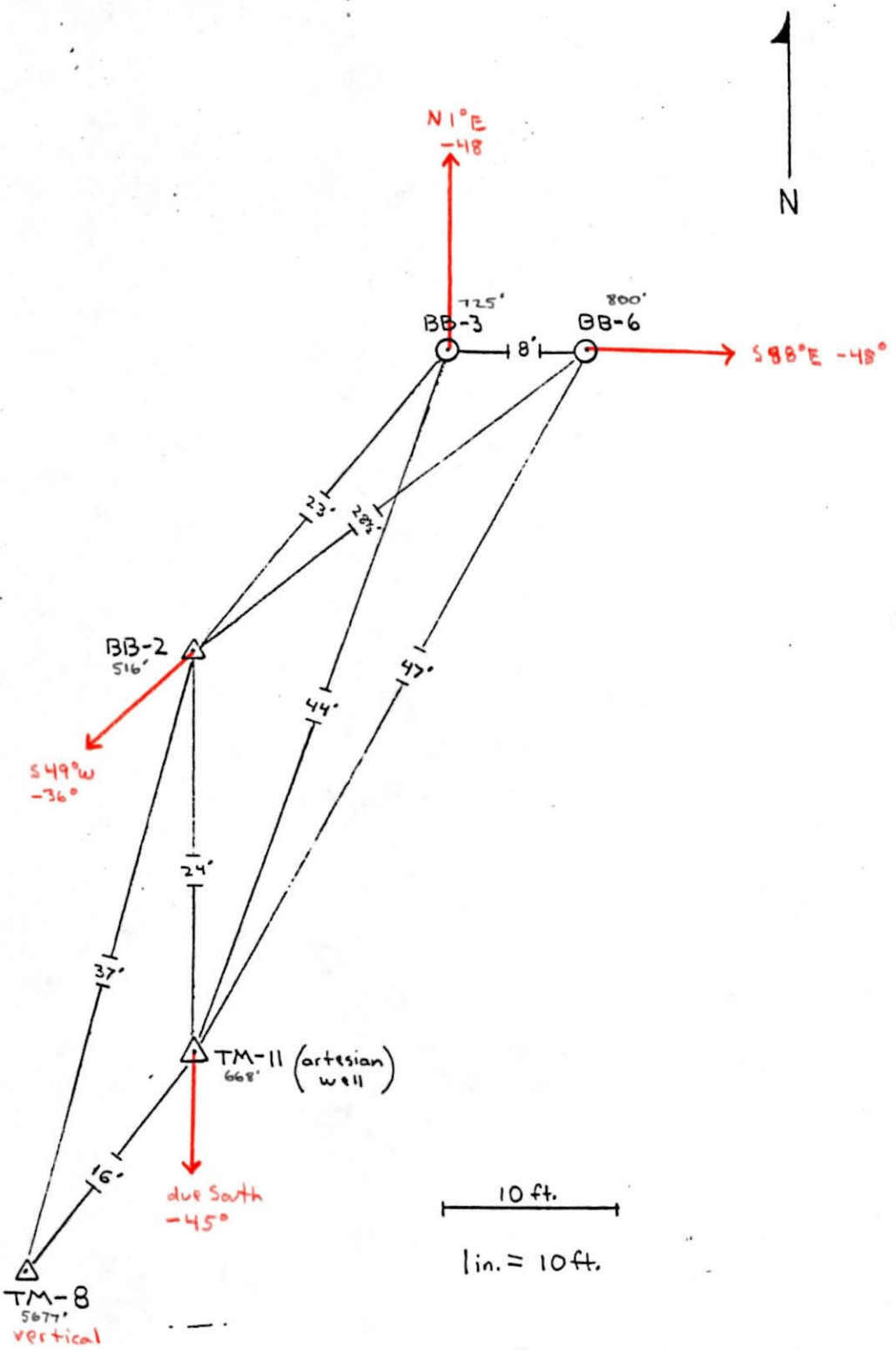
FIGURE 1



ASARCO Incorporated
GEOLOGY MAP OF THE
THREE R - THUNDER MTN. AREA
PATAGONIA MOUNTAINS
SANTA CRUZ CO., ARIZONA
J.D.S. 0 500' 05-07-90
REV 11/90
mn900509 JDS/dem fuc 05-18-90

Figure 2

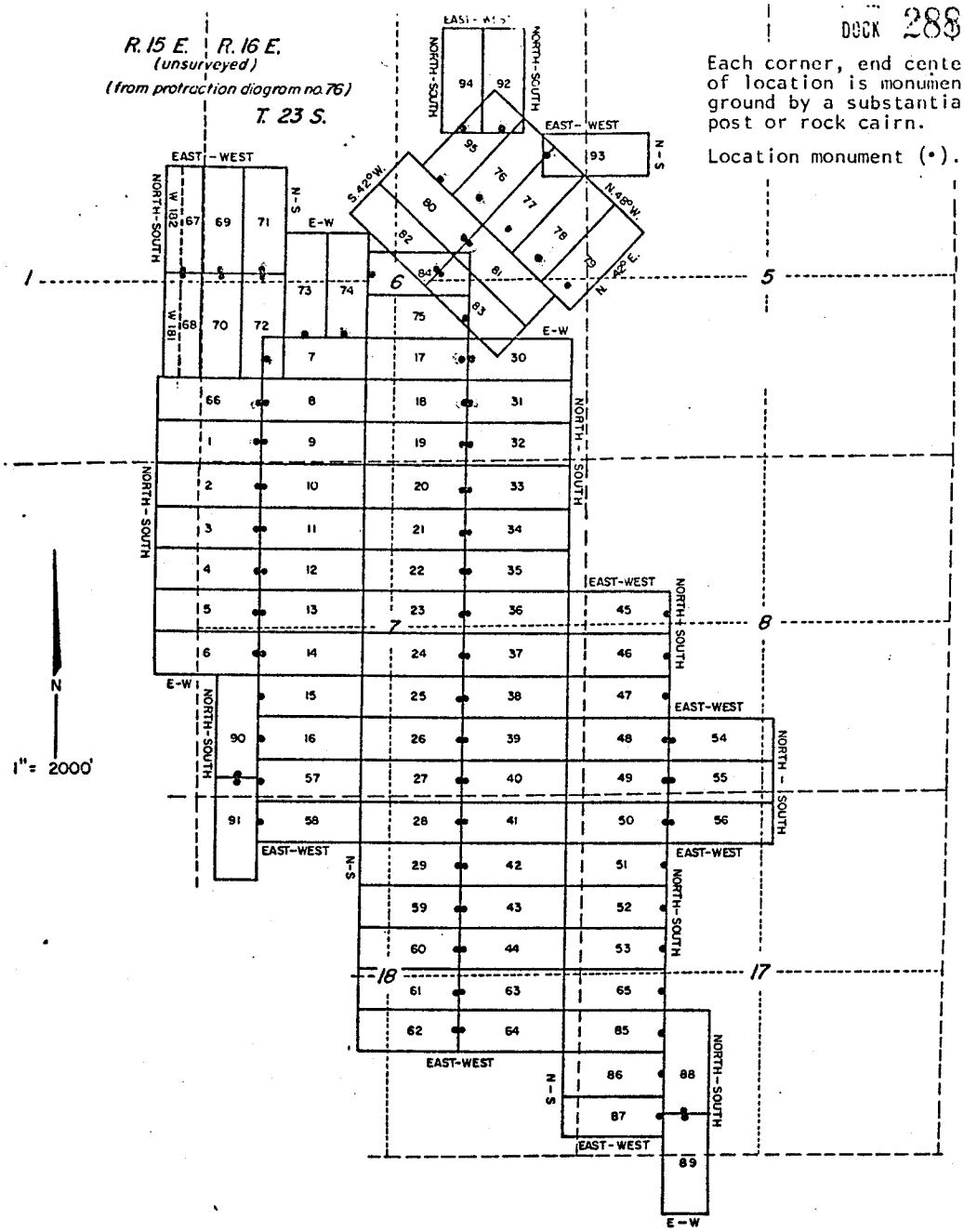
Thunder Mtn. Drill Hole Location Map



22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

Each corner, end center & point of location is monumented on the ground by a substantial wooden post or rock cairn.

Location monument (•).



OWNER: ASARCO INCORPORATED
P. O. BOX 5747
TUCSON, AZ 85703

AND

KERR MCGEE CORPORATION
P. O. BOX 25861
OKLAHOMA CITY, OK 73125

SECTION 6, T23S, R16E SANTA CRUZ COUNTY, AZ, G&SRB&M

LODE CLAIM	RECORDED BOOK	RECORDED PAGES	BLM A MC SERIAL NO.
TM 1	042	120	32905
TM 7-9	"	126-128	32911-32913
TM 17-19	"	136-138	32921-32923
TM 30-32	"	149-151	32934-32936
TM 69-84	060	92-107	32973-32988
TM 92-94	061	57-59	32996-32998
TM 95	066	457	32999

AMENDED RECORDING -- ORIGINAL NOTICE POSTED IN OFFICIAL RECORDS OF SANTA CRUZ COUNTY, ARIZONA, IN DOCKET 283, PAGES 522-527.

ASARCO INCORPORATED

BY R. B. Crist

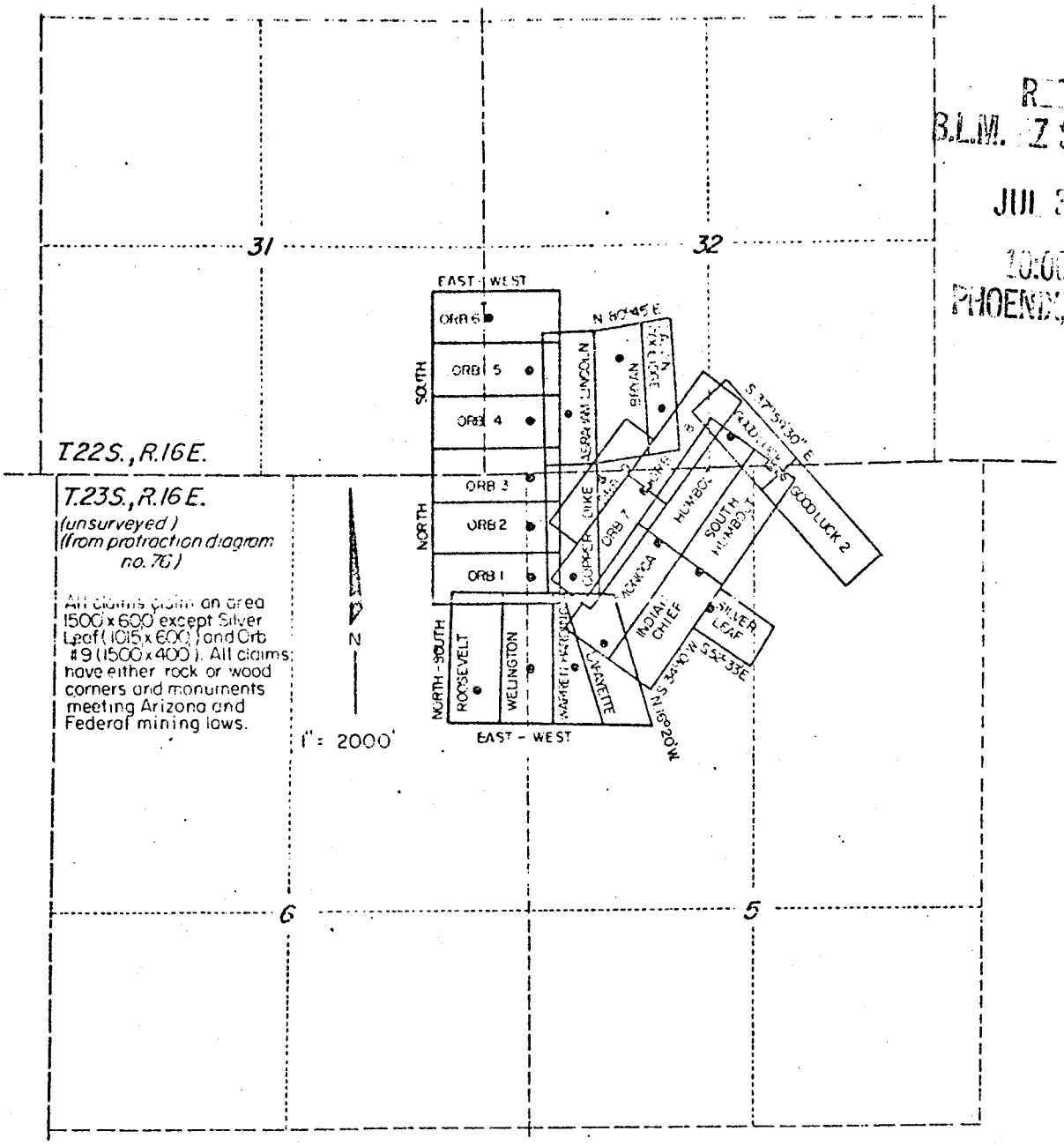
STATE OF ARIZONA)
) SS
COUNTY OF PIMA)

THE FOREGOING INSTRUMENT WAS ACKNOWLEDGED BEFORE ME THIS 20th DAY OF October, 1980, BY R. B. CRIST.

Mildred C. Cain

MY COMMISSION EXPIRES:

RECEIVED
B.L.M. AZ STATE OFFICE
JUL 30 1979
10:00 A.M.
PHOENIX, ARIZONA



THE CALVIN COOLIDGE, ABRAHAM LINCOLN, ROOSEVELT, WARREN HARDING, COPPER DIKE, BRYAN, LAFAYETTE, WELINGTON, HUMBOLT, GOOD LUCK, INDIAN CHIEF, SILVER LEAF, SOUTH HUMBOLT, GOOD LUCK NO.2, MONOCA, AND ORB # 1 THRU 9 ARE LOCATED IN SECTION 32 OF TOWNSHIP 22 SOUTH, RANGE 16 EAST AND SECTIONS 5 AND 6 OF TOWNSHIP 23 SOUTH, RANGE 16 EAST.

LODE CLAIM	ORIG. LOCATION NOTICE / DATE	LODE CLAIM	AMENDED LOCATION NOTICE / DATE
CALVIN COOLIDGE	J.O'Donnell, N. Shea, K. Sheehy & M. Sheehy / 7-2-28		
ABRAHAM LINCOLN	E.T. Sheehy, P.J. Sheehy, & K. Sheehy / 5-16-52		
ROOSEVELT	P.J. Sheehy, D.J. Sheehy & E.T. Sheehy / 6-21-15		
WARREN HARDING	" " " / 10-26-21		
COPPER DIKE	A. O'Donnell / 1-1-17		
BRYAN	B.A. Neighbours, P.J. Sheehy, E.T. Sheehy / 1-1-09		
LAFAYETTE	B.A. Neighbours, P.J. Sheehy, D.J. Sheehy, E.T. Sheehy / 8-5-07		
WELINGTON	" " " " / 2-14-08		

OWNER
Rita Sheehy
649 Morley Ave.
Nogales, Az
Kerr-McGee Corp.
Oklahoma City, Ok.
ASARCO Incorporated
PO. Box 5747
Tucson, Az 85703

ORB # 1, 2	Kerr-McGee Corp. Oklahoma City, Ok	/ 9-27-72	Kerr-McGee Corp. Oklahoma City, Ok
ORB # 3-6	K.H. Sandin	/ 11-13-72	ASARCO Incorporated Tucson, Az 85703
ORB # 7-9	"	/ 11-11-72	

LODE CLAIMS IN
SANTA CRUZ CO

ASARCO Incorporated
1800 North 7th Avenue
TUCSON, ARIZONA 85703

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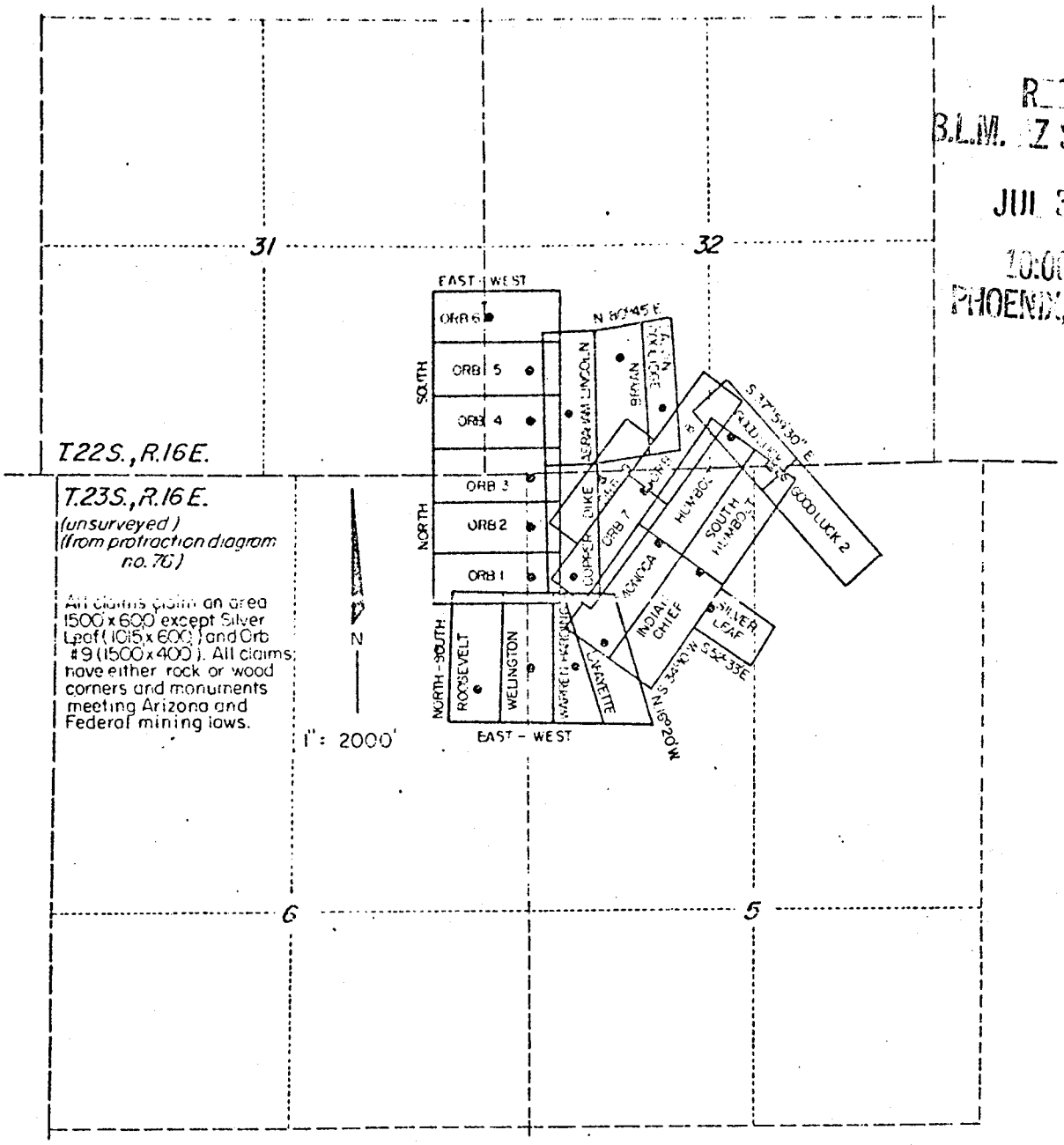

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ORB # 7-9	"	/ 11-11-72	

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TUCSON, ARIZONA 85703

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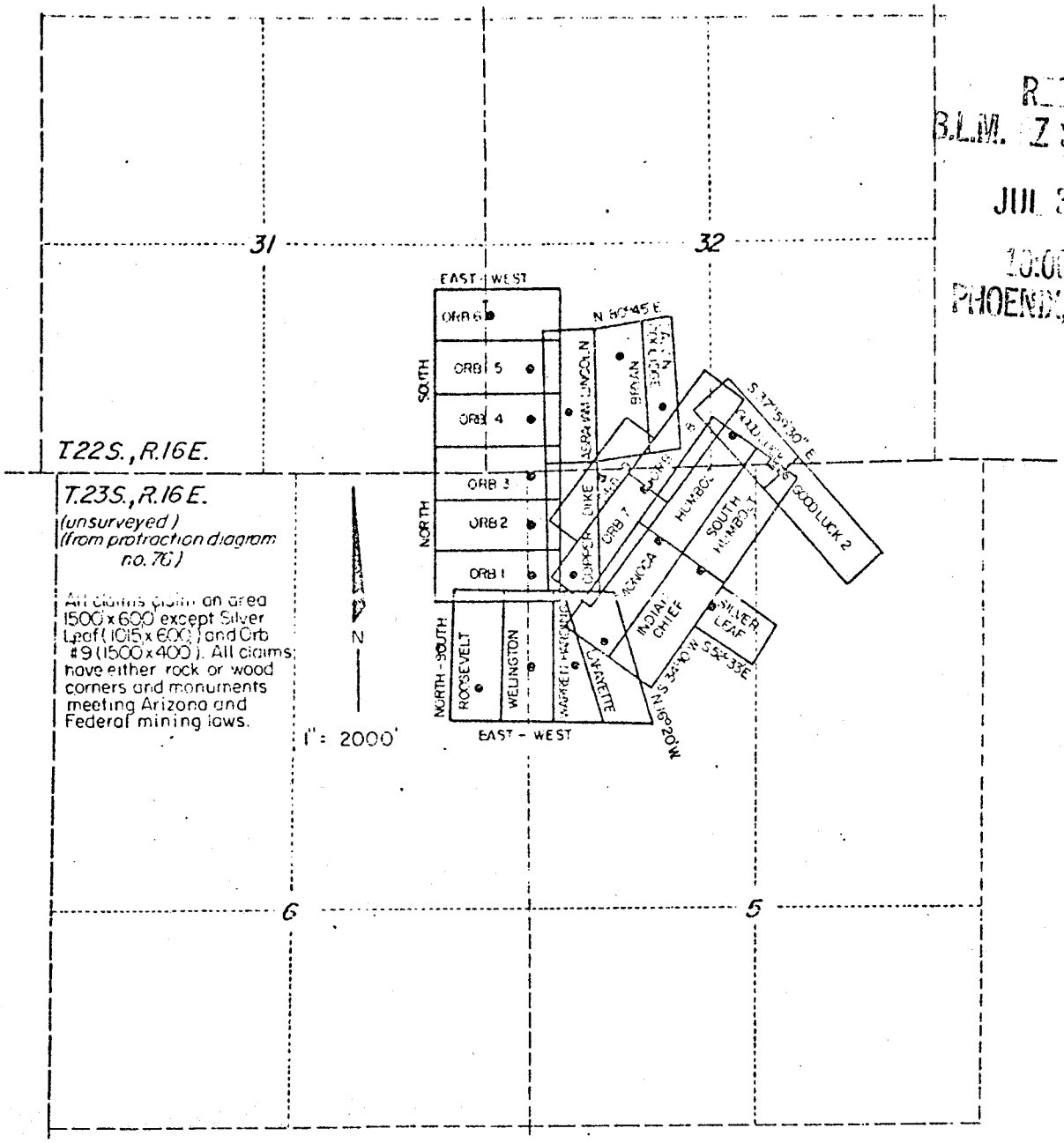

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WELINGTON	" " " " / 2-14-08		

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ASARCO Incorporated
P.O. Box 5747
Tucson, Az 85703

ORB # 1, 2	Kerr-McGee Corp. Oklahoma City, Ok	/ 9-27-72	Sep 27	Kerr-McGee Corp. Oklahoma City, Ok
ORB # 3-6	K.H. Sandin	/ 11-13-72	Nov 13	ASARCO Incorporated Tucson, Az 85703
ORB # 7-9	"	/ 11-11-72		

LODE CLAIMS IN
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ASARCO Incorporated
1900 EIGHTH AVENUE
TUCSON, ARIZONA 85703

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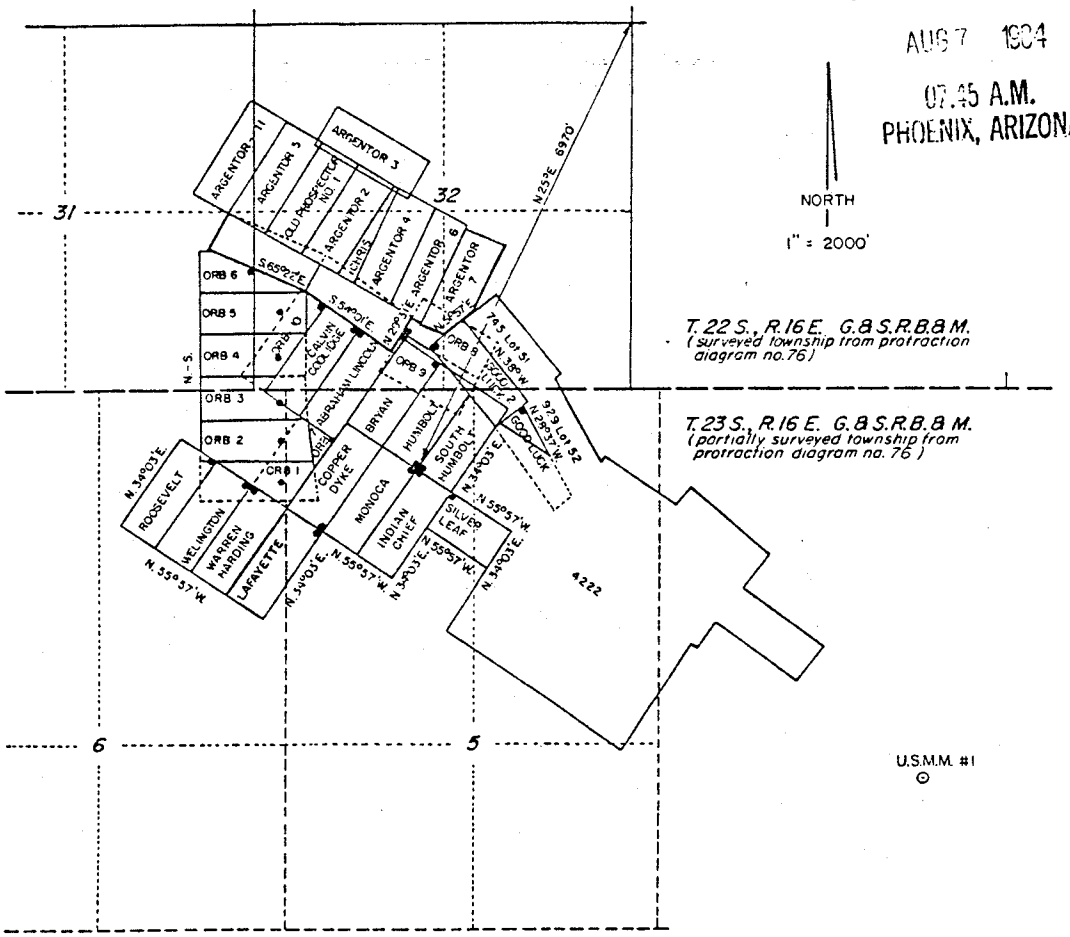

ALL CLAIMS AS PRESCRIBED BY A.R.S. sec. 27-204

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CALVIN COOLIDGE		
ORB 7-10		
HUMBOLT	12/20/82	6/6/84
SOUTH HUMBOLT		6/6/84
MONOCA		6/6/84
INDIAN CHIEF		6/6/84
SILVER LEAF		6/6/84
GOOD LUCK		
GOOD LUCK 2		6/6/84
COPPER DYKE		
LAFAYETTE		6/6/84
WELINGTON		6/8/84
WARREN HARDING		6/8/84
ROOSEVELT		6/8/84

OWNER

ASARCO Incorporated
PO Box 5747
Tucson, Arizona 85703

Kerr-McGee Corporation
P.O Box 25861
Oklahoma City, Ok. 73125

LODE CLAIMS IN
SANTA CRUZ, COUNTY

ASARCO Incorporated
1150 North 7th Avenue
Tucson, Arizona 85705

mn 5130 zz dom

FEE NO. 13271

STATE OF ARIZONA, County of Santa Cruz — SS.
I do hereby certify that the within instrument was filed and recorded at the request of ASARCO Incorporated
on JUL 30 '84 - 10 00 AM Docket No. 380 Page 674 - 675
Records of Santa Cruz County, Arizona.
WITNESS my hand and official seal the day and year first above written.

SANTA CRUZ COUNTY COUNTY RECORDER STATE OF ARIZONA

MARY LOU G. SAINZ, COUNTY RECORDER
Deborah N. Soto

DOCK 380 PAGE 675

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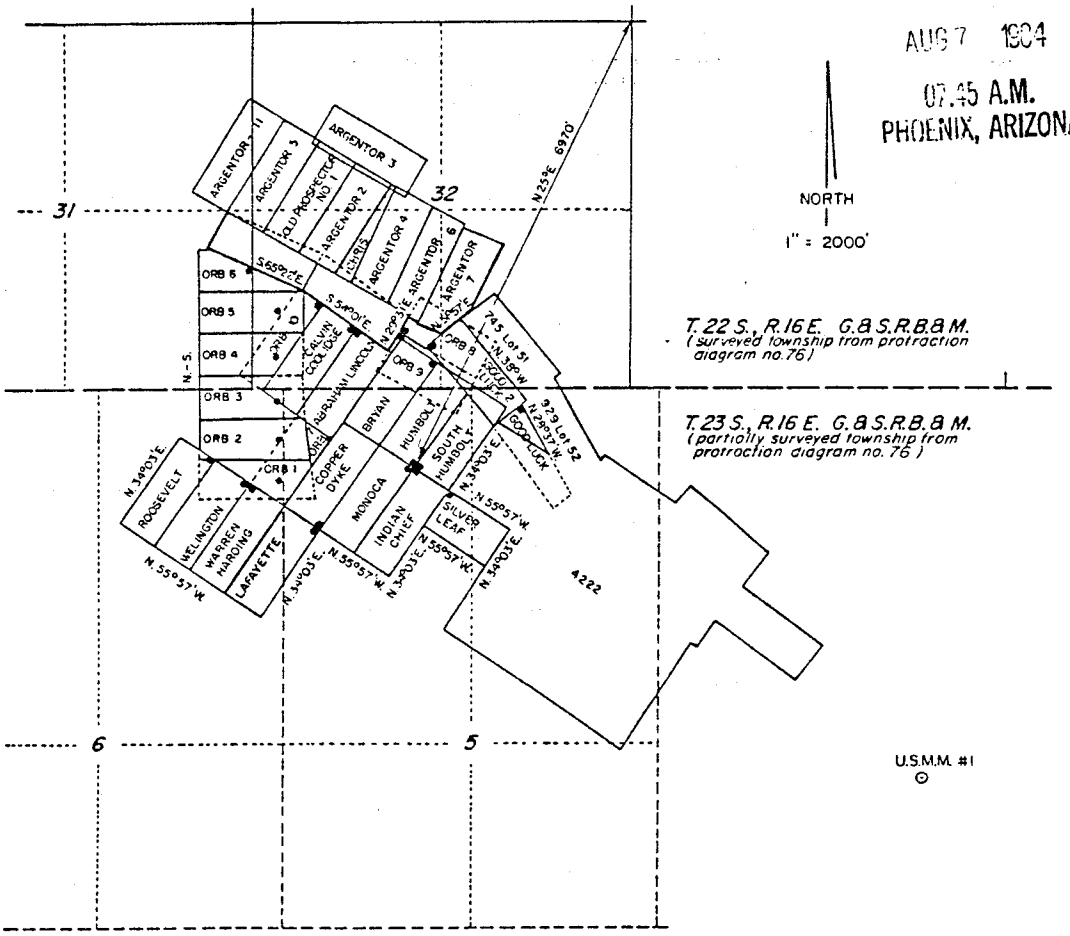
07:45 A.M.
PHOENIX, ARIZONA



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OWNER

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Barbara Y. Soto

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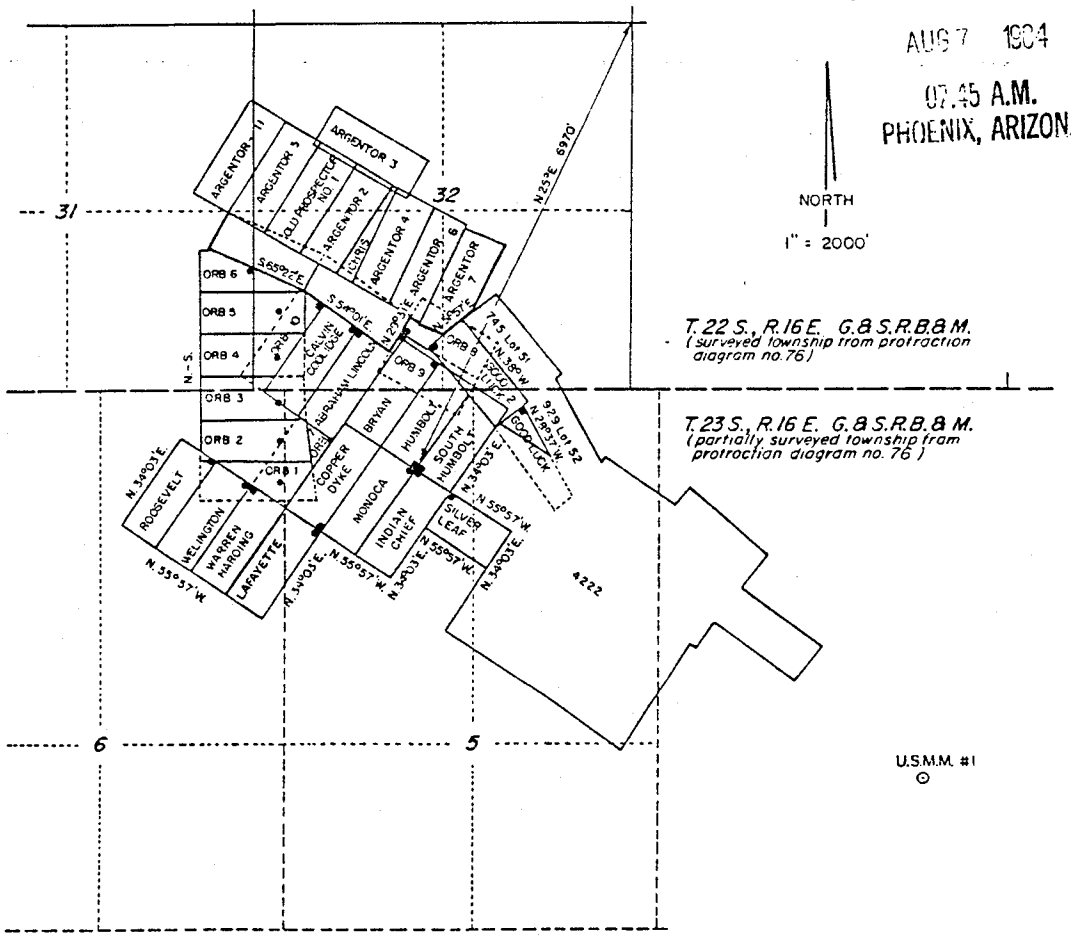

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OWNER

ASARCO Incorporated
PO Box 5747
Tucson, Arizona 85703

Kerr-McGee Corporation
P.O Box 25861
Oklahoma City, Ok. 73125

LODE CLAIMS IN
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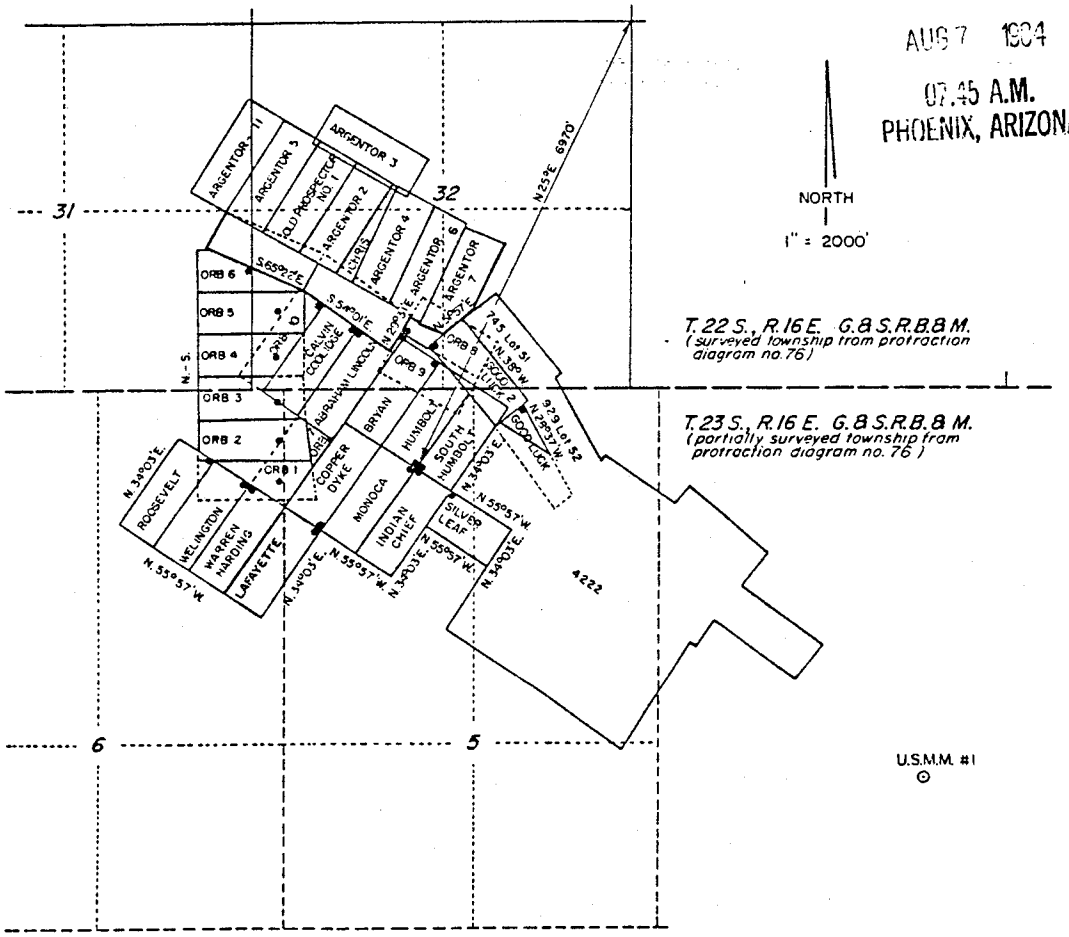

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COUNTY RECORDER SANTA CRUZ COUNTY STATE OF ARIZONA

MARY LOU G. SAINZ, COUNTY RECORDER
Barbara H. Soto

To J D Sell

Date 6/5 Time 1:13 AM PM

WHILE YOU WERE OUT

M F. Graybeal

of

Phone ( ) Area Code Number Extension

TELEPHONED	✓	PLEASE CALL	✓
CALLED TO SEE YOU		WILL CALL AGAIN	
WANTS TO SEE YOU		URGENT	
RETURNED YOUR CALL			

Message Geneva Pel ?

T Mary
Operator

AMPAD EFFICIENCY®

REORDER #23-000

1. Ventura
No: 401K
Assessment only

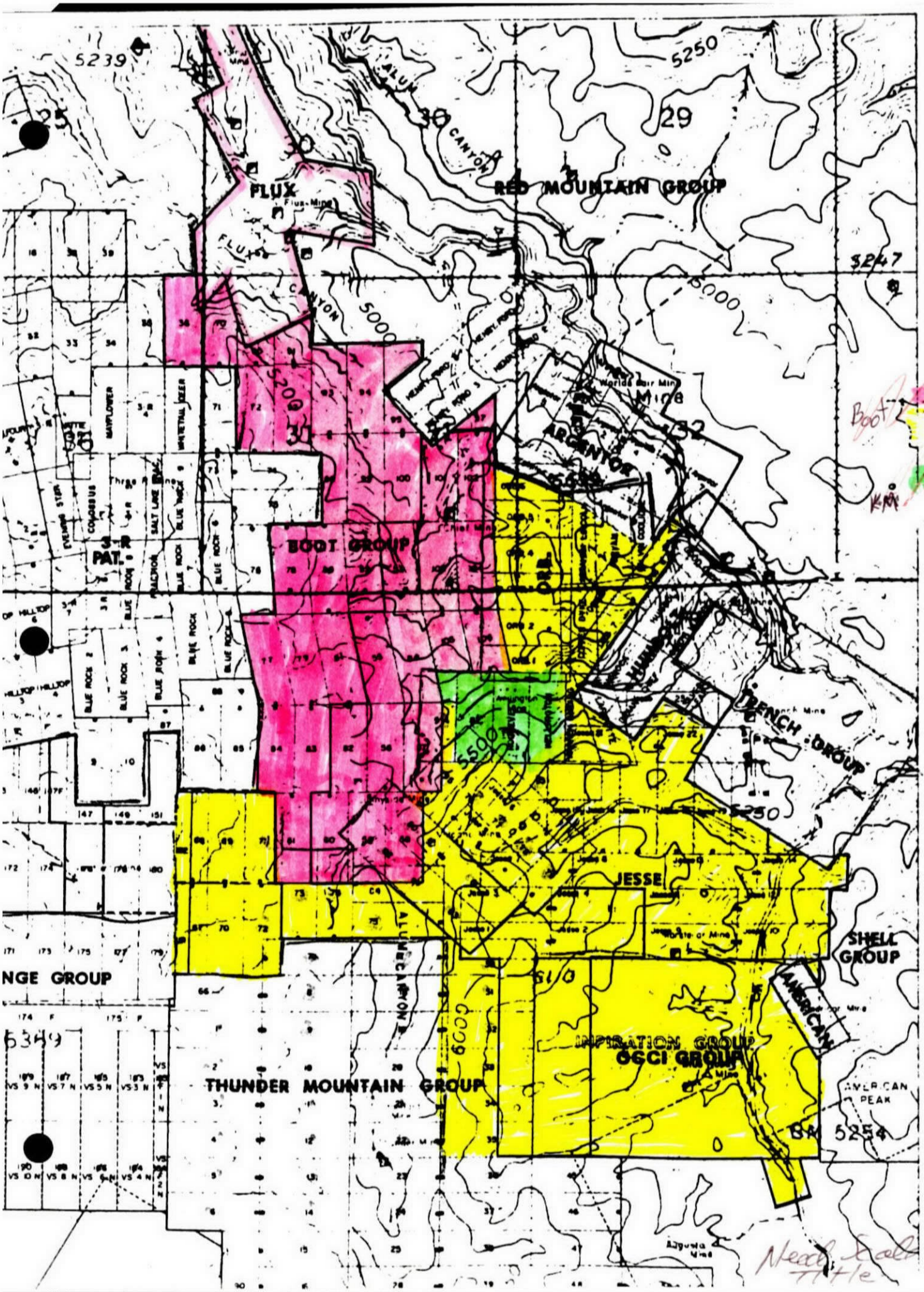
2. Superior East
$22,000

3. Make quadrupelly
fully known to
all ever time
we onemen

4. TM Holmberg
FTG doesn't like :

5. Why outline charge on TM-TR ?
document !

TR-10	STARTED	8-17-72	COMPLETED	8-9-74
TR-14	STARTED	8-11-76	COMPLETED	12-11-76
TR-15	STARTED	1-4-77	COMPLETED	3-22-77


5239
5250
29
30
25
ALUM CANYON
RED MOUNTAIN GROUP
FLUX
Flux Mine
FLUX CANYON
5000
5247
5200
31
32
World Fair Mine
ARGENTINE
BOOT GROUP
PAT.
MAYFLOWER
MINERAL DEER
EVERING STAR
CONGRESS
SALT LAKE
BLUE ROCK
FRACTION
HILLTOP
5500
TRENCH GROUP
JESSE
SHELL GROUP
AMERICAN
ALUM CANYON
5100
INSPIRATION GROUP
OCCI GROUP
THUNDER MOUNTAIN GROUP
NGE GROUP
5349
5254
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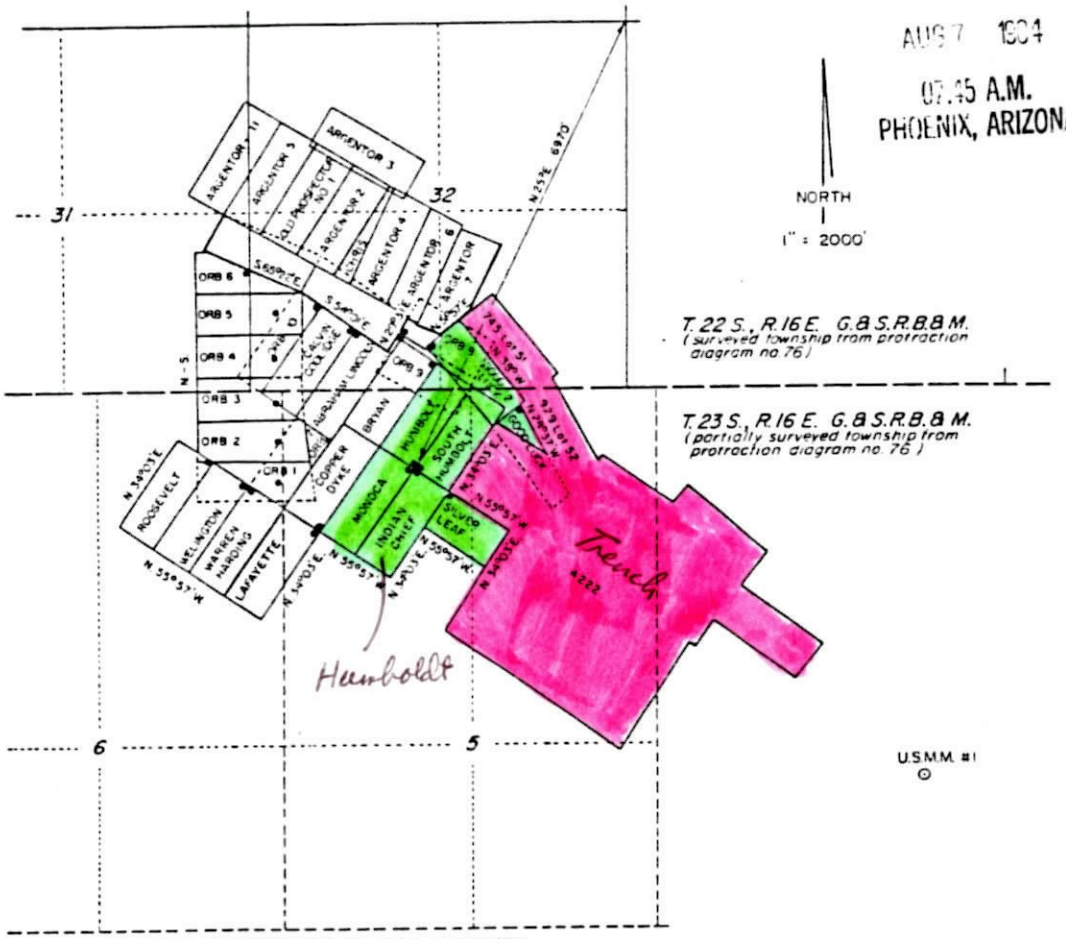

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mn 5130 zz dom

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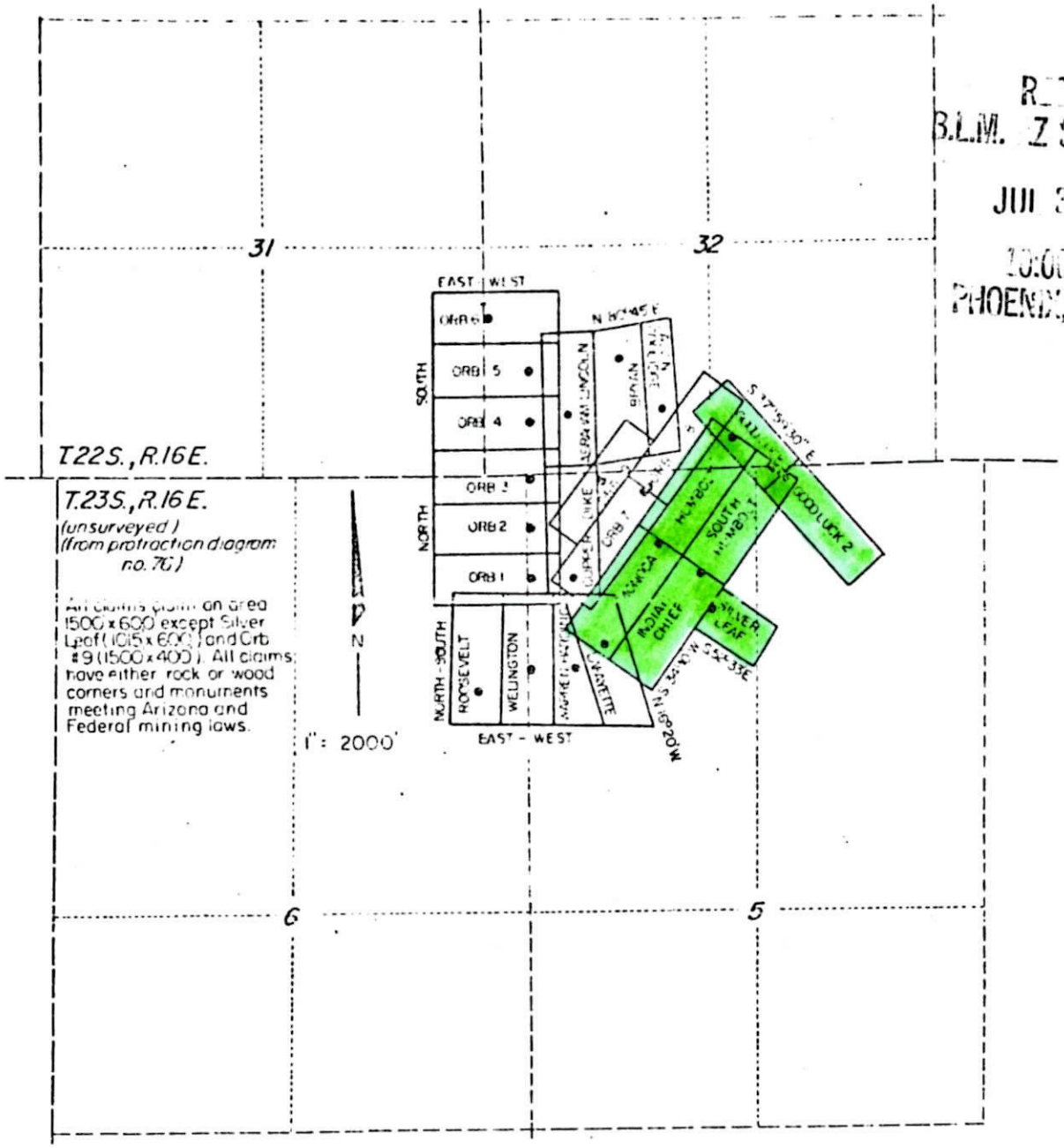

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WELINGTON	" " " " / 2-14-08		

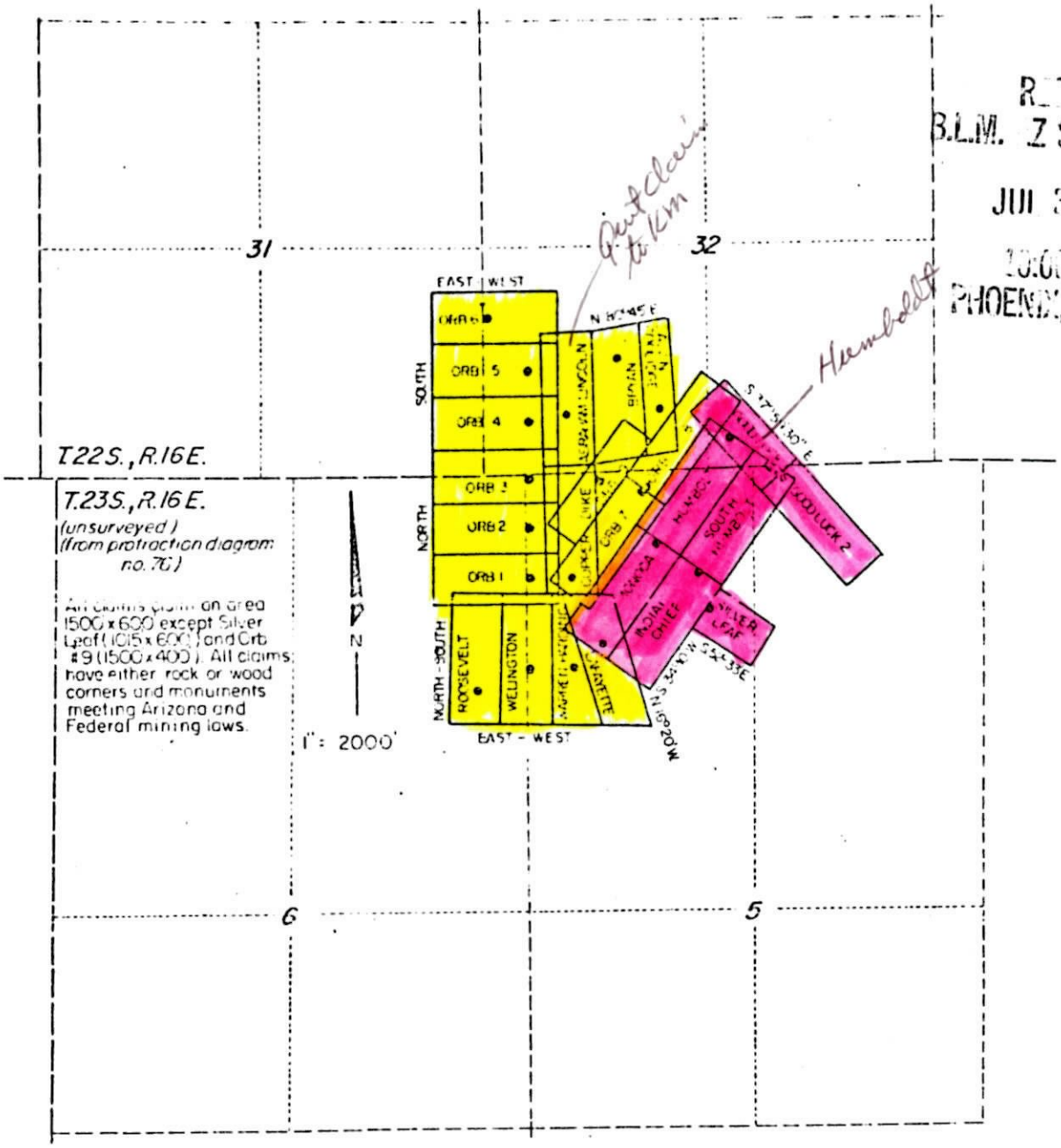
OWNER
Rito Sheehy
649 Morley Ave.
Nogales, Az
Kerr-McGee Corp.
Oklahoma City, Ok
ASARCO Incorporated
PO Box 5747
Tucson, Az 85703

ORB # 1, 2	Kerr-McGee Corp Oklahoma City, Ok	/ 9-27-72	Kerr-McGee Corp. Oklahoma City, Ok
ORB # 3-6	K H Sanchez	/ 11-13-72	ASARCO Incorporated Tucson, Az 85703
ORB # 7-9	"	/ 11-11-72	

LODE CLAIMS IN
SANTA CRUZ CO

ASARCO Incorporated
[illegible] 7th AVENUE
TUCSON, ARIZONA 85703

RECEIVED
B.L.M. ARIZONA STATE OFFICE
JUL 30 1979
10:00 A.M.
PHOENIX, ARIZONA



THE CALVIN COOLIDGE, ABRAHAM LINCOLN, ROOSEVELT, WARREN HARDING, COPPER DIKE, BRYAN, LAFAYETTE, WELINGTON, HUMBOLT, GOOD LUCK, INDIAN CHIEF, SILVER LEAF, SOUTH HUMBOLT, GOOD LUCK NO 2, MONOCA, AND ORB # 1 THRU 9 ARE LOCATED IN SECTION 32 OF TOWNSHIP 22 SOUTH, RANGE 16 EAST AND SECTIONS 5 AND 6 OF TOWNSHIP 23 SOUTH, RANGE 16 EAST.

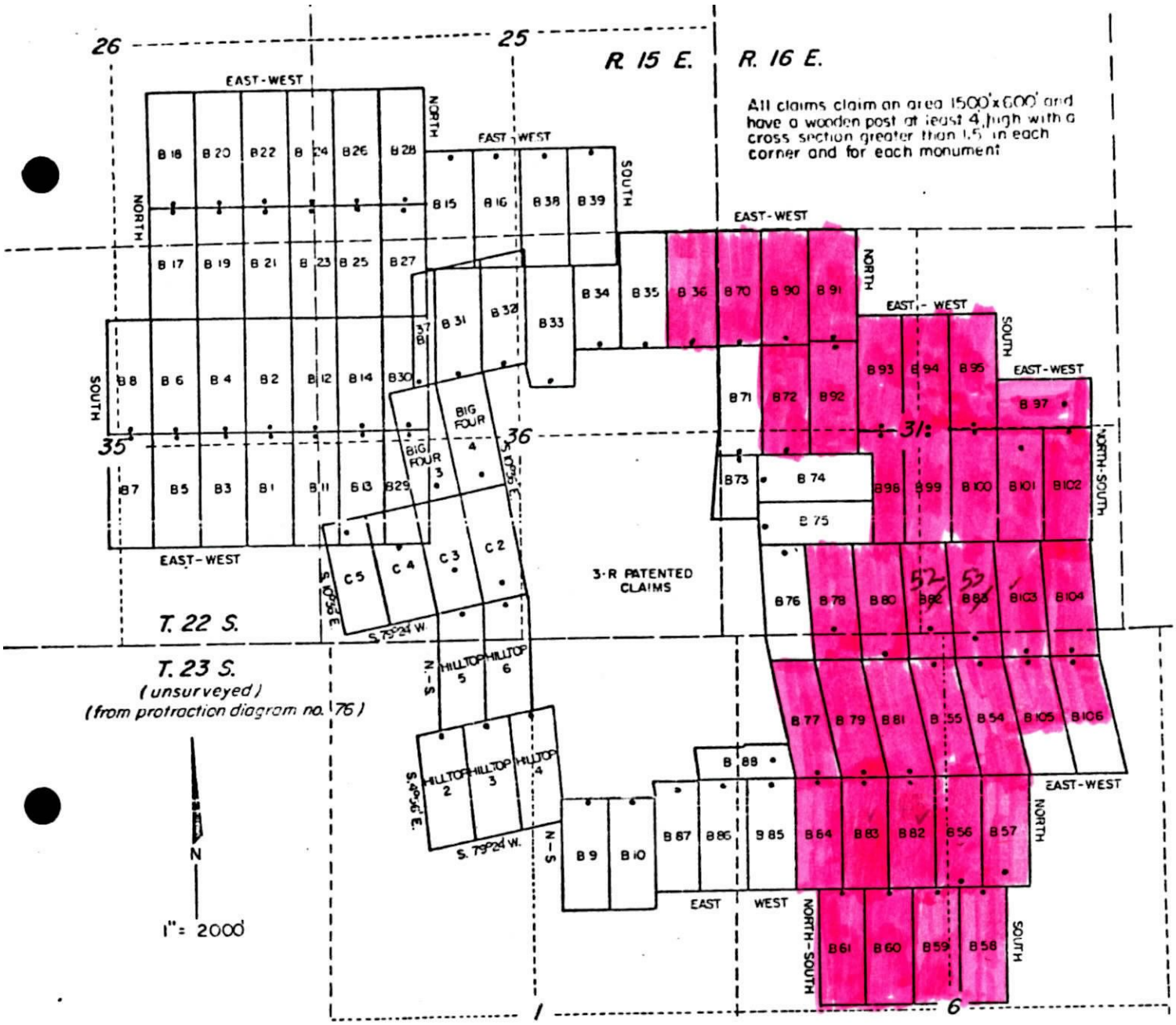
LODE CLAIM	ORIG. LOCATION NOTICE	DATE	LODE CLAIM	AMENDED LOCATION NOTICE	DATE
CALVIN COOLIDGE	J.O'Donnell, N.Shea, K.Sheehy, B.M.Sheehy	7-2-28			
ABRAHAM LINCOLN	E.T.Sheehy, P.J.Sheehy, B.K.Sheehy	5-16-52			
ROOSEVELT	P.J.Sheehy, D.J.Sheehy, E.T.Sheehy	6-21-15			
WARREN HARDING	" " "	10-26-21			
COPPER DIKE	A. O'Donnell	1-1-17			
BRYAN	B.A.Neighbours, P.J.Sheehy, E.T.Sheehy	7-1-09			
LAFAYETTE	B.A.Neighbours, P.J.Sheehy, D.J.Sheehy, E.T.Sheehy	8-5-07			
WELINGTON	" " " "	2-14-08			
ORB # 1, 2	Kerr-McGee Corp Oklahoma City, Ok	9-27-72		Kerr-McGee Corp Oklahoma City, Ok	
ORB # 3-6	K.H.Sandin	11-13-72		ASARCO Incorporated Tucson, Az 85703	
ORB # 7-9	"	11-11-72			

OWNER
Rita Sheehy
649 Morley Ave
Nogales, Az
Kerr-McGee Corp
Oklahoma City, Ok
ASARCO Incorporated
PO Box 5747
Tucson, Az 85703

LODE CLAIMS IN
SANTA CRUZ CO

ASARCO Incorporated
[illegible] 7th AVENUE
TUCSON, ARIZONA 85703

1-K	May 23, 1983	Quit Claim	6 claims
1-K	June 13, 1983	" "	6 claim
1-K & 1-H	Aug ust 5, 1987	" "	Lease No 24. (4th Amend)
1-G	Oct 20, 1980 (assessment maps)		



THE BIG FOUR, COLOSSUS, HILLTOP, AND BOOT CLAIMS LOCATED IN SECTIONS 25,26,35,36 OF T. 22 S., R. 15 E.; 31 OF T. 22 S., R. 16 E.; SECTION 1 OF T. 23 S., R. 15 E. AND SECTION 6 OF T. 23 S., R. 16 E.

LODE CLAIM	ORIG. LOCATION NOTICE/DATE		LODE CLAIM	AMENDED LOCATION NOTICE/DATE
BIG FOUR NO. 3 & 4	Douglas Gray, H. J. Gray and Frederick Olsen/	3-22-07	BOOT NO 78 & 80	G.A. Barber for The Anaconda Company/ 12-29-64
COLOSSUS NO. 2-5	address unknown	/3-21-07		P.O. Box 11309
HILLTOP NO. 2-6	H.J. Gray and Frederick Olsen	/8-5-07		Tucson, Az 85706
	address unknown			
BOOT NO 1-8	G.A. Barber for The Anaconda Company	/12-19-62		
BOOT NO 9 & 10	P.O. Box 11309	/1-2-63		
BOOT NO. 11-14	Tucson, Az 85706	/12-20-62		
BOOT NO 15 & 16		/1-5-63		
BOOT NO. 17-26		/12-21-62		
BOOT NO 27-30		/12-22-62		
BOOT NO 31		/12-26-62		
BOOT NO. 32 & 33		/12-22-62		
BOOT NO 34 & 35		/12-23-62		
BOOT NO. 36 & 37		/12-26-62		
BOOT NO. 38 & 39		/1-5-63		
BOOT NO 52 & 54		/2-12-65		
BOOT NO. 55		/2-19-65		
BOOT NO. 56-58		/2-17-65		
BOOT NO 59-61		/2-18-65		
BOOT NO 70-88		/12-29-64		
BOOT NO. 90-95	M.F. Thompson / The Anaconda Co.	/8-9-67		
BOOT NO 98-100	P.O. Box 11309	/8-9-67		
BOOT NO 102-106	Tucson, Az 85706	/8-10-67		
BOOT NO 97 & 101	P.H. Pickard / The Anaconda Company			
	P.O. Box 11309			
	Tucson, Az 85706			

OWNER
ASARCO Incorporated
P.O. Box 5747
Tucson, Az 85703
and
The Anaconda Company
P.O. Box 11309
Tucson, Az 85706

LODE CLAIMS IN SANTA CRUZ CO.

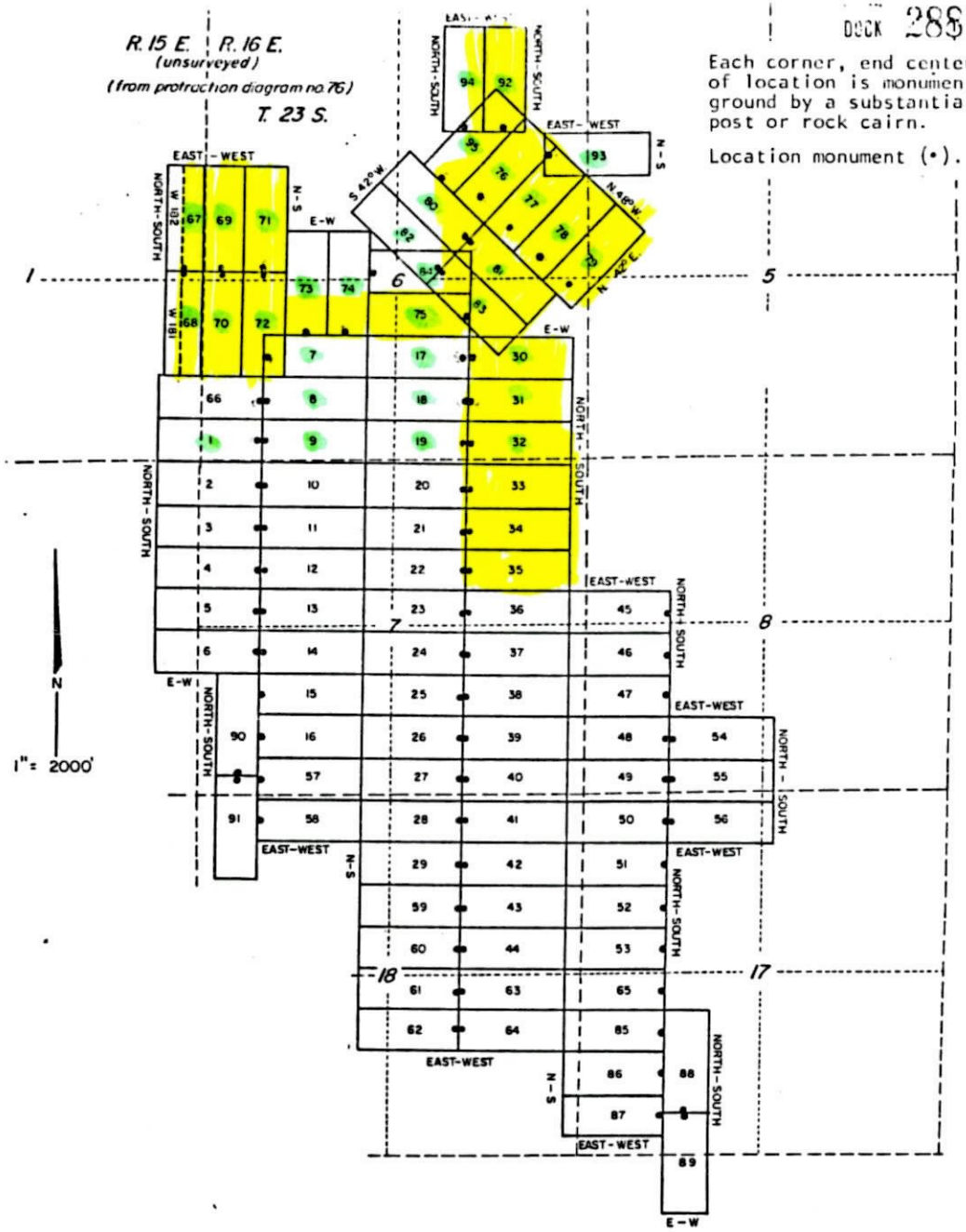
ASARCO Incorporated
1150 NORTH 7TH AVENUE
TUCSON, ARIZONA 85703

mn 5130 o

dam

Each corner, end center & point of location is monumented on the ground by a substantial wooden post or rock cairn.

Location monument (•).



OWNER: ASARCO INCORPORATED
P. O. BOX 5747
TUCSON, AZ 85703

AND

KERR MCGEE CORPORATION
P. O. BOX 25861
OKLAHOMA CITY, OK 73125

SECTION 6, T23S, R16E SANTA CRUZ COUNTY, AZ, G&SRB&M

LODE CLAIM	RECORDED BOOK	RECORDED PAGES	BLM A MC SERIAL NO.
TM 1	042	120	32905
TM 7-9	"	126-128	32911-32913
TM 17-19	"	136-138	32921-32923
TM 30-32	"	149-151	32934-32936
TM 69-84	060	92-107	32973-32988
TM 92-94	061	57-59	32996-32998
TM 95	066	457	32999

AMENDED RECORDING -- ORIGINAL NOTICE POSTED IN OFFICIAL RECORDS OF SANTA CRUZ COUNTY, ARIZONA, IN DOCKET 283, PAGES 522-527.

ASARCO INCORPORATED

BY R. B. Crist

STATE OF ARIZONA)
) SS
COUNTY OF PIMA)

THE FOREGOING INSTRUMENT WAS ACKNOWLEDGED BEFORE ME THIS 20th DAY OF October, 1980, BY R. B. CRIST.

Mildred C. Cain

MY COMMISSION EXPIRES:

Senior [redacted]

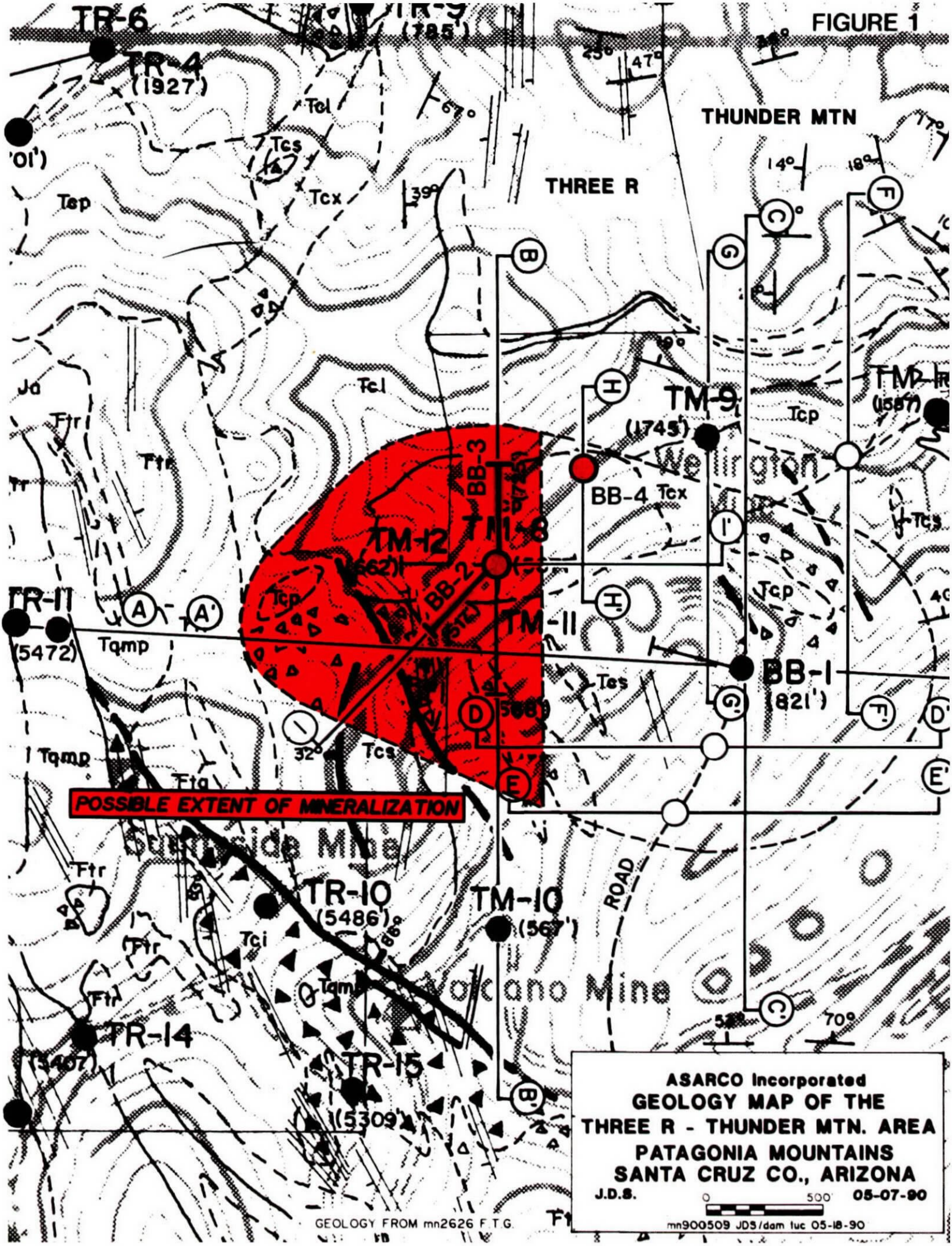
Jr. [redacted]

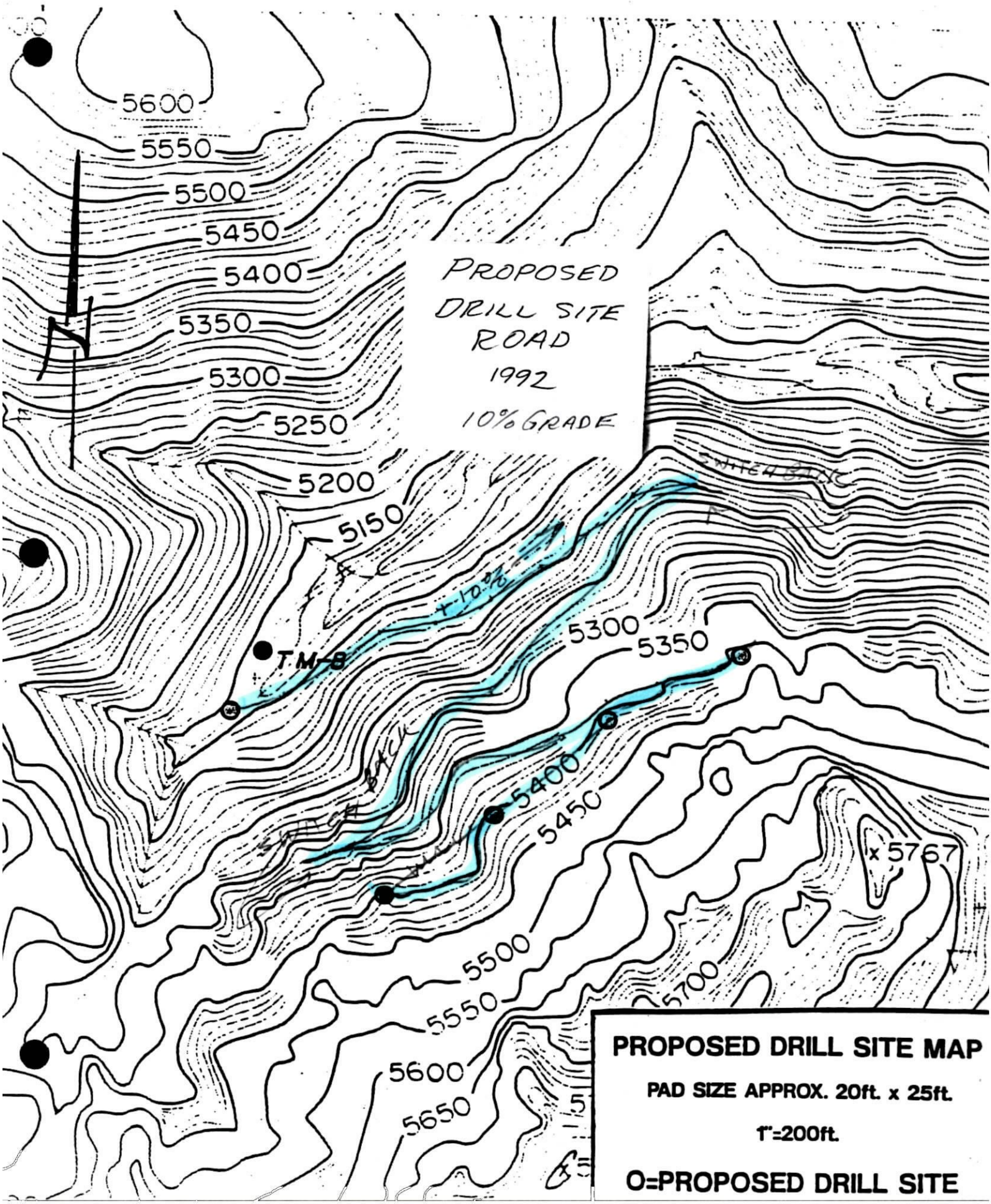
Original Locations

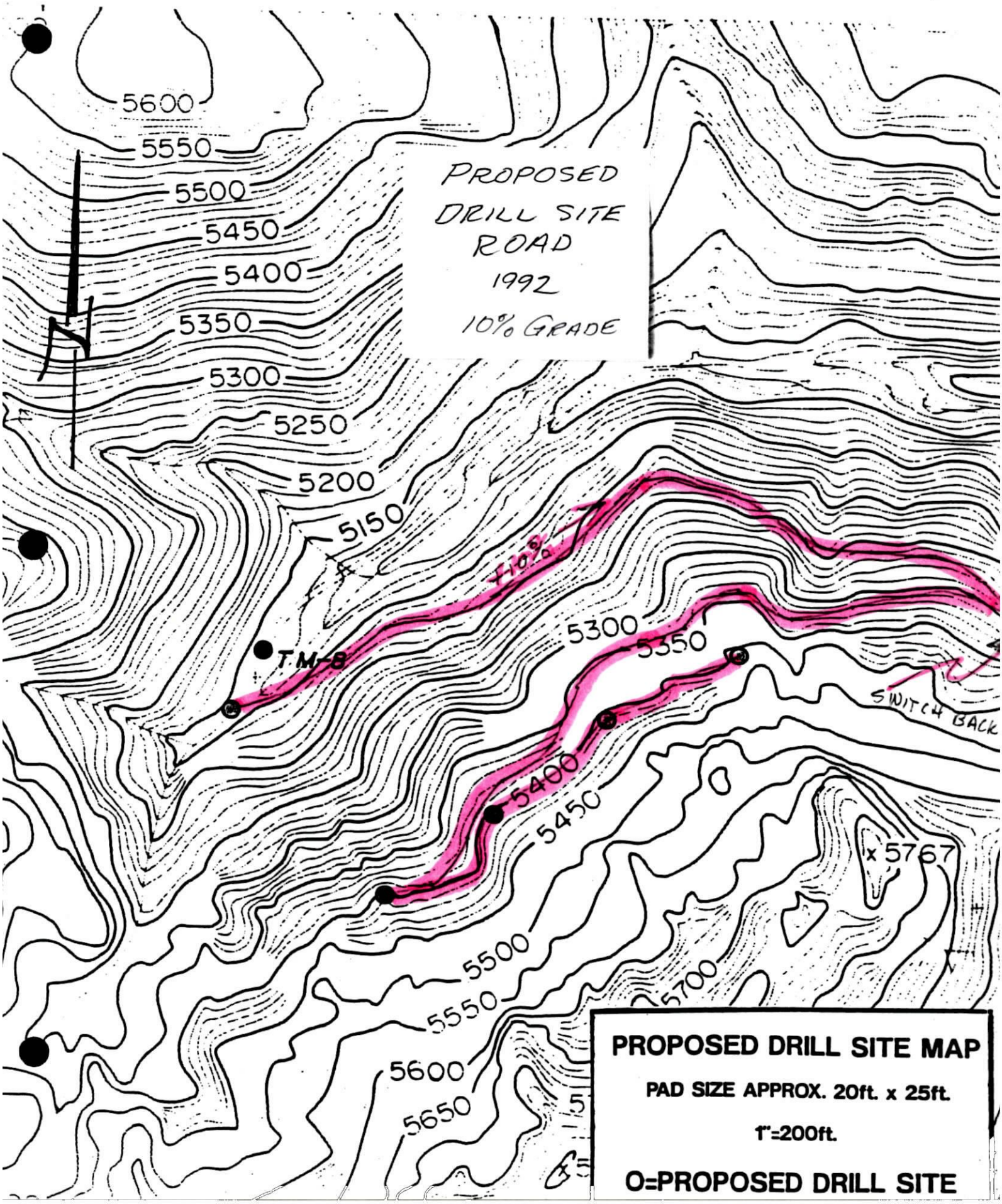
TM-67	22 Feb '65
68	"
69	"
70	"
71	"
72	"
73	"
74	"
75	"
76	"
77	"
78	"
79	"
80	29 March '65
81	"
82	"
83	"
84	2 April '65
92	12 May '65
93	"
94	4 June '65
95	14 December '65

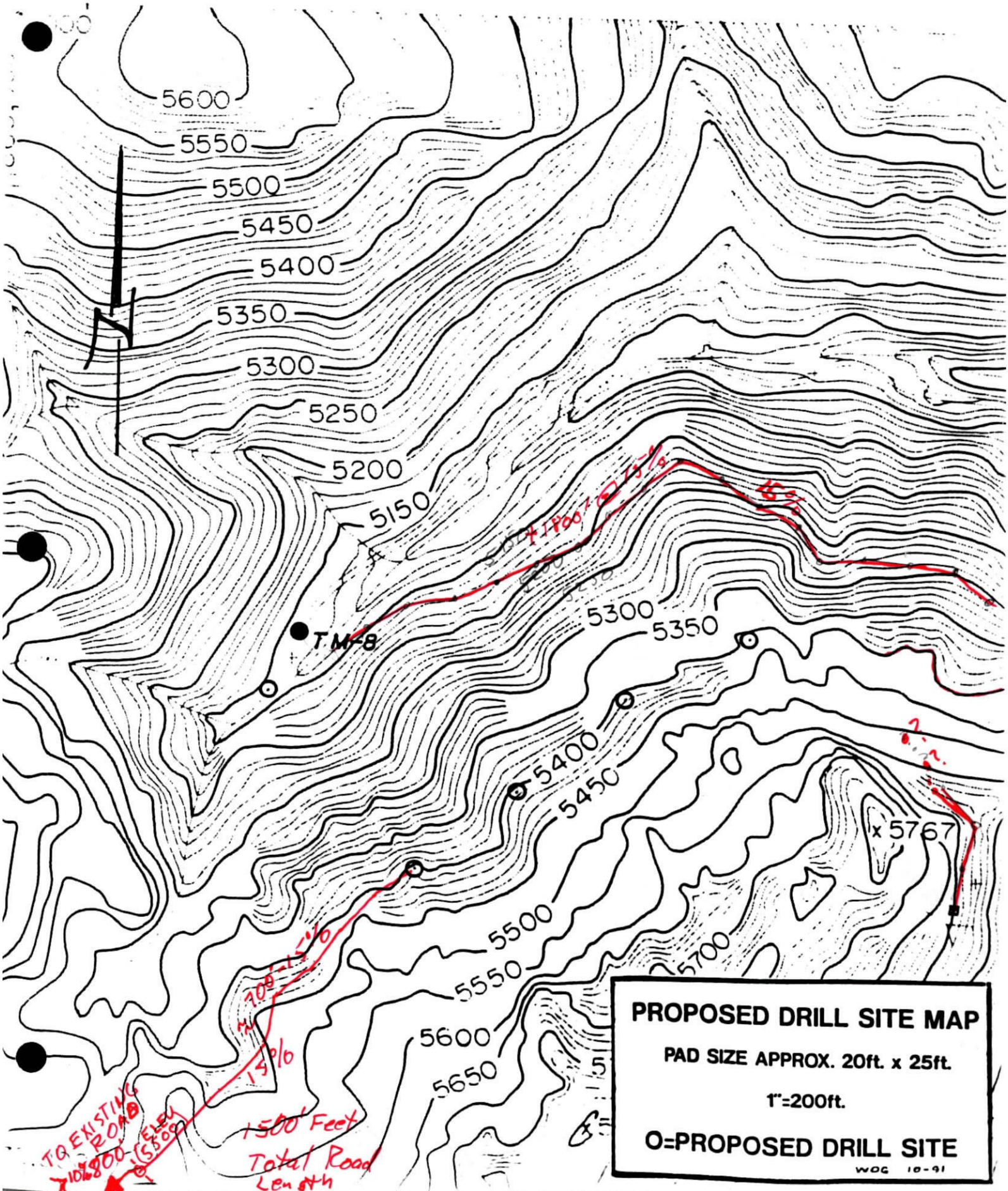
Boat 54	2-12-65
55	2-19-65
56	2-17-65
57	2-17-65
* 76	12-29-64
77	12-29-64
78	12-29-64
79	12-29-64
80	12-29-64
81	12-29-64
82	12-29-64
83	12-29-64
84	12-29-64
85	12-29-64
97	Aug 14, 67
* 58	2-17-65
59	2-18-65
60	2-18-65
61	2-18-65
100	9-Aug 67
101	14 Aug 67
102	10 Aug 67
103	"
104	"
* 105	"
* 106	10 Aug 67
70-75	29 Dec '64

FIGURE 1


TR-6
TR-4
(1927')
TR-9
(785')
THUNDER MTN
THREE R
Tcl
Tcs
Tcx
Tcp
Ja
Ftr
Tqmp
Tqa
Tci
TM-9
(1745')
BB-4
BB-3
BB-2
TM-12
TM-8
TM-11
BB-1
(821')
TR-11
(5472)
TR-10
(5486')
TM-10
(567')
TR-14
(5407)
TR-15
(5309')
POSSIBLE EXTENT OF MINERALIZATION
Sunnyside Mine
Volcano Mine
ROAD
ASARCO Incorporated
GEOLOGY MAP OF THE
THREE R - THUNDER MTN. AREA
PATAGONIA MOUNTAINS
SANTA CRUZ CO., ARIZONA
J.D.S.
0
500
05-07-90
mn900509 JDS/dam luc 05-18-90
GEOLOGY FROM mn2626 F.T.G.


5600
5550
5500
5450
5400
5350
5300
5250
5200
5150
PROPOSED
DRILL SITE
ROAD
1992
10% GRADE
SWITCH BACK
+10%
TM-8
5300
5350
5400
5450
x 5767
5500
5550
5600
5650
5700
PROPOSED DRILL SITE MAP
PAD SIZE APPROX. 20ft. x 25ft.
1"=200ft.
O=PROPOSED DRILL SITE


PROPOSED
DRILL SITE
ROAD
1992
10% GRADE
5600
5550
5500
5450
5400
5350
5300
5250
5200
5150
10%
TM-8
5300
5350
SWITCH BACK
5400
5450
x 5767
5500
5550
5700
5600
5650
PROPOSED DRILL SITE MAP
PAD SIZE APPROX. 20ft. x 25ft.
1"=200ft.
O=PROPOSED DRILL SITE


5600
5550
5500
5450
5400
5350
5300
5250
5200
5150
T.M.-8
5300
5350
5400
5450
x 5767
5500
5550
5600
5650
5700
PROPOSED DRILL SITE MAP
PAD SIZE APPROX. 20ft. x 25ft.
1"=200ft.
O=PROPOSED DRILL SITE
WOG 10-91
TO EXISTING ROAD
1500' Feet
Total Road Length

TAB

Assays

LOGGING NOTES:

1.) ore minerals: gives % Cu (or Zn) in each mineral, estimated assay not available; left blank where no ore min

2.) gangue minerals: vol. % present; only alteration minerals logged

3.) sulfide veins: number present, range of dips.

TM-8

DEPTH from	DEPTH to	DEPTH int'vl	% CORE RECOV.		ASSAY % Cu			% MoS_2	oz Au	oz Ag	ORE chalcocite	ORE covellite	
NC → 0	10	10	–		–	–	–	–	–	–	–	–	
	20	all 10' except EOH	above 90% except where noted		.04						.03	.01	
	30				.01							.01	
	40				.01							.01	
	50				.01							.01	
	60				.01							.01	
	70				.01							.01	
	80				.01							.01	
	90				.02							.02	
90	100				.01			.002	.013	.20		.01	
	110				.01							.01	
	120				.02							.02	
	130				.03							.03	
130	140				.20			composite 100-200'			.03	.17	
	150				.59				.004	.21	.09	.50	
	160				.37						.07	.30	
	170				.99	70'	80'				.19	.80	
	180				.69	@	@				.09	.60	
	190				.51	0.58	0.53				.11	.40	
190	200				.42			.001	.010	.14	.12	.30	
	210				.47						.07	.40	
	220				.25						.05	.20	
	230				.23						.03	.20	
	240				.26						.06	.20	
	250				.14			composite 200-300'			.04	.10	
	260				.08				.003	.12	.04	.04	
	270				.12						.02	.10	
	280				.09						.04	.05	
	290				.24	160'					.04	.20	
290	300			340'	.27	@		.001	.008	.07	.07	.20	
	310			@	.58	0.25					.08	.50	
	320			0.46 Cu	.49						.09	.40	
	330				.14						.04	.10	
	340			0.005 Au	.43			composite 300-400'			.03	.40	
	350			0.23 Ag	.36				.008	.28	.06	.30	
	360				.23						.03	.20	
	370				.15						.05	.10	
370	380				.61						.11	.50	
	390				1.02						.07	.95	
390	400				.38	110'	170'	.0003	.007	.25	.08	.30	
	410				.70	@	@				.05	.65	
	420				.56	0.68	0.55				.06	.50	
	430				.77						.07	.70	

TM-8

DEPTH from	DEPTH to	DEPTH int'vl	% CORE RECOV.		ASSAY % Cu			ASSAY % MoS_2	ASSAY oz. Au	ASSAY oz. Ag	ORE chalcocite	ORE covellite		
430	440	10			1.22						.22	1.00		
	450				.27			composite 400-500'			.02	.25		
	460				.88				.003	.31	.03	.85		
	470		100		.45						.05	.40		
	480		60		.62						.02	.60		
	490		20		.27							.27		
490	500		95		.37			.007	.008	.18		.37		
	510				.07							.07		
	520		130-540: 17.70/41		.23							.23		
	530		=410 @ 0.43 Cu		.77						.07	.70		
	540		0.27 Ag oz		.21							.21		
	550				.02							.02		
	560				.07							.07		
	570				.15							.15		
	580				.09							.09		
	590				.03							.03		
590	600				.12			.001	.006	.25		.12		
	610											tr		
	620											tr		
	630											tr		
	640											tr		
	650											tr		
	660										tr	tr		
	670											tr		
	680											tr		
	690											tr		
690	700				.06			.001	.004	.21		.06		
	710											tr		
	720											tr		
	730											tr		
	740											tr		
	750											tr		
	760											tr		
	770											tr		
	780											tr		
	790											tr		
790	800				.03			.001	.005	.05		.03		
	810											tr		
	820											tr		
	830											tr		
	840											tr		
	850											tr		

LOGGING NOTES:

1) ore minerals: gives % Cu in each mineral, estimated where assay not available; left blank where no ore minerals seen

2) gangue minerals: vol. % present, only alteration minerals were logged

3) sulfide veins: number present, range of dips

TM-9

	DEPTH from	DEPTH to	int'vl	% CORE RECOV.		ASSAY % Cu			ppm Mo	oz. Au	oz. Ag	ORE covellite	chalcocite		enargite		MIN molybdenite
NX →	0	10	10	—													
	10	20		+90		.04						.03	.01				
		30				.07							.07				
		40				.11							.11				
		50				.03											
		60				.02											
		70				.02											
		80				.04							.04				
		90				.02							.02				
	90	100				.01	20-100':		9		.10						
		110				.01											
		120				.02											
		130				.02											
		140				.12							.12				
		150				.15							.15				
		160				.08							.08				
		170				.08							.08				
		180				.07							.07		tr(?)		
		190				.06							.06				
	190	200				.05	100-200':		10	.001	.06		.05				
		210				.03							.03				
		220				.02							.02				
		230				.03							.03				
		240				.03							.03				
		250				.01											
		260				.01											
		270				.01											
		280				.02						10-500=490=					
		290				.21							2.10/49 = 0.04 % Cu				
	290	300				.01	200-300':		13	tr	.01						
		310				.01											
		320				.01											tr
		330				.01											
		340				.01						10-430=420=					
		350				.01							1.49 /42 = 0.04				
		360	35			.03											
		370				.04											
		380				.06											
		390				.02											
	390	400				.02	300-400':		20	.002	.09						
		410				.04											
		420				.02											
		430				.01											

290-280 = 10
1.39/10 = 0.05

350-330 = 20
0.71/20 = 0.03

TM-9

DEPTH from	DEPTH to	int'vl	% CORE RECOV.		% Cu			ppm Mo	oz. Au	oz. Ag	ORE covellite	chalcocite	chalcopyrite	enargite		MIN molybdenite
430	440	10			.05						.05					
	450				.08						.08					
	460				.03											tr
	470				.13											
	480				.06											
	490				.03											
490	500				.03	400-500':		20	.002	.11						
500	510				.09						.07		.02			
	520				.13						.13					
	530				.08						.08					
	540				.11	60' = 0.97/8 = 0.12% Cu					.07		.04			
	550				.12						.12					
	560				.19						.19					
	570				.14						.14					
	580				.11						.10		.01			
	590				.08						.07		.01			
590	600				.04	500-600':		40	.002	.19						
	610				.02											tr
	620				.03	500-640 = 140 = 1.27/14 =							.03			
	630				.05				0.09		.05					
	640				.08						.08					
640	650				.12						.12					
	660				.06						.04		.02			tr
	670				.10						.07		.03			tr
	680				.08						.08					tr
	690				.12						.11		.01			
690	700				.13	600-700':		62	.003	.15	.13					
	710				.84	640-710 = 130'					.80		.04			
	720				.25	130' = 2.20/13 = 0.17					.25					
	730				.03						.03					
	740				.13						.13					
	750				.15						.15					
	760				.09											
	770				.10											
770	780				.06	770-900 = 130' = 1.19/13 = 0.09										
	790				.04								.04			
790	800		70		.04	700-800':		17	.001	.18						
	810				.07						.07					tr
810	820				.11						.10		.01			
	830				.01						.01					
	840				.16	90' = 0.98 = 0.11					.15		.01			
	850				.19						.19					
	860				.09											

500-900 = 400' = 44.6/40 = ~~0.1466~~ 0.12

wt% 0.77/5 = 0.15 Cu

0.12 Cu

440 = 210'

1.68/21 = 0.08

.77

5.57/14

TM-9

DEPTH from	DEPTH to	DEPTH int'vl	% CORE RECOV.		% Cu	ASSAY		ppm Mo	oz Au	oz. Ag	ORE covellite	black sulfide(?)	chalcopyrite	enargite		MINE molybdenite
860	870	10			.14						.14					
	880				.15						.15					
	890				.02											
890	900				.11	800-900':		28	.001	.14	.10		.01			
	910				.01											tr
	920				.06						.06					tr
	930				.01											tr
	940				.07								.07			tr
	950				.05											tr
	960				.05								.05			
	970				.01											
	980				.07											
	990				.06											
990	1000				.03	900-1000':		44	.001	.05						
	1010				.08						.04		.04			
	1020				.04						.04					
	1030				.07						.07					
	1040				.02											
	1050				.01											
	1060				.01											tr
	1070				tr											
	1080				.01											
	1090				.01						.01					
1090	1100				.01	1000-1100':		36	tr	.09						
	1110				tr											
	1120				.01											
	1130				.01											
	1140				.01											
	1150				.01											
	1160				.01											
	1170				.01											
	1180				.01											tr
	1190				.01											
1190	1200				.01	1100-1200'		16		.02						
	1210				.01											
	1220				.01											
	1230				.01											
	1240				.01							.01				
	1250				tr							tr				
	1260				.01							.01				
	1270		60		tr											
	1280				tr											
	1290				.01											

Phone 889-5787

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85714

SAMPLE SUBMITTED BY ASARCO, INC. DATE Feb. 14, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
TM-11 5-10			0.01					
10-20			0.04				5-40=35=	0.21/4=0.05%
20-30			0.03					
30-40			0.13					
40-50		See back	0.59	0.09	0.21	.0004		
50-60			0.41					
60-70			0.31					
70-80			0.51					
80-90			0.70					
90-100			0.47	0.12	0.42	.0002		
100-110			0.41				40-180=140=6.84/14=0.49	
110-120			0.62					
123-130			0.51					
130-140			0.52		40-630=590=19.17/59=0.32%			
140-150			0.54		40-630=0.35 oz opt Ag			
150-160			0.26					
160-170			0.42					
170-180			0.57					
180-190			0.28					
190-200			0.14	0.03	0.10	.0003	180-600=	420=11.03/42= =0.26%
200-210			0.21				~~180-630=450=12.33/45=~~	~~0.27%~~
210-220			0.32					
220-230	210-270=60' =2.36/6=0.39%		0.33	0.05	0.17	.0004		
230-240			0.52					
240-250			0.26					

CHARGES $ 108.75

INVOICE NO. 15630

REGISTERED ASSAYER Arizona U.S.A. 2/14/78

ASSAYER - CHEMIST

Phone 889-5787

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS · CHEMISTS · METALLURGISTS

TUCSON, ARIZONA 85714

SAMPLE SUBMITTED BY ASARCO, INC.

DATE Feb. 14, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
TM-11 250-260			0.59					
260-270			0.34					
270-280			0.26					
280-290			0.28			m)	180-410=230=7.40 /23 = 0.32	
290-300			0.34	0.05	0.02	.0007		
300-310			0.20					
310-320			0.19					
320-330			0.21					
330-340			0.11					
340-350			0.28					
350-360			0.12					
360-370			0.50	0.09	0.28	.0004		
370-380		30'=1.87/3=0.62%	0.62					
380-390			0.75					
390-400			0.25	0.05	0.11	.0024		
400-410			0.30					
410-420			0.11					
420-430			0.21			h)	410-630=220=4.93 /22= = 0.22	
430-440			0.20					
440-450			0.19					
450-460			0.15			t)	40-630=590=19.17/59= = 0.32	
460-470			0.26					
470-480			0.37					
480-490			0.19					
490-500			0.17	0.04	0.03	.0010		

CHARGES $ 108.75

INVOICE NO. 15630

REGISTERED ASSAYER CERTIFICATE NO. 1283 STATE OF ARIZONA Date Signed 2/14/78 Arizona U. S. A.

ASSAYER · CHEMIST

Phone 889-5787

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS · CHEMISTS · METALLURGISTS

TUCSON, ARIZONA 85714

SAMPLE SUBMITTED BY ASARCO, INC. DATE Feb. 14, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
TM-11 500-510			0.29					
510-520			0.21					
520-530			0.19					
530-540			0.31					
540-550			0.16					
550-560			0.10					
560-570			0.09					
570-580			0.05	0.21	0.56	.0005		
580-590			0.18					
590-600			0.20	0.04	0.05	.0006		
600-610			0.32					
610-620	600-630=		0.47					
620-630	30=1.30/3=0.43		0.51	40-630=	1717			
630-640			0.02					
640-650			0.01					
650-660			0.04					
660-668			0.02	0.07	0.02	.0070		

CHARGES $ 76.75

INVOICE NO. 15630

REGISTERED ASSAYER ARIZONA U. S. A.

2/19/78

ASSAYER - CHEMIST

Phone 889-5787

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85714

SAMPLE SUBMITTED BY ASARCO, INC. DATE Feb. 20, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
TM-11								
40-50	.003	0.40						
90-100	.001	0.26						
190-200	.002	0.27						
220-230	.001	0.31	3.46 /10 =	0.35 oz Ag				
290-300	.003	0.27						
360-370	.002	1.39						
390-400	.003	0.07						
490-500	.001	0.10	71297					
570-580	.002	0.20						
590-600	.002	0.19						
660-668	.001	0.03						

CHARGES $ 52.25

INVOICE NO. 15652

REGISTERED ASSAYER CERTIFICATE NO. 8F2 PETE S. DORES Date Signed 2/20/78 Arizona U.S.A.

ASSAYER-CHEMIST

Phone 889-5787

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS · CHEMISTS · METALLURGISTS

TUCSON, ARIZONA 85714

SAMPLE SUBMITTED BY ASARCO, INC. DATE March 7, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
TM-12 5-10			0.03					
10-20			0.18					
20-30			0.18				10-600 =	590 =
30-40			0.51				14.33/59	= 0.24% Cu
40-50			0.49				with	
50-60			0.70				10-100=90' =	3.709 = 0.41%
60-70			0.95				100-220=120 =	1.02/12 = 0.085
70-80			0.28			457/26 = 0.18	220-250=30' =	1.26/3 = 0.42
80-90			0.14				250-360=110 =	22.9/11 = 0.21
90-100	.002	0.21	0.27	0.05	0.08	.0008	360-600=240 =	6.06/24 = 0.25
								14.33/59 = 0.24
100-110			0.07					
110-120			0.17				Ag 10-600 = 590'	
120-130	Trace	0.05	0.11	0.28	0.46	.0004	a 2.62/11 = 0.24 oz Ag	
130-140			0.10					
140-150			0.07					
150-160			0.05					
160-170			0.16					
170-180			0.08					
180-190			0.04					
190-200	.003	0.34	0.09	0.04	0.19	.0005		
200-210			0.04					
210-220			0.04					
220-230			0.58					
230-240			0.18					
240-250			0.50					

CHARGES $ 113.00

INVOICE NO. 15666

REGISTERED ASSAYER CERTIFICATE NO. 8-152 PETE S. TORRES Date Signed 3-7-78 Arizona U. S. A.

ASSAYER-CHEMIST

Phone 889-5787

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS · CHEMISTS · METALLURGISTS

TUCSON, ARIZONA 85714

SAMPLE SUBMITTED BY ASARCO, INC. DATE March 7, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
TM-12 250-260			0.12					
260-270			0.07					
270-280	Trace	0.02	0.21	0.07	0.12	.0005		
280-290			0.38					
290-300	.001	0.19	0.27	0.03	0.09	.0007		
300-310			0.24					
310-320			0.08					
320-330			0.21					
330-340			0.45					
340-350			0.10					
350-360	Trace	0.03	0.16	0.07	0.25	.0005		
360-370			0.23					
370-380			0.87					
380-390			0.26					
390-400	.003	0.21	0.13	0.08	0.12	.0037		
400-410			0.13					
410-420	.004	0.78	0.30	0.16	0.39	.0024		
420-430			0.06					
430-440			0.37					
440-450			0.41					
450-460			0.38					
460-470			0.31					
470-480			0.32					
480-490			0.20					
490-500			0.36					

CHARGES $ 142.50

INVOICE NO. 15666

REGISTERED ASSAYER CERTIFICATE NO. 1 PETE S. FLORES Date Signed 3/7/78 Arizona U. S. A.

Pete S. Flores

ASSAYER · CHEMIST

3441 East Milber

Phone 889-5787

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85714

SAMPLE SUBMITTED BY ASARCO, INC.

DATE March 7, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON
TM-12 500-510	.006	0.51	0.28	0.08	0.14	.0020	
510-520			0.07				
520-530	Trace	0.02	0.29	0.05	0.42	.0037	
530-540			0.19				
540-550			0.22				
550-560			0.17				
560-570			0.29				
580-590			0.11				
590-600	.003	0.26	0.11	0.05	0.08	.0045	
600-610			0.02				
610-620			0.03				

CHARGES $ 74.50

INVOICE NO. 15666

REGISTERED ASSAYER CERTIFICATE NO. PETE S. FLORES Date Signed 3/7/78 Arizona U. S. A.

ASSAYER-CHEMIST

3441 East Milber

Phone 889-5787

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS · CHEMISTS · METALLURGISTS

TUCSON, ARIZONA 85714

SAMPLE SUBMITTED BY ASARCO, INC.

DATE March 7, 1978

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PPM COPPER	PPM LEAD	PPM ZINC	PPM MOLYBDENUM	PPM As
M-12 270-280							21
500-510							78

REGISTERED ASSAYER CERTIFICATE No. 6632 Peter S. Fischer Date Signed 3/7/78 Arizona U. S. A.

CHARGES $ 7.50

Invoice # 15666

ASSAYER - CHEMIST

Guess I don't know
why we can silver on
all the pups or
copper either for that
matter.

3441 East Milber

Phone (602) 889-5787

Rec'd Jak 16 SEPT 82 Ewe Roy OT

W/K - JDS

AMERICAN ANALYTICAL and METALLURGICAL LABORATORIES, INC.

ASSAYERS - CHEMISTS - METALLURGISTS

Tucson, Arizona 85714

SAMPLE SUBMITTED BY Asarco, Inc.

DATE Sept. 9, 1982

SAMPLE MARKED	GOLD PPM	SILVER PPM	PPM COPPER	PPM LEAD	PPM ZINC	PPM MOLYBDENUM	PPM Arsenic	
TM-14: 21-30	<0.1	1.7	194	52	1700	10	26	
60-70		1.1	76		1960			
70-80		1.3	109		1860			
80-90		1.3	82		1280			
90-100	<0.1	4.0	159	275	+2000 0.41%	10	41	
120-130		4.1	175		+2000 0.34%			
130-140		2.3	140		+2000 0.29%			
190-200	<0.1	1.1	57	54	1560	19	17	
220-230		1.6	143		1500			
230-240		1.9	114		+2000 0.22%			
240-250		3.0	162		+2000 0.26%			
250-260		7.7	1110		+2000 0.35%			
290-300	<0.1	2.1	201	241	1240	16	32	
390-400	<0.1	2.2	203	60	+2000 0.25%	12	3	
490-500	<0.1	1.5	77	30	160	38	9	
550-560		1.0	133		240			
560-570		1.7	518		1540			
590-600	<0.1	1.6	94	18	1090	15	<1	
640-650		1.0	66					
650-660		0.9	73					
690-700	<0.1	0.8	79	18	93	16	88	
720-730		2.6	727					
730-740		2.4	311					
740-750		2.6	166					
750-760		2.6	204					

REGISTERED ASSAYER CERTIFICATE NO. 9072 RICHARD M. ARON DATE 9 1982 Arizona U.S.A.

CHARGES $

INVOICE NO.

ASSAYER-CHEMIST

3441 East Milber

Rec'd 7pm 14 SEPT 82 Eureka, UT

Phone (602) 889-5787

AMERICAN ANALYTICAL and METALLURGICAL LABORATORIES, INC.

ASSAYERS - CHEMISTS - METALLURGISTS

Tucson, Arizona 85714

SAMPLE SUBMITTED BY Asarco, Inc. DATE Sept. 9, 1982

SAMPLE MARKED	GOLD PPM	SILVER PPM	PPM COPPER	PPM LEAD	PPM ZINC	PPM MOLYBDENUM	PPM Arsenic	
TM-14: 760-770		2.0	202					
770-780		2.9	269					
780-790		2.8	259					
790-800	<0.1	6.4	469	35	805	15	9	
800-810		2.6	161					
810-820		3.5	130					
820-830		5.4	146					
830-840		6.0	337					
840-850		2.6	490					
850-860		3.7	270					
860-870		3.7	364					
870-880		2.5	134					
880-890		2.8	285					
890-900	0.32	2.0	58	21	1501	9	3	
900-910		4.8	133					
AV.		2.7	222.		1996			

REGISTERED ASSAYER CERTIFICATE NO. 9012 RICHARD M. KROS DATE SIGNED 9/9/82 Arizona U.S.A.

CHARGES $

INVOICE NO

ASSAYER-CHEMIST

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 393
October 8, 1984
PROJECT NO. EA-0042
SHIPMENT NO. TM-14-1984
TM-14 990-1000

ASARCO INCORPORATED
Attn: Mr. Fleetwood Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 52 Split Drill Core Samples

ITEM	SAMPLE NUMBER	Cu (ppm)	Zn (ppm)	Zn (%)	Ag (ppm)
1	TM-14 990-1000	220.	120.		.2
2	TM-14 1090-1100	200.	75.		.8
3	TM-14 1190-1200	160.	95.		<.2
4	TM-14 1240-1250	220.	275.		.2
5	TM-14 1290-1300	170.	105.		<.2
6	TM-14 1340-1350	85.	100.		.2
7	TM-14 1390-1400	300.	120.		<.2
8	TM-14 1440-1450	100.	230.		.2
9	TM-14 1490-1500	35.	110.		<.2
10	TM-14 1590-1600	280.	1800.		1.0
11	TM-14 1640-1650	45.	200.		.6
12	TM-14 1690-1700	140.	160.		.2
13	TM-14 1790-1800	125.	180.		.2
14	TM-14 1800-1810	280.	2300.		1.8
15	TM-14 1810-1820	140.	2500.		1.6
16	TM-14 1820-1830	185.	2100.		2.4
17	TM-14 1830-1840	280.	1800.		1.6
18	TM-14 1840-1850	460.	500.		.8
19	TM-14 1850-1860	450.	1800.		1.0
20	TM-14 1860-1870	480.	280.		.4
21	TM-14 1870-1880	85.	80.		<.2
22	TM-14 1880-1890	80.	390.		<.2
23	TM-14 1890-1900	80.	65.		<.2
24	TM-14 1940-1950	35.	50.		<.2
25	TM-14 1990-2000	25.	550.		<.2

RECEIVED
OCT 10 1984
EXPLORATION DEPARTMENT

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	Cu (ppm)	Zn (ppm)	Zn (%)	Ag (ppm)
26	TM-14 2040-2050	120.	125.		<.2
27	TM-14 2090-2100	30.	45.		<.2
28	TM-14 2190-2200	360.	1000.		.6
29	TM-14 2240-2250	490.	370.		.4
30	TM-14 2250-2260	450.	>3000.	.32	1.4
31	TM-14 2290-2300	700.	500.		.4
32	TM-14 2340-2350	830.	1000.		1.0
33	TM-14 2390-2400	590.	930.		1.0
34	TM-14 2440-2450	315.	1000.		.8
35	TM-14 2490-2500	200.	185.		<.2
36	TM-14 2590-2600	380.	130.		<.2
37	TM-14 2690-2700	520.	375.		<.2
38	TM-14 2790-2800	415.	200.		<.2
39	TM-14 2840-2850	700.	340.		.6
40	TM-14 2850-2860	220.	670.		.2
41	TM-14 2860-2870	200.	560.		.4
42	TM-14 2870-2880	275.	390.		<.2
43	TM-14 2880-2890	600.	600.		<.2
44	TM-14 2890-2900	335.	700.		.4
45	TM-14 2900-2910	250.	720.		.2
46	TM-14 2910-2920	200.	780.		.2
47	TM-14 2940-2950	1050.	880.		.2
48	TM-14 2980-2990	150.	600.		<.2
49	TM-14 2990-3000	150.	600.		<.2
50	TM-14 3000-3010	390.	600.		<.2
51	TM-14 3010-3020	125.	550.		.2
52	TM-14 3060-3070	280.	600.		.2

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 393
October 8, 1984

ITEM	SAMPLE NUMBER	Pb (ppm)	Au (ppm)	Mo (ppm)
1	TM-14 990-1000	20.	<.02	2.
2	TM-14 1090-1100	40.	<.02	2.
3	TM-14 1190-1200	10.	<.02	2.
5	TM-14 1290-1300	50.	<.02	2.
7	TM-14 1390-1400	50.	<.02	4.
9	TM-14 1490-1500	35.	<.02	4.
10	TM-14 1590-1600	60.	<.02	4.
12	TM-14 1690-1700	40.	<.02	2.
13	TM-14 1790-1800	40.	<.02	4.
23	TM-14 1890-1900	15.	<.02	2.
25	TM-14 1990-2000	20.	<.02	10.
27	TM-14 2090-2100	35.	<.02	2.
28	TM-14 2190-2200	70.	<.02	<2.
31	TM-14 2290-2300	15.	<.02	<2.
33	TM-14 2390-2400	25.	<.02	<2.
35	TM-14 2490-2500	50.	<.02	14.
36	TM-14 2590-2600	95.	<.02	6.
37	TM-14 2690-2700	40.	<.02	2.
38	TM-14 2790-2800	35.	<.02	6.
44	TM-14 2890-2900	50.	<.02	<2.
49	TM-14 2990-3000	85.	<.02	2.
52	TM-14 3060-3070	50.	<.02	4.

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

REGISTERED ASSAYER
CERTIFICATE NO.
9425
WILLIAM L.
LEHMBECK
DATE SIGNED
Arizona

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

ASARCO

Southwestern Exploration Division

November 27, 1985

To: J. D. Sell

From: F. R. Koutz

TM-14 Assays (1985)
Thunder Mt. Project (EA-0042)
Santa Cruz County, AZ

Character assays from 11 ten foot intervals from the 425 feet of deepening of DDH TM-14 from 3075'-3500' in August have been returned. Ranges and means are as follows: Cu: 230-1600 ppm, 695 ppm; Pb: 30-240 ppm, 83 ppm; Zn: 170-1300 ppm, 800 ppm; Au: all <.02 ppm; Ag: 0.6-2.0 ppm, 1.3 ppm. These values in the Laramide Quartz Monzonite Porphyry (earlier than the mineralizing Quartz Feldspar Porphyry) are significantly higher than the values in the section of Quartz Monzonite Porphyry above. This is probably due to the intrusive breccia from 3094-3110' with assorted stronger quartz-sericite-pyrite ± sphlerite alteration/mineralization. The values are also higher (at least for Cu, Pb, Zn) than the section at equivalent depths in DDH TM-13, TCH-2 and TCH-2A although these latter holes were in the lower Hardshell Ignimbrite sequences by this depth.

It is of interest to note that not only is Cu higher in TM-14 but also Cu/Zn and Cu/Pb which would fit with the zoning pattern in the "Sunnyside" mineralized system. The lower TM-14 Ag values than TCH-2/2A fit with this zoning pattern although I hate to compare several ppm AA Ag values with a few tenths opt Ag five values at these low levels. In any case, these results are encouraging for better mineralization at depth in TM-14 and would suggest higher Cu values and relatively lower Pb-Ag values in the expected replacement/skarn deposits in Paleozoic carbonates.

A copy of the assay sheet and this year's drill log are attached for the files as an addendum to the Sept. 23, 1985 operation/geology report on TM-14.

F. R. Koutz

FRK:mek
Att: Assays TAJ 457
Sheets 4 & 5 TM-14 drill log

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 457
November 20, 1985
PROJECT NO. TM-14
TM-14 3090-3100
PAGE 1 OF 1

ASARCO Incorporated
NOV 21 1985
SW Exploration

ASARCO INCORPORATED
Attn: Mr. Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 11 Split Core Samples

ITEM	SAMPLE NUMBER	Cu (ppm)	Pb (ppm)	Zn (ppm)	Au (ppm)	Ag (ppm)
1	TM-14 3090-3100	590.	60.	445.	<.02	1.0
2	TM-14 3100-3110	590.	30.	170.	<.02	1.0
3	TM-14 3110-3120	550.	100.	740.	<.02	2.0
4	TM-14 3160-3170	1600.	30.	770.	<.02	1.0
5	TM-14 3170-3180	680.	45.	410.	<.02	.6
6	TM-14 3190-3200	840.	20.	1100.	<.02	.8
7	TM-14 3200-3210	710.	35.	780.	<.02	1.2
8	TM-14 3220-3230	950.	90.	1100.	<.02	2.0
9	TM-14 3290-3300	490.	110.	1300.	<.02	1.6
10	TM-14 3390-3400	230.	155.	730.	<.02	1.2
11	TM-14 3490-3500	385.	240.	1300.	<.02	1.6
	mean:	472	83	804	<.02	1.3

cc: Asarco Incorporated
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703
Attn.: Mr. James D. Sell
Ms. Mary Kavanagh

REGISTERED ASSAYER CERTIFICATE NO. 9425 WILLIAM L. LEHMBECK ARIZONA U.S.A.

(4)

GEOLOGIC LOG

PROJECT: Thunder Mountain HOLE NO. TM-4
Collar elev.
Final depth 3075' (1984)
Coord N.
Inclination
Coord E.
Page 4 of
Logged by F.R. Koutz
Date start
Date finish

1985: 3075-3500'

From	To	Int'vl	Core Recovery	Sample	Cu (ppm)	Pb	Zn	Au	Ag	Mo		Chalcopyrite	Chalcocite	Covellite		Sphalerite	Cu S^2 in SS	Pyrite-Dissem	Pyrite-Vein	Hem		Magnetite	CPS x10³	Alunite	K-Feldspar	Qtz-Dissem/Flood	Qtz VN	Clay	Sericite	Chlorite	Epidote	Calcite	Gypsum	% Vugs	Av clast size	% Bx Matrix	Fx/Foot	Dip Dirs Flow	Sulphide VN/FT # ∠	Width-mm Sulphide + Alt Selv + Dissem Size	Faults — Crushing — Shearing	Detail
2560	2580	20	100	2570 TS								T	-	.1		.1	.2	3	2	T-		-	8	-	1	10	3	8	22	-	-	-	-	1	-	-	1	-	½-2 65-90°	1-50 10-40 <½-2	wk shear in Fx	1-2" Py dissem vn stringers 2573-77
2580	2600	↑	↑	2580-2600	380	95	130	<.02	<.2	6.		-	-	.2		.1	.3	3	1½	-		-	5	-	3?	8	3	6	18	-	-	-	-	½	-	-	1-2	-	¼-1 70-80°	1-80 10-50 <½-3	wk shear on Fx	2583-84 1-3" Py vn @ 75-90°. Pyrite replaces mafics (½-2-3 mm) Fs ɸ (MP? Fresher than above)
2613 VC/IA	2620			2604 TS (M)								-	-	.1		.1?	.2	3	1½	-		-	3	-	3	8	4	8	20	-	-	-	-	½	-	-	½-2	-	¼-3 75-90°	½-8 10-400 <½-3	→	2596-2601 [illegible] Fx + [illegible], wk tan stain in some Fs, "more Fs" "Rock Fresher" @2613 NC→IIX 2474
	2640											T?	T	T+		T	.2	2.8	.5	-		-	8	-	1	7	3	6	23	-	-	-	-	½	-	-	½	-	⅛-½ 50+	¼-½ 4-10 <½-3	-	QMP-No Q-eyes 1-6 mm Fs (35-45%) Py replaces ex-Bio + Fs
	2660											T-	-	T		-	.5	3.5	2	-		-	8	-	1	10	5	8	25	-	-	-	-	½	-	-	2-10	-	¼-2 50 70-85	½-20 5-30 <½-4	2648-50 Brx. Streaks	2644-46 ¾-½ Py vn + Qtz-ser, 2660 75° ½ Qtz-Py vn (+ [illegible]) 50-70° ser
	2680											T	T	-		-	.2	3.5	¾	-		-	10	-	1	11	4	5	22	-	-	T-	-	½	-	-	1-2	-	<½-1 70-90°	½-4 3-20 <½-3	wk slicks on Fx	
2680	2700			2690-2700	520	40	375	<.02	<.2	2.		T-	T	T+		T?	.2	3.2	½	-		-	10	T?	1	10	4	7	25	-	-	-	-	2 [illegible]	-	-	1-4	-	¼-2 30 80	½-1 2-10 ¼-3	wk slicks on Fx	
	2720											T	.1	.2		T	.2	3.7	.3	-		-	8	-	1	8	3	6	22	-	-	-	-	2	-	-	1-2	-	¼-½ 30 [illegible]	¼-½ 2-10 <½-2	wk slicks on Fx	
	2740			2738 TS								-	-	T		T	.3	3.0	.3	-		-	3	-	1	8	3	7	20	-	-	-	-	1	-	-	¼-4	-	<½-½ 60-70	¼-1 5-20 <½-2	wk slicks on Fx in sea	Includes a few Fs ɸ (no Q-eyes) [illegible] Keno. / wk tan stain in Fs
	2760											-	-	-		T	.3	3.0	.6	-		-	5	-	2	12	5	6	22	-	-	-	-	1	-	-	½-3	-	<½-2 30 60-80	½-2 10-30 <½-2	wk slicks in wk clay-sea	
	2780											T	-	-		-	.2	3.0	.6	-		-	5	-	2	10	4	5	20	-	-	-	-	3 [illegible]	-	-	1-3	-	¼-1 50-70°	¼-2 10-40 <½-2	-	
2780	2800			2790-2800	415	35	200	<.02	<.2	6.		T	-	-		T+	.2	3.5	.4	-		-	10	-	2	10	5	5	20	-	-	-	-	2	-	-	½-5	-	<½-2 30-60°	½-½ 5-20 <½-4	-	Q-S-py selv, [illegible], [illegible] in Fs / 2788-2802: Sm [illegible] Fx
	2820											.1	-	T+		T	.2	3.2	.8	-		-	10	-	2	8	6	6	25	-	-	-	-	1	-	-	½-2	-	<½-2 20-30 70-80	¼-50 5-40 <½-3	→	2806: 2"-70% py [illegible] @ 55° [illegible]
	2840											.1	.1	.3		.1	.2	3.8	1	-		-	13	-	1	8	5	6	25	-	-	-	-	2	-	-	½-2	-	¼-1 20-30 60-75	½-1 5-20 <½-2	-	
	2860			2850	700 / 220	-	390 / 670	-	0.6 / 0.2	-		.2?	T+	.2		T	.3	4.0	1	-		-	8	-	1	10	5	5	25	-	-	-	-	2	-	-	½-1	-	¼-4 40-60°	¼-1 5-30 <½-3	-	
	2880			2870	200 / 275	-	560 / 390	-	0.4 / <.2	-		.1	T+	.2		T	.2	4.0	1	-		-	10	-	1	10	6	6	25	-	-	-	-	1	-	-	½-1	-	¼-1 30-70	½-1 5-80 <½-3	T slicks, [illegible] on Fx	
2880	2900			2890	600 / 335	50	600 / 700	<.02	<.2 / 0.4	<2.		.3	T	.3		T+	.2	3.5	¾	-		-	5	-	1	12	5	5	27	-	-	-	-	2	-	-	⅓-1	-	<½-2 30-50	¼-1 5-30 <½-3	-	Str Q-S flood selv w/tan stained Fs by wd (Prox.)
	2920			2910	250 / 200	-	720 / 780	-	0.2 / <.2	-		.3	T	.2	Loc T Bn	-	.2	3.5	.6	-		-	8	-	2?	12	5	5	25	-	-	-	-	1	-	-	⅓-1	-	¼-1 20-40 60-70	¼-1 5-40 <½-2	-	
	2940			2921 TS.								.2	T	.1		-	.3	3.3	.5	-		-	5	-	1	10	5	5	25	-	-	-	-	1	-	-	⅓-1	-	¼-1 30° 75-90°	¼-1 5-30 <½-2	-	
	2960			2940-50	1050		880		0.2	-		.3	.4	.2		T?	.3	3.5	.7	-		-	10	-	1	12	4	4	25	-	-	-	-	1	-	-	½-1	-	¼-1 20-30 70-80	½-15 5-40 <½-2	-	¼-½" Py-cp? VN @ 30° 2947.
	2980											.2	.1	.2		-	.2	3.0	1	-		-	8	-	1	10	4	4	23	-	-	-	-	1	-	-	1-2	-	¼-1 10-20 50-60	½-10 5-30 <½-2	wk slicks on Fx	
2980	3000			2985 TS. 2990	150 / 150	85	600 / 600	<.02	<0.2 / <0.2	2		.2	.2	.1		-	.2	3.5	.8	-		-	3	-	1	10	5	4	25	-	-	-	-	1	-	-	½-1	-	¼-1 20-30	¼-3 5-30 <½-3	wk slicks on Fx	V. strong Q-S selv 1-2/ft, loc. chalc/Qtz
	3020			3010	380 / 125	-	600 / 550	-	<.02 / 0.2			.2	T+	.2	T Bn	-	.2	3.2	.8	-		-	10	-	1	8	4	4	28	-	-	-	-	1	-	-	1-2	-	¼-2 20-40 60°	½-2 5-30 <½-3	-	@3012-2-6" chalc/bn, Qtz-py stringers @ 65°
	3040	↓										.1	T	.1		-	.2	3.8	.7	-		-	13	-	1	10	5	4	25	-	-	-	-	1	-	-	½-2	-	¼-2 20-40	½-10 5-50 <½-2	-	Loc. Fresher Fs.
	3060	20	↓									T	-	.1		T	.4	2.5	1.0	-		-	10	-	1	12	4	4	25	-	-	-	-	1½	-	-	⅓-2	-	<½-3/70-90	<½-1 5-30 <½-1	-	1½" py (70%) 65° VN [illegible] @3039'
3060	3075	15	100	3071 TS 3060-3075	280	50	600	<.02	0.2	4		T	.2	.1		T	.3	3.5	1	-		-	10	-	½	12	6	6	35	-	-	-	-	2	-	-	1	-	<½-2/70-80 20-30	½-2 5-20 <½-2	-	Str chalky, [illegible] below 3068.
3075	3080	5	36	3075-79: core ground							1725457	T	T+	-		T	.2	4	.8	T-		-	8	-	-	15	8	10	40	-	-	-	-	1	-	-	1	-	½-2/60-70 10-20	<½-1 10-20	-	
3080	3100	20	98	[illegible] ɸ 3117; 3080-3100	590	60	445	<.02	1.0			.2	T	T	T Bn	.1	.3	5	5	T- MoS2	T-	-	13	T?	3?	30	10	5	40	-	-	-	-	3	2 cm	60	4	60 60°	2-5/10-60 150+	<½-1 (10) <½-2	wk shear 60-80°	
	3120	↑	100	3100-	680 / 550	70 / 60	170 / 240	<.02 / <.02	1.0 / 2.0		3110 TS	.3	T	T	T Bn	.1	.3	5	3	-	T	-	15	T?	3	35	12	6	35	-	-	-	-	5	4-5 cm	20	3	30 60	2-8/20-[illegible]	¼-5 (5-10) <½-4	mod [illegible] shear 60°	@3096 [illegible]
75°	3140		100	3124 1' zone chalcd in to [illegible]							mostly [illegible] vnlts	.2	T	-		T+	.2	5	4	-		-	12	T	½	20	10	5	40	-	-	-	-	3	-	T cracking	2	-	2-10/10-60 ±80	¼-4 (5-20) <½-1	loc 75° shear.	Loc Fe? [illegible]
	3160		100									.3	T?	-		.1	.3	4	3	T-MoS2	T	T [illegible]	10	-	1	15	8	5	35	-	-	-	-	2	-	-	½-2	-	2-6/20-50 ±80	¼-1 (5-30) <½-1	-	
75°	3180		100	3166' 1-2" vn [illegible]	1600 / 680	30 / 45	770 / 410	<.02 / <.02	1.0 / 0.6	-3170'	[illegible]	.4	T	T	T Bn	.1	.4	4	1.5	-		-	5	-	5	12	10	4	30	-	-	-	-	½	-	-	½-1	-	2-3/40-60 90	½-1 (5-60) <½-1	-	30% aplitic Fs groundmass [illegible] NOT ALT related [illegible] QMP
3180	3200		99	1" Py vn @3184 60°	80 / 710	20 / 35	1100 / 280	<.02 / <.02	0.8 / 1.2	-3190'		.1	-	-		.1	.2	3.5	2.5	-		-	10	-	3	15	7	3	28	-	-	-	-	½	-	-	1-3	-	1-5/20 60+	½-25 (5-20) <½-2	wk [illegible]	10% aplitic [illegible] MATRIX [illegible] than above 3160
	3220		100	3200 3-6% py vn 2" @ 55°						-3210		.2	T	.2		T	.2	4	2	-		-	25 / 8? 18	-	2	25	10	4	25	-	-	-	-	½	-	-	½-1	-	½-3/30-60	½-3 (5-20) ¼-1	wk 85° Fx	loc. [illegible] to [illegible]
70°	3240		100	3226 [illegible] py [illegible] vn @ [illegible]	950	80	1100	<.02	2.0	-3226'		.2	-	T		T	.3	3.5	3	T+ MoS2		-	15	-	1	18	9	5	25	-	-	-	-	2	-	-	½-1	30°	½-2/50-60	½-50 (5-10) <½-2	wk 65° Fx	3238-40: 2' 3% [illegible] 10% Aplitic matrix [illegible]
	3260		100									.1	-	T-		T	.2	3.5	1.5	T MoS2		-	10	-	1	18	10	4	25	-	-	-	-	½	-	-	1-4	-	½-2/20-50 60-80	<½-2 (5-70) <½-2	wk loc shearing	Py in [illegible] Biotites
60°	3280		100	3268 1" py vn @ 20°							TS 3272	.1	-	T-	T Bn	T	.2	3.5	2	T MoS2		-	10	-	1	15	7	4	28	-	-	-	-	2	-	-	½-3	-	½-2/60-80	<½-50 (5-5?) <½-2	-	wk tan ALT between Q-S-py [illegible] vnlts. 3274 ½" [illegible] [illegible]
3280	3300		100		490	110	1300	<.02	1.6	3290		T	-	T+		T	.2	3.5	1	-		-	8	-	-	12	10	4	25	-	-	-	-	3	-	-	½-1	-	½-2/60-90	<½-1 (5-20) <½-1	loc open Fx	Loc. wh [illegible] vn @ 60° Loc. tan stain between Q-S selv.
	3320		100									.1	-	T+		T+	.2	3.0	.8	T- MoS2		-	3	T?	-	10	10	6	25	-	-	-	-	1	-	-	⅓-1	-	½-2/20-40	<½-1 (5-80) <½-1	slicks in clay on Fx	
	3340		100	3341 ½" py vn @ 80°								.1	-	T+		T	.1	3.0	.8	T- MoS2		-	5	-	2	8	7	4	28	-	-	-	-	½	-	-	¼-1	-	¼-3/60-85	<½-3 (5-50) <½-1	-	80% ɸ Groundmass: Aplitic [illegible] still 30-50% [illegible] ɸ
	3360		99	3356-58 1-2" 60% py vn 60-75°							3342 TS.	T	-	T-		T	.1	4	6	-		-	5	-	2	12	12	3	23	-	-	T-	-	2	-	-	½-4	60 ±	½-4/60-90	1-50 (5-100) <½-2	[illegible] shear	3354 1-2" IBX in Qz-Py vn 60-80°, 80% Aplitic Groundmass
	3380	↓	100									T	-	T-		.2	.2	4	1	-		-	3	-	1	15	9	3	25	-	-	-	-	2	-	-	½-2	-	½-2/30+70	1-3 (5-50) <½-1	wk shear [illegible] 70° Fx	
3380	3400	20	100									-	-	T-		.2	.2	3.5	1	T MoS2		-	3	-	-	12	8	5	28	-	-	-	-	2	-	-	½-1	30°	1-3/50-60 70-90	<½-2 (5-30) <½-1		Loc tan-stained plag. between Q-S stockwork / wkly leached. 3399' [illegible] Qtz vnlts @ 40°

ROCK TYPE AND REMARKS

⇒ General comments

⇒ 2560-3075: Quartz Monzonite Porphyry, lt to med grey (mostly Qtz-ser flood) with local tan stain between strong Q-S-P selvages. Fe pdt. from [illegible] (limonite?) BOT 1-5%. Now sericite clay (Montmorillonite?) QFP has no [illegible]. Only V. rare Qtz phenocrysts although some Qtz in groundmass. Plag?, Fs 20-60% (30-40 av.), 1-4 mm w/ local up to 10 mm. A [illegible] minor zones with [illegible] Fs, igneous xenolith (1-5%). Some Fs have [illegible]. Some KFs (1-2%) phenocrysts 2-3 mm. Qtz-ser [illegible] [illegible] [illegible], not strong. Pyrite 2.5-4% dissem, mostly in former Biotite sites + on Fs rims. Local wk [illegible] cov. on py + cp. Some py has pink-gold (cpy) tarnish [illegible]. Local chalcocite but never strong. Porosity from wk leaching of [illegible] + some vuggy Qtz vn. Contact relationships above 2560' uncertain. Is this QMP of FTG Seasonal report? If so above 2580 appears to engulf + contain xenoliths of QFP. QMP = MP of FMT TCH-2 report AT about this interval. This may be a phase of QFP at depth. Assuming this is QMP-MP the hole should progress out of this unit within several 100 feet into HDS Group or Flow Group [illegible]. [illegible] using TCH-2 model. ∴ Deepen hole NEXT YEAR. ∠3075 1984 E.O.H. 2552

3075-3094.5' QMP as above but incr. [illegible] + py vnlets

⇒ 3094.5-3110: IBX: 30-60% Q-S-py matrix w/ dissem py + cp, + Tbn ev; clasts sub-∢ to sub-round. Mostly QMP (some Au-Bx) but also 20% chal [illegible] [illegible] [illegible] [illegible] ~5% [illegible] in clasts [illegible]. Possibly some QFP clasts, a few HDS [illegible]. 10-20' Q-S halo.

⇒ 3110-3500: QMP→MP. Lt-m gy (Qtz-ser) with local tan stained plag between Q-S-py stockwork. Fx but now ser + py. Local aplitic-[illegible] groundmass somewhat like Kxl (Submarine Fs) / Jnonz [illegible] Bx. Lv. Py vn + Qtz py-chalcedonic to 1-2° usually [illegible]. [illegible] cpy in vnlts I consider coatings, loc. cc/cov on py. T Qtz-MoS₂-py (rare cpy) vnlts. A few zones below 3400 have less Q-S + almost fresh MP w/ green stained plag. Compared to TCH-2 should have gone into Lower HDS Group volcanics below ~3100-3200! Prob. thicker (apparent dip of MP at [illegible]?) MP. Hole needs to be deepened. Would guess than S1 ≥ cpy: is this encouraging for [illegible] @ Depth? [illegible] may still [illegible] out from the center.

for F.T.G. mn 2555 A dam

GEOLOGIC LOG

PROJECT: Thunder Mountain
HOLE NO.: TM-14
Collar elev.:
Final depth: 3500 (1885)
Coord N.:
Inclination:
Coord E.:
Page 5 of
Logged by: F.R. Arntz
Date start:
Date finish:

DEPTH From	DEPTH To	Int'vl	Core Recovery	Unit notes:	ASSAY Cu	Pb	Zn	Au	Ag	Mo		MINERALOGY AND STRUCTURE: Chalcopyrite	Cuprite/Tenorite	Covellite	Sphalerite	Kaolinite	Marc-Unstr.	Marc-VN	Hematite	Magnetite	Cpx-Trem-Act	Actinolite	Hbl-Hbn	Qtz-Unstr.	Qtz VN	Clay	Sericite	Calcite	Fluorite	Talc	Gypsum	Mixed/Fault	Sulfate	Br Matrix	Fe/Fe	Qtz-Sulf Fault	Sulfide VN/Fr	Mixed Mn Fault Sulf VN	Fault Gouge	ROCK TYPE AND REMARKS
3400	3420	20	100	3416-17' Fr. Qtz, Fr. Qtz							+3 Wm 75	T	–	T-		.2	.2		4	1.5	–		1		5	–	2	12	7	8	35	T-	–	T-	–	2	4%	–	1-10	–	2-3 / 3-20	5-2 / 5-50 / 1/2-1	→	3418-24' [illegible]
–	3440	↑	99	3344 1/2 [illegible] Py & 85-Fe								T-	T+	–		.3	.2		3.5	2	–		–		5	–	3	15	10	5	22	T-	–	–	–	2	–	–	1/2-1	–	1-4 / 60-75	5-2 / 7-30 / 1/2-1	–	70% [illegible]
3460	3460		100									–	–	T-		.1	.2		3	1.5	–		1		5	T+	3	12	12	5	22	T-	–	T-	–	2	–	–	1/2-1	–	1/2-2 / 70-80	1/2-10 / 5-20	→	3462 [illegible]
	3480	↓	100	3482-12' [illegible] Sec-Sheared. 3482-[illegible]								T	–	T		.1	.2		3	1.5	–		–		0	–	2	12	10	3	20	–	–	–	–	1	–	–	1/2	–	1/2-2 / 30-70	1/2-10 / 5-10 / 1/2-1	–	20% [illegible] / 30% [illegible]
3480	3500	20	99									T-	–	T-		.2	.2		3.5	1	–		–		3	T	1	12	12	5	35	–	–	–	–	2	–	1-2 / 1-5	2%	1/2-2 / 30-60-80	1/2-2 / 5-30 / 1/2-1	→	3485-3500 [illegible]
1885	B.O.H.																																						

ASSAY: ALL PPM

for F.T.G. mn 2555 A dam

JDS [redacted]

JABA INC.
2100 N. Wilmot Rd. #218
Tucson, AZ 85712
(602) 885-9141
(FAX) 721-2768

Assays
DDH BB-2
Thunder Mtn Pr
Patagonia Mtns
Santa Cruz Co; A

ASARCO Incorporate
AUG 9 1990
SW Exploration

August 8, 1990

Mr. James D. Sell
ASARCO, Inc.
1150 N. 7th Avenue
P. O. Box 5747
Tucson, AZ 85703

RE: Transmittal of MAP III results on DDH BB #2

Dear Jim:

Enclosed is a printout of the MAP III results that I took on August 2. Please discard the copies I faxed to you, as there are typos in the first page.

Let me know when the assays are back.

Very truly yours,

Jim (Jas)

James A. Briscoe

JAB/mas

Enclosure

ASARCO DDH BB#2 8/2/90
REPORT OF MAP SYSTEM DATA
d:\map3\ddhbb#2.AS2
REPORT GENERATED 08-07-1990 AT 17:45:25

********** COMMENTS **********

The drill hole is located in the Patagonia Mtns., Santa Cruz Co., AZ. This ass

~~y~~ log was prepared by Consulting Geologist James A. Briscoe using the MAP III

portable XRay analyzer from Scitec. The analyses were performed on unsplit cor

which has been logged by consultant Harold Downey. The core will be split & st

assays done. The rejects, pulps & split core will be reMAPed for comparison

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M A P Scitec Corporation
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	ASSAYER			BLK	ELEMENT	DESCRIPTION
1.	FACE	AG-02-02-040	072590	(1)	AG	.25 TO 287 OPT
				(2)	MO	.004 TO .96%
				(3)	PB	.2 TO 6.1%
				(4)	ZN	.007 TO 5.5%
				(5)	CU	.16 TO 2.82%
				(6)	CU-TRACK	COPPER TRACK

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ID number: 8.2.90. (there are 4 assay sets in this ID)

ASSY NUM	ASSAYER	TIME (sec)	DEPTH (ft)	BLK	ASSAY	
1	1.	30		(1)	18.4 OPT	AG
				(2)	0.00 %	MO
				(5)	0.08 %	CU
				(6)	0.00	CU-TRACK
2	1. Demo	30		(1)	2.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.51 %	CU
				(6)	0.23	CU-TRACK
70	1.	30		(1)	0.0 OPT	AG

				(2)	2.08 %	MO
				(5)	0.00 %	CU
				(6)	0.00	CU-TRACK
4	1.	30	83886.07	(1)	0.0 OPT	AG
				(2)	2.01 %	MO
				(5)	0.00 %	CU
				(6)	0.00	CU-TRACK

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ID number: 8.2.90. (there are 46 assay sets in this ID)

ASSY NUM	ASSAYER	TIME (sec)	DEPTH (ft)	BLK	ASSAY	
1	1.	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.05 %	CU
				(6)	0.00	CU-TRACK
2	1.	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.21 %	CU
				(6)	0.05	CU-TRACK
3	1.	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.05 %	CU
				(6)	0.00	CU-TRACK
4	1.	120		(1)	0.4 OPT	AG
				(2)	0.00 %	MO
				(5)	0.22 %	CU
				(6)	0.05	CU-TRACK
5	1.	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.23 %	CU
				(6)	0.06	CU-TRACK
6	1.	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.34 %	CU
				(6)	0.12	CU-TRACK
7	1.	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.40 %	CU
				(6)	0.16	CU-TRACK
~~8~~	~~1.~~ Abort	~~120~~				
9	1.	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.39 %	CU

			(6)	0.15		CU-TRACK
10	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.40	%	CU
			(6)	0.16		CU-TRACK
11	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.29	%	CU
			(6)	0.10		CU-TRACK
12	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.20	%	CU
			(6)	0.04		CU-TRACK
13	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.67	%	CU
			(6)	0.32		CU-TRACK
14	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.96	%	CU
			(6)	0.50		CU-TRACK
15	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.54	%	CU
			(6)	0.24		CU-TRACK
16	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.41	%	CU
			(6)	0.17		CU-TRACK
17	1.	120	(1)	0.0	OPT	AG
			(2)	0.01	%	MO
			(5)	0.45	%	CU
			(6)	0.19		CU-TRACK
18	1.	120	(1)	0.0	OPT	AG
			(2)	0.01	%	MO
			(5)	0.28	%	CU
			(6)	0.09		CU-TRACK
19	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.54	%	CU
			(6)	0.24		CU-TRACK
20	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.49	%	CU
			(6)	0.21		CU-TRACK
21	1.	120	(1)	0.3	OPT	AG
			(2)	0.00	%	MO
			(5)	0.78	%	CU
			(6)	0.39		CU-TRACK

22	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.69	%	CU
			(6)	0.34		CU-TRACK
23	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.69	%	CU
			(6)	0.33		CU-TRACK
24	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.52	%	CU
			(6)	0.23		CU-TRACK
25	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.98	%	CU
			(6)	0.51		CU-TRACK
26	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.82	%	CU
			(6)	0.41		CU-TRACK
27	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
28. Missing			(5)	0.92	%	CU
			(6)	0.47		CU-TRACK
29	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.64	%	CU
			(6)	0.30		CU-TRACK
30	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.83	%	CU
			(6)	0.42		CU-TRACK
31	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.71	%	CU
			(6)	0.35		CU-TRACK
32	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.56	%	CU
			(6)	0.26		CU-TRACK
33	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.89	%	CU
			(6)	0.45		CU-TRACK
34	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
			(5)	0.46	%	CU
			(6)	0.20		CU-TRACK
35	1.	120	(1)	0.0	OPT	AG

0.0
0.00
0.59 % Cu
1.27

			(2)	0.00 %		MO
			(5)	0.89 %		CU
			(6)	0.45		CU-TRACK
	1.	120	(1)	0.0 OPT		AG
			(2)	0.00 %		MO
			(5)	0.82 %		CU
			(6)	0.41		CU-TRACK
37	1.	120	(1)	0.0 OPT		AG
			(2)	0.00 %		MO
			(5)	0.87 %		CU
			(6)	0.44		CU-TRACK
38	1.	120	(1)	0.0 OPT		AG
			(2)	0.00 %		MO
			(5)	0.62 %		CU
			(6)	0.29		CU-TRACK
39	1.	120	(1)	0.0 OPT		AG
			(2)	0.00 %		MO
			(5)	0.64 %		CU
			(6)	0.31		CU-TRACK
40	1.	120	(1)	0.0 OPT		AG
			(2)	0.01 %		MO
			(5)	0.89 %		CU
			(6)	0.45		CU-TRACK
41	1.	120	(1)	0.0 OPT		AG
			(2)	0.01 %		MO
			(5)	0.97 %		CU
			(6)	0.50		CU-TRACK
42	1.	120	(1)	0.0 OPT		AG
			(2)	0.00 %		MO
			(5)	0.80 %		CU
			(6)	0.40		CU-TRACK
43	1.	120	(1)	0.0 OPT		AG
			(2)	%	MO	
			(5)	0.63 %		CU
			(6)	0.30		CU-TRACK
44	1.	120	(1)	0.0 OPT		AG
			(2)	0.00 %		MO
			(5)	0.59 %		CU
			(6)	0.28		CU-TRACK
45	1.	120	(1)	0.0 OPT		AG
			(2)	0.00 %		MO
			(5)	0.90 %		CU
			(6)	0.46		CU-TRACK
46	1.	120	(1)	0.0 OPT		AG
			(2)	0.00 %		MO
			(5)	0.55 %		CU
			(6)	0.25		CU-TRACK

JABA INC.
2100 N. Wilmot Rd. #218
Tucson, AZ 85712
(602) 885-9141
(FAX) 721-2768

***** MEMORANDUM *****

TRNSMITTED BY FAX TO: (602) 792-3934
6 pages total

Date : August 7, 1990

To : James D. Sell

From : James A. Briscoe

Subject : Transmittal of Computer Printout of MAP III Results DDH BB#2 from 8/2/90.

Sent with This FAX please see find above referenced analyses.

SAMCO

AUG 7 1990

SW Exploration

ASARCO DDH BB#2 8/2/90
REPORT OF MAP SYSTEM DATA
d:\map3\ddhbb#2.AS2

REPORT GENERATED 08-07-1990 AT 13:37:30

ASARCO Incorporated
AUG 7 1990
SW Exploration

********** COMMENTS **********

The drill hole is located in the Patagonia Mtns., Santa Cruz Co., AZ. Tihis ass ay log was prepared by Consulting Geologist James A. Brixscoe using the MAP III ortable XRay analyzer from Scitec. The analyses were performed on unsplit core hcich has been logged by consultant Harold Downey. The core will be split & std assays done. The rejects, pulps & split core will be reMAPed for compairson

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M A P Scitec Corporation

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	ASSAYER	BLK	ELEMENT	DESCRIPTION
1.	FACE AG-02-02-040 072590	(1)	AG	.25 TO 287 OPT
		(2)	MO	.004 TO .96%
		(3)	PB	.2 TO 6.1%
		(4)	ZN	.007 TO 5.5%
		(5)	CU	.16 TO 2.82%
		(6)	CU-TRACK	COPPER TRACK

****

****

ID number: 8.2.90. (there are 4 assay sets in this ID)

ASSY NUM	ASSAYER	TIME (sec)	DEPTH (ft)	BLK	ASSAY	
1	1.	30		(1)	18.4 OPT	AG
				(2)	0.00 %	MO
				(5)	0.08 %	CU
				(6)	0.00	CU-TRACK
2	1.	30		(1)	2.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.51 %	CU
				(6)	0.23	CU-TRACK
70	1.	30		(1)	0.0 OPT	AG

Control Sample

PAGE # 2

				(2)	2.08 %	MO
				(5)	0.00 %	CU
				(6)	0.00	CU-TRACK
4	1. Leached Sample	30	83886.07	(1)	0.0 OPT	AG
				(2)	2.01 %	MO
				(5)	0.00 %	CU
				(6)	0.00	CU-TRACK

****

ID number: 8.2.90. (there are 46 assay sets in this ID)

ASSY NUM	ASSAYER	TIME (sec)	DEPTH (ft)	BLK	ASSAY	
1	1. 12-20'	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.05 %	CU
				(6)	0.00	CU-TRACK
2	1. 20-30'	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.21 %	CU
				(6)	0.05	CU-TRACK
3	1. 30-40'	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.05 %	CU
				(6)	0.00	CU-TRACK
4	1. 40-50'	120		(1)	0.4 OPT	AG
				(2)	0.00 %	MO
				(5)	0.22 %	CU
				(6)	0.05	CU-TRACK
5	1. 50-60'	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.23 %	CU
				(6)	0.06	CU-TRACK
6	1. 60-70'	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.34 %	CU
				(6)	0.12	CU-TRACK
7	1. 70-80'	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.40 %	CU
				(6)	0.16	CU-TRACK
~~8~~	~~1. Abort~~	~~120~~				
9	1. 80-90'	120		(1)	0.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.39 %	CU

PAGE # 3

			(6)	0.15		CU-TRACK
10	1.	120	(1)	0.0	OPT	AG
	90-100'		(2)	0.00	%	MO
			(5)	0.40	%	CU
			(6)	0.16		CU-TRACK
11	1.	120	(1)	0.0	OPT	AG
	100-110'		(2)	0.00	%	MO
			(5)	0.29	%	CU
			(6)	0.10		CU-TRACK
12	1.	120	(1)	0.0	OPT	AG
	110-120'		(2)	0.00	%	MO
			(5)	0.20	%	CU
			(6)	0.04		CU-TRACK
13	1.	120	(1)	0.0	OPT	AG
	120-130'		(2)	0.00	%	MO
			(5)	0.67	%	CU
			(6)	0.32		CU-TRACK
14	1.	120	(1)	0.0	OPT	AG
	130-140'		(2)	0.00	%	MO
			(5)	0.96	%	CU
			(6)	0.50		CU-TRACK
15	1.	120	(1)	0.0	OPT	AG
	140-150'		(2)	0.00	%	MO
			(5)	0.54	%	CU
			(6)	0.24		CU-TRACK
16	1.	120	(1)	0.0	OPT	AG
	150-160'		(2)	0.00	%	MO
			(5)	0.41	%	CU
			(6)	0.17		CU-TRACK
17	1.	120	(1)	0.0	OPT	AG
	160-170'		(2)	0.01	%	MO
			(5)	0.45	%	CU
			(6)	0.19		CU-TRACK
18	1.	120	(1)	0.0	OPT	AG
	170-180'		(2)	0.01	%	MO
			(5)	0.28	%	CU
			(6)	0.09		CU-TRACK
19	1.	120	(1)	0.0	OPT	AG
	180-190'		(2)	0.00	%	MO
			(5)	0.54	%	CU
			(6)	0.24		CU-TRACK
20	1.	120	(1)	0.0	OPT	AG
	190-200'		(2)	0.00	%	MO
			(5)	0.49	%	CU
			(6)	0.21		CU-TRACK
21	1.	120	(1)	0.3	OPT	AG
	200-210'		(2)	0.00	%	MO
			(5)	0.78	%	CU
			(6)	0.39		CU-TRACK

$\frac{2.47}{8} = 0.30$

80' = 0.31 Cu

PAGE # 4

22	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	210-220'		(5)	0.69	%	CU
			(6)	0.34		CU-TRACK
23	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	220-230'		(5)	0.69	%	CU
			(6)	0.33		CU-TRACK
24	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	230-240'		(5)	0.52	%	CU
			(6)	0.23		CU-TRACK
25	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	240-250'		(5)	0.98	%	CU
			(6)	0.51		CU-TRACK
26	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	250-260'		(5)	0.82	%	CU
			(6)	0.41		CU-TRACK
27	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	260-270'	0.0 OPT 0.00 % 0.59 Cu 1.27	(5)	0.92	%	CU
28 Missing	270-280		(6)	0.47		CU-TRACK
29	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	280-290		(5)	0.64	%	CU
			(6)	0.30		CU-TRACK
0	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	290-300'		(5)	0.83	%	CU
			(6)	0.42		CU-TRACK
31	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	300-310'		(5)	0.71	%	CU
			(6)	0.35		CU-TRACK
32	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	310-320'		(5)	0.56	%	CU
			(6)	0.26		CU-TRACK
33	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	320-330'		(5)	0.89	%	CU
			(6)	0.45		CU-TRACK
34	1.	120	(1)	0.0	OPT	AG
			(2)	0.00	%	MO
	330-340'		(5)	0.46	%	CU
			(6)	0.20		CU-TRACK
35	1.	120	(1)	0.0	OPT	AG

. PAGE # 5

35	1	120	(1)	6.0 OPT	AG
	340-350'		(2)	0.00 %	MO
			(5)	0.89 %	CU
			(6)	0.45	CU-TRACK
36	1.	120	(1)	0.0 OPT	AG
	350-360		(2)	0.00 %	MO
			(5)	0.82 %	CU
			(6)	0.41	CU-TRACK
37	1.	120	(1)	0.0 OPT	AG
	360-370		(2)	0.00 %	MO
			(5)	0.87 %	CU
			(6)	0.44	CU-TRACK
38	1.	120	(1)	0.0 OPT	AG
	370-380		(2)	0.00 %	MO
			(5)	0.62 %	CU
			(6)	0.29	CU-TRACK
39	1.	120	(1)	0.0 OPT	AG
	380-390		(2)	0.00 %	MO
			(5)	0.64 %	CU
			(6)	0.31	CU-TRACK
40	1.	120	(1)	0.0 OPT	AG
	390-400		(2)	0.01 %	MO
			(5)	0.89 %	CU
			(6)	0.45	CU-TRACK
41	1.	120	(1)	0.0 OPT	AG
	400-410		(2)	0.01 %	MO
			(5)	0.97 %	CU
			(6)	0.50	CU-TRACK
42	1.	120	(1)	0.0 OPT	AG
	410-420		(2)	0.00 %	MO
			(5)	0.80 %	CU
			(6)	0.40	CU-TRACK
43	1.	120	(1)	0.0 OPT	AG
	420-430		(2)	% MO	
			(5)	0.63 %	CU
			(6)	0.30	CU-TRACK
44	1.	120	(1)	0.0 OPT	AG
	430-440		(2)	0.00 %	MO
			(5)	0.59 %	CU
			(6)	0.28	CU-TRACK
45	1.	120	(1)	0.0 OPT	AG
	440-450		(2)	0.00 %	MO
			(5)	0.90 %	CU
			(6)	0.46	CU-TRACK
46	1.	120	(1)	0.0 OPT	AG
	450-460		(2)	0.00 %	MO
			(5)	0.55 %	CU
			(6)	0.25	CU-TRACK

23.59 / 34 = 0.69

340 @ 0.69

9 DS

JABA INC.
2100 N. Wilmot Rd. #218
Tucson, AZ 85712
(602) 885-9141
(FAX) 721-2768

ASARCO Incorporate
AUG 2 1990
SW Exploration

***** MEMORANDUM *****

Date : August 2, 1990 TRANSMITTED BY FAX TO: 792-3934

To : James D. Sell

From : James A. Briscoe

Subject : Transmittal of hand written MAP III results on DDH BB#2

Completed the MAP III assays at Noon. Here are the hand written results. I'll get more formal results shortly.

JABA MAP SCAN
BB # 2

1/

#	FOOTAGE	Ag	Mo	Cu_1	Cu_6
1	12-20	0	0	.05	0
2	20-30	0	0	.21	.05
3	30-40	0	0	.05	0
4	40-50	.4	0	.22	.05
5	50-60	0	0	.23	.06
6.	60-70	0	0	.34	.12
7.	70-80	0	0	.4	.16
8.	— A				
9	80-90	0	0	.39	.15
10.	90-100	0	0	.4	.16
11.	100-110	0	0	.29	.10
12	110-120	0	0	.20	.04
13.	120-130	0	0	.67	.32
14.	130-140	0	0	.96	.5
15.	140-150	0	0	.54	.24
16.	150-160	0	0	.41	.17
17.	160-170	0	.01	.45	.19
18.	170-180	0	.01	.28	.09
19.	180-190	0	0	.54	.24
20.	190-200	0	0	.49	.21
21.	200-210	.3	0	.78	.39
22.	210-220	0	0	.69	.34
23.	220-230	0	0	.69	.33
24	230-240	0	0	.52	.23
25	240-250	0	0	.98	.51
26	250-260	0	0	.82	.41

2/

	FOOTAGE	Ag	Mo	Cu	Cu_6
27	260-270	0	0	.92	.47
28	270-280	0	0	.59	1.27 ✓
29	280-290	0	0	.64	.30
30	290-300	0	0	.83	.42
31	300-310	0	0	.71	.35
32	310-320	0	0	.56	.26
33	320-330	0	0	.89	.45
34	330-340	0	0	.46	.20
35	340-350	0	0	.89	.45
36	350-360	0	0	.82	.41
37	360-370	0	0	.87	.44
38	370-380	0	0	.62	.29
39	380-390	0	0	.64	.31
40	390-400	0	.01	.89	.45
41	400-410	0	.01	.97	.50
42	410-420	0	0	.80	.40
43	420-430	0	0	.63	.30
44	430-440	0	0	.59	.28
45	440-450	0	0	.90	.46
46	450-460	0	0	.55	.25

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 662
August 17, 1990
BB-2 (12 TO 350)

Thunder Mtn.

ASARCO Incorporated
AUG 2 0 1990
SW Exploration

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 34 Drill Core Samples

Bearing S49°W
Inclination -37°

ITEM	SAMPLE NUMBER	FIRE ASSAY Au* (ppm)	Ag* (ppm)	Cu (%)	
1	BB-2 12-20	.012	.5	.03	12-40' @ .03% Cu
2	BB-2 20-30	.014	.2	.02	
3	BB-2 30-40	.016	.5	.04	
4	BB-2 40-50	.010	.9	.48	
5	BB-2 50-60	.026	5.0	.58	
6	BB-2 60-70	.012	4.0	.51	40-140
7	BB-2 70-80	.022	2.7	.72	100' @ 0.47% Cu
8	BB-2 80-90	.024	1.8	.82	
9	BB-2 90-100	.006	1.1	.51	
10	BB-2 100-110	.026	1.8	.22	
11	BB-2 110-120	.020	2.1	.19	
12	BB-2 120-130	.030	1.7	.41	
13	BB-2 130-140	.026	1.1	.26	
14	BB-2 140-150	.006	2.0	.04	140-180
15	BB-2 150-160	.036	1.2	.11	40' @ 0.04% Cu
16	BB-2 160-170	.012	3.4	<.01	
17	BB-2 170-180	.016	7.6	<.01	
18	BB-2 180-190	.012	4.5	.34	
19	BB-2 190-200	.024	7.3	.22	
20	BB-2 200-210	.040	4.4	.14	
21	BB-2 210-220	.006	2.2	.36	180-360
22	BB-2 220-230	.020	3.4	.20	180' @ 0.27% Cu
23	BB-2 230-240	.022	3.0	.20	
24	BB-2 240-250	.016	4.9	.15	
25	BB-2 250-260	.008	14.0	.33	

Ag
40-360 = 320' =
239.9/32 = 7.49 ppm
= 0.22 opt Ag

40-500 = 460' =
280.6/46 = 6.10 ppm
= 0.18 opt Ag

0.393 ppm = 0.01 opt Ag
0.0202 ppm = 0.0006 opt Au
2.2 ppm = 0.065 opt Ag
0.0175 ppm = 0.0005 opt Au
3.55 ppm = 0.10 opt Ag
0.0271 ppm = 0.0008 opt Au
1.26 ppm = 0.38 opt Ag

40-360 = .23

202.6/180 = 11.26 ppm
.33 opt Ag

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
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Tucson, Arizona 85703
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ASARCO Incorporated

AUG 2 0 1990

SW Exploration

JOB NO. TAJ 662
August 17, 1990

ITEM	SAMPLE NUMBER	FIRE ASSAY Au* (ppm)	Ag* (ppm)	Cu (%)
26	BB-2 260-270	.050	60.0	.21
27	BB-2 270-280	.070	44.0	.32
28	BB-2 280-290	.030	15.0	.28
29	BB-2 290-300	.034	7.8	.25
30	BB-2 300-310	.040	7.8	.42
31	BB-2 310-320	.030	7.9	.43
32	BB-2 320-330	.030	4.5	.20
33	BB-2 330-340	.012	6.0	.29
34	BB-2 340-350	.014	3.2	.31

includes 40' of 33.25 ppm = 0.98 opt Ag

*NOTE: Method of analysis by combination fire assay and atomic absorption.

Charles E. Thompson
Arizona Registered Assayer No. 9427

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REPORT OF ANALYSIS

JOB NO. TAJ 663
August 17, 1990
PROJET: EA-0042
BB-2 (350 TO 516.5)
PAGE 1 OF 1

ASARCO Incorporate
AUG 2 0 1990
SW Exploration

ASARCO INCORPORATED
Attn: Mr. John Malusa
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 17 Drill Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au* (ppm)	Ag* (ppm)	Cu (%)
1	BB-2 350-360	.03	2.7	.26
2	BB-2 360-370	.02	2.8	.17
3	BB-2 370-380	.04	3.8	.12
4	BB-2 380-390	.02	1.6	.09
5	BB-2 390-400	.05	6.6	.20
6	BB-2 400-410	.06	4.7	.05
7	BB-2 410-420	.05	4.1	.12
8	BB-2 420-430	.03	3.8	.14
9	BB-2 430-440	.06	6.0	.15
10	BB-2 440-450	.03	1.2	.17
11	BB-2 450-460	.02	1.0	.13
12	BB-2 460-470	.02	.5	.03
13	BB-2 470-480	.05	.4	.14
14	BB-2 480-490	.19	2.2	.19
15	BB-2 490-500	.10	2.9	.10
16	BB-2 500-510	.10	1.6	.01
17	BB-2 510-516.5	.06	1.2	.01

0.529 ppm = 0.016 opt Au
2.97 ppm = 0.09 oz/ton Ag

340-500'
140' @ 0.13% Cu

340-500 = 156' =
1.82/16 = 0.11% Cu

14-500 = 11.57
11.57/46 = 0.25 Cu

*NOTE: Method of analysis by combination fire assay and atomic absorption.

Charles E. Thompson
Chief Chemist
8/8/90

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

Thunder Mtn

REPORT OF ANALYSIS

JOB NO. TAJ 663
August 15, 1990
PROJET: EA-0042
BB-2 (350 TO 516.5)
PAGE 1 OF 1

ASARCO INCORPORATED
Attn: Mr. John Malusa
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

AUG 1 5 1990
SW Exploration

Preliminary Analysis of 16 Drill Core Samples

ITEM	SAMPLE NUMBER	Cu (%)
1	BB-2 350-360	.26
2	BB-2 360-370	.17
3	BB-2 370-380	.12
4	BB-2 380-390	.09
5	BB-2 390-400	.20
6	BB-2 400-410	.05
7	BB-2 410-420	.12
8	BB-2 420-430	.14
9	BB-2 430-440	.15
10	BB-2 440-450	.17
11	BB-2 450-460	.13
12	BB-2 460-470	.03
13	BB-2 470-480	.14
14	BB-2 480-490	.19
15	BB-2 490-500	.10
16	BB-2 500-510	.01
17	BB-2 510-516.5	.01

JDS

MEMORANDUM

To: James D. Sell

From: Harold Downey

Date: August 10,1990

Subject: Summary of Test Run of the MAP III Portable X-ray Fluorescence Analyzer

On August 2, 1990, James A. Briscoe of JABA, Inc., Tucson, AZ., conducted a test of the MAP III portable x-ray analyzer on un-split core from DDH # BB-2, ASARCO Thunder Mountain Project. The purpose of the test was to compare assay results given by this instrument with regular assays which will be forthcoming from Skyline Labs, Inc.

According to Briscoe, the MAP III unit has been successful in providing accurate assays, particularly for silver and copper, at several mining locations throughout the U. S. and Canada. If accurate assays can be obtained by MAP III, several advantages over conventional laboratory methods are evident, the most obvious being quick turnaround time, on-site evaluation and reduced cost if used on a large quantitiy of samples.

Before beginning the test on BB-2 core, Briscoe demonstrated the prodecure using three hand specimen size samples, one from the Troy deposit for copper, another from the Sunshine Mine for silver, and another from Thompson Creek for molybdenum. He pointed out that the instrument should be calibrated for a specific deposit inasmuch as rock density and sulfide content will affect the absorption of gamma rays entering the rock, i.e., denser rock will have less feedback to the instrument's sensor thus giving lower than true values, and conversely, a lower density rock would give higher values.

Testing BB-2 core was performed at 10 foot intervals (excepting the first interval from 12'-20') for a total of 45 intervals to a depth of 460' in the hole. A total of 120 seconds was spent in scanning each 10 foot section during which 3 to 4 passes were made back and forth over the core. At the end of each sequence, the values for silver, molybdenum, and copper were displayed on a digital read-out and were also fed into the instrument's internal computer/recorder.

Results of the test are attached in table form. I have calculated two grade averages for copper which are as follows:

12'--120' 108' of 0.025% Cu

120'--460' 340' of 0.69% Cu

Only minor, occasional readings for silver and molybdenum were noted.

If the copper values from this test are verified by conventional assays, the use of MAP III for various ASARCO projects may well be warranted.

H. Downey

Att.

cc: R.L. Brown
W.L. Kurtz

ASARCO DDH BB#2 8/2/90
REPORT OF MAP SYSTEM DATA
d:\map3\ddhbb#2.AS2
REPORT GENERATED 08-07-1990 AT 17:45:25

********** COMMENTS **********

The drill hole is located in the Patagonia Mtns., Santa Cruz Co., AZ. This assay log was prepared by Consulting Geologist James A. Briscoe using the MAP III portable XRay analyzer from Scitec. The analyses were performed on unsplit core which has been logged by consultant Harold Downey. The core will be split & std assays done. The rejects, pulps & split core will be reMAPed for comparison

****

****

M A P Scitec Corporation

****

ASSAYER			BLK	ELEMENT	DESCRIPTION
1. FACE	AG-02-02-040	072590	(1)	AG	.25 TO 287 OPT
			(2)	MO	.004 TO .96%
			(3)	PB	.2 TO 6.1%
			(4)	ZN	.007 TO 5.5%
			(5)	CU	.16 TO 2.82%
			(6)	CU-TRACK	COPPER TRACK

****

****

ID number: 8.2.90. (there are 4 assay sets in this ID)

ASSY NUM	ASSAYER	TIME (sec)	DEPTH (ft)	BLK	ASSAY	
1	1.	30		(1)	18.4 OPT	AG
				(2)	0.00 %	MO
				(5)	0.08 %	CU
				(6)	0.00	CU-TRACK
2	1.	30		(1)	2.0 OPT	AG
				(2)	0.00 %	MO
				(5)	0.51 %	CU
				(6)	0.23	CU-TRACK
70	1.	30		(1)	0.0 OPT	AG

Demo

				(2)	2.08	%	MO
				(5)	0.00	%	CU
				(6)	0.00		CU-TRACK
4	1.	30	83886.07	(1)	0.0	OPT	AG
				(2)	2.01	%	MO
				(5)	0.00	%	CU
				(6)	0.00		CU-TRACK

****

ID number: 8.2.90. (there are 46 assay sets in this ID)

ASSY NUM	ASSAYER	TIME (sec)	DEPTH (ft)	BLK	ASSAY		
1	1.	120	12-20'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.05	%	CU
				(6)	0.00		CU-TRACK
2	1.	120	20-30'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.21	%	CU
				(6)	0.05		CU-TRACK
3	1.	120	30-40'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.05	%	CU
				(6)	0.00		CU-TRACK
4	1.	120	40-50'	(1)	0.4	OPT	AG
				(2)	0.00	%	MO
				(5)	0.22	%	CU
				(6)	0.05		CU-TRACK
5	1.	120	50-60'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.23	%	CU
				(6)	0.06		CU-TRACK
6	1.	120	60-70'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.34	%	CU
				(6)	0.12		CU-TRACK
7	1.	120	70-80'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.40	%	CU
				(6)	0.16		CU-TRACK
~~8~~	~~1.~~ Abort	~~120~~					
9	1.	120	80-90'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.39	%	CU

				(6)	0.15		CU-TRACK
10	1.	120	90-100'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.40	%	CU
				(6)	0.16		CU-TRACK
11	1.	120	100-110'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.29	%	CU
				(6)	0.10		CU-TRACK
12	1.	120	110-120'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.20	%	CU
				(6)	0.04		CU-TRACK
13	1.	120	120-130'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.67	%	CU
				(6)	0.32		CU-TRACK
14	1.	120	130-140'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.96	%	CU
				(6)	0.50		CU-TRACK
15	1.	120	140-150'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.54	%	CU
				(6)	0.24		CU-TRACK
16	1.	120	150-160'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.41	%	CU
				(6)	0.17		CU-TRACK
17	1.	120	160-170'	(1)	0.0	OPT	AG
				(2)	0.01	%	MO
				(5)	0.45	%	CU
				(6)	0.19		CU-TRACK
18	1.	120	170-180'	(1)	0.0	OPT	AG
				(2)	0.01	%	MO
				(5)	0.28	%	CU
				(6)	0.09		CU-TRACK
19	1.	120	180-190'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.54	%	CU
				(6)	0.24		CU-TRACK
20	1.	120	190-200'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.49	%	CU
				(6)	0.21		CU-TRACK
21	1.	120	200-210'	(1)	0.3	OPT	AG
				(2)	0.00	%	MO
				(5)	0.78	%	CU
				(6)	0.39		CU-TRACK

22	1.	120	210-220'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.69	%	CU
				(6)	0.34		CU-TRACK
[illegible]	1.	120	220-230'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.69	%	CU
				(6)	0.33		CU-TRACK
24	1.	120	230-240'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.52	%	CU
				(6)	0.23		CU-TRACK
25	1.	120	240-250'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.98	%	CU
				(6)	0.51		CU-TRACK
26	1.	120	250-260'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.82	%	CU
				(6)	0.41		CU-TRACK
27	1.	120	260-270'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
28. Missing	verbal	0.0 OPT Ag, 0.00 % Mo, 0.59 % Cu, 1.27 Cu-Track	270-280'	(5)	0.92	%	CU
				(6)	0.47		CU-TRACK
29	1.	120	280-290'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.64	%	CU
				(6)	0.30		CU-TRACK
30	1.	120	290-300'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.83	%	CU
				(6)	0.42		CU-TRACK
31	1.	120	300-310'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.71	%	CU
				(6)	0.35		CU-TRACK
32	1.	120	310-320'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.56	%	CU
				(6)	0.26		CU-TRACK
33	1.	120	320-330'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.89	%	CU
				(6)	0.45		CU-TRACK
34	1.	120	330-340'	(1)	0.0	OPT	AG
				(2)	0.00	%	MO
				(5)	0.46	%	CU
				(6)	0.20		CU-TRACK

							Skyline	
35	1.	120	340-350'	(1)	0.0	OPT		AG
				(2)	0.00	%		MO
				(5)	0.89	%		CU
				(6)	0.45			CU-TRACK
36	1.	120	350-360'	(1)	0.0	OPT		AG
				(2)	0.00	%		MO
				(5)	0.82	%	.26	CU
				(6)	0.41			CU-TRACK
37	1.	120	360-370'	(1)	0.0	OPT		AG
				(2)	0.00	%		MO
				(5)	0.87	%	.17	CU
				(6)	0.44			CU-TRACK
38	1.	120	370-380'	(1)	0.0	OPT		AG
				(2)	0.00	%		MO
				(5)	0.62	%	.12	CU
				(6)	0.29			CU-TRACK
39	1.	120	380-390'	(1)	0.0	OPT		AG
				(2)	0.00	%		MO
				(5)	0.64	%	.09	CU
				(6)	0.31			CU-TRACK
40	1.	120	390-400'	(1)	0.0	OPT		AG
				(2)	0.01	%		MO
				(5)	0.89	%	.20	CU
				(6)	0.45			CU-TRACK
41	1.	120	400-410'	(1)	0.0	OPT		AG
				(2)	0.01	%		MO
				(5)	0.97	%	.05	CU
				(6)	0.50			CU-TRACK
42	1.	120	410-420'	(1)	0.0	OPT		AG
				(2)	0.00	%		MO
				(5)	0.80	%	.12	CU
				(6)	0.40			CU-TRACK
43	1.	120	420-430'	(1)	0.0	OPT		AG
				(2)	0.00	%		MO
				(5)	0.63	%	.14	CU
				(6)	0.30			CU-TRACK
44	1.	120	430-440'	(1)	0.0	OPT		AG
				(2)	0.00	%		MO
				(5)	0.59	%	.15	CU
				(6)	0.28			CU-TRACK
45	1.	120	440-450'	(1)	0.0	OPT		AG
				(2)	0.00	%		MO
				(5)	0.90	%	.17	CU
				(6)	0.46			CU-TRACK
46	1.	120	450-460'	(1)	0.0	OPT		AG
				(2)	0.00	%		MO
				(5)	0.55	%	.13	CU
				(6)	0.25			CU-TRACK

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 670
August 31, 1990
BB-3 1-2 TO
BB-3 60-70
PAGE 1 OF 1

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 7 Drill Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
~~1~~	~~BB-3 1-2~~	~~.046~~	~~.09~~	~~.13~~	contd ?
2	BB-3 14-20	<.002	<.01	.13	
3	BB-3 20-30	<.002	.02	.55	20-90
4	BB-3 30-40	<.002	<.01	.80	70' @ 0.64
5	BB-3 40-50	<.002	.03	.51	
6	BB-3 50-60	<.002	<.01	1.30	
7	BB-3 60-70	<.002	<.01	.62	14-90

70' @

cc: Mr. John Malusa

ASARCO Incorporated
SEP 4 1990
SW Exploration

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 673
September 5, 1990
BB-3 70 TO 210

ASARCO Incorporated
SEP 1 0 1990
SW Exploration

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 15 Drill Cutting Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
1	BB-3 70-80	<.002	.16	.28
2	BB-3 80-90	<.002	.08	.44
3	BB-3 90-100	<.002	<.01	.06
~~4~~	~~BB-3 100-101~~	~~.050~~	~~.15~~	~~.06~~ control
5	BB-3 100-110	<.002	.01	.11
6	BB-3 110-120	<.002	.01	.10
7	BB-3 120-130	<.002	.05	.18
8	BB-3 130-140	<.002	<.01	.18
9	BB-3 140-150	<.002	<.01	.07
10	BB-3 150-160	<.002	<.01	.01
11	BB-3 160-170	<.002	<.01	.05
12	BB-3 170-180	<.002	<.01	.01
13	BB-3 180-190	<.002	.03	.08
14	BB-3 190-200	<.002	.15	.04
15	BB-3 200-210	<.002	<.01	<.01

14-90=76 = 45.78/76 = 0.60 Cu 0.09 Ag
31/76 = 0.04 Ag

cc: ASARCO INCORPORATED
Attn: Mr. John Malusa
Southwestern Exploration
P. O. Box 5747
Tucson, AZ 85703

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 681
September 14, 1990
BB-3 210-450
PAGE 1 OF 2

ASARCO Incorporate
SEP 1 7 1990
SW Exploration

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 26 Drill Cutting Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
~~1~~	~~BB-3 201-202~~	~~.006~~	~~.08~~	~~.01~~	control
2	BB-3 210-220	.002	.07	.07	
3	BB-3 220-230	<.002	.10	.12	
4	BB-3 230-240	<.002	.11	.04	
5	BB-3 240-250	<.002	.01	.06	
6	BB-3 250-260	<.002	.05	.09	
7	BB-3 260-270	<.002	.01	.12	
8	BB-3 270-280	<.002	<.01	.07	
9	BB-3 280-290	<.002	.04	.07	
10	BB-3 290-300	<.002	.09	.08	
11	BB-3 300-310	.004	.07	.05	
~~12~~	~~BB-3 301-303~~	~~.008~~	~~1.50~~	~~.21~~	control
13	BB-3 310-320	.004	.03	.06	
14	BB-3 320-330	.002	.04	.03	
15	BB-3 330-340	<.002	.01	.07	
16	BB-3 340-350	<.002	<.01	.06	
17	BB-3 350-360	<.002	<.01	.07	
18	BB-3 360-370	<.002	<.01	.10	
19	BB-3 370-380	<.002	.02	.04	
20	BB-3 380-390	<.002	<.01	.09	

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 681
September 14, 1990

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
21	BB-3 390-400	<.002	<.01	.05
22	BB-3 400-410	<.002	.02	.06
23	BB-3 410-420	<.002	<.01	.03
24	BB-3 420-430	<.002	<.01	.07
25	BB-3 430-440	<.002	<.01	.10
26	BB-3 440-450	<.002	<.01	.06

cc: ASARCO INCORPORATED
Attn: Mr. John Malusa
Southwestern Exploration
P. O. Box 5747
Tucson, AZ 85703

ASARCO Incorporated
SEP 17 1990
SW Exploration

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 681
September 14, 1990
BB-3 210-450

ASARCO Incorporated

SEP 17 1990

SW Exploration

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 26 Drill Cutting Samples

26 Au&Ag(oz/t) @ $10.00	$260.00
26 Cu(%) @ $5.15	$133.90
26 samples crushed, split and pulverized @ $4.80	$124.80
Totals	$518.70

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JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 684
September 14, 1990
BB-3 450 TO 725

ASARCO Incorporated
SEP 17 1990
SW Exploration

ASARCO INCORPORATED
Attn: Mr. J.D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 29 Drill Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
1	BB-3 450-460	.002	<.01	.10
2	BB-3 460-470	.002	<.01	.05
3	BB-3 470-480	<.002	<.01	.07
4	BB-3 480-490	<.002	<.01	.08
5	BB-3 490-500	<.002	.02	.06
6	BB-3 500-510	<.002	.03	.14
7	BB-3 510-520	<.002	<.01	.20
8	BB-3 520-530	<.002	.04	.17
9	BB-3 530-540	.002	<.01	.11
10	BB-3 540-550	<.002	<.01	.05
11	BB-3 550-560	<.002	.04	.13
12	BB-3 560-570	<.002	.13	.39
13	BB-3 570-580	.002	.12	.18
14	BB-3 580-590	.002	.04	.10
15	BB-3 590-600	.004	<.01	.02
16	BB-3 600-610	.004	.06	.18
17	BB-3 610-620	<.002	.02	.30
18	BB-3 620-630	<.002	.02	.33
19	BB-3 630-640	.004	.23	.55
20	BB-3 640-650	<.002	.08	.40

90-500=410= 2.92/41 = 0.07 Cu
1.05/41 = 0.03 Ag
500-600= 100= 1.49/10 = 0.15 Cu
0.42/10 = 0.04 Ag

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ASARCO Incorporated

SEP 1 7 1990

SW Exploration

JOB NO. TAJ 684
September 14, 1990

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
21	BB-3 650-660	.002	.13	.35
22	BB-3 660-670	<.002	.11	.19
23	BB-3 670-680	<.002	<.01	.30
24	BB-3 680-690	.002	.11	.36
25	BB-3 690-700	.002	<.01	.33
~~26~~	~~BB-3 701-703~~	~~.006~~	~~1.04~~	~~.32~~ control
27	BB-3 700-710	<.002	.04	.36
28	BB-3 710-720	<.002	<.01	.19
29	BB-3 720-725	<.002	.02	.02

600-720 = 120 = $\frac{3.84}{12}$ = 0.32 Cu

$\frac{.88}{12}$ = 0.08 Ag

cc: Asarco Incorporated
Attn.: Mr. John Malusa
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

14-720 = 706' = $\frac{128.28}{706}$ = 0.18 Cu

= 706' = $\frac{2.60}{71}$ = 0.04 oz Ag

JPS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 684
September 14, 1990
BB-3 450 TO 725

ASARCO Incorporated

SEP 17 1990

SW Exploration

ASARCO INCORPORATED
Attn: Mr. J.D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 29 Drill Core Samples

29 Au&Ag(oz/t) @ $10.00	$290.00
29 Cu(%) @ $5.15	$149.35
29 samples crushed, split and pulverized @ $6.52	$189.08
Totals	$628.43

COPY

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

ASARCO

Southwestern Exploration Division

September 17, 1990

J.D. Sell

Assay Checks
Thunder Mountain
Santa Cruz County, AZ

For hole BB-3 both Standards C & D, Asarco multi-element standards, and resubmitted rejects from hole BB-2 were used.

Values of the standards are as follows:

Element and Units	C (95% confid.)	D (95% confid.)
Au oz/ton	0.056 ± 0.002	0.008 ± 0.0003
Ag oz/ton	0.260 ± 0.005	0.119 ± 0.004
Cu %	0.05 ± .002	0.012 ± .0004

Skyline Results for Standards used on Hole BB-3

Standard	Interval	Au (oz/t)	Ag (oz/t)	Cu (%)
C	1-2	.046	.09	.13
C	100-101	.050	.15	.06
D	201-202	.006	.08	.01

recalibrate

Resubmitted Rejects

	Hole #	Interval	Au (oz/t)	Ag (oz/t)	Cu (%)
original	BB-2	260-270	.001	1.74	.21
resubmit	BB-3	301-303	.008	1.50	.21
original	BB-2	270-280	.002	1.28	.32
resubmit	BB-3	701-703	.006	1.04	.32

John J. Malusa

JJM:mek

John J. Malusa

JDS

ASARCO

Exploration Department
Southwestern United States Division

September 20, 1990

RECEIVED FROM ASARCO:

Rejects		
ppm Ag	% Cu	Pulps (BB-2)*
7.6	<0.01	170-180
1.6	0.01	500-510
0.2	0.02	20-30
4.7	0.05	400-410
1.2	0.11	150-160
3.4	0.20	220-230
15.0	0.28	280-290
3.2	0.31	340-350
1.7	0.41	120-130
7.9	0.43	310-320
0.9	0.48	40-50
4.0	0.51	60-70
5.0	0.58	50-60
2.7	0.72	70-80
1.8	0.82	80-90

*Pulps to be returned within 30 days.

9/20/90
Date Signed

Jim Briscoe

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010

JDS

ASARCO

Southwestern Exploration Division

September 28, 1990

J.J. Malusa

Thunder Mountain Project
Drill Holes
Santa Cruz County, AZ

When you have completed a drill hole and have the assays, replot the hole on to the sketch sections at its proper dip and length and replot the top and bottom of the mineralized zone for submitting with your Monthly Reports.

Submit to D. Melhado to keep his originals up-to-date.

James D. Sell

JDS:mek

James D. Sell

cc: W.L. Kurtz

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 688
October 9, 1990
BB-4 (1-500)

OCT 1 0 1990

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 54 Drill Core Samples

54 Au&Ag(oz/t) @ $10.00	$540.00
54 Cu(%) @ $5.15	$278.10
54 samples crushed, split and pulverized @ $4.65	$251.10
Totals	$1069.20

COPY

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

Orig to Acctg 10/22/90

JDS

EA0042
TM

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 690
October 9, 1990
BB-4 (500-797)

ASARCO INCORPORATED
Attn: Mr. J. D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

OCT 1 0 1990
SW Exploration

Analysis of 33 Core Samples

33 Au&Ag(oz/t) @ $10.00*	$330.00
33 Cu(%) @ $5.15	$169.95
33 samples crushed, split and pulverized @ $4.60	$151.80
Totals	$651.75

* Multi Element Discount

COPY

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 688
October 9, 1990
BB-4 (1-500)

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

ASARCO Incorporated
OCT 10 1990
SW Exploration

Analysis of 54 Drill Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
1	BB-4 1-2	.050	.21	.05	control
2	BB-4 7-10	.004	.62	.43	control
3	BB-4 10-20	.008	.17	.59	
4	BB-4 20-30	<.002	.08	.83	10-190 = 180'
5	BB-4 30-40	<.002	<.01	.38	= 8.39/18 = 0.466 % Cu
6	BB-4 40-50	<.002	.08	.29	
7	BB-4 50-60	<.002	.06	.58	
8	BB-4 60-70	<.002	<.01	.59	
9	BB-4 70-80	<.002	<.01	.18	
10	BB-4 80-90	<.002	<.01	.24	10-190 = 0.67/18 = 0.037 opt Ag
11	BB-4 90-100	<.002	.03	.65	
12	BB-4 100-110	<.002	.16	1.29	
13	BB-4 110-120	<.002	<.01	.44	
14	BB-4 120-130	<.002	<.01	.14	
15	BB-4 130-140	<.002	.02	.49	
16	BB-4 140-150	<.002	<.01	.39	
17	BB-4 150-160	<.002	<.01	.41	
18	BB-4 160-170	.006	.01	.26	
19	BB-4 170-180	.004	.01	.30	
20	BB-4 180-190	.002	<.01	.34	
21	BB-4 190-200	.004	<.01	.06	
22	BB-4 200-210	<.002	<.01	.03	
~~23~~	~~BB-4 201-202~~	~~.010~~	~~.21~~	~~.05~~	~~control~~
24	BB-4 210-220	.002	<.01	.03	
25	BB-4 220-230	<.002	<.01	<.01	

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 688
October 9, 1990

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
26	BB-4 230-240	<.002	<.01	<.01	
27	BB-4 240-250	<.002	<.01	<.01	
28	BB-4 250-260	.002	<.01	<.01	
29	BB-4 260-270	<.002	<.01	<.01	190-390 = 200'
30	BB-4 270-280	<.002	<.01	<.01	= 1.33/20 = 0.067%
31	BB-4 280-290	<.002	<.01	<.01	
32	BB-4 290-300	<.002	<.01	<.01	
33	BB-4 300-310	<.002	<.01	.02	
34	BB-4 310-320	<.002	<.01	.03	
35	BB-4 320-330	.002	<.01	.14	
36	BB-4 330-340	.002	<.01	.09	
37	BB-4 340-350	.004	<.01	.19	
38	BB-4 350-360	.006	<.01	.19	
39	BB-4 360-370	<.002	<.01	.19	
40	BB-4 370-380	.004	<.01	.13	
41	BB-4 380-390	<.002	.02	.19	
42	BB-4 390-400	<.002	.01	.62	
43	BB-4 400-410	.008	.07	.02	
~~44~~	~~BB-4 402-403~~	~~<.002~~	~~.05~~	~~.57~~	Control
~~45~~	~~BB-4 403-404~~	~~<.002~~	~~<.01~~	~~.44~~	Control
46	BB-4 410-420	<.002	<.01	.41	390-470 = 80'
47	BB-4 420-430	<.002	<.01	.30	= 2.92/8 = 0.365
48	BB-4 430-440	<.002	<.01	.44	% Cu
49	BB-4 440-450	.002	<.01	.44	
50	BB-4 450-460	.006	<.01	.34	

340-550 = 210 =
5.47/21 = 0.26

(190-470 = 280
4.25/28 = 0.15)

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 688
October 9, 1990

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
51	BB-4 460-470	.006	<.01	.35
52	BB-4 470-480	<.002	<.01	.26
53	BB-4 480-490	<.002	<.01	.12
54	BB-4 490-500	.002	<.01	.28

470-610 = 140'
= 2.37/14 = 0.17% Cu

cc: Mr. John Malusa

William L. Lehmbeck
Manager
10/9/90

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JDS

REPORT OF ANALYSIS

JOB NO. taj 690
October 9, 1990
BB-4 (500-797)

ASARCO INCORPORATED
Attn: Mr. J. D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

OCT 1 0 1990

Analysis of 33 Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
1	BB-4 500-510	.002	<.01	.19	
~~2~~	~~BB-4 501-502~~	~~.050~~	~~.21~~	~~.06~~	control
3	BB-4 510-520	.004	.01	.22	
4	BB-4 520-530	.002	<.01	.20	
5	BB-4 530-540	.004	<.01	.13	
6	BB-4 540-550	.004	<.01	.26	
7	BB-4 550-560	.004	<.01	.07	
8	BB-4 560-570	<.002	<.01	.07	
9	BB-4 570-580	.006	<.01	.10	
10	BB-4 580-590	.004	<.01	.17	
11	BB-4 590-600	.002	<.01	.20	
12	BB-4 600-610	.002	<.01	.10	
~~13~~	~~BB-4 602-603~~	~~.010~~	~~<.01~~	~~.01~~	control
14	BB-4 610-620	.004	<.01	.03	
15	BB-4 620-630	.002	<.01	.08	
16	BB-4 630-640	<.002	<.01	.03	
17	BB-4 640-650	<.002	<.01	.09	
18	BB-4 650-660	<.002	<.01	.05	
19	BB-4 660-670	<.002	<.01	.02	
20	BB-4 670-680	<.002	<.01	.03	
21	BB-4 680-690	<.002	<.01	.01	
22	BB-4 690-700	<.002	<.01	.01	
23	BB-4 700-710	<.002	<.01	.05	
~~24~~	~~BB-4 703-704~~	~~.002~~	~~<.01~~	~~.60~~	control
25	BB-4 710-720	<.002	<.01	.03	

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

OCT 1 0 1990

JOB NO. taj 690
October 9, 1990
PAGE 2 OF 2

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
26	BB-4 720-730	<.002	<.01	.02
27	BB-4 730-740	<.002	<.01	.02
28	BB-4 740-750	<.002	<.01	.01
29	BB-4 750-760	<.002	<.01	.03
30	BB-4 760-770	<.002	<.01	.04
31	BB-4 770-780	<.002	<.01	.04
32	BB-4 780-790	<.002	<.01	.01
33	BB-4 790-797 T.D.	<.002	<.01	.01

cc: Mr. John Malusa

William L. Lehmbeck
Manager 10/9/90

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 693
October 22, 1990
BB-5 10-270

ASARCO INC.
OCT 24 1990
SW Exploration

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

-30°

Analysis of 28 Drill Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
1	BB-5 10-20	<.002	<.01	.02	
2	BB-5 20-30	<.002	<.01	.02	
3	BB-5 30-40	<.002	<.01	.02	
4	BB-5 40-50	<.002	<.01	.03	
5	BB-5 50-60	<.002	<.01	.04	
6	BB-5 60-70	<.002	<.01	.04	10-230'
7	BB-5 70-80	<.002	<.01	.07	= 220' = 0.96/22 =
8	BB-5 80-90	<.002	<.01	.04	
9	BB-5 90-100	<.002	<.01	.01	220' @ 0.04%
10	BB-5 100-110	.004	.03	.02	Cu
~~11~~	~~BB-5 101-102~~	~~.055~~	~~.23~~	~~.05~~	control
12	BB-5 110-120	.002	<.01	.05	
13	BB-5 120-130	<.002	<.01	.08	
14	BB-5 130-140	.002	<.01	.10	
15	BB-5 140-150	<.002	.03	.13	
16	BB-5 150-160	<.002	<.01	.06	
17	BB-5 160-170	<.002	<.01	.03	
18	BB-5 170-180	<.002	<.01	.06	
19	BB-5 180-190	<.002	<.01	.01	
20	BB-5 190-200	<.002	<.01	.02	
~~21~~	~~BB-5 202-203~~	~~.010~~	~~.07~~	~~.01~~	control
22	BB-5 200-210	<.002	<.01	.02	
23	BB-5 210-220	.004	.05	.03	
24	BB-5 220-230	<.002	.03	.06	
25	BB-5 230-240	<.002	<.01	.19	

TD 767

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 693
October 22, 1990

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
26	BB-5 240-250	<.002	<.01	.25
27	BB-5 250-260	<.002	<.01	.24
28	BB-5 260-270	<.002	<.01	.12

cc: Mr. John Malusa

or 230-260 = 30'
= 30' = $\frac{0.68}{3}$ = 0.227
30' @ 0.23% Cu

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 693
October 22, 1990
BB-5 10-270

AS

OCT 2 4 1990

SW Exploration

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 28 Drill Core Samples

28 Au&Ag(oz/t) @ $10.00	$280.00
28 Cu(%) @ $5.15	$144.20
28 samples crushed, split and pulverized @ $4.69	$131.32
Totals	$555.52

APPROVED FOR PAYMENT

By:_____
(Signature)

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 695
October 24, 1990
BB-5 270-370
PAGE 1 OF 1

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

ASARCO Incorporated
OCT 26 1990
SW Exploration

Analysis of 11 Drill Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
1	BB-5 270-280	<.002	<.01	.08
2	BB-5 280-290	<.002	<.01	.13
3	BB-5 290-300	<.002	.03	.12
4	BB-5 300-310	<.002	<.01	.10
~~5~~	~~BB-5 302-303~~	~~.010~~	~~.03~~	~~.02~~
6	BB-5 310-320	<.002	<.01	.05
7	BB-5 320-330	<.002	.01	.06
8	BB-5 330-340	<.002	<.01	.03
9	BB-5 340-350	<.002	<.01	.03
10	BB-5 350-360	<.002	<.01	.07
11	BB-5 360-370	<.002	<.01	.05

230'-310' = 80'
= 1.23/8 = 0.15
80' @ 0.15 % Cu

cc: Mr. John Malusa

310-800' =
490' = 2.00 /49
= 0.041

bottom 690-780 =
90' = 0.90/9
= 0.100

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 695
October 24, 1990
BB-5 270-370

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 11 Drill Core Samples

11 Au&Ag(oz/t) @ $10.00	$110.00
11 Cu(%) @ $5.15	$56.65
11 samples crushed, split and pulverized @ $4.65	$51.15
Totals	$217.80

COPY

ASARCO Incorporated
OCT 26 1990
SW Exploration

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JLS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 699
November 6, 1990
BB-5 370-570

ASARCO INCORPORATED
Attn: Mr. J. D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 22 Split Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
1	BB-5 370-380	<.002	.05	.04
2	BB-5 380-390	<.002	<.01	.02
3	BB-5 390-400	<.002	<.01	.01
4	BB-5 400-410	<.002	<.01	.04
~~5~~	~~BB-5 401-402~~	~~.050~~	~~.16~~	~~.05~~ control
6	BB-5 410-420	<.002	<.01	.01
7	BB-5 420-430	<.002	<.01	.01
8	BB-5 430-440	<.002	<.01	<.01
9	BB-5 440-450	<.002	<.01	.01
10	BB-5 450-460	<.002	<.01	.04
11	BB-5 460-470	<.002	<.01	.01
12	BB-5 470-480	<.002	<.01	.07
13	BB-5 480-490	<.002	<.01	.01
14	BB-5 490-500	<.002	<.01	.02
15	BB-5 500-510	<.002	<.01	.02

ASARCO
NOV 6 1990
SW Exploration

continued

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 699
November 6, 1990

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
~~16~~	~~BB-5 503-504~~	~~.004~~	~~.18~~	~~1.27~~ control
17	BB-5 510-520	<.002	<.01	<.01
18	BB-5 520-530	<.002	<.01	.01
19	BB-5 530-540	<.002	<.01	.01
20	BB-5 540-550	<.002	<.01	.01
21	BB-5 550-560	<.002	<.01	<.01
22	BB-5 560-570	<.002	<.01	<.01

cc: ASARCO INCORPORATED
Attn: Mr. John J. Malusa
Southwestern Exploration
P. O. Box 5747
Tucson, AZ 85703

ASARCO Inc.
NOV 16 1990
SW Exploration

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 699
November 6, 1990
BB-5 370-570

ASARCO INCORPORATED
Attn: Mr. J. D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 22 Split Core Samples

22 Au&Ag(oz/t) @ $10.00	$220.00
22 Cu(%) @ $5.15	$113.30
22 samples crushed, split and pulverized @ $4.77	$104.94
Totals	$438.24

COPY

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 700
November 6, 1990
BB-5 570 TO 800
PAGE 1 OF 2

ASARCO Incorporated
NOV 8 1990
SW Exploration

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 25 Drill Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
1	BB-5 570-580	<.002	<.01	.01	
2	BB-5 580-590	<.002	<.01	.02	
3	BB-5 590-600	<.002	<.01	.04	
~~4~~	~~BB-5 602-603~~	~~.010~~	~~.08~~	~~.01~~	control
5	BB-5 600-610	<.002	<.01	.05	
6	BB-5 610-620	<.002	<.01	.03	
7	BB-5 620-630	<.002	<.01	.03	
8	BB-5 630-640	<.002	<.01	.05	
9	BB-5 640-650	.002	<.01	.07	
10	BB-5 650-660	<.002	<.01	.02	
11	BB-5 660-670	<.002	<.01	.03	
12	BB-5 670-680	<.002	.01	.02	
13	BB-5 680-690	<.002	<.01	.03	
14	BB-5 690-700	<.002	<.01	.22	
~~15~~	~~BB-5 703-704~~	~~<.002~~	~~.04~~	~~.62~~	control
16	BB-5 700-710	<.002	<.01	.04	690-780 = 90'
17	BB-5 710-720	<.002	<.01	.03	= 0.90/9 = 0.10 %
18	BB-5 720-730	<.002	<.01	.07	
19	BB-5 730-740	<.002	<.01	.15	
20	BB-5 740-750	<.002	<.01	.16	

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ASARCO Incorporated

NOV 8 1990

SW Exploration

JOB NO. TAJ 700
November 6, 1990

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
21	BB-5 750-760	<.002	<.01	.04
22	BB-5 760-770	<.002	.01	.11
23	BB-5 770-780	<.002	.01	.08
24	BB-5 780-790	<.002	<.01	.02
25	BB-5 790-800	<.002	.02	.03

cc: ASARCO INCORPORATED
Attn: Mr. John J. Malusa
Southwestern Exploration
P. O. Box 5747
Tucson, AZ 85703

William L. Lehmbeck
Manager
11/6/90

JDS

SKYLINE LABS, INC.

1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 700
November 6, 1990
BB-5 570 TO 800

ASARCO Incorporated
NOV 8 1990
SW Exploration

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 25 Drill Core Samples

25 Au&Ag(oz/t) @ $10.00	$250.00
25 Cu(%) @ $5.15	$128.75
25 samples crushed, split and pulverized @ $4.80	$120.00
Totals	$498.75

COPY

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

ASARCO

Southwestern Exploration Division

November 12, 1990

J.J. Malusa

Rejects BB-2, -3, -4
Bucket Breccia Zone
Thunder Mountain Project
Santa Cruz County, AZ

Pull the following rejects to be delivered to Skyline for them to prepare a composite to be used in leach tests by Met-Con.

Skyline should submit a head assay with the following values: Total copper, copper oxide, copper sulfide, gold, silver, arsenic, antimony, and whole rock (SiO_2, Al_2O_3, MgO, CuO, Na_2O, K_2O, Fe_2O_3, and FeO) as well as the bulk composite.

The leach procedures will be confirmed with D.E. Crowell.

Hole	Footage	Estimated % Copper
BB-2	40-140	0.47
BB-3	14-90	0.60
BB-4	10-190	0.47

James D. Sell

JDS:mek

James D. Sell

cc: D.E. Crowell
W.L. Kurtz

Metcon # 1703
1704
1705
1706
Angie 12/4

JDS

ASARCO

Southwestern Exploration Division

November 16, 1990

FILE NOTE

Assay Checks
Thunder Mtn. Project
Patagonia Mountains
Santa Cruz County, AZ

Based on the Fletcher Standards for the "C" and "D" standards, it would appear that Skyline is 40%-55% low in their silver assays and good (with one bust) in the copper assays (BB-4, 402-403).

In rerunning submitted rejects, Skyline appears to be good in silver, with one large discrepancy (BB-3, 630-640), and good in copper, with again one large difference (BB-3, 50-60).

Gold values were not considered.

James D. Sell

James D. Sell

JDS:mek
Att.

cc: F.T. Graybeal
D.I. Fletcher
W.L. Kurtz
J.J. Malusa

Assay Checks
Thunder Mountain Project

November 16, 1990

"C" Standard
Ag = 0.260 opt
Cu = 0.05%

Skyline Results:

Ag	Cu
0.09	0.13
0.15	0.06
0.21	0.05
0.21	0.05
0.21	0.06
0.23	0.05
0.16	0.05
1.10/7=	0.45/7=
=0.157	=0.064
overall	Good
LOW	
±40%	

"D" Standard
Ag = 0.119 opt
Cu = 0.012%

Skyline Results:

Ag	Cu
0.08	0.01
0.05	~~0.57~~-bust
<0.01	0.01
0.07	0.01
0.03	0.02
0.08	0.01
0.32/6=	0.0615=
=0.053	=0.012
overall	Good
LOW	w/1 bust
by ±55%	

ASARCO Southwestern Exploration Division

JDS

November 9, 1990

J.D. Sell

Assay Checks
Thunder Mountain Project
Santa Cruz County, AZ

For holes BB-3, 4, and 5, both C & D, Asarco multi-element standards, and resubmitted rejects from holes BB-2, 3 and 4 have been used.

Values of the standards are as follows:

Element & Units	C (95% confid.)	D (95% confid.)
Au oz/ton	0.056 ± 0.002	0.008 ± 0.0003
Ag oz/ton	0.260 ± 0.005	0.119 ± 0.004
Cu %	0.05 ± 0.002	0.012 ± 0.0004

Skyline Results for Standards used on BB-3, 4 and 5

Standard	Hole #	Interval	Au (oz/t)	Ag (oz/t)	Cu (%)
C	BB-3	1-2	0.046	0.09	0.13
C	BB-3	100-101	0.050	0.15	0.06
D	BB-3	201-202	0.006	0.08	0.01
C	BB-4	1-2	0.050	0.21	0.05
C	BB-4	201-202	0.010	0.21	0.05
D	BB-4	402-403	<0.002	0.05	0.57
C	BB-4	501-502	0.050	0.21	0.06
D	BB-4	602-603	0.010	<0.01	0.01
C	BB-5	101-102	0.055	0.23	0.05
D	BB-5	202-203	0.010	0.07	0.01
D	BB-5	302-303	0.010	0.03	0.02
C	BB-5	401-402	0.050	0.16	0.05
D	BB-5	602-603	0.010	0.08	0.01

Resubmitted Rejects

	Hole #	Interval (ft.)	Au (oz/t)	Ag (oz/t)	Cu (%)
Original	BB-2	260-270	0.001	1.74	0.21
Resubmit	BB-3	301-303	0.008	1.50	0.21
Original	BB-2	270-280	0.002	1.28	0.32
Resubmit	BB-3	701-703	0.006	1.04	0.32
Original	BB-3	50-60	<0.002	<0.01	1.30
Resubmit	BB-4	403-404	<0.002	<0.01	0.44
Original	BB-3	630-640	0.004	0.23	0.55
Resubmit	BB-4	703-704	0.002	<0.01	0.60
Original	BB-4	100-110	<0.002	0.16	1.29
Resubmit	BB-5	503-504	0.004	0.18	1.27
Original	BB-4	390-400	<0.002	0.01	0.62
Resubmit	BB-5	703-704	<0.002	0.04	0.62

John J. Malusa

J.J. Malusa

JJM:mek

cc: W.L. Kurtz

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 702
November 30, 1990
BB-6 (20 TO 280)

ASARCO Inc.
DEC 4 1990
SW Exploration

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 28 Drill Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
					20-90 = 70'
1	BB-6 20-30	.002	.36	.81	70' @ 2.60/7 =
2	BB-6 30-40	.008	<.01	.18	= 0.37% Cu
3	BB-6 40-50	.006	.08	.15	
4	BB-6 50-60	.004	.03	.44	
5	BB-6 60-70	.002	.06	.30	
6	BB-6 70-80	.002	.14	.26	
7	BB-6 80-90	.004	.31	.46	
8	BB-6 90-100	.002	.12	.18	
~~9~~	~~BB-6 101-102~~	~~.050~~	~~.18~~	~~.06~~	control
10	BB-6 100-110	.002	.05	.19	
11	BB-6 110-120	.002	<.01	.21	90-300 = 210
12	BB-6 120-130	<.002	<.01	.07	= 2.91/21 = ~~0.139~~
13	BB-6 130-140	.002	<.01	.08	= 0.14%
14	BB-6 140-150	<.002	.07	.26	Cu
15	BB-6 150-160	.002	<.01	.13	
16	BB-6 160-170	.006	<.01	.06	
17	BB-6 170-180	<.002	<.01	.14	
18	BB-6 180-190	<.002	<.01	.08	
19	BB-6 190-200	<.002	.03	.07	
~~20~~	~~BB-6 202-203~~	~~.006~~	~~.07~~	~~.02~~	control
21	BB-6 200-210	<.002	<.01	.05	
22	BB-6 210-220	<.002	<.01	.16	
23	BB-6 220-230	<.002	.09	.23	
24	BB-6 230-240	.002	<.01	.12	
25	BB-6 240-250	<.002	<.01	.14	

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 702
November 30, 1990

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
26	BB-6 250-260	<.002	<.01	.08
27	BB-6 260-270	<.002	.05	.13
28	BB-6 270-280	<.002	<.01	.15

cc: Asarco Incorporated
Attn.: Mr. John J. Malusa
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

JDS

SKYLINE LABS, INC.

1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 705
December 7, 1990
PROJECT NO.: EA-0042
BB-6 280 TO 800

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

ASARCO Incorporated
DEC 10 1990
SW Exploration

Analysis of 57 Split Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
1	BB-6 280-290	<.002	.09	.23	
2	BB-6 290-300	<.002	.02	.15	
~~3~~	~~BB-6 301-302~~	~~.055~~	~~.16~~	~~.06~~	control
4	BB-6 300-310	.002	<.01	.34	
5	BB-6 310-320	<.002	<.01	.18	(90-490=400' =15.02/400=.3852)
6	BB-6 320-330	.002	<.01	.31	
7	BB-6 330-340	.002	<.01	.17	
8	BB-6 340-350	<.002	.06	.52	300-490=190'
9	BB-6 350-360	.002	<.01	.11	=12.11/19=0.637
10	BB-6 360-370	.004	1.69	3.75	=0.64%Cu
11	BB-6 370-380	<.002	<.01	.45	
12	BB-6 380-390	.002	<.01	.70	
13	BB-6 390-400	<.002	.27	1.03	
~~14~~	~~BB-6 402-403~~	~~.008~~	~~.07~~	~~.02~~	control
15	BB-6 400-410	.002	.10	.81	
16	BB-6 410-420	.006	.15	.69	
17	BB-6 420-430	<.002	.04	.41	
18	BB-6 430-440	.002	.04	.53	
19	BB-6 440-450	.002	.34	1.00	
20	BB-6 450-460	.002	<.01	.23	
21	BB-6 460-470	<.002	<.01	.17	
22	BB-6 470-480	.002	.03	.30	
23	BB-6 480-490	<.002	<.01	.41	
24	BB-6 490-500	<.002	<.01	.15	
~~25~~	~~BB-6 503-504~~	~~<.002~~	~~.04~~	~~.36~~	control

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
26	BB-6 500-510	<.002	<.01	.12	
27	BB-6 510-520	<.002	<.01	.24	
28	BB-6 520-530	<.002	<.01	.16	
29	BB-6 530-540	<.002	<.01	.11	
30	BB-6 540-550	<.002	<.01	.04	
31	BB-6 550-560	<.002	<.01	.11	
32	BB-6 560-570	<.002	<.01	.14	
33	BB-6 570-580	.002	<.01	.07	
34	BB-6 580-590	<.002	<.01	.12	
35	BB-6 590-600	<.002	<.01	.02	
~~36~~	~~BB-6 601-602~~	~~.050~~	~~.20~~	~~.06~~	~~control~~
37	BB-6 600-610	.002	<.01	.25	
38	BB-6 610-620	.002	.15	.36	
39	BB-6 620-630	<.002	<.01	.15	
40	BB-6 630-640	<.002	<.01	.05	
41	BB-6 640-650	.002	<.01	.03	
42	BB-6 650-660	<.002	<.01	.14	
43	BB-6 660-670	<.002	<.01	.26	
44	BB-6 670-680	<.002	<.01	.12	
45	BB-6 680-690	<.002	<.01	.53	
46	BB-6 690-700	<.002	<.01	.30	
~~47~~	~~BB-6 702-703~~	~~.006~~	~~.11~~	~~.02~~	~~control~~
48	BB-6 700-710	.002	<.01	.24	
49	BB-6 710-720	<.002	<.01	.04	
50	BB-6 720-730	<.002	<.01	.25	

or 490-600 = 110'
= 1.28/11 = 0.12

600-760 = 160'
= 3.68/16 = 0.23

490-760 = 270'
= 4.96/27 = 0.18% Cu

(490-600 = 110 = 1.28/11 = 0.12%
(600-760 = 160 = 3.68/16 = 0.23%

20-760 = 740'
= 22.58/74 = 0.31%

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 705
December 7, 1990

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
51	BB-6 730-740	.002	<.01	.21
52	BB-6 740-750	.010	.10	.52
53	BB-6 750-760	<.002	<.01	.23
54	BB-6 760-770	<.002	<.01	.02
55	BB-6 770-780	<.002	<.01	.01
56	BB-6 780-790	<.002	<.01	.06
57	BB-6 790-800	<.002	<.01	.13

760-800 = 40'
0.22 = M = 0.055 %Cu

cc: Mr. John J. Malusa

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
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Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 702
November 30, 1990
BB-6 (20 TO 280)

ASARCO

DEC 4 1990

SW Exploration

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 28 Drill Core Samples

28 Au&Ag(oz/t) @ $10.00	$280.00
28 Cu(%) @ $5.15	$144.20
28 samples crushed, split and pulverized @ $4.80	$134.40
Totals	$558.60

COPY

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 705
December 7, 1990
PROJECT NO.: EA-0042
BB-6 280 TO 800

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

ASARCO Incorporated
DEC 10 1990
SW Exploration

Analysis of 57 Split Core Samples

57 Au&Ag(oz/t) @ $10.00..... $570.00
57 Cu(%) @ $5.15..... $293.55
57 samples crushed, split and pulverized @ $4.80 ..... $273.60

Totals $1137.15

COPY

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

12/6/90

FROM: J. D. SELL

TO: JJ Moliesa

Reject BB-2, -3, -4

On Nov. 12, 1990, I requested you to have Skyline prepare a new bulk composite from selected zones in the above holes and give us assay data and whole rock analysis.

What TAS number has these samples been submitted under?

JDS.

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 704
December 12, 1990
TM-14 3600-4580
PAGE 1 OF 1

ASARCO INCORPORATED
Attn: Mr. J. D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 13 Drill Core Samples

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	Cu (ppm)	%	Pb (ppm)	Zn (ppm)	%
1	TM-14 3600-3610	<.02	.9	325.	0.03	12.	295.	0.03
2	TM-14 3601-3602	.36	8.5	450.	0.05	410.	360.	0.04
3	TM-14 3700-3710	<.02	2.2	1500.	0.15	85.	730.	0.07
4	TM-14 3800-3810	<.02	1.4	550.	0.06	80.	465.	0.05
5	TM-14 3900-3910	<.02	2.6	1400.	0.14	160.	680.	0.07
6	TM-14 4000-4010	<.02	1.7	700.	0.07	120.	650.	0.07
7	TM-14 4100-4110	<.02	2.3	1050.	0.11	150.	1600.	0.16
8	TM-14 4200-4210	<.02	2.0	1150.	0.12	70.	750.	0.08
9	TM-14 4300-4310	<.02	1.6	670.	0.07	80.	840.	0.08
10	TM-14 4400-4410	<.02	1.1	425.	0.04	28.	195.	0.02
11	TM-14 4500-4510	<.02	1.8	1100.	0.11	60.	890.	0.09
12	TM-14 4550-4560	<.02	1.2	1050.	0.11	48.	345.	0.03
13	TM-14 4570-4580	<.02	2.0	1500.	0.15	65.	780.	0.08

cc: Mr. John Malusa

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 704
December 12, 1990
TM-14 3600-4580
PAGE 1 OF 1

ASARCO Incorporated
DEC 13 1990
SW Exploration

ASARCO INCORPORATED
Attn: Mr. J. D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 13 Drill Core Samples

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)
1	TM-14 3600-3610	<.02	.9	325.	12.	295.
2	TM-14 3601-3602	.36	8.5	450.	410.	360.
3	TM-14 3700-3710	<.02	2.2	1500.	85.	730.
4	TM-14 3800-3810	<.02	1.4	550.	80.	465.
5	TM-14 3900-3910	<.02	2.6	1400.	160.	680.
6	TM-14 4000-4010	<.02	1.7	700.	120.	650.
7	TM-14 4100-4110	<.02	2.3	1050.	150.	1600.
8	TM-14 4200-4210	<.02	2.0	1150.	70.	750.
9	TM-14 4300-4310	<.02	1.6	670.	80.	840.
10	TM-14 4400-4410	<.02	1.1	425.	28.	195.
11	TM-14 4500-4510	<.02	1.8	1100.	60.	890.
12	TM-14 4550-4560	<.02	1.2	1050.	48.	345.
13	TM-14 4570-4580	<.02	2.0	1500.	65.	780.

cc: Mr. John Malusa

William L. Lehmbeck
Manager
12/12/90

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 704
December 12, 1990
TM-14 3600-4580

ASARCO INCORPORATED
Attn: Mr. J. D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 13 Drill Core Samples

13 Au(ppm) @ $5.20	$67.60
13 Ag,Cu,Pb(ppm) @ $6.30*	$81.90
13 Zn(ppm) @ $0.70*	$9.10
13 samples crushed, split and pulverized @ $3.34	$43.42
Totals	$202.02

* Multi Element Discount

OK for payment
James D Sell
Thunderbird Res
EA-0042

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

905

12/13/90

FROM: J. D. SELL

TO: H. J. Downey

Thunder Mtn

Please prepare individual core sheets for holes BB-2, thru BB-7, giving a rehash of the geology and the copper values found, broken out as to rock types ~~assay groupings~~. This is to be attached to your log sheets & submitted to me.

Jim

(42)

FROM: J. D. SELL 12/13/90

TO: ~~#~~ J J Malusa

Thunderwitch

Hole BB-7, presently drilling will be the last hole in this series. Nino has been alerted, keep control of the hole.

Jim

12/12/90

FROM: J. D. SELL

TO: J J Malusa

Thunderstruck
TM-14

JDS

Pull the TM-14 log sheet and add the new assays to the sheets & refile.

JDS

106

YSIS

JOB NO. TAJ 704
December 12, 1990
TM-14 3600-4580
PAGE 1 OF 1

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	Cu (ppm)	%	Pb (ppm)	Zn (ppm)	%
1	TM-14 3600-3610	<.02	.9	325.	0.03	12.	295.	0.03
2	TM-14 3601-3602	.36	8.5	450.	0.05	410.	360.	0.04
3	TM-14 3700-3710	<.02	2.2	1500.	0.15	85.	730.	0.07
4	TM-14 3800-3810	<.02	1.4	550.	0.06	80.	465.	0.05
5	TM-14 3900-3910	<.02	2.6	1400.	0.14	160.	680.	0.07
6	TM-14 4000-4010	<.02	1.7	700.	0.07	120.	650.	0.07
7	TM-14 4100-4110	<.02	2.3	1050.	0.11	150.	1600.	0.16
8	TM-14 4200-4210	<.02	2.0	1150.	0.12	70.	750.	0.08
9	TM-14 4300-4310	<.02	1.6	670.	0.07	80.	840.	0.08
10	TM-14 4400-4410	<.02	1.1	425.	0.04	28.	195.	0.02
11	TM-14 4500-4510	<.02	1.8	1100.	0.11	60.	890.	0.09
12	TM-14 4550-4560	<.02	1.2	1050.	0.11	48.	345.	0.03
13	TM-14 4570-4580	<.02	2.0	1500.	0.15	65.	780.	0.08

cc: Mr. John Malusa

JDS

ASARCO

Southwestern Exploration Division

December 21, 1990

J.D. Sell

TM-14 Assays
Thunder Mtn. Project
Santa Cruz County, AZ

The lower 1000 ft. of TM-14 (3600'-4600') was assayed every 100 feet for a 10 foot interval (i.e., 3600-3610, 3700-3710 ...).

Results are attached and have been added to the file copy drill logs.

JJM:mek

John J. Malusa

file copy has attached log sheets.

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 704
December 12, 1990
TM-14 3600-4580
PAGE 1 OF 1

ASARCO Incorporated
DEC 13 1990
SW Exploration

ASARCO INCORPORATED
Attn: Mr. J. D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 13 Drill Core Samples

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)
1	TM-14 3600-3610	<.02	.9	325.	12.	295.
2	TM-14 3601-3602	.36	8.5	450.	410.	360.
3	TM-14 3700-3710	<.02	2.2	1500.	85.	730.
4	TM-14 3800-3810	<.02	1.4	550.	80.	465.
5	TM-14 3900-3910	<.02	2.6	1400.	160.	680.
6	TM-14 4000-4010	<.02	1.7	700.	120.	650.
7	TM-14 4100-4110	<.02	2.3	1050.	150.	1600.
8	TM-14 4200-4210	<.02	2.0	1150.	70.	750.
9	TM-14 4300-4310	<.02	1.6	670.	80.	840.
10	TM-14 4400-4410	<.02	1.1	425.	28.	195.
11	TM-14 4500-4510	<.02	1.8	1100.	60.	890.
12	TM-14 4550-4560	<.02	1.2	1050.	48.	345.
13	TM-14 4570-4580	<.02	2.0	1500.	65.	780.

1990 Flasher C standard

cc: Mr. John Malusa

William L. Lehmbeck
Manager 12/12/90

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

ree.
1/14/90

JDS

Attachment "A"

Summary of Logs of BB-2 through BB-7 Drill Holes, Thunder Mountain Project, 1990

BB-2: Coord N: 1710,010, Coord E: 865,425, Elev: 5,170, Incl: -35
Bearing: S 45 W
12'-120': Quartz Feldspar Porphyry - white, soft, intensely altered, original texture nearly obliterated. Predominant alteration mineral is pyrophyllite, subordinate sericite, kaolinite, and alunite. 5%-8% disseminated pyrite grains and clusters sometimes rimmed with chalcocite/covellite. A few blebs of sphalerite 20'-30'. Breccia (QFP) 78'-88'.
120'-176.5': Lappili Tuff- Subangular fragments of dark grey siliceous volcanics, tan quartzite, and chert in QFP matrix. Sooty chalcocite associated with pyrite in matrix (short sections). Fault breccia 162'-165'.
176.5-183': Intrusive Breccia - Lapilli to block size angular fragments in QFP matrix.
183'-352': Quartz Feldspar Porphyry - similar to unit above 120', minor sulfide veining, mineralization mostly associated with disseminated pyrite, 3" of compacted gouge at 322'. Better Cu 262'-318'.
352'-501.5': Intrusive Breccia - Angular siliceous fragments in QFP matrix, pyrite fills voids and fractures, also pyrite veining, Cu decreasing with depth. Red hematite fracture filling 460'-510'.
501.5'-511.5': Agglomeritic Scoria - brown, pumiceous, vesicular fragments in ash matrix.
511.5'-516.5' (BOH): Brecciated Chert - Large angular fragments of brown/grey chert or very fine grained quartzite interlocked in siliceous matrix. Nil sulfides, red hematite coating fractures. Probably same unit as in bottoms of TM-11 & TM-12.

BB-2 Assays	Interval	Footage		Cu %	Ag opt
	40-140	100	QFP	0.47	0.07
	140-180	40	lap. tuff	0.04	0.10
	180-360	180	int bx & QFP	0.27	0.33
	360-500	140	int bx	0.13	0.09

BB-3: Coord N: 171,010, Coord E: 865,425, Elev: 5170, Incl: -45 ,
Bearing: due North
14'-555': Quartz Feldspar Porphyry - White to light grey, intensely altered to pyrophillite, lesser sericite, kaolin. Minor pyrite veining to 110', then increasing to 160'. Multiple fault zones (gouge & breccia) 164'-184' and 217.5'-245'. Chalcocite/covellite mineralization rims pyrite grains, also with pyrite in hairline, random veinlets. Mineralization weak below 100'.
555'-640': Major Fault - Orientation is 15° to core axis. gougy and porous, sulfides oxidized to red hematite and goethite/jarosite limonites
640'-722': Intrusive Breccia - Angular fragments of grey/tan chert and dark grey silicified andesite in QFP matrix. Fragment size (to

BB-3 continued -
3") generally increasing with depth. Very fine grained disseminated pyrite, total 3%, with associated chalcocite/covellite.
722'-725' (BOH): Fault Breccia - Fragments of intrusive breccia in a red hematite/goethite gouge matrix.

BB-3 Assays	Interval	Footage		Cu %	Ag opt
	14-90	76	QFP	0.60	0.04
	90-500	410	QFP	0.07	0.03
	500-720	220	int. bx	0.24	0.06

BB-4: Coord N: 171,400, Coord E: 865,850, Elev: 5140, Incl: -90

8'-189': Quartz Feldspar Porphyry - White to light grey, intensely altered, similar to QFP in other holes. Scattered lapilli size clasts - may be bordering on a lapilli tuff but clasts are only about 10% at most. Small breccia zones 15'-18' and 56'-60'. Clastic texture of the rock becomes more prominent below 90'- may be gradational change to lapilli tuff. Total sulfides 5%-7% disseminated and in veinlets. Chalcocite/covellite rimming and coating pyrite, traces of sphalerite filling a few cavities 87'-91.5'.
189'-318': Intrusive Breccia - Angular light brown chert and dark grey silicified volcanic fragments, also some QFP frags. in a light grey tuffaceous matrix (gritty tuff matrix). Sulfide content decreases.
318'-647': Quartz Feldspar Porphyry - Similar to QFP at top of hole. A few lapilli sized clasts of brown chert and grey volcanics. Very fine grained pyrite with associated chalcocite/covellite disseminated and in random veinlets. 8' discontinuous breccia zone at 388'(may be fault breccia). Cu mineralization generally better 440'-500' with good chalcocite/covellite section 430'-470'. Brecciated and gougy 502'-505'. Below 505' rock is less altered and more siliceous (not silica alteration).
647'-797 (BOH):Tongues of medium grained Quartz Diorite Porphyry may represent gradational contact. Pyrite only sulfide observed.

BB-4 Assays	Interval	Footage		Cu %	Ag opt
	10-190	180	QFP	0.47	0.04
	190-390	200	int bx + QFP	0.07	0.08
	390-610	220	QFP + QDio Porp	0.24	<0.01

BB-5: Coord N: 171,550, Coord E: 866,300, Elev: 5,110, Incl: -30, Bearing: due South
10'-107': Quartz Feldspar Porphyry - White to light grey, intensely altered to pyrophyllite, sericite, kaolinite, originally an intermediate rock (dacite). 3 %-5 % sulfides disseminated, sparse hairline veining.
107'-199': Intrusive Breccia - Angular to subangular fragments of chert and silicified volcanics in QFP matrix. Less veining than in previous holes.

BB-5 continued -
199'-257': Alternating zones or layers of Brecciated Chert and Intrusive Breccia. Oxidized zone with red hematite and goethite staining along fractures 199'-228'. Contact 60 to core axis. 1" seam chalcopyrite, bornite, pyrite at 247'.
257'-800' (BOH): Intrusive Breccia - Same unit as 107'-199'. The section from 370'-450' contains multiple fault breccia and gouge zone but without lithological of mineralogical change.Alteration intensity decreases below 460'. Nil veining to 750' where 2 mm veinlets occur mostly 30 -40 to acore axis and continue to bottom of hole.

BB-5 Assays	Interval	Footage	Cu %	Ag opt
	10-'-230'	220 QFP + int bx	0.04	<0.01
	230'-310'	80 int bx + chert bx	0.15	<0.01
	310'-800'	490 int bx	0.04	<0.01

BB-6: Coord N: 171,010, Coord E: 865,425, Elev: 5,170, Incl: -45
Bearing: due East
20'-368': Quartz Feldspar Porphyry - Intensely altered, originally a dacite ?. Granular pyrite blebs 1-5 mm, some coated or rimmed with chalcocite/ covellite, some sootiness as fracture coating. Nil veining to 105', then increasing. Fault ? (multiple gouge sections) 200'-219'. Heavy chalcocite/covellite/pyrite 360'-369'.
368'-454': Intrusive Breccia - Angular silicified fragments in QFP matrix. Probable fault breccia 382.5- 394. Short section of Lapilli Tuff 382'-394'.
454'-718': Quartz Feldspar Porphyry - Same as above 368'. Well mineralized sections with sooty chalcocite/pyrite blebs to 5 mm diameter. Cu mineralization decreases somewhat below 560'. Fault gouge and breccia 667'-674' & 685'-692'.
718'-800' (BOH): Mixed Intrusive Breccia and Quartz Feldspar Porphyry -Mostly breccia but with short (1'-5') sections of QFP. Contact zone 716'-718' is flow banded @ 30 to core axis.

BB-6 Assays	Interval	Footage	Cu %	Ag opt
	20-90	70 QFP	0.37	0.14
	90-280	190 QFP	0.13	0.02
	280-520	240 QFP + int bx	0.54	0.12
	520-600	80 QFP	0.10	<0.01
	600-760	160 QFP	0.23	0.02
	760-800	40 int bx + QFP	0.05	<0.01

BB-7: Coord N: 170,700, Coord E: 866,550, Elev: 5,585, Incl: -90
12'-27': Lapilli Tuff - Light grey altered tuff with subangular fragments to 10 mm diameter.
Argillic alteration intense, also sericite/pyrophyllite? Red hematite and goethite fills some fractures.
27'-32': Compacted Talc (may contain alunite) - White, very soft, pure mixture without fragments.
32'-41.5': Brcciated Chert - Very siliceous grey chert (of fine

BB-7 continued -
grained quartzite) fragments in siliceous matrix, appearance similar to bottom of BB-2.
41.5'-51': Fault gouge & breccia.
51'-257: Rhyolite or Rhyodacite - Light to medium grey, very siliceous (not silica alteration) with numerous brccia and gouge zones. Fine grained pyrite disseminated and filling some fractures. Some thin alunite stringers. Sooty gouge 144'-156'.
257'-617.5': Lapilli Tuff - Appearance similar to unit at top of hole but with occasional fragments up to 2 cm diameter. Fine grained disseminated pyrite, only slight hairline veining. Occasional clasts to 10 mm are rich in pyrite (>25%). Alteration appears more sericitic below 460'. 1-3 mm pyrite/chalcocite veinlets more common 520'-580.
617.5'-635': Rhyodacite - Similar to unit 51'-257'. Contact @ 20 to core axis.
635'-735.5' (BOH): Lapilli Tuff - Fragment size generally smaller than in units higher in hole (grit size predominant).

BB-7 Assays	Interval	Footage	Cu %	Ag opt

based on lap tuff in other holes & lack of real mineral ce,
Probably not good!

best values
QPF ±0.4
int bx ±0.2

JDS

SKYLINE LABS, INC.

1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 709
January 18, 1991
PROJECT NO.: EA-0042
BB-7 (12 TO 735)

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

ASARCO Incorporated
JAN 21 1991
SW Exploration

Analysis of 79 Drill Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
1	BB-7 12-20	<.002	<.01	.01
2	BB-7 20-30	<.002	<.01	.01
3	BB-7 30-40	.010	.18	.01
4	BB-7 40-50	.004	.26	.01
5	BB-7 50-60	<.002	.03	.01
6	BB-7 60-70	<.002	<.01	.05
7	BB-7 70-80	<.002	<.01	.16
8	BB-7 80-90	<.002	<.01	.09
9	BB-7 90-100	<.002	<.01	.06
10	BB-7 100-110	<.002	<.01	.04
~~11~~	~~BB-7 101-102~~	~~.050~~	~~.20~~	~~.06~~ control
12	BB-7 110-120	<.002	<.01	.11
13	BB-7 120-130	<.002	<.01	.03
14	BB-7 130-140	<.002	<.01	.06
15	BB-7 140-150	<.002	<.01	.05
16	BB-7 150-160	.002	<.01	.06
17	BB-7 160-170	<.002	<.01	.01
18	BB-7 170-180	<.002	<.01	.01
19	BB-7 180-190	.004	<.01	.02
20	BB-7 190-200	.002	<.01	.06
21	BB-7 200-210	.002	<.01	.03
22	BB-7 210-220	.002	.11	.03
23	BB-7 220-230	.002	<.01	.01
24	BB-7 230-240	<.002	<.01	.02
25	BB-7 240-250	<.002	<.01	.02

60-610
0.710
+0.945
+0.190
1.845/55 = 0.03

550' = 0.03

60-160 = 100'
= 0.71/10 = 0.07 %Cu

160-580 = 420
= 0.945/42 = 0.02 %Cu

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 709
January 18, 1991

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
26	BB-7 250-260	<.002	<.01	.01	
27	BB-7 260-270	<.002	<.01	.01	
28	BB-7 270-280	<.002	<.01	.01	
29	BB-7 280-290	<.002	<.01	.01	
30	BB-7 290-300	<.002	<.01	.04	
31	BB-7 300-310	<.002	<.01	.01	
~~32~~	~~BB-7 302-303~~	~~.008~~	~~.07~~	~~.01~~	control
33	BB-7 310-320	<.002	<.01	.01	
34	BB-7 320-330	<.002	<.01	.02	
35	BB-7 330-340	<.002	<.01	.01	
36	BB-7 340-350	<.002	<.01	.03	
37	BB-7 350-360	<.002	<.01	.04	
38	BB-7 360-370	<.002	<.01	.01	
39	BB-7 370-380	<.002	<.01	.01	
40	BB-7 380-390	<.002	<.01	.02	
41	BB-7 390-400	<.002	<.01	.02	
42	BB-7 400-410	<.002	<.01	.03	
~~43~~	~~BB-7 403-404~~	~~.002~~	~~<.01~~	~~.29~~	control
44	BB-7 410-420	<.002	<.01	.03	
45	BB-7 420-430	<.002	<.01	.04	
46	BB-7 430-440	<.002	<.01	.04	
47	BB-7 440-450	<.002	<.01	.01	
48	BB-7 450-460	<.002	<.01	.02	
49	BB-7 460-470	<.002	<.01	.03	
50	BB-7 470-480	<.002	<.01	.04	

380-480 = 140'
.37/14 = 0.026
= 0.03

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
51	BB-7 480-490	<.002	<.01	.02	
52	BB-7 490-500	<.002	<.01	<.01	
53	BB-7 500-510	<.002	<.01	.02	
~~54~~	~~BB-7 501-502~~	~~.050~~	~~.18~~	~~.06~~	control
55	BB-7 510-520	<.002	<.01	.04	
56	BB-7 520-530	<.002	<.01	.02	
57	BB-7 530-540	<.002	<.01	.02	
58	BB-7 540-550	<.002	<.01	.05	
59	BB-7 550-560	<.002	<.01	.02	
60	BB-7 560-570	<.002	<.01	.01	
61	BB-7 570-580	<.002	<.01	.03	
62	BB-7 580-590	<.002	<.01	.05	580-610 = 30'
63	BB-7 590-600	<.002	<.01	.06	= 0.19/3 = 0.06 %Cu
64	BB-7 600-610	<.002	<.01	.08	
~~65~~	~~BB-7 602-603~~	~~.010~~	~~.07~~	~~.02~~	control
66	BB-7 610-620	<.002	<.01	.01	
67	BB-7 620-630	<.002	<.01	<.01	
68	BB-7 630-640	<.002	<.01	<.01	
69	BB-7 640-650	<.002	<.01	<.01	
70	BB-7 650-660	<.002	<.01	<.01	
71	BB-7 660-670	<.002	<.01	<.01	
72	BB-7 670-680	<.002	<.01	<.01	
73	BB-7 680-690	<.002	<.01	.01	
74	BB-7 690-700	<.002	<.01	.02	
75	BB-7 700-710	<.002	<.01	.01	

480-610=130
0.19/3=0.033

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 709
January 18, 1991

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
~~76~~	~~BB-7 703-704~~	~~<.002~~	~~<.01~~	~~.01~~ conf'd
77	BB-7 710-720	<.002	<.01	<.01
78	BB-7 720-730	<.002	<.01	<.01
79	BB-7 730-735	<.002	<.01	<.01

cc: Mr. John J. Malusa

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 709
January 18, 1991
PROJECT NO.: EA-0042
BB-7 (12 TO 735)

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 79 Drill Core Samples

79 Au&Ag(oz/t) @ $10.00	$790.00
79 Cu(%) @ $5.15	$406.85
79 samples crushed, split and pulverized @ $3.94	$311.26
Totals	$1508.11

COPY

Received 1/25/91 [illegible]

ASARCO Incorporated
JAN 21 1991
SW Exploration

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

BB-7

ASARCO Incorporated

JAN 18 1991

SW Exploration

DATE: 1/18

TO: Mr. J. D. Sell
Asarco

FROM: William Lehmbeck

OUR FAX NUMBER: (602) 622-6065

RE: TAJ 709

TOTAL NUMBER OF PAGES 5, INCLUDING COVER SHEET

Please call Barbara (at (602) 622-4836)
if there are any problems with this transmission

COMMENTS:

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 709
January 18, 1991
PROJECT NO.: EA-0042
BB-7 (12 TO 735)

ASARCO Incorporate.
JAN 18 1991
SW Exploration

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 79 Drill Core Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)
1	BB-7 12-20	<.002	<.01	.01
2	BB-7 20-30	<.002	<.01	.01
3	BB-7 30-40	.010	.18	.01
4	BB-7 40-50	.004	.26	.01
5	BB-7 50-60	<.002	.03	.01
6	BB-7 60-70	<.002	<.01	.05
7	BB-7 70-80	<.002	<.01	.16
8	BB-7 80-90	<.002	<.01	.09
9	BB-7 90-100	<.002	<.01	.06
10	BB-7 100-110	<.002	<.01	.04
~~11~~	~~BB-7 101-102~~	~~.050~~	~~.20~~	~~.06~~ control
12	BB-7 110-120	<.002	<.01	.11
13	BB-7 120-130	<.002	<.01	.03
14	BB-7 130-140	<.002	<.01	.06
15	BB-7 140-150	<.002	<.01	.05
16	BB-7 150-160	.002	<.01	.06
17	BB-7 160-170	<.002	<.01	.01
18	BB-7 170-180	<.002	<.01	.01
19	BB-7 180-190	.004	<.01	.02
20	BB-7 190-200	.002	<.01	.06
21	BB-7 200-210	.002	<.01	.03
22	BB-7 210-220	.002	.11	.03
23	BB-7 220-230	.002	<.01	.01
24	BB-7 230-240	<.002	<.01	.02
25	BB-7 240-250	<.002	<.01	.02

60-220 = 160
= 0.87/16 = 0.054 %Cu

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 709
January 18, 1991
PAGE 2 OF 4

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
26	BB-7 250-260	<.002	<.01	.01	
27	BB-7 260-270	<.002	<.01	.01	
28	BB-7 270-280	<.002	<.01	.01	
29	BB-7 280-290	<.002	<.01	.01	
30	BB-7 290-300	<.002	<.01	.04	
31	BB-7 300-310	<.002	<.01	.01	
~~32~~	~~BB-7 302-303~~	~~.008~~	~~.07~~	~~.01~~	contd
33	BB-7 310-320	<.002	<.01	.01	
34	BB-7 320-330	<.002	<.01	.02	
35	BB-7 330-340	<.002	<.01	.01	
36	BB-7 340-350	<.002	<.01	.03	
37	BB-7 350-360	<.002	<.01	.04	
38	BB-7 360-370	<.002	<.01	.01	
39	BB-7 370-380	<.002	<.01	.01	
40	BB-7 380-390	<.002	<.01	.02	
41	BB-7 390-400	<.002	<.01	.02	
42	BB-7 400-410	<.002	<.01	.03	
~~43~~	~~BB-7 403-404~~	~~.002~~	~~<.01~~	~~.29~~	contd
44	BB-7 410-420	<.002	<.01	.03	
45	BB-7 420-430	<.002	<.01	.04	
46	BB-7 430-440	<.002	<.01	.04	
47	BB-7 440-450	<.002	<.01	.01	
48	BB-7 450-460	<.002	<.01	.02	
49	BB-7 460-470	<.002	<.01	.03	
50	BB-7 470-480	<.002	<.01	.04	

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
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JOB NO. TAJ 709
January 18, 1991
PAGE 3 OF 4

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
51	BB-7 480-490	<.002	<.01	.02	
52	BB-7 490-500	<.002	<.01	<.01	
53	BB-7 500-510	<.002	<.01	.02	
~~54~~	~~BB-7 501-502~~	~~.050~~	~~.18~~	~~.06~~	control
55	BB-7 510-520	<.002	<.01	.04	220-610 = 390'
					=0.975/39=0.025%Cu
56	BB-7 520-530	<.002	<.01	.02	
57	BB-7 530-540	<.002	<.01	.02	
58	BB-7 540-550	<.002	<.01	.05	
59	BB-7 550-560	<.002	<.01	.02	
60	BB-7 560-570	<.002	<.01	.01	
61	BB-7 570-580	<.002	<.01	.03	
62	BB-7 580-590	<.002	<.01	.05	
63	BB-7 590-600	<.002	<.01	.06	
64	BB-7 600-610	<.002	<.01	.08	
~~65~~	~~BB-7 602-603~~	~~.010~~	~~.07~~	~~.02~~	control
66	BB-7 610-620	<.002	<.01	.01	
67	BB-7 620-630	<.002	<.01	<.01	
68	BB-7 630-640	<.002	<.01	<.01	610-735 = 125'
69	BB-7 640-650	<.002	<.01	<.01	
70	BB-7 650-660	<.002	<.01	<.01	=.095/12.5 = <0.01%Cu
71	BB-7 660-670	<.002	<.01	<.01	
72	BB-7 670-680	<.002	<.01	<.01	
73	BB-7 680-690	<.002	<.01	.01	
74	BB-7 690-700	<.002	<.01	.02	
75	BB-7 700-710	<.002	<.01	.01	

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 709
January 18, 1991
PAGE 4 OF 4

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Cu (%)	
~~76~~	~~BB-7 703-704~~	~~<.002~~	~~<.01~~	~~.01~~	control
77	BB-7 710-720	<.002	<.01	<.01	
78	BB-7 720-730	<.002	<.01	<.01	
79	BB-7 730-735	<.002	<.01	<.01	

cc: Mr. John J. Malusa

1/18/91

JDS

FROM: J. D. SELL 1-25-91

TO: JJ Malusa

Stay in Tucson the week of Jan. 28 and get the control sample report out on Thunder Mtn now that BB-7 assays are back.
Full report from BB-2 → BB-7.

JDS

JPS

ASARCO

Southwestern Exploration Division

January 29, 1991

J.D. Sell

Assay Checks
Thunder Mountain Project
Patagonia Mountains
Santa Cruz County, AZ

Based on the Fletcher Standards for the "C" and "D" standards, it appears that Skyline is 30 to 45% low in their silver assays, 20% high on the "C" standard copper assays, and good on the "D" standard copper assays with the exception of one "bust" BB-4, 402-403.

In rerunning resubmitted rejects, Skyline appears to be good in silver, with one large discrepancy (BB-3, 630-640) and good in copper, with again one large difference (BB-3, 50-60).

Gold values were not considered.

This concludes the assay checks for the 1990-1991 Thunder Mountain drilling program.

J.J. Malusa

JJM:mek
Att.

cc: F.T. Graybeal
D.I. Fletcher
W.L. Kurtz

Assay Checks
Thunder Mountain Project

January 29, 1991

"C" Standard
Ag = 0.260 opt
Cu = 0.05%

Skyline Results:

Ag	Cu
0.09	0.13
0.15	0.06
0.21	0.05
0.21	0.05
0.21	0.06
0.23	0.05
0.16	0.05
0.18	0.06
0.16	0.06
0.20	0.06
0.20	0.06
0.18	0.06
2.18/12	0.75/12
= 0.18	= 0.06
Standard Deviation from mean = 0.038	Standard Deviation from mean = 0.022
Overall LOW by 30%	Overall HIGH by 20%

"D" Standard
Ag = 0.119 opt
Cu = 0.012%

Skyline Results:

Ag	Cu
0.08	0.01
0.05	~~0.57~~-bust
<0.01	0.01
0.07	0.01
0.03	0.02
0.08	0.01
0.07	0.02
0.07	0.02
0.11	0.02
0.07	0.01
0.07	0.02
0.71/11	0.15/10
= 0.065	= 0.015
Standard Deviation from mean = 0.028	Standard Deviation from mean = 0.005
Overall LOW 45%	Overall GOOD

Assay Checks
Thunder Mountain Project

January 29, 1991

Assay checks for holes BB-2 thru BB-7.

Values of the standards are as follows:

Element & Units	C (95% confid.)	D (95% confid.)
Au oz/ton	0.056 ± 0.002	0.008 ± 0.0003
Ag oz/ton	0.260 ± 0.005	0.119 ± 0.004
Cu %	0.05 ± 0.002	0.012 ± 0.0004

Skyling Results for Standards used on BB-3 thru BB-7

Standard	Hole #	Interval	Au (oz/t)	Ag (oz/t)	Cu (%)
C	BB-3	1-2	0.046	0.09	0.13
C	BB-3	100-101	0.050	0.15	0.06
D	BB-3	201-202	0.006	0.08	0.01
C	BB-4	1-2	0.050	0.21	0.05
C	BB-4	201-202	0.010	0.21	0.05
D	BB-4	402-403	<0.002	0.05	0.57
C	BB-4	501-502	0.050	0.21	0.06
D	BB-4	602-603	0.010	<0.01	0.01
C	BB-5	101-102	0.055	0.23	0.05
D	BB-5	202-203	0.010	0.07	0.01
D	BB-5	302-303	0.010	0.03	0.02
C	BB-5	401-402	0.050	0.16	0.05
D	BB-5	602-603	0.010	0.08	0.01
C	BB-6	101-102	0.050	0.18	0.06
D	BB-6	202-203	0.006	0.07	0.02
C	BB-6	301-302	0.055	0.16	0.06
D	BB-6	402-403	0.008	0.07	0.02
C	BB-6	601-602	0.050	0.20	0.06
D	BB-6	702-703	0.006	0.11	0.02
C	BB-7	101-102	0.050	0.20	0.06
D	BB-7	302-303	0.008	0.07	0.01
C	BB-7	501-502	0.050	0.18	0.06
D	BB-7	602-603	0.010	0.07	0.02

Assay Checks
Thunder Mountain Project

January 29, 1991

Resubmitted Rejects

	Hole #	Interval (ft.)	Au (oz/t)	Ag (oz/t)	Cu (%)
Original	BB-2	260-270	0.001	1.74	0.21
Resubmit	BB-3	301-303	0.008	1.50	0.21
Original	BB-2	270-280	0.002	1.28	0.32
Resubmit	BB-3	701-703	0.006	1.04	0.32
Original	BB-3	50-60	<0.002	<0.01	1.30
Resubmit	BB-4	403-404	<0.002	<0.01	0.44
Original	BB-3	630-640	0.004	0.23	0.55
Resubmit	BB-4	703-704	0.002	<0.01	0.60
Original	BB-4	100-110	<0.002	0.16	1.29
Resubmit	BB-5	503-504	0.004	0.18	1.27
Original	BB-4	390-400	<0.002	0.01	0.62
Resubmit	BB-5	703-704	<0.002	0.04	0.62
Original	BB-4	460-570	0.006	<0.01	0.35
Resubmit	BB-6	503-504	<0.002	0.04	0.36
Original	BB-4	420-430	<0.002	<0.01	0.30
Resubmit	BB-7	403-404	0.002	<0.01	0.29
Original	BB-5	520-530	<0.002	<0.01	0.01
Resubmit	BB-7	703-704	<0.002	<0.01	0.01

Compilation

Bucket Breccia #1 K-M Assay log sheet

Depth	Lt	Cu	Ag	
7-145	138	<0.02	0.14	—
145-150	5	0.44	0.06	
150-160	10	0.07	0.06	145-177.3 = 32.3'
160-170	10	0.32	0.06	= 9.071/32.3 = 0.28 %Cu
170-175.2	5.2	0.43	0.06	
175.2-177.3	2.1	0.35	—	
188-198	10	—	0.20	
198-208	10	—	0.02	177.3-250.6 = 73.3
208-216	8	—	0.12	?
216-237	21	—	0.12	± < 0.02 Cu
237-239.6	2.6	0.01	0.14	
239.6-242.6	3.0	0.04	—	
242.6-246.6	4.0	0.07	—	
246.6-250.6	4.0	0.03	—	
250.6-261	10.4	0.17	—	
261-274.4	13.4	0.19	—	
274.4-285.2	10.8	0.22	—	250.6-350 = 99.4'
285.2-290	4.8	0.38	—	= 15.146/99.4 = 0.15 %Cu
290-300	10	0.29	—	
300-305	5	0.10	—	
305-314.2	9.2	0.02	—	
314.2-320	5.8	0.06	—	
320-330	10	0.03	—	
330-340	10	0.14	—	
340-350	10	0.10	—	
350-360	10	0.32	—	
360-370	10	0.13	—	

Bucket Beccia BB-1 Continued

Depth	Footage	% Cu	g/Ag
370-380	10	0.32	–
380-390	10	1.20	–
390-400	10	0.66	–
400-410	10	0.42	–
410-420	10	0.07	–
420-430	10	0.18	–
430-440	10	0.14	–
440-450	10	0.07	
450-460	10	0.50	
460-470	10	0.56	
470-480	10	0.64	
480-490	10	0.48	
490-500	10	0.25	
500-510	10	0.14	
510-520	10	0.02	
520-530	10	0.13	
530-540	10	0.50	
540-550	10	0.35	
550-560	10	0.10	
560-570	10	0.26	
570-580	10	0.24	
580-590	10	0.23	
590-600	10	0.33	
600-602.5	2.5 } 10	0.37 } 0.15	
602.5-610	7.5	0.08	
610-620	10	0.30	
620-630	10	0.33	
630-640	10	0.39	

350-410 = 60'
= 3.05/6 = 0.57 %

410-450 = 40'
= 0.46/4 = 0.12%

450-490 = 40'
= 2.18/4 = 0.55 %

490-740 = 250'
= 5.91 /25 = 0.24%

350-490 = 140' = 5.29/14 = 0.4%

350-740 = 390' = 11.60/39 = 0.30%

Bucket Breccia BB-1 Continued

③

Depth	Footage	% Cu
640-650	10	0.32
650-660	10	0.35
660-670	10	0.15
670-680	10	0.29
680-690	10	0.25
690-700	10	0.35
700-710	10	0.09
710-720	10	0.10
720-730	10	0.10
730-740	10	0.19
740-750	10	0.04
750-760	10	0.05
760-770	10	0.05
770-780	10	0.21
780-790	10	0.09
790-800	10	0.01
800-810	10	<0.01
810-821	11	<0.01
T.D.		

740-821 = 81'

= 4.605/81 = 0.06 %

Thunder Mtn

5-20-92

			Cu	MoS_2
TM-8	4490 - 4840 =	350' at	0.28	0.016
TR-10	3860 - 4210 =	350' at	0.57	0.033
TR-14	4590 - 4980	390' at	0.46	0.026
TR15	4640 - 5120	460' at	0.24	0.015
		1550/4 = at	587.3/1550 =	34.19/1550 =
	(wtave) Ave	= 388' at	0.38	0.022

$$\frac{3800 \times 5500 \times 388}{12.5} = \cancel{649{,}000{,}000}$$

(648,734,000) use 650,000,000

Hole Number	"Upper" Interval from-to = feet - % Cu	"Middle" Interval from-to = feet - % Cu	"Lower" Interval from-to = feet - % Cu	Total Drill Interval from-to = feet - % Cu
BB-1	350-490 = 140-0.41	490-740 = 250-0.24	740-821 = 81-0.06	350-821 = 471-0.30
BB-2	10-250 = 240-0.28	250-400 = 150-0.26	400-516 = 116-0.12	10-516 = 506-0.24
BB-3	20-90 = 70-0.64	90-600 = 510-0.09	600-720 = 120-0.32	20-720 = 700-0.18
BB-4	10-190 = 180-0.47	190-470 = 280-0.15	470-610 = 140-0.17	10-610 = 600-0.25
BB-5 *	10-230 = 220-0.04 *	230-310 = 80-0.15 *	310-800 = 490-0.04 *	10-800 = 790-0.05 *
BB-6	20-300 = 280-0.20	300-490 = 190-0.64	490-760 = 270-0.18	20-760 = 740-0.31
BB-7 *	340-480 = 140-0.03 *	480-610 = 130-0.03 *	610-735 = 125-0.01 *	340-735 = 395-0.02 *
TM-8	130-210 = 80-0.53	210-370 = 160-0.25	370-540 = 170-0.55	130-540 = 410-0.43
TM-9 *	10-290 = 280-0.05 *	290-500 = 210-0.03 *	500-770 = 270-0.13 *	10-770 = 760-0.07 *
TM-11	40-180 = 140-0.49	180-410 = 230-0.32	410-630 = 220-0.22	40-630 = 590-0.32
TM-12	10-100 = 90-0.41	100-360 = 260-0.18	360-600 = 240-0.25	10-600 = 590-0.24
* Interval NOT used in Average		980/5 334.3 0.20+, 196 - 0.34 1050/3 134.7 <0.20, 350 - 0.13	750/4 240.3 0.20+, 188 - 0.32 607/4 91.18 <0.20, 152 - 0.15	599/8-75
Average	1220/8 467.9 153 - 0.38	2030/8 468.9 254 - 0.23	1357/8 331.48 169 - 0.24	4607/8 1274.84 576 - 0.28

Hole Number	Collar Elev. ft.	Hole Inclination degrees	In drill hole, ft to top of "upper", Elev. ft.	Vertical Thickness "upper", ft	In drill hole, ft to top of "middle", Elev. ft.	Vertical Thickness "middle", ft	In drill hole, ft to top of "lower", Elev. ft.	Vertical Thickness "lower", ft.	In drill hole, ft to base of "lower", Elev. ft.	Composite, total Thickness, ft.	Hole Number	Depth of Hole feet
BB-1	5585	-55°	350, 5300	120	490, 5180	200	740, 4980	70	821, 4910	390	BB-1	821
BB-2	5145	-37°	40, 5120	60	140, 5060	130	360, 4930	85	500, 4845	275	BB-2	517
BB-3	5145	-45°	20, 5130	50	90, 5080	355	600, 4725	85	720, 4640	490	BB-3	725
BB-4	5115	Vertical	10, 5105	180	190, 4925	280	470, 4645	140	610, 4505	600	BB-4	797
BB-5 *	5080	-30°	10, 5075	110 *	230, 4965	40 *	310, 4925	250 *	800, 4675	400 *	BB-5	800
BB-6	5145	-45°	20, 5130	200	300, 4930	135	490, 4795	190	760, 4605	525	BB-6	800
BB-7 *	5590	Vertical	340, 5250	140 *	480, 5110	130 *	610, 4980	125 *	735, 4855	395 *	BB-7	735
TM-8	5145	Vertical	130, 5015	80	210, 4935	160	370, 4775	170	540, 4605	410	TM-8	850 +
TM-9 *	5080	Vertical	10, 5070	280 *	290, 4790	210 *	500, 4580	270 *	770, 4310	760 *	TM-9	1100 +
TM-11	5145	-45°	40, 5115	95	180, 5020	165	410, 4855	155	630, 4700	415	TM-11	668
TM-12	5145	-45°	10, 5135	65	100, 5070	180	360, 4890	170	600, 4720	415	TM-12	620
all Holes, Average			1380/11	125	1885/11	180	1710/11	155	5074/11	461		
Average * Excluding BB-5, BB-7 & TM-9			8018	106	1605/8	201	1065/8	133	3526/8	440		

6-15-92

Claims:

TM	94	101
Humboldt	7	
3R Boat Fluey	49	
		150

hole	Vertical thickness	Cu %	g Ag
BB-1	380	0.30	NA
TM-8	410	0.43	0.23 e
TM-11	570	0.32	0.35 e
TM-12	540	0.24	0.28 e
BB-2	440	0.25	0.18
BB-3	420	0.18	0.04
BB-4	600	0.25	0.01
~~BB-5~~	—	~~0.15~~	~~0.01~~
BB-6	340	0.36	0.07
~~BB-7~~	—	—	—
	3700	1060.3/3700 =>	570.8/3320 =>
		0.029	0.17

6/16/92

ASARCO

From: S. A. Anzalone

To: J. D. Sell

Flux Production

1937 – 1957 ± 1,000,056 tons ASARCO

1957 – 1965 120,000 tons NASH-McFARLAND

± 1,120,056

	Oz Ag	% Pb	% Zn	% Cu
assaying ±	3.30	5.10	9.80	.30

6-15-92

ASARCO Drill Holes on TM claims (or units).

	TM-8	5677
	TM-9	1745
	TM-10	567
	TM-11	648
~~642~~ 662	TM-12	622
	TM-13	4777
~~4587~~	TM-14	4587
	TCH-1	5560
	TCH-2	5830
TD 5126	TCH-2A	2209
	BB-2	516
	BB-3	725
	BB-4	797
	BB-5	800
	BB-6	800
	BB-7	735
	16	36,615

627,316
194 428

TM	856,713
TCH	664,635
	1,521,348

TM	13	23,016	$856,713
Humbolt	3	13,599	$664,635
	16	36,615	1,521,348

Over the same period of time Asarco has drilled 23,016 feet in 13 holes at a cost of $856,713 on the Thunder Mountain claims, and 13,599 feet in 3 holes at a cost of $664,635 on the Humbolt Group for a total of 36,615 feet in 16 holes at a total expenditure of $1,521,348 within the present Thunder Mountain agreement lands.

Over the same period of time Asarco has drilled 23,016 feet in 13 holes at a cost of $856,713 on the Thunder Mountain claims, and 13,599 feet in 3 holes at a cost of $664,635 on the Humbolt Group for a total of 36,615 feet in 16 holes at a total expenditure of $1,521,348 within the present Thunder Mountain agreement lands.

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 744
November 5, 1992
PROJECT: THUNDER MTN.
BB-8 (90-320)

ASARCO INCORPORATED
Attn: Mr. Jim Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

ASARCO Incorporate.
NOV 9 1992
SW Exploration

Analysis of 23 Drill Core Samples

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	Cu (%)
1	BB-8 90-100	<.02	4.8	.11
2	BB-8 100-110	<.02	8.4	.20
3	BB-8 110-120	.02	8.9	.13
4	BB-8 120-130	.04	4.1	.07
5	BB-8 130-140	.03	7.5	.32
6	BB-8 140-150	.02	5.3	.17
7	BB-8 150-160	.02	6.4	.38
8	BB-8 160-170	<.02	10.0	.27
9	BB-8 170-180	.02	16.0	.51
10	BB-8 180-190	<.02	7.6	.56
11	BB-8 190-200	<.02	5.8	.27
12	BB-8 200-210	.03	18.0	1.35
13	BB-8 210-220	<.02	8.3	.09
14	BB-8 220-230	<.02	7.6	.11
15	BB-8 230-240	<.02	5.3	.12
16	BB-8 240-250	<.02	8.9	.10
17	BB-8 250-260	<.02	5.7	.25
18	BB-8 260-270	<.02	4.2	.26
19	BB-8 270-280	<.02	4.7	.53
20	BB-8 280-290	<.02	12.0	1.22

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 744
November 5, 1992

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	Cu (%)
21	BB-8 290-300	<.02	3.4	.20
22	BB-8 300-310	.04	4.2	.11
23	BB-8 310-320	<.02	3.8	.21

cc: Mr. Harold Downey
1803 E. 10th Steet
Tucson, AZ 85719

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.

1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 746
November 5, 1992
PROJECT: THUNDER MTN.
BB-9 (150-250)

ASARCO Incorporated
NOV 9 1992
SW Exploration

ASARCO INCORPORATED
Attn: Mr. Jim Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 10 Drill Core Samples

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	Cu (%)
1	BB-9 150-160	.02	2.1	.08
2	BB-9 160-170	.08	2.2	.10
3	BB-9 170-180	.02	2.7	.29
4	BB-9 180-190	<.02	<.1	.16
5	BB-9 190-200	<.02	4.5	.09
6	BB-9 200-210	<.02	3.6	.19
7	BB-9 210-220	<.02	3.5	.07
8	BB-9 220-230	<.02	5.2	.08
9	BB-9 230-240	<.02	7.0	.08
10	BB-9 240-250	.03	5.7	.50

cc: Mr. Harold Downey
1803 E. 10th Steet
Tucson, AZ 85719

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 747
November 12, 1992
PROJECT: THUNDER MTN.
BB-9 (310-510)

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 20 Drill Core Samples

20 Au(ppm) @ $5.40	$108.00
20 Ag(ppm) @ $3.50	$70.00
20 Cu(%) @ $5.25	$105.00
20 samples crushed, split and pulverized @ $4.70	$94.00
Totals	$377.00

COPY

ASARCO Inc.

NOV 13 1992

SW Exploration

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 747
November 12, 1992
PROJECT: THUNDER MTN.
BB-9 (310-510)
PAGE 1 OF 1

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

ASARCO Inc.
NOV 12 1992
SW Exploration

Analysis of 20 Drill Core Samples

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	Cu (%)
1	BB-9 310-320	.03	2.0	.17
2	BB-9 320-330	<.02	2.8	.24
3	BB-9 330-340	<.02	3.0	.25
4	BB-9 340-350	.03	2.5	.16
5	BB-9 350-360	<.02	3.7	.33
6	BB-9 360-370	<.02	3.6	.22
7	BB-9 370-380	<.02	1.9	.09
8	BB-9 380-390	<.02	3.5	.17
9	BB-9 390-400	<.02	2.5	.20
10	BB-9 400-410	<.02	3.1	.22
11	BB-9 410-420	.03	2.2	.04
12	BB-9 420-430	<.02	2.4	.07
13	BB-9 430-440	<.02	3.5	.09
14	BB-9 440-450	<.02	4.9	.43
15	BB-9 450-460	<.02	4.1	.06
16	BB-9 460-470	<.02	4.9	.08
17	BB-9 470-480	<.02	2.1	.13
18	BB-9 480-490	<.02	1.5	.14
19	BB-9 490-500	<.02	5.3	.08
20	BB-9 500-510	<.02	4.4	.40

280-450 = 170'
= 3.06/17 = 0.18% Cu

320-410 = 90'
= 1.88/9 = 0.21% Cu

320-370 = 50'
= 1.20/5 = 0.24% Cu

cc: Mr. Harold Downey
1803 E. 10th Steet
Tucson, AZ 85719

REGISTERED ASSAYER CERTIFICATE NO. 9425 WILLIAM L. LEHMBECK

William L. Lehmbeck
Manager

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 748
November 18, 1992
PROJECT: THUNDER MOUNTAIN
BB-8 0-90, BB-9 (13-150)
BB-9 (250-310)

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 28 Drill Core Samples

28 Au(ppm) @ $5.40	$151.20
28 Ag(ppm) @ $3.50	$98.00
28 Cu(%) @ $5.25	$147.00
28 samples crushed, split and pulverized @ $4.83	$135.24
Totals	$531.44

APPROVED FOR PAYMENT
By: W. D. Gay
(Signature)

ASARCO Incorporated
NOV 19 1992
SW Exploration

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 748
November 18, 1992
PROJECT: THUNDER MOUNTAIN
BB-8 0-90, BB-9 (13-150)
BB-9 (250-310)

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 28 Drill Core Samples

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	Cu (%)
1	BB-8 00-10	.04	3.8	.07
2	BB-8 10-20	.03	1.1	.14
3	BB-8 20-30	.03	.9	.06
4	BB-8 30-40	.02	1.0	.07
5	BB-8 40-50	.02	1.0	.14
6	BB-8 50-60	.03	2.8	.07
7	BB-8 60-70 *	2.02	7.8	.23
8	BB-8 70-80	.02	1.6	.05
9	BB-8 80-90	.02	4.1	.12
10	BB-9 13-20	.02	1.6	.16
11	BB-9 20-30	.02	1.9	.04
12	BB-9 30-40	.02	3.2	.11
13	BB-9 40-50	.02	1.9	.17
14	BB-9 50-60	.04	1.8	.07
15	BB-9 60-70	.02	2.5	.07
16	BB-9 70-80	.02	.4	.01
17	BB-9 80-90	.02	3.9	.04
18	BB-9 90-100	.02	5.5	.31
19	BB-9 100-110	.02	1.5	.02
20	BB-9 110-120	<.02	1.7	.04

0 - 130 = 130'
= 1.[illegible]/13 = 0.08%

see Nov. 5 for correction

ASARCO Incorporated
NOV 19 1992
SW Exploration

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ASARCO Incorporated

JAN 25 1993

SW Exploration

REPORT OF ANALYSIS

JOB NO. TAJ 749
January 22, 1993
PROJECT: THUNDER MTN.
BB-8 (60-70), (320-600)

ASARCO INCORPORATED
Attn: Mr. Jim Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 29 Drill Core Samples

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	Cu (ppm)
1	BB-8 60-70	<.02	7.8	2300.
2	BB-8 320-330	.04	4.4	1900.
3	BB-8 330-340	<.02	3.6	900.
4	BB-8 340-350	<.02	1.8	1250.
5	BB-8 350-360	.02	2.8	1700.
6	BB-8 360-370	<.02	2.9	750.
7	BB-8 370-380	<.02	2.9	720.
8	BB-8 380-390	<.02	2.2	610.
9	BB-8 390-400	<.02	3.1	1250.
10	BB-8 400-410	<.02	8.2	2000.
11	BB-8 410-420	<.02	4.1	1150.
12	BB-8 420-430	<.02	3.8	185.
13	BB-8 430-440	<.02	2.5	850.
14	BB-8 440-450	<.02	4.3	900.
15	BB-8 450-460	<.02	4.2	2050.
16	BB-8 460-470	<.02	1.6	1300.
17	BB-8 470-480	.04	3.8	1700.
18	BB-8 480-490	<.02	.9	385.
19	BB-8 490-500	<.02	5.4	1450.
20	BB-8 500-510	<.02	1.9	305.

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 749
January 22, 1993

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	Cu (ppm)
21	BB-8 510-520	<.02	4.4	550.
22	BB-8 520-530	<.02	2.9	800.
23	BB-8 530-540	<.02	3.7	495.
24	BB-8 540-550	<.02	1.3	280.
25	BB-8 550-560	<.02	1.4	750.
26	BB-8 560-570	<.02	.9	580.
27	BB-8 570-580	<.02	1.4	660.
28	BB-8 580-590	<.02	.8	680.
29	BB-8 590-600	<.02	1.0	530.

cc: Mr. Harold Downey
1803 E. 10th Steet
Tucson, AZ 85719

William L. Lehmbeck
Manager

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 749
January 22, 1993
PROJECT: THUNDER MTN.
BB-8 (60-70), (320-600)

ASARCO INCORPORATED
Attn: Mr. Jim Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 29 Drill Core Samples

29 Au(ppm) @ $5.40	$156.60
29 Ag(ppm) @ $2.64*	$76.56
29 Cu(ppm) @ $2.64*	$76.56
29 samples crushed, split and pulverized @ $5.20	$150.80
Totals	$460.52

* Multi Element Discount

ASARCO Incorporated
JAN 25 1993
SW Exp.

COPY

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 748A
February 2, 1993
PROJECT: THUNDER MOUNTAIN
BB-8 0-90, BB-9 (13-150)
BB-9 (250-310)

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 8 Pulp Samples

ITEM	SAMPLE NUMBER	Cu (%)	Cu** (%)
1	BB-8 00-10	.07	.06
2	BB-8 10-20	.14	.13
3	BB-8 20-30	.06	.06
4	BB-8 30-40	.07	.06
5	BB-8 40-50	.14	.14
6	BB-8 50-60	.07	.06
7	BB-8 60-70 *	~~.00~~ .23	.23
8	BB-8 70-80	.05	.05
9	BB-8 80-90	.12	.11
10	BB-9 13-20	.16	
11	BB-9 20-30	.04	
12	BB-9 30-40	.11	
13	BB-9 40-50	.17	
14	BB-9 50-60	.07	
15	BB-9 60-70	.07	
16	BB-9 70-80	.01	
17	BB-9 80-90	.04	
18	BB-9 90-100	.31	
19	BB-9 100-110	.02	
20	BB-9 110-120	.04	
21	BB-9 120-130	.01	
22	BB-9 130-140	.08	
23	BB-9 140-150	.04	
24	BB-9 250-260	.08	
25	BB-9 260-270	.08	

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 748A
February 2, 1993

ITEM	SAMPLE NUMBER	Cu (%)	Cu** (%)
26	BB-9 270-280	.08	
27	BB-9 280-290	.26	
28	BB-9 290-300	.07	
29	BB-9 300-310	.05	

*NOTE: Sample not was not received on this original job, submitted at a later date on job TAJ 749.

**NOTE: Repeat analysis requested per Harold Downey.

cc: Mr. Harold Downey
1803 E. 10th Steet
Tucson, AZ 85719

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 748A
February 2, 1993
PROJECT: THUNDER MOUNTAIN
BB-8 0-90, BB-9 (13-150)
BB-9 (250-310)

ASARCO INCORPORATED
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 8 Pulp Samples

8 Cu(%) @ $5.25.....	$42.00
Totals	$42.00

COPY

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 749A
February 2, 1993
PROJECT: THUNDER MTN.
BB-8 (60-70), (320-600)

ASARCO INCORPORATED
Attn: Mr. Jim Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 1 Pulp Sample

ITEM	SAMPLE NUMBER	Cu (ppm)	Cu (%)
1	BB-8 60-70	2300.	.23

cc: Mr. Harold Downey
1803 E. 10th Steet
Tucson, AZ 85719

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

Job No. TAJ 749A
February 2, 1993
PROJECT: THUNDER MTN.
BB-8 (60-70), (320-600)

ASARCO INCORPORATED
Attn: Mr. Jim Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

Analysis of 1 Pulp Sample

1 Cu(%) @ $5.25..... $5.25

Totals $5.25

COPY

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

Synopsis drill hole BB-8.

~~Surface~~

Depth	Feet	% Cu	ppm Ag
0-130	130	0.11	3.8
130-290	160	0.41	8.3
290-500	210	0.13	3.5
500-600	100	0.06	1.8
0-600'	600	0.19	4.6

Synopsis drill hole BB-9.

Depth	Feet	% Cu	ppm Ag
10-150	140	0.08	2.2
150-310	160	0.14	2.8
310-410	100	0.21	2.9
410-510	100	0.15	3.5
10-510	500	0.14	2.8

TAB

FOREST SERVICES

Forest Service Notes

ASARCO

Exploration Department
Southwestern United States Division

July 1, 1982

Mr. Dennis Brandolino
District Ranger
U. S. Forest Service
R.R. 2, Box 1150
Sierra Vista, AZ 85635

1982 Drill Hole
Thunder Mountain Project
Santa Cruz County, AZ

Dear Mr. Brandolino:

As outlined to you yesterday on the phone we expect that we will be drilling a single hole about 1500 feet west of the hole drilled last year in Upper Alum Gulch near Trench Camp. This hole, as will be outlined to you by Mr. Tony Benavidez, will be on the Warren Harding claim and will be just off of the existing road as shown on the attached map. The actual drill site will be about 30 x 50 feet and will probably be built by a local Patagonia contractor. We expect that drilling will start in early August and will be done by Joy Mfg. using the same crews used for the last several years. We expect that they will be at this site less than one month.

As we will be reoccupying both our 1982 and 1981 drill sites in future years we will only be doing minimal site restoration at this time. Mr. Benavidez, our geological field technician, will be in direct charge of drilling and if he decides a gate is necessary during drilling, it will be built to your specifications.

Should you have any questions that cannot be answered by Mr. Benavidez or in our absence, please contact Mr. Robert Crist, our Property Manager, or Mr. James Sell, our Southwestern Exploration Manager. Thanks for your help.

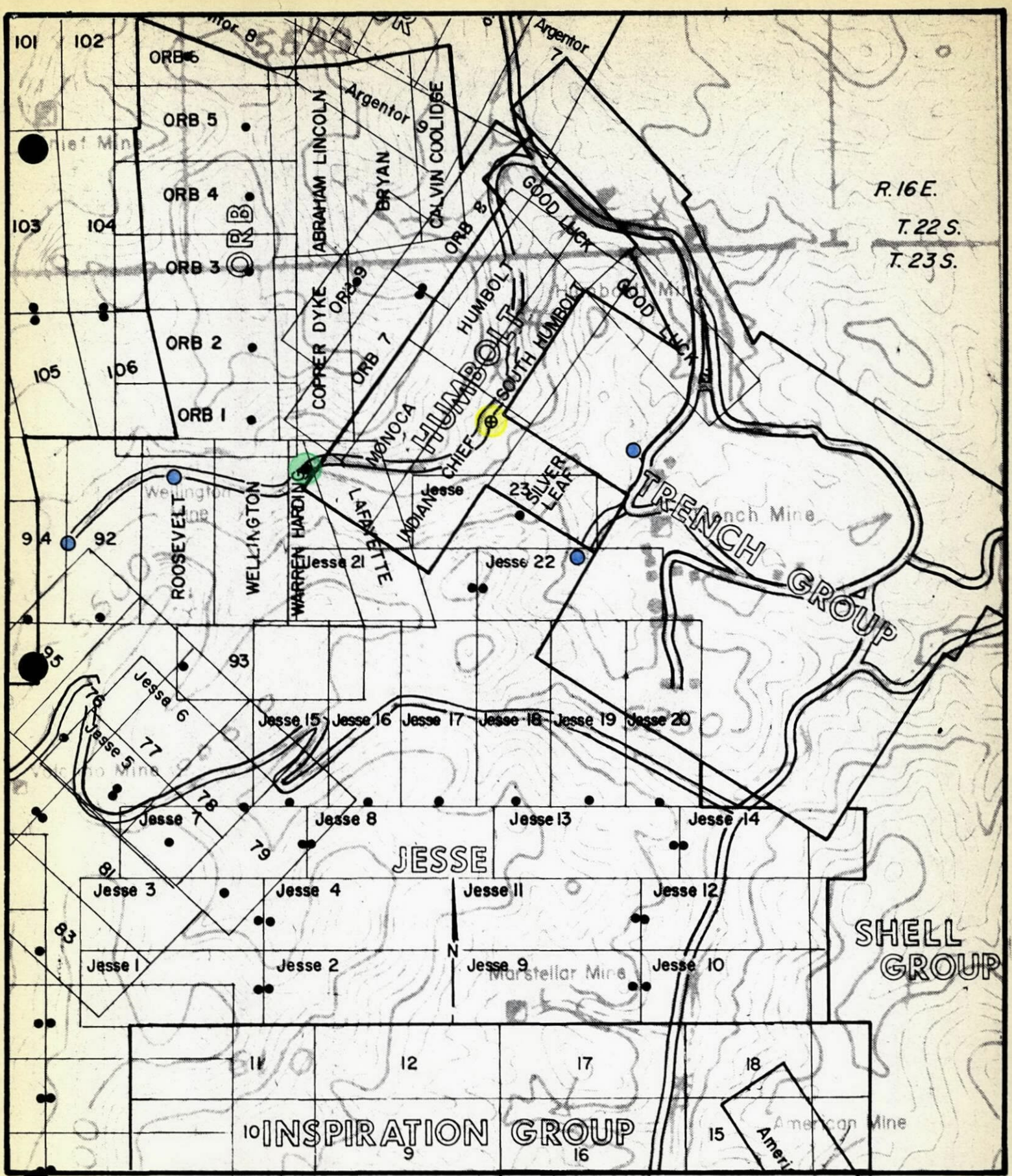
Very truly yours,

Fleetwood R. Koutz
Geologist

FRK/cg

cc: J. D. Sell
R. B. Crist
T. C. Benavidez

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703
1150 North 7th Avenue (602) 792-3010



Existing road

Drill site (1982)

Drill site (Old)

Drill site (1981)

TO ACCOMPANY Letter to U.S. Forest Service

DATED July 1, 1982

BY D. R. Koontz

Proposed Drill Site

PATAGONIA MOUNTAINS
SANTA CRUZ CO., ARIZONA
1" = 1000'

ASARCO

Exploration Department
Southwestern United States Division

July 17, 1985

Mr. Dennis Brandolino
District Ranger
U.S. Forest Service
RR 2, Box 1150
Sierra Vista, AZ 85635

1985 Drill Hole Reentry
Thunder Mountain Project
Santa Cruz County, AZ

Dear Mr. Brandolino:

As outlined to you yesterday on the phone, we expect to reenter and deepen the diamond drill hole at the same site occupied in 1982, 83 and 84. The hole is located on the Warren Harding claim in Upper Alum Gulch on the existing road as shown on the attached map. The drilling, as in past years, will be done by Joy Manufacturing and should start in early August and take between one and three weeks to complete. We will clean up the existing road to our water source, at the west end of the Upper Alum Gulch road (claims 94-92 boundary), using a grader of a Patagonia contractor just before drilling starts. We expect to reoccupy this site in future years, but will clean up the site as we have done annually. We will contact you just before starting work.

Don Melhado, draftsman, and I will be handling this project. In our absence please contact Jim Stringham or Bill Gay, property managers, or Jim Sell, S.W. Exploration Manager, if there are any questions.

Thanks for your help.

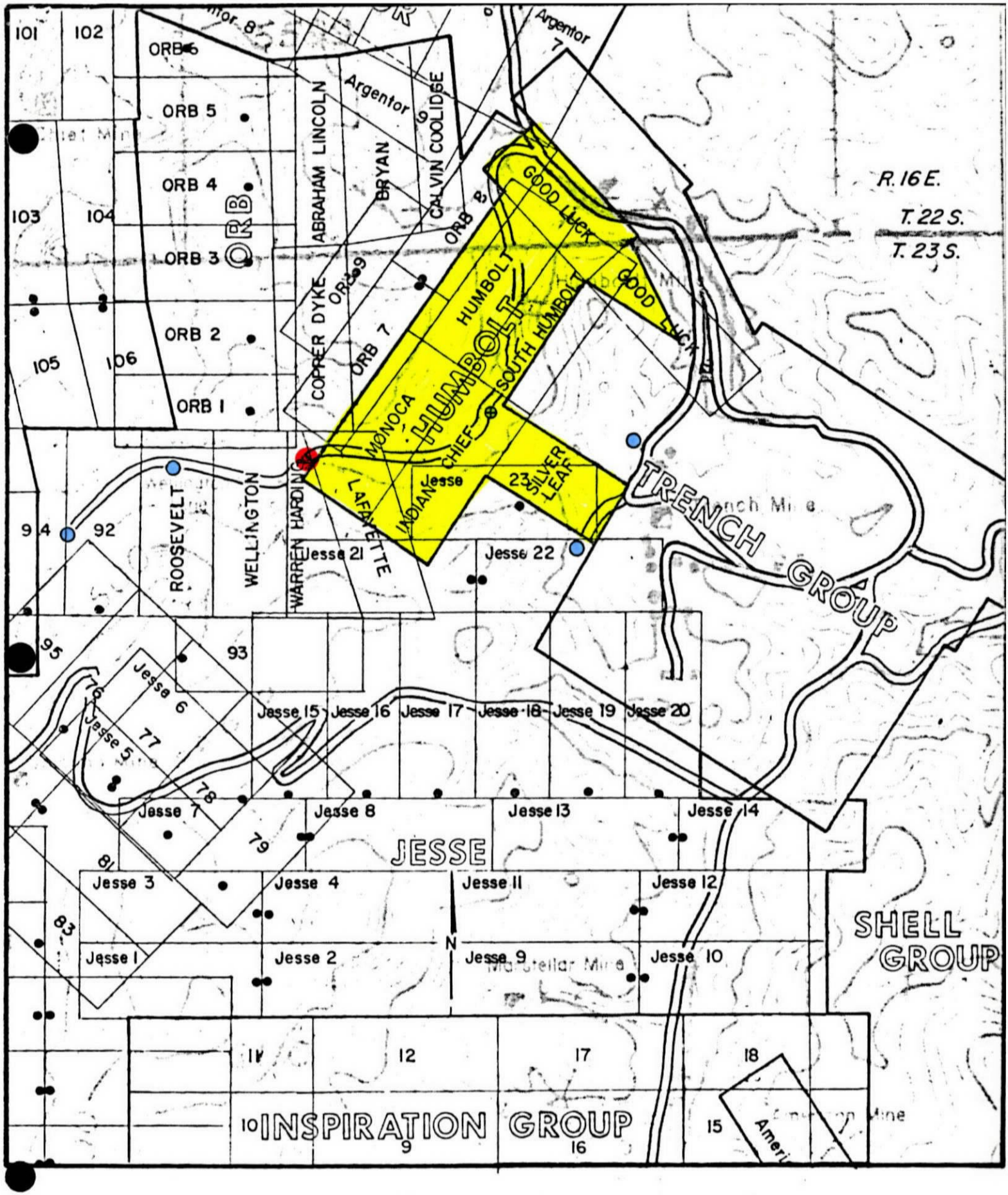
Very truly yours,

Fleetwood R. Koutz
Geologist

FRK:mek
Att: Drill Site Map

cc: J. D. Sell
J. R. Stringham/W. D. Gay
D. A. Melhado

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010



Existing Road

Drill Site 82-85

Drill Site Old

Drill Site 1981

To accompany letter to the U.S.F.S. Dated 7/17/85 By F.R.Koutz

Proposed Drill Site

PATAGONIA MOUNTAINS
SANTA CRUZ CO., ARIZONA
1" = 1000'

6279

ASARCO

Exploration Department
Southwestern United States Division

June 11, 1987

Mr. Jerry Deiter
District Ranger
Coronado National Forest
U.S. Forest Service
RR 2, Box 1150
Sierra Vista, AZ 85635

Thunder Mountain
Santa Cruz Co., AZ

Dear Mr. Deiter:

This letter is to inform you of Asarco's intent to deepen the drill hole shown on the attached map. This hole was drilled periodically from 1982 to 1985, and the last USFS-Asarco correspondence on drilling at this site was in F.R. Koutz's letter to Dennis Brandolino, dated July 17, 1985.

I tried calling you and Mr. Brandolino on the telephone to discuss this matter, but both of you were out for the week on a controlled burn. I assume it is permissible for Asarco to go ahead with the deepening of this drill hole and no formalities, other than this notification, are required.

I'll be in Nevada for the summer, so if you have any comments or questions, please call or write James D. Sell, Manager, or Bill Gay, Land Engineer, at the address and telephone number shown at the bottom of this page.

Sincerely yours,

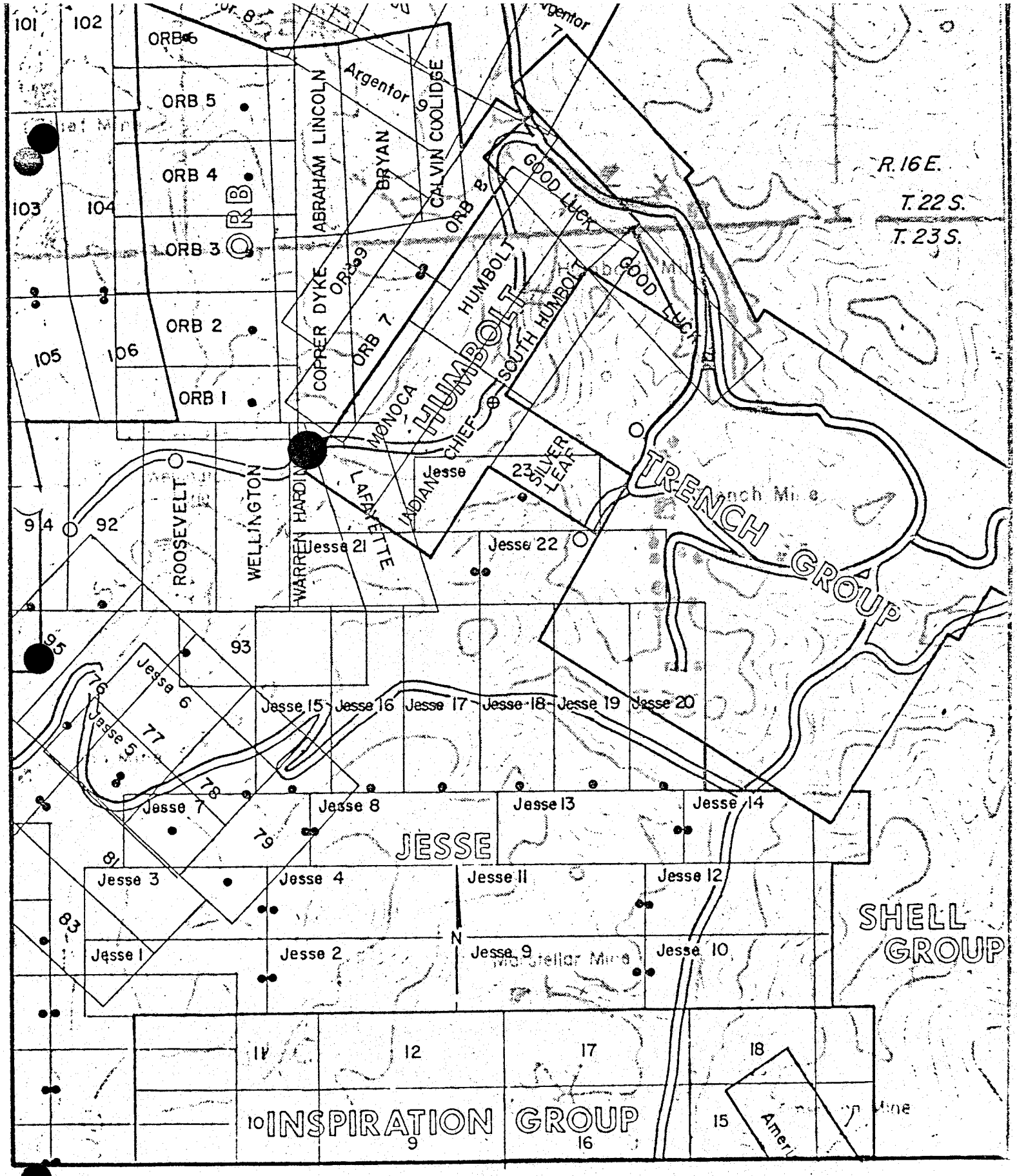
Henry Kreis

Henry G. Kreis
Geologist

HGK:mek
Att.

cc: W.L. Kurtz
J.D. Sell
W.D. Gay

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010



Existing Road

Drill Site 82-85,87

Drill Site Old

Drill Site 1981

To accompany letter to the U.S.F.S. Dated 7/17/85 By F.R.Koutz 6/11/87 By H.G.Kreis

Proposed Drill Site

PATAGONIA MOUNTAINS
SANTA CRUZ CO., ARIZONA
1" = 1000'

6279

J.D.S./W.D.G.

United States Department of Agriculture
Forest Service
Sierra Vista Ranger District
R.R. 2, Box 1150
Sierra Vista, AZ 85635

Reply to:

Date: July 9, 1987

Mr. Henry Kreis
ASARCO Incorporated
P.O. Box 5747
Tucson, AZ 85703-0747

Dear Mr. Kreis:

Thank you for your letter of 6/11/87 informing us of your continuing drilling operation. Under our previous approval, you are authorized to continue drilling at that site.

Please notify us well in advance if you are going to occupy a new site. Any ground disturbing activity not previously approved, will require a minimum of 45 days for approval to be acquirred. Forty-five day approval time even for relatively simple ground disturbing activities is so long because of strict compliance with archeological laws which require a 30 day waiting period in which the S.H.I.P.O. can comment on the activity. Your notification to us well in advance of any planned activity will enable us to comply with all of the laws and regulations and avoid delays of your assessment work.

If you have any questions please contact Dennis J. Brandolino at 458-0530.

Sincerely,

JERRY A. DEITER
District Ranger

CC: W.D. Gay (7/14/87)

ASARCO

Exploration Department
Southwestern United States Division

June 27, 1988

Mr. Jerry Deiter
District Ranger
Coronado National Forest
RR 2, Box 1150
Sierra Vista, AZ 85635

Thunder Mountain
Santa Cruz County, AZ

Dear Mr. Deiter:

This letter is to inform you of Asarco's intent to deepen the drill hole shown on the attached map. This is the same hole we continued to deepen last year. Drilling should conmmence late August and continue until early September.

I will assume it is permissible to deepen this drill hole unless you notify me to the contrary.

You can contact me at the address and telephone number shown at the bottom of this page.

Sincerely yours,

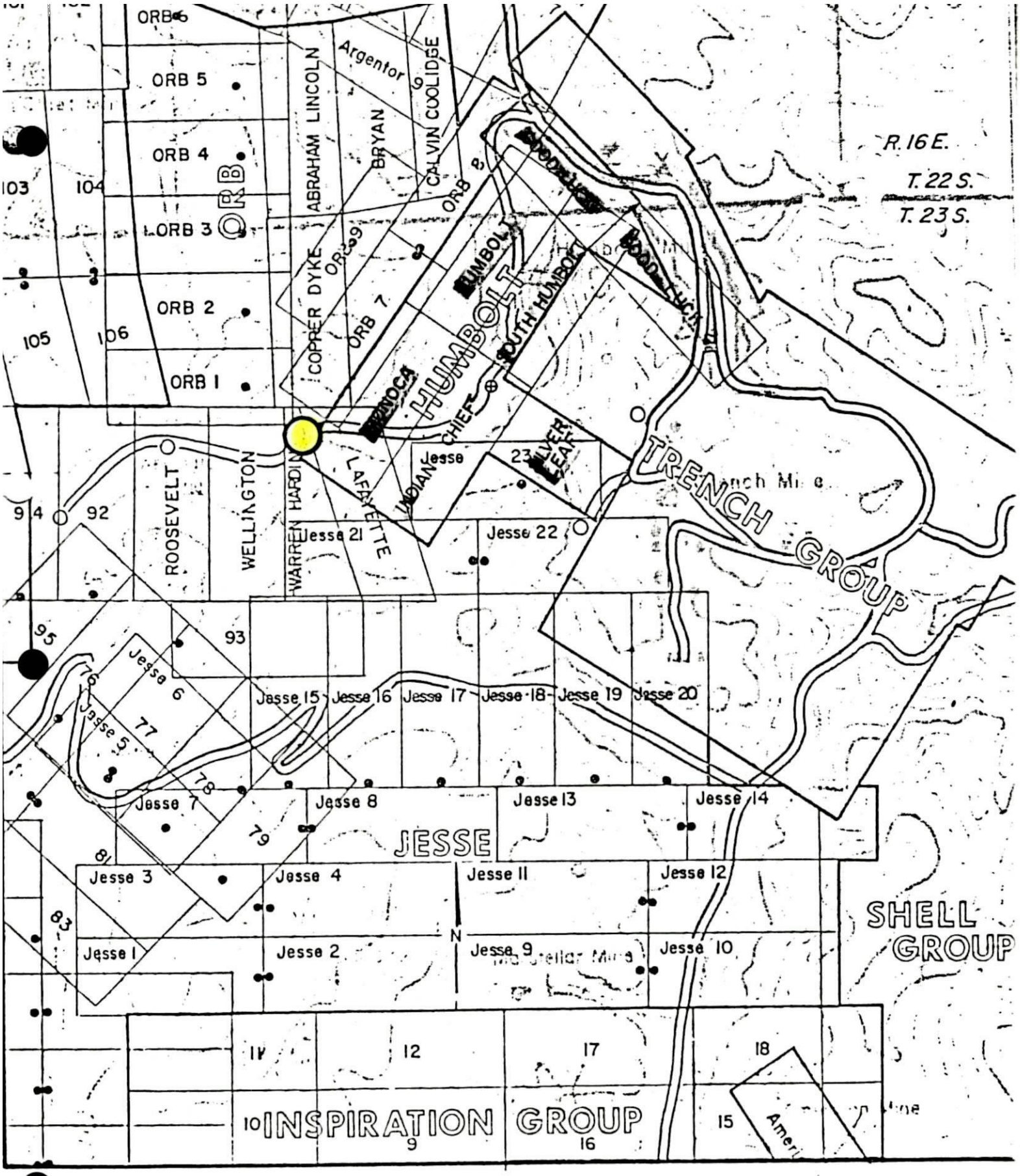
William D. Gay

William D. Gay
Land Engineer, SWED

WDG:mek

cc: J.D. Sell

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010



Existing Road

Drill Site 82-85,87

Drill Site Old

Drill Site 1981

To accompany letter to the U.S.F.S. Dated
7/17/85 By F.R.Koutz
6/11/87 By H.G.Kreis
6/27/88 By W.D.Gay

Proposed Drill Site

PATAGONIA MOUNTAINS
SANTA CRUZ CO., ARIZONA
1" = 1000'

6279

ASARCO

Southwestern Exploration Division

July 27, 1988

FILE NOTE

Archaeology Permit for TM-14

On July 12, I talked to Mr. Duane Bennett, Forest Ranger from Sierra Vista office. He said we need an archaeological study on the area at TM-14. Don Melhado and I met Mr. Bennett in Patagonia on July 14, 1988, and went to TM-14 site. Mr. Bennett said he was a para-archaeologist and could study the site and would let us know whether or not we had a problem.

Today, July 27, 1988, at 8:14 AM, Mr. Bennett called me and said we could go ahead with our drilling. I asked if we needed written approval and he said no, that verbal approval was sufficient.

William D. Gay

WDG:mek

William D. Gay

cc: W.L. Kurtz
J.D. Sell

Copy sent to Ibapah
7/27
mek

ASARCO

Southwestern Exploration Division

JDS

July 27, 1988

FILE NOTE

Archaeology Permit for TM-14

On July 12, I talked to Mr. Duane Bennett, Forest Ranger from Sierra Vista office. He said we need an archaeological study on the area at TM-14. Don Melhado and I met Mr. Bennett in Patagonia on July 14, 1988, and went to TM-14 site. Mr. Bennett said he was a para-archaeologist and could study the site and would let us know whether or not we had a problem.

Today, July 27, 1988, at 8:14 AM, Mr. Bennett called me and said we could go ahead with our drilling. I asked if we needed written approval and he said no, that verbal approval was sufficient.

William D. Gay

William D. Gay

WDG:mek

cc: W.L. Kurtz
J.D. Sell

ASARCO

Exploration Department
Southwestern United States Division

May 25, 1990

Mr. Jerry Deiter
District Ranger
Coronado National Forest
U.S. Forest Service
RR2, Box 1150
Sierra Vista, AZ 85635

Thunder Mountain
Santa Cruz Co., AZ

Dear Mr. Deiter:

This letter is to inform you of Asarco's intent to continue work in the Patagonia Mountains west of Trench Camp. Asarco intends to:

1. Reoccupy three previous drill sites and drill 8 new holes.

2. Clean old road to drill site (BB-1), establish 2 drill sites along road and drill 5 new holes.

3. Establish two new drill sites along road in canyon bottom that goes to hole TM-8. Drill two new holes.

All holes (15 holes in total) range in depth from 600 to 1400 feet. Plate 1 is a general location map while Plate 2 shows location of proposed new drill sites and proposed drill sites to be reoccupied.

Please inform us if this work is permissible. If you have any comments or questions, please call or write James D. Sell, Manager, Southwest Exploration Division at the address and telephone shown at the bottom of this page.

Sincerely yours,

John J. Malusa
Geologist

JJM:mek
Atts.

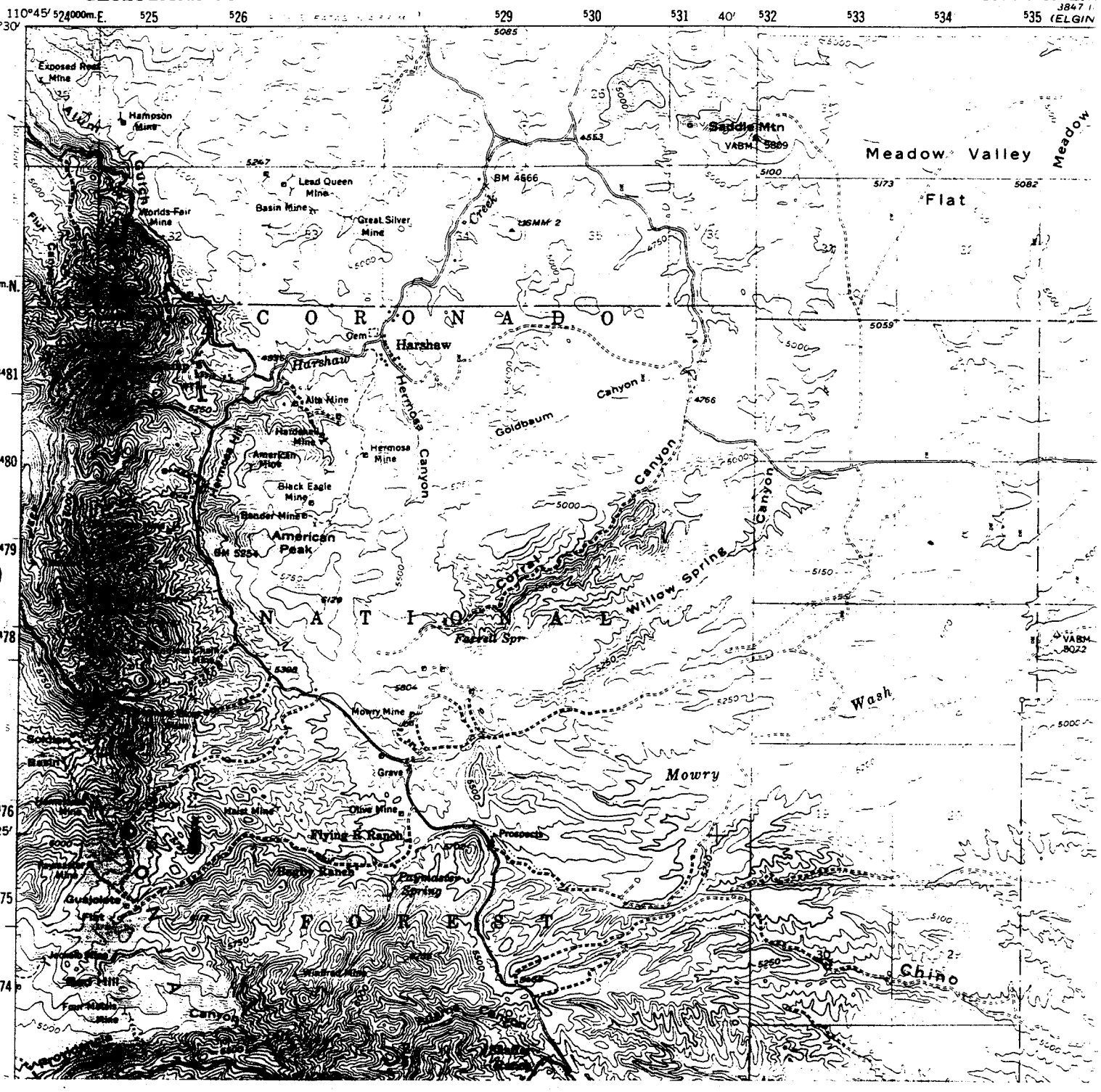
cc: J.D. Sell
W.D. Gay

ASARCO Incorporated P.O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010

Plate 1

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED ST
DEPARTMENT OF
CORPS OF EN
(ELGIN



SCALE 1:62500

1 ½ 0 1 2 3 4 MILES

0 3000 6000 9000 12000 15000 18000 21000 FEET

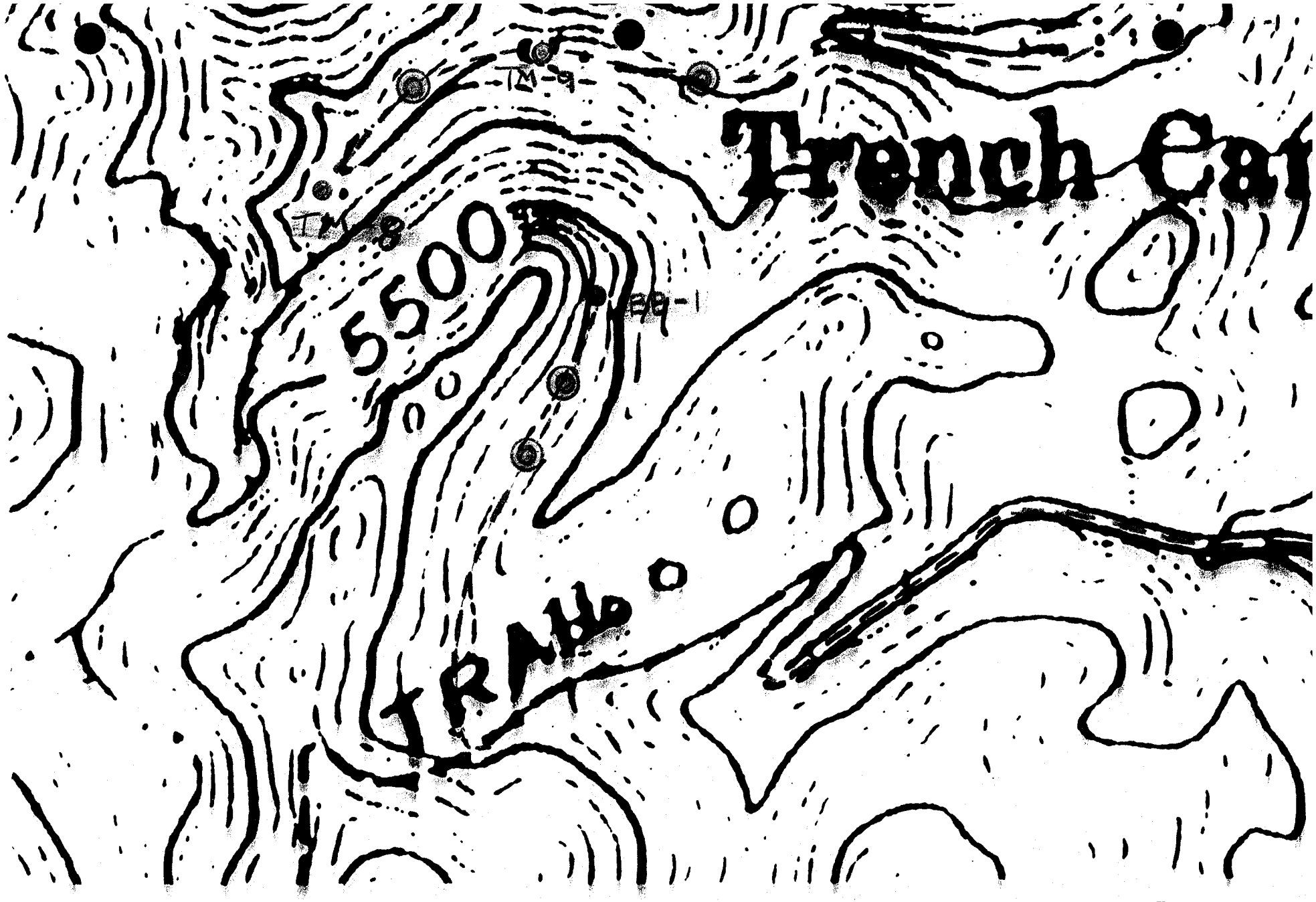
1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 50 FEET
DATUM IS MEAN SEA LEVEL

QUADRANGLE LOCATION

LOCHIEL, ARIZ.
N3115—W11030/15
1958
AMS 3846 I—SERIES V798

area where new drill sites are proposed



● preexisting drill site to be reoccupied

● proposed new drill site

— — — established road

Plate 2

JDS

ASARCO

Southwestern Exploration Division

May 29, 1990

J.J. Malusa

Meet Forest Service
Thunder Mountain Project
Patagonia Mountains
Santa Cruz County, AZ

Meet Mr. Duane Bennett of the Patagonia area Forest Service at the Stage Stop cafe, 9 AM, Thursday, June 7, 1990, in Patagonia.

Mr. Bennett has received the Asarco request for drilling and wishes to inspect all the drill sites. I have informed him that all sites are on existing roadways.

Check with Tony Dalla Vista, Mining Dept., as to the cat man that was used on their rehab in the Patagonias. Call/stop by and see the operator and arrange to clean the road up to the BB-1 drill site and to TM-9 also.

You might go down a day early and review the potential site(s) at the Ventura project, and, if possible, also review this area with Mr. Bennett, as some new roads may be necessary at Ventura. Contact the cat man to do the Ventura clean-up and road work.

James D. Sell

JDS:mek

James D. Sell

cc: W.L. Kurtz
W.D. Gay

JPS

ASARCO

Exploration Department
Southwestern United States Division

June 11, 1990

Mr. Jerry Deiter
District Ranger
Coronado National Forest
U.S. Forest Service
RR 2, Box 1150
Sierra Vista, AZ 85635

Dear Mr. Deiter:

This letter is to inform you of Asarco's intent to continue work in the Patagonia Mountains 1) west of Trench Camp, and 2) on the road to the Ventura Mine. All of the proposed drill sites were shown to Mr. Duane Bennett of the Patagonia area Forest Service on June 7, 1990.

Asarco will only engage in road maintenance and not in any road building or improvements at the present time. All new drill sites will be located on preexisting roads and will not include any road widening.

Topographic maps have been included to aid in locating the areas of interest. Plates 1 and 2 are general location maps while 3 and 4 are detailed.

In all, Asarco intends to:

1) Reoccupy three previous drill sites and drill 8 new holes at those sites.

2) Do road maintenance on road to drill site BB-1, and drill 5 holes on 2 new sites that will be located on the established road. No road widening will be needed to drill on these new sites.

3) Drill at two sites along road in canyon bottom that goes to hole TM-8.

4) Do road maintenance and drill on two sites along preexisting roads near the Ventura mine.

ASARCO Incorporated P.O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010

Please inform us if this work is permissible. If you have any comments or questions, please call or write James D. Sell, Manager, Southwestern Exploration Division at the address and telephone shown at the bottom of page 1.

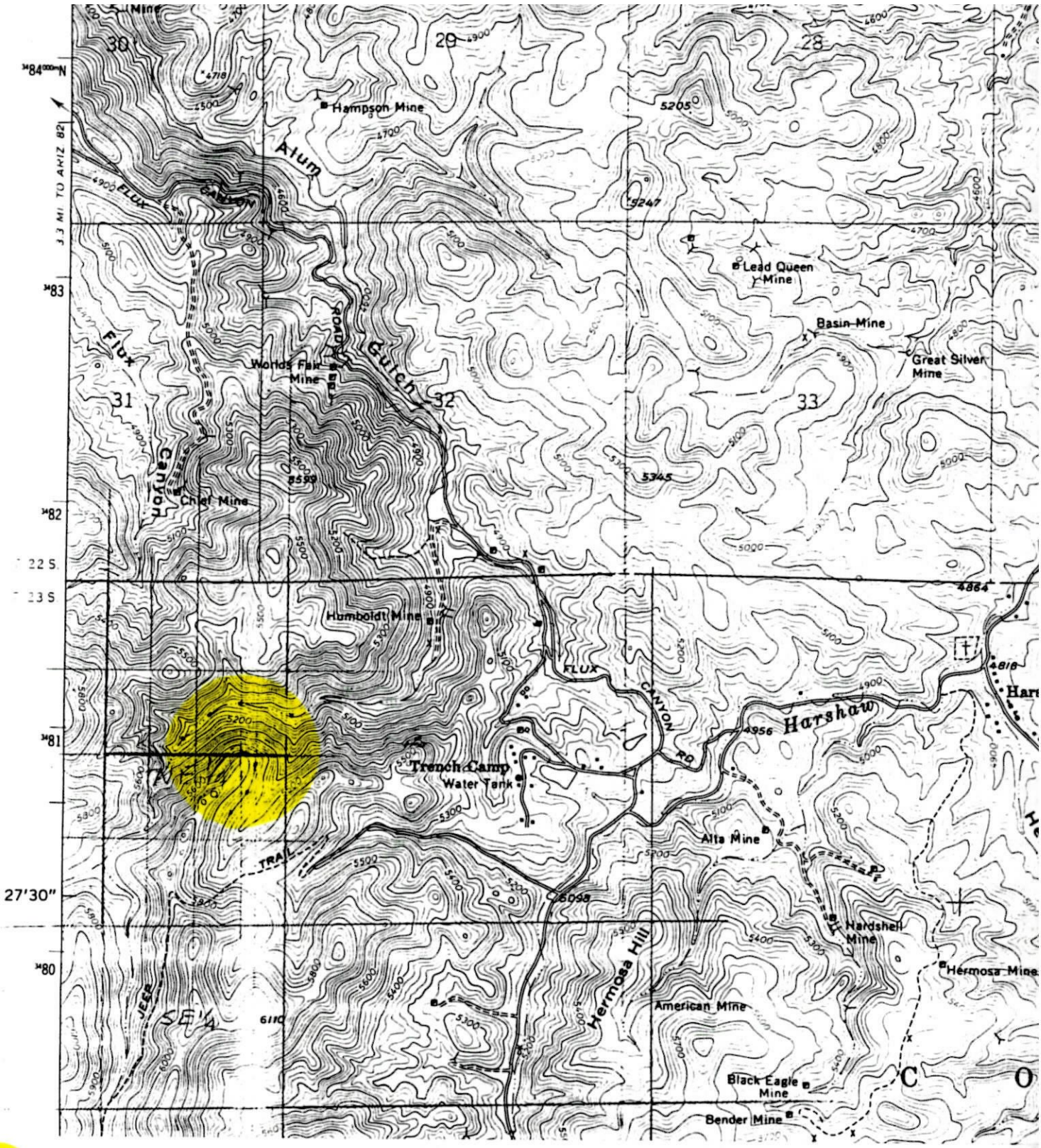
Sincerely yours,

John J. Malusa

John J. Malusa
Geologist

JJM:mek
encs.

cc: J.D. Sell
W.D. Gay



Area of interest

SCALE 1:24 000

1 ½ 0 1 MIL

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

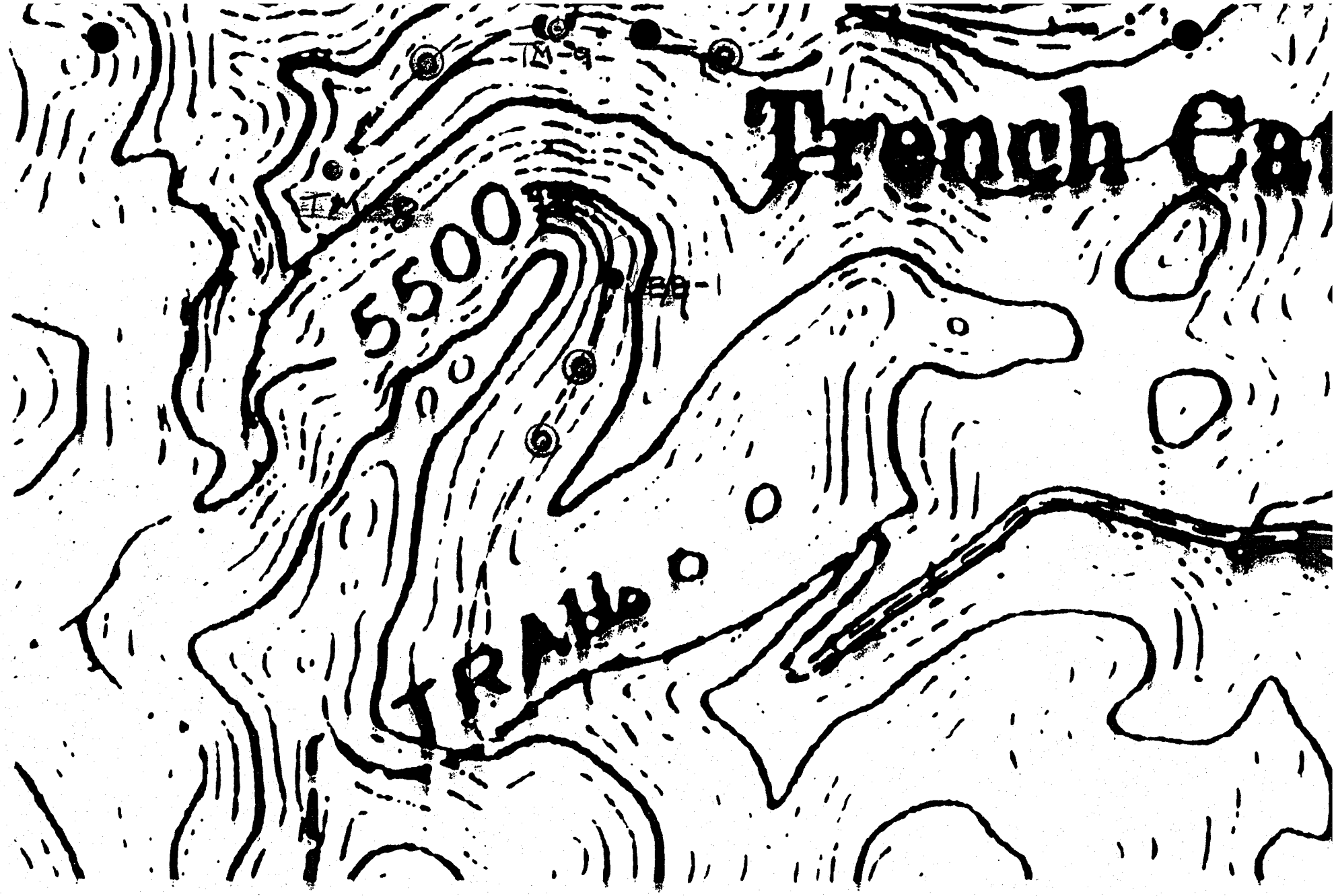
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 25 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

HARSHAW, ARIZ.
NW/4 LOCHIEL 15' QUADRANGLE
31110-D6-TF-024

1958
PHOTOINSPECTED 1982
DMA 3846 I NW-SERIES V898

Plate 1



● preexisting drill site to be reoccupied

◎ proposed new drill site to be drilled on road without widening road

— — — established road

Plate 3

United States Department of Agriculture
Forest Service
Sierra Vista RD
Coronado NF
769 N. Hwy 90 Bypass
Sierra Vista, AZ 85635
602/458-0530

Reply to: 2810

Date: July 9, 1990

Thunder Mtn
Ventana

John J. Malusa, Geologist
ASARCO Inc.
P.O. Box 5747
Tucson, AZ. 85703-0747

Dear John,

This letter serves as authorization for ASARCO, Inc., to begin road maintenance work on the roads leading to the drill sites outlined in your letter of June 11, 1990. As we mentioned to you during our field visit to these sites last month, the road maintenance work must be contained within the existing roadbed and any pruning of trees along the roadside will be done in a manner as described to you during the aforementioned field trip.

If you find that it becomes necessary to widen any road or drill site, please contact our office so we may conduct the proper surveys and complete all environmental documentation prior to such work beginning..

If you have any questions please contact Duane Bennett or myself at our new phone number 378-0311. For your information, our new address is:

Sierra Vista Ranger District
5990 S. Hwy 92
Hereford, AZ. 85615

Sincerely,

Dennis J. Brandolino
DENNIS J. BRANDOLINO
Activities Staff

cc: J.D. Sell
W.D. Gay

ASARCO Inc
JUL 12 1990
SW Exploration

ASARCO

Exploration Department
Southwestern United States Division

October 16, 1991

Mr. Jerry Deiter
District Ranger
Sierra Vista Ranger District
U.S. Forest Service
5990 South Highway 92
Hereford, AZ 85615

Dear Mr. Deiter:

This morning I spoke to Mr. Duane Bennett about Asarco's drilling exploration program in the Patagonia Mountains for 1992.

The work would consist of five (5) drill sites (hand dug) 20' x 25'. These sites are shown on the enclosed map. A skid mounted rig would be used so no road building would be necessary.

As discussed with Mr. Bennett, Asarco will stake the sites, contact your office, so they can be field checked for your approval.

Sincerely yours,

William D. Gay

William D. Gay
Land Engineer, SWED

WDG:mek
encs. 1. Area Map
2. 1"=200' map of drill sites

cc: J.D. Sell

ASARCO Incorporated P.O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010

ASARCO

Exploration Department
Southwestern United States Division

October 16, 1991

Mr. Jerry Deiter
District Ranger
Coronado National Forest
U.S. Forest Service
RR 2, Box 1150
Sierra Vista, AZ 85635

new address

Dear Mr. Deiter:

This morning I spoke to Mr. Duane Bennett about Asarco's drilling exploration program in the Patagonia Mountains for 1992.

The work would consist of five (5) drill sites (hand dug) 20' x 25'. These sites are shown on the enclosed map. A skid mounted rig would be used so no road building would be necessary.

As discussed with Mr. Bennett, Asarco will stake the sites, contact your office, so they can be field checked for your approval.

Sincerely yours,

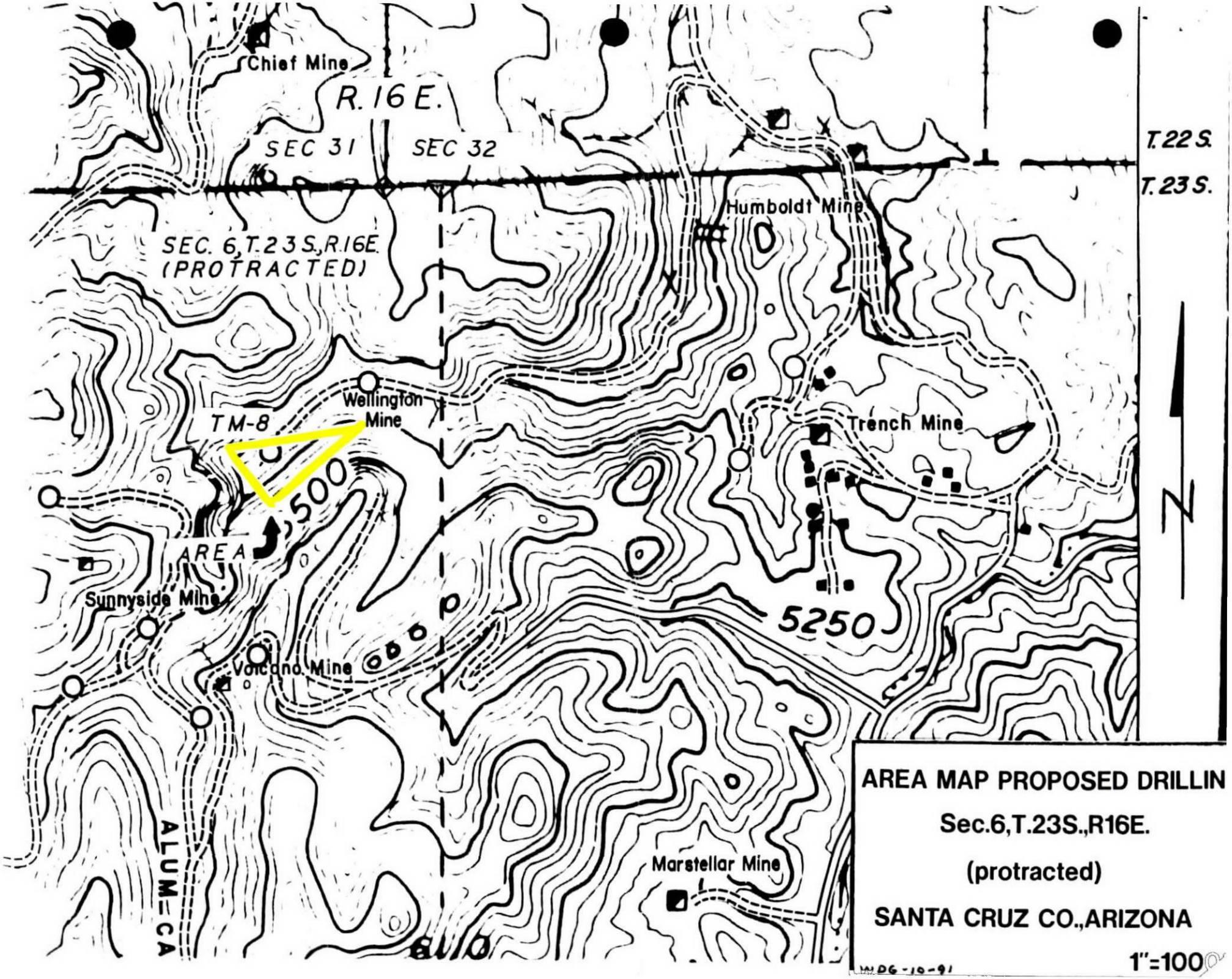
William D. Gay

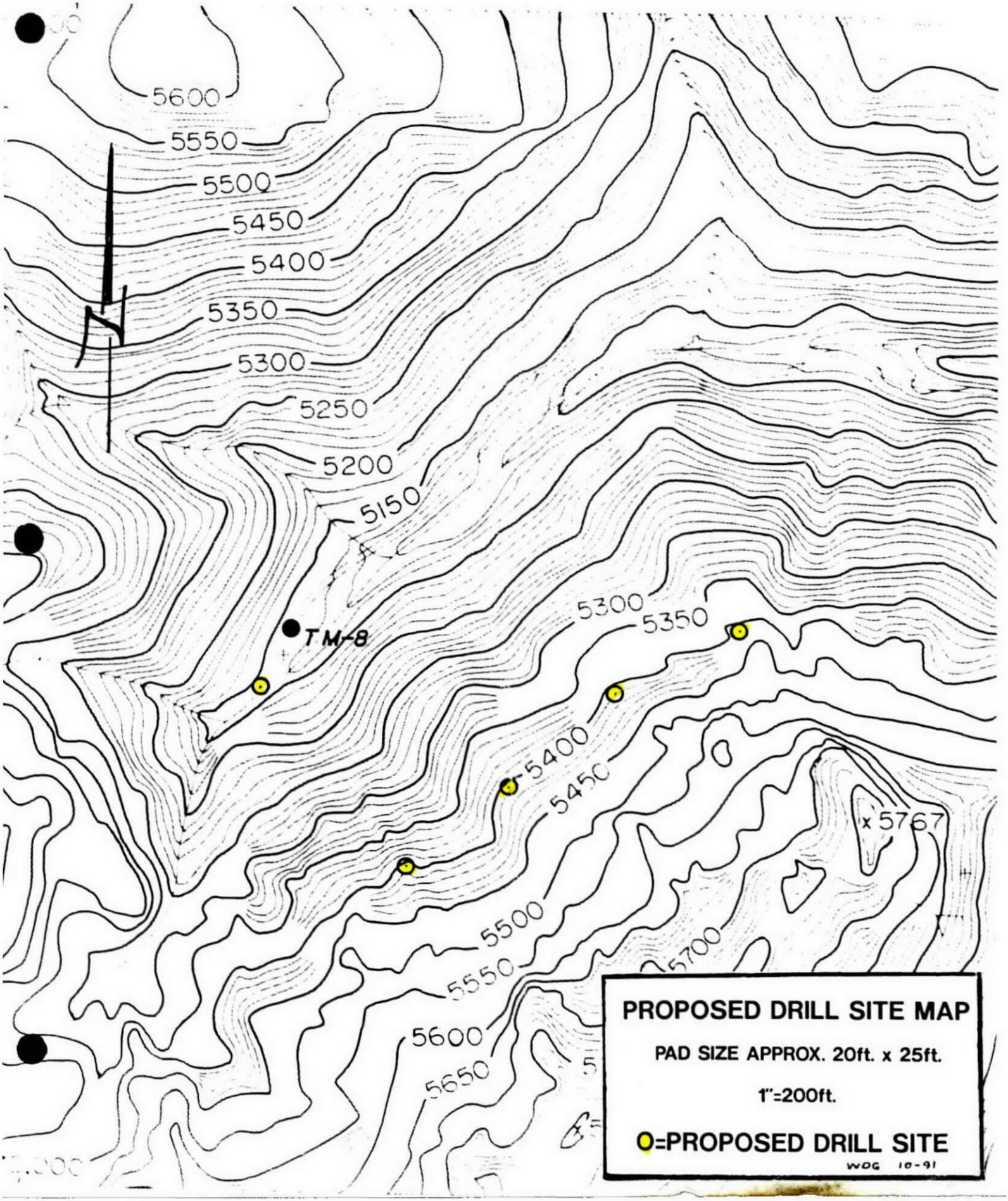
William D. Gay
Land Engineer, SWED

WDG:mek
encs. 1. Area Map
2. 1"=200' map of drill sites

cc: J.D. Sell

ASARCO Incorporated P.O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010


Chief Mine
R. 16 E.
SEC 31
SEC 32
T. 22 S.
T. 23 S.
Humboldt Mine
SEC. 6, T. 23 S., R. 16 E.
(PROTRACTED)
Wellington Mine
TM-8
Trench Mine
500
AREA
Sunnyside Mine
5250
Volcano Mine
ALUM-CA
Marstellar Mine
N
AREA MAP PROPOSED DRILLIN
Sec.6,T.23S.,R16E.
(protracted)
SANTA CRUZ CO.,ARIZONA
1"=100
WDG-10-91


5600
5550
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5250
5200
5150
TM-8
5300
5350
5400
5450
x 5767
5500
5550
5700
5600
5650
PROPOSED DRILL SITE MAP
PAD SIZE APPROX. 20ft. x 25ft.
1"=200ft.
O=PROPOSED DRILL SITE
WOG 10-91

JDS

ASARCO

Southwestern Exploration Division

December 17, 1991

W.D. Gay

TM drill holes proposed
Thunder Mountain Project
Santa Cruz County, AZ

Write letter to the FS with map showing the location of the four stakes we placed and flagged on the slope above TM-8, for possible drilling sites.

At the present time it has not been confirmed on how the sites will be occupied, but if they need 10 weeks to get their work done, then we'd better get this started.

James D. Sell

JDS:mek

James D. Sell

cc: W.L. Kurtz

ASARCO

Exploration Department
Southwestern United States Division

December 23, 1991

Mr. Jerry Deiter
District Ranger
Sierra Vista Ranger District
U.S. Forest Service
5990 South Highway 92
Hereford, AZ 85615

Dear Mr. Deiter:

Reference is made to my letter of October 16, 1991, in which I stated that we (Asarco) would stake drill sites as indicated on the attached maps. The sites have been staked and are ready to be field checked by your people.

Please let us know when you are ready to check the sites and we will meet your representative at the location.

Sincerely yours,

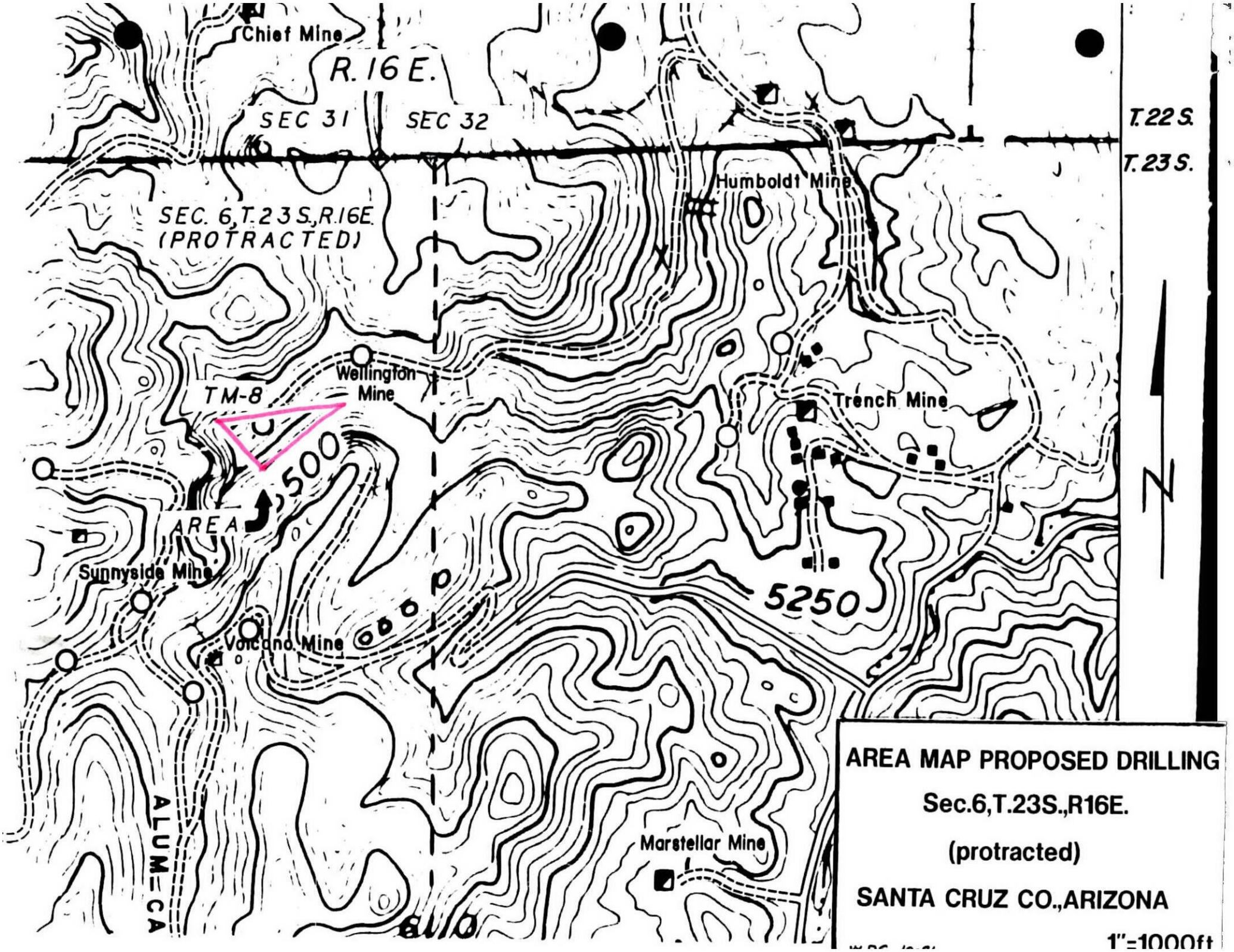
William D. Gay

William D. Gay
Land Engineer, SWED

WDG:mek
encs.: 1. Area Map
2. 1" = 200' map of drill sites

cc: J. D. Sell

ASARCO Incorporated P.O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010



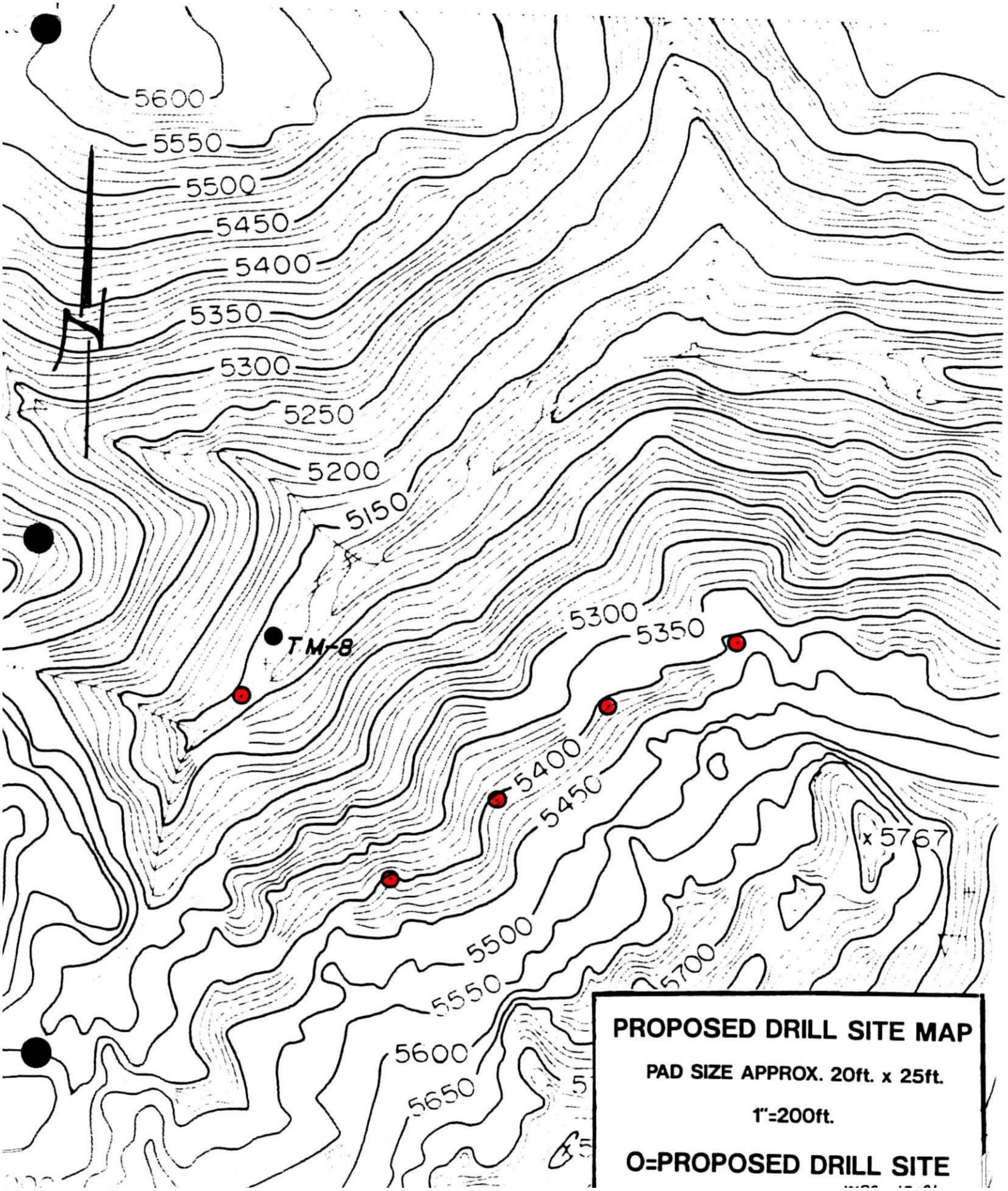
AREA MAP PROPOSED DRILLING

Sec.6,T.23S.,R16E.

(protracted)

SANTA CRUZ CO.,ARIZONA

1"=1000ft


5600
5550
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5450
5400
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5250
5200
5150
TM-8
5300
5350
5400
5450
x 5767
5500
5550
5700
5600
5650
PROPOSED DRILL SITE MAP
PAD SIZE APPROX. 20ft. x 25ft.
1"=200ft.
O=PROPOSED DRILL SITE

JDS

ASARCO

Southwestern Exploration Division

February 3, 1992

J.D. Sell

Visit with Forest Service
Personnel for Road and Drill
Site Building - Thunder Mtn.

On January 27, 1992 I met with Mr. Duane Bennett and Mr. Dennis Brandolino, both Forest Rangers, to discuss the possibility of building a drill site about 200 feet south of TM-8 and also building a road from the 5150 foot elevation to the 5400 foot elevation on the slope southeast of TM-8.

Mr. Brandolino seemed to be the spokesman for the Forest Service and the following sums up his thoughts:

1. The site south of TM-8 should not be a problem. We could go north about 200 feet, then start the road on an incline, level off, and go south about 400 feet. Would need a biological and archaeological study for this site.
2. The road on the slope was another matter. Mr. Brandolino said crossing the drainage was a problem, the steepness of the slope where the road would be built was so steep that damage to trees, etc. would be excessive. In fact the last thing he said when we parted was that if we insist on building the road we will get into a new set of problems.

Another alternative was looked at and that was building a road from the top around to the drill sites, but again the steepness of the slope would not allow this without major cutting into the slope.

I also talked with Mr. Dave Martin about the roads on the SE slope, and his thoughts were, it could be done, but it would take a lot of blasting and would be time consuming. He said the site south of TM-8 could probably be built with a front-end loader.

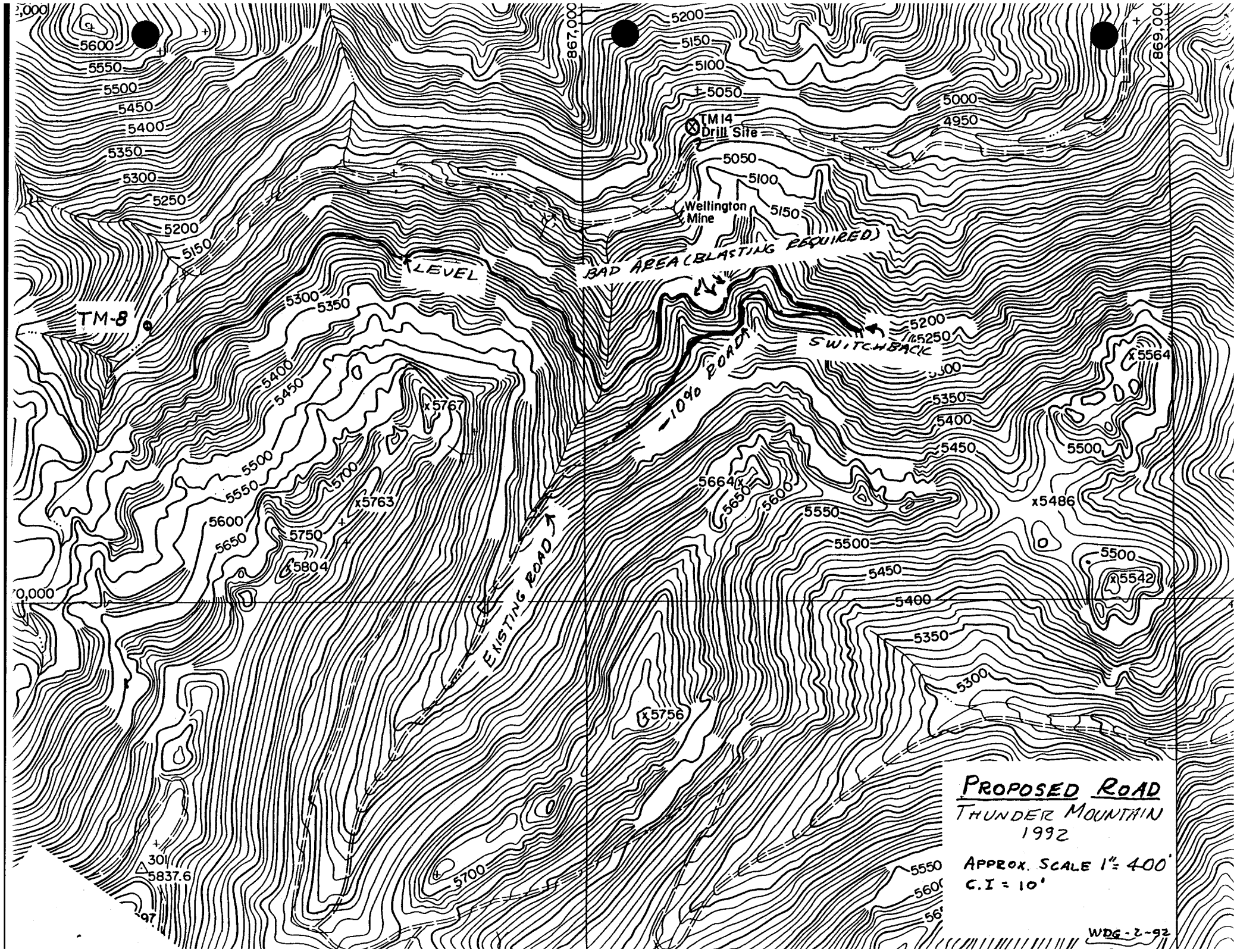
Attached is a map with a "maybe" alternate road that you and I discussed on January 31, 1992. It also looks difficult and expensive.

William D. Gay

William D. Gay

WDG:mek

cc: W.L. Kurtz


PROPOSED ROAD
THUNDER MOUNTAIN
1992
APPROX. SCALE 1" = 400'
C.I = 10'
WDG-2-92
TM14 Drill Site
Wellington Mine
BAD AREA (BLASTING REQUIRED)
LEVEL
SWITCHBACK
-10% ROAD
EXISTING ROAD
TM-8
867,000
869,000
5837.6

DENNIS J. BRANDOLINO
Recreation & Lands Staff
(602) 378-0311

CORONADO NATIONAL FOREST
Sierra Vista Ranger District
5990 South Hwy. 92
Hereford, Az. 85615

DUANE A. BENNETT
Recreation & Lands Forester
(602) 378-0311
FAX (602) 670-5078

CORONADO NATIONAL FOREST
Sierra Vista Ranger District
5990 South Hwy. 92
Hereford, AZ 85615

2-5-92

J. D. Sell

These are the gentleman we deal with at Thunder Mtn. etc.

W. W. Hay

ASARCO Incorporated
FEB 6 1992
SW Exploration

JDS

ASARCO

Exploration Department
Southwestern United States Division
James D. Sell
Manager

June 1, 1992

Mr. Jerry Deiter
District Ranger
Sierra Vista Ranger District
U.S. Forest Service
5990 South Highway 92
Hereford, AZ 85615

Drilling Notification
Alum Canyon
Patagonia Mountains
Santa Cruz County, AZ

Dear Mr. Deiter:

Asarco SWED requests the approval to core five holes along the road in Alum Canyon (Figure 1). The drilling would use a truck-mounted diamond core machine and would start 100 feet northeast of the water-flowing drill hole (TM-8) near the head of the present road in the canyon, and continue eastward along the road (Figure 2).

As the previous drilling has done in the area, the surplus drilling mud will continue to be contained in tanks and disposed of in prepared pits.

You had previously field checked sites requested along the hillside (letter of Dec. 23, 1991), but SWED does not intend to drill these at this time.

Very little disturbance will be necessary during this phase of the drilling request.

Sincerely yours,

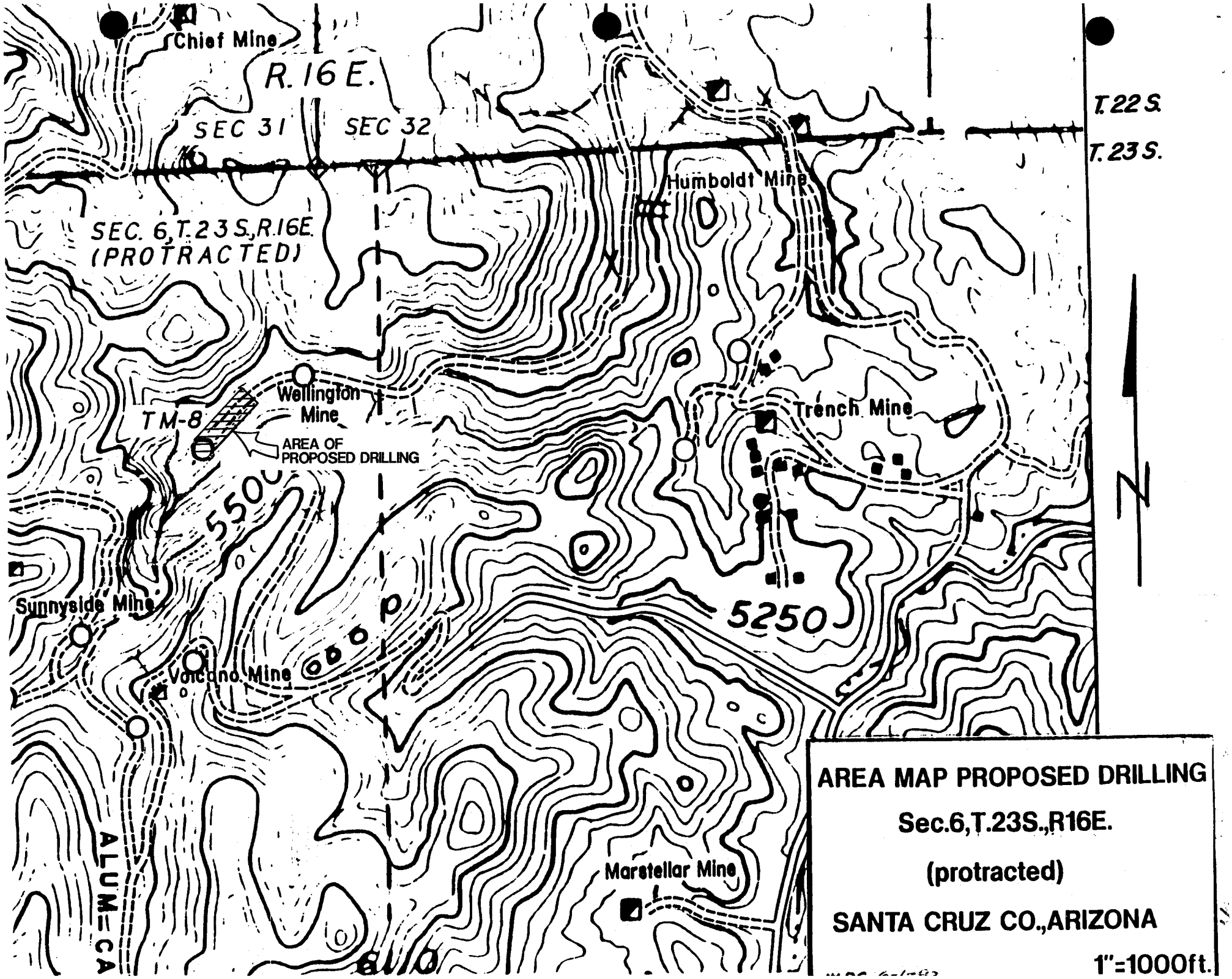
James D. Sell

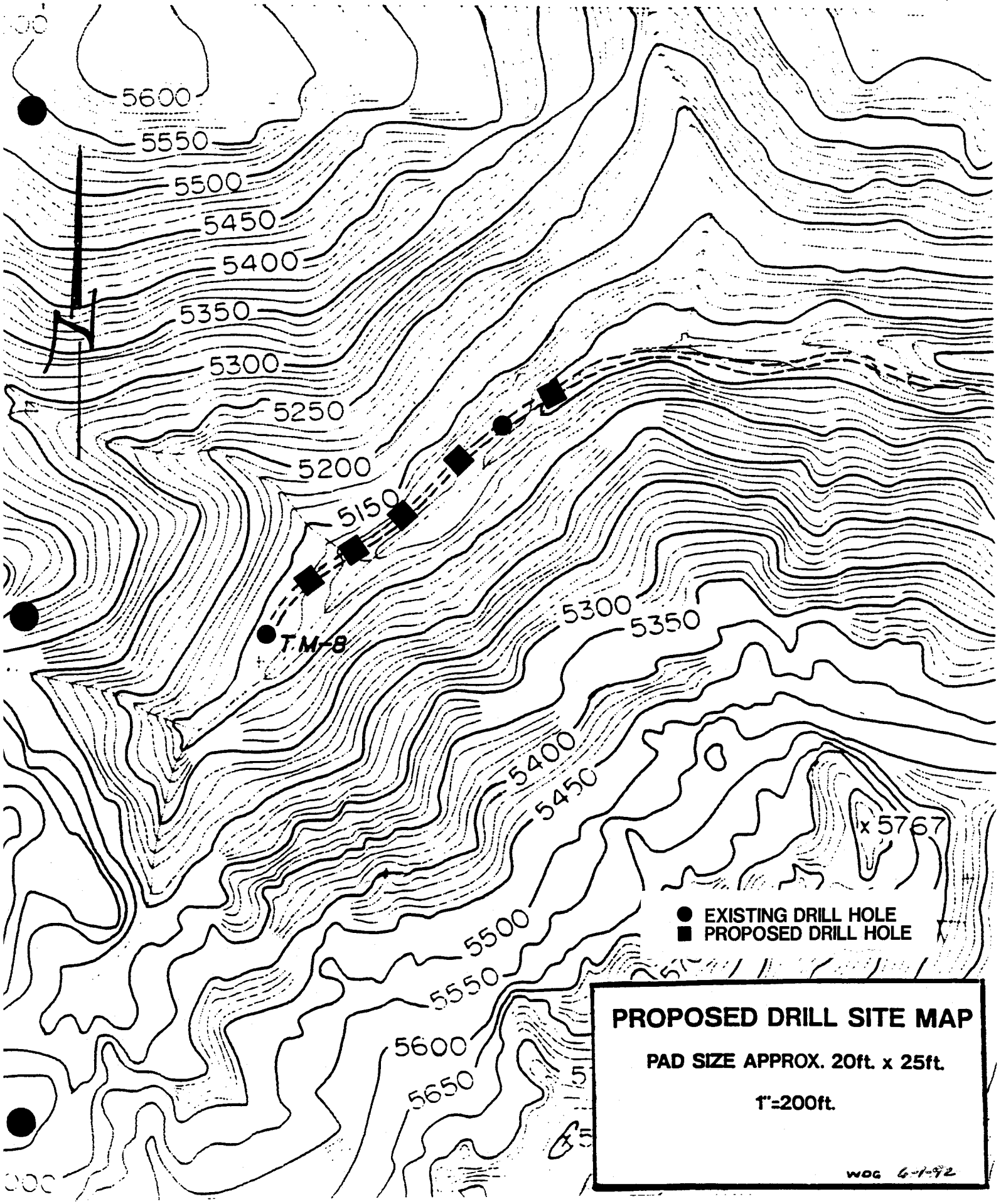
James D. Sell

JDS:mek
encs.: 1. Area Map
2. 1"=200' drill site map

cc: W.L. Kurtz
W.D. Gay

ASARCO Incorporated P.O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue FAX (602) 792-3934 Phone (602) 792-3010


Chief Mine
R. 16 E.
SEC 31
SEC 32
T. 22 S.
T. 23 S.
Humboldt Mine
SEC. 6, T. 23 S., R. 16 E.
(PROTRACTED)
Wellington Mine
TM-8
AREA OF PROPOSED DRILLING
Trench Mine
5500
5250
Sunnyside Mine
Volcano Mine
Marstellar Mine
ALUM=CA
N
AREA MAP PROPOSED DRILLING
Sec.6,T.23S.,R16E.
(protracted)
SANTA CRUZ CO.,ARIZONA
1"=1000ft.


5600
5550
5500
5450
5400
5350
5300
5250
5200
5150
5300
5350
5400
5450
5500
5550
5600
5650
x 5767
T.M-8
N
EXISTING DRILL HOLE
PROPOSED DRILL HOLE
PROPOSED DRILL SITE MAP
PAD SIZE APPROX. 20ft. x 25ft.
1"=200ft.
WDG 6-1-92

TAB

Leach Tests

Leach Water
Thin Sections

JDS

ASARCO

Southwestern Exploration Division

July 18, 1990

FILE NOTE

Chalcocite-Chalcopyrite Leach
Cochise Project - Phelps Dodge
Bisbee North
Cochise County, Arizona

In talking with Mike Greeley of the USBM, who had just returned from an AIPG tour of Bisbee, he stated the following:

PD has mined, and placed on pads of 10,000 tons each, the following:

Pad 1. Mine Run
Pad 2. Crushed to 6 inch
Pad 3. Crushed to 1 inch.

They have completed 50 days of a 150 day leach test using iron sulfate-sulfuric acid.

They expect the project to continue if they can secure a 60% recovery.

At present they are encouraged with the daily rise in cumulative recovery of copper (no figures given out).

James D. Sell

JDS:mek

James D. Sell

cc: W.L. Kurtz
D.E. Crowell
S.A. Anzalone

ASARCO

Exploration Department
Southwestern United States Division

September 21, 1990

Dr. Sid Williams
Globo De Plomo Enterprises
P.O. Box 872
Douglas, AZ 85607

Dear Sid:

I have delivered to Arnulfo Manzo five samples of split drill core for petrographic and mineral analyses as per the following list:

Sample ID	Petrographic	Polished Section
BB-2-85	X	X
BB-2-400	X	X
BB-3-50	X	X
BB-3-260	X	X
BB-3-700	X	X

Of particular interest petrographically is the alteration assemblage, and, of course, rock classification. For the polished sections the copper minerals are of importance. We have seen chalcocite and covellite under the hand lens and would be interested to know if you see any covellite coating bornite. You may observe some silver mineralization, but it is running only in the low ppm range.

This job is for Asarco. Report and billing whould be directed to:

Purchase order number T-199-0

Mr. James D. Sell
ASARCO Incorporated
P.O. Box 5747
Tucson, Arizona 85703

Also a copy to Mr. John Malusa and myself, same address.

Thank you.

Sincerely,

Harold Downey

Harold J. Downey

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010

TM
JDS

GLOBO DE PLOMO ENTERPRISES

P.O. BOX 872
DOUGLAS, AZ 85607
USA

26 September 1990

Harold J. Downey
ASARCO Incorporated
P.O. Box 5747
Tucson, AZ 85703-0747

Dear Harold:

Enclosed are descriptions of thin sections and polished sections prepared by Mr. Manzo from your five samples. You will see that the alteration assemblage is somewhat variable but is dominated by pyrophyllite, possibly with sericite in some cases, for the two are virtually indistinguishable, plus alunite, and kaolinite in one instance. Silicification has been relatively unimportant.

The rocks are called dacites but this is a nominal term for the alteration has destroyed all feldspars and it is possible that the intrusion was more acid than I imagine. In addition to copper you will see that zinc is important in some of the mineralized samples.

I hope these data are helpful to you.

Best regards,

SAW

Sidney A. Williams
SAW:bj

cc: J.D. Sell
J. Malusa

SEP 2 6 1990
SW Exploration

TEL: (602) 364-9637 / TLX: "GLOPLO" / SHIPPING: 1201 F AVENUE, DOUGLAS

BB-2-85

The rock is a porphyry, a shallow intrusive or hypabyssal unit most likely. The composition is judged to have been dacite originally but can no longer be determined with certainty owing to intense epizonal alteration.

Phenocrysts of plagioclase, β quartz, and biotite are common and are thickly dispersed in a dense cherty-textured matrix of quartz and feldspars formed by slow devitrification of the glass base. The plagioclase is entirely altered to scaly mush of coarse grained pyrophyllite in which occasional clusters of alunite tablets are embedded. Pyrophyllite and fine grained granular quarts together have replaced biotite and leucoxene marks the pseudomorphs clearly. β Quartz is unchanged by the alteration process but fine grained quartz has grown throughout the matrix and together with dispersed scales of pyrophyllite replaces all of the feldspars once present.

Pyrite is the dominant sulfide, occurring as rounded pyritohedra often packed in sizable clusters, the grains with simple mutual boundaries. On occasion equally large grains of sphalerite occur satellitic to them. Copper sulfides are abundant and seem to represent the youngest minerals in the ore assemblage. Bornite appears to have been the earliest of these sulfides but little remains. Commonly the bornite relicts are severely corroded and the margins of them marked by numerous tiny ribbon-like grains of chalcopyrite which penetrate the bornite and extend beyond its margins. Both of these minerals are embedded in and replaced by chalcocite which in turn has largely altered to a fine grained scaly aggregate of covellite. All of these sulfides commonly cluster around a nucleus of pyrite grains but in places the covellite appears to occur in crosscutting fractures the course through the rock as veinforms. On rare occasion a sulfosalt was observed as inclusions in bornite. Grains are small but it is thought to be tetrahedrite/tennantite.

BB-2-400

The rock is a porphyry identical to the preceding sample but here may be an intrusion breccia, for it entrains numerous cognate xenoliths, some of them blending imperceptibly into the matrix. All of these have glassy bases and devitrification produced considerable uniformity of texture. Many of the quartz phenocrysts and feldspar grains are angular and seem to have been broken during the process of intrusion. Biotite books likewise are sometimes crumpled. Textures remain clear though epizonal alteration has been intense.

Feldspar clasts are replaced by a fine grained, scaly paste of kaolinite in which minute alunite rhombs are present as inclusions. Only in the vicinity of sulfide grains is alunite coarser, occurring as clusters of densely packed tablets. Sometimes lacy barite crystalloblasts are embedded in these clusters. The matrix of the rock is dense, cherty-textured

BB-2-400 con't.

quartz with minuscule grains of kaolinite dusting the quartz grain boundaries. Alunite beads are also disseminated in this assemblage.

Granular pyrite is a dominant sulfide in this sample occurring as crude pyritohedra of rounded outline that sometimes are closely clustered together. Inclusions of gangue are most uncommon but when present may be large. Surrounding the pyrite are large irregular patches of sphalerite which show complex color zoning. The darker colored bands occur within the cores of the sphalerite grains and are characterized by innumerable minute chalcopyrite exsolution beads. A few grains of tetrahedrite/tennantite were found, chiefly embedded in gangue near pyrite and some of the grains enclose corroded and isolated islands of former pyrite crystals indicative of strong replacement relationship.

BB-3-50 (or 56)

The rock is a porphyry judged to have been a dacite originally. Phenocrysts of plagioclase and biotite, joined by β quartz are common and show a vague alignment in a matrix that was originally glass but devitrified to a chert-like quartz/-feldspar after emplacement had ceased. Cognate xenoliths entrained in the rock are virtually identical to the matrix and blend imperceptibly into it. Textures remain clear although epizonal alteration has been strong.

Coarse grained scaly pyrophyllite replaces the feldspar phenocrystals. Sometimes they seem leached and the pseudomorphs are a trifle vuggy. Pyrophyllite has likewise replaced biotite but is then distinctively marked by accessory leucoxene. A few of the feldspar phenocrystals are replaced by very fine grained alunite instead of pyrophyllite and there seems to be no pattern as to which mineral occupies the pseudomorphs. The matrix is dense cherty-textured quartz flecked with pyrophyllite scales and in the sample quartz does not appear to have grown to any degree during the alteration process.

Pyrite is uncommon in this sample, occurring as equant but anhedral grains of medium size that are widely disseminated and often embedded in strongly altered feldspar grains or are associated with rutile in former biotite crystals. No other sulfides were found in this sample.

BB-3-260

The rock is a chilled porphyry identical to the preceding samples and thought to have been dacitic originally. Phenocrysts of feldspars are smaller here and less numerous whereas β quartz and biotite are relatively abundant. Sometimes the quartz eyes are cracked and broken and many phenocrysts appear as angular fragments. The glass matrix likewise seems to be

BB-3-260 con't.

heterogenous as though cognate xenoliths were entrained in a intrusion breccia during emplacement but they have devitrified to identical cherty-textured quartz-feldspars and blend into one another closely. There is also a crude alignment of phenocrysts to a common direction. Epizonal alteration has been strong.

β Quartz remains unchanged and in the matrix the quartz has grown to a cherty-textured aggregate only in irregular and small domains. These host only minor amounts of pyrophyllite whereas in most areas quartz has not grown and pyrophyllite scales are abundant in the interstices representing the former feldspar content. Pyrophyllite has also replaced biotite and feldspar phenocrysts. The biotite is characterized by the presence of accessory rutile.

Pyrite is erratically dispersed in this sample as equant grains rich in inclusions of gangue. The larger crystals have frilly margins dotted with inclusions but solid cores in which gangue grains are uncommon. No other sulfides were found in this samples.

BB-3-700

The rock is a microbreccia thought to be an intrusion breccia, generally of dacitic character. This sample differs from the others in that it contains a relatively large variety of textures amongst the fragments present and there may be some xenoliths of other origins. The rock fragments, and loose clasts of β quartz, feldspar, and biotite all lie with longer dimensions crudely parallel, but for the most part the rock appears to have been intruded as a relatively dry unconsolidated breccia and there is really no vitric matrix here. Textures remain quite clear although epizonal alteration has been strong.

Many of the fragments are strongly silicified with quartz as cherty-textured or coarse grained granular material occupying much of the former matrix. It is uncertain how much of silicification occurred prior to intrusion. By contrast the matrix debris is replaced by a very fine grained paste of pyrophyllite in which alunite is abundantly present. Often the alunite occurs in clusters that represent feldspar clasts. Biotite is altered either to pyrophyllite or alunite but is marked by accessory leucoxene. Some crystals seem to have been deformed and shredded during the process of intrusion.

Pyrite is widely disseminated in this sample and the size and habit of the grains seems to reflect the particular fragment in which the pyrite occurs. In some areas it is as dust-like beads embedded in quartz within xenoliths. In the matrix the pyrite grains are large and subhedral and free of gangue inclusions. Tiny irregular inclusions of chalcopyrite were found in a couple of the larger pyrite crystals but none was seen as freed grains in the matrix.

JDS

ASARCO Inco.p

OCT 9 1990

SW Exploration

MEMORANDUM

To: James D. Sell

From: Harold Downey

Date: October 5, 1990

Subject: Sid Williams Report of 9/26/90; Petrographic and Polished Section Analyses of Some Core Samples--Thunder Mountain Project.

In logging core drilled this year at the Thunder Mountain project (BB series), I came up with some questions regarding alteration, original rock classifications, and mineralogy which I felt could be answered by petrographic analyses. Thin sections and polished sections were prepared from 2 samples of core from BB-2 and 3 from BB-3 and shipped to Sid Williams for analyses.

A large portion of the rock cut by the BB series drilling has been an intensely altered sequence which has been logged by me and previous workers as Quartz Feldspar Porphyry. The original texture has been so obliterated as to make this classification open to question. Specifically, the texture bears some resemblence to a Quartz Eye Tuff, in that small clasts of rock foreign to the groundmass are seen, although layering and/or flow-banding are absent. Samples BB-2-85, BB-3-50, and BB-3-260 are all from the above sequence. Sid's evaluation confirms the unit is indeed an intrusive porphyry and he judges it to have been of dacitic origin although he hedges toward possibly a more felsic clasification in his cover letter. Regardless, the name Quartz Feldspar Porphyry seems appropriate for our purposes.

A second unit commonly seen in the BB holes has a similar ground mass to the above QFP but contains a large quantity of angular fragments which are highly silicified and which I called chert or quartzite fragments. I logged the unit as either a volcanic agglomerate or intrusive breccia. Sid's opinion leans toward an intrusive breccia with a matrix of dacite porphyry. Further, he describes the chertlike appearances of the fragments to be the result of devitrification.

An interesting evaluation of the alteration assemblage by Sid is that the dominant mineral is found to be pyrophillite , a clay mineral, rather than sericite as logged. In his cover letter, Sid acknowledges the megascopic similarities of the two as "indistinguishable". We should probably change some of the log headings to allow for a more argi
llic classification.

The mineralogical evaluation confirms a sequence of earliest bornite/chalcopyrite to chalcocite to covellite latest. Although I observed some sphalerite in the upper portion of BB-2, I did not

note as much as Sid seems to have seen in the BB-2 samples. Sid identifies tetrahedrite/tennantite in one sample (BB-2-85). This mineral is no doubt responsible for some of the silver values seen in the assay results.

In conclusion, the petrographic work is of considerable assistance in confirming the rock classifications and alteration assemblage found in the recent drilling. The dominance of the alteration mineral, pyrophillite is somewhat surprising but can now be more easily recognized and logged as such. If the deposit should come to a stage of greater metallurgical study, the sphalerite mode and content should be further evaluated. Some spot assays for zinc, particularly in the better copper zones, would be of value at this time.

H. Downey

ASARCO

Southwestern Exploration Division

JDS

October 10, 1990

F.T. Graybeal

Thunder Mountain Thin Sections
Bucket Breccia Drill Holes
Santa Cruz County, Arizona

Attached for your interest is a report on five thin sections from the current drilling.

James D. Sell /mek

James D. Sell

JDS:mek
Att.

cc: W.L. Kurtz

ASARCO Inc.
OCT 9 1990
SW Exploration

MEMORANDUM

To: James D. Sell

From: Harold Downey

Date: October 5, 1990

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H. Downey

JDS

ASARCO

Southwestern Exploration Division

December 6, 1990

FILE MEMO

Ferric-acid Leach
Bucket Breccia drill holes
Thunder Mountain Project
Patagonia Mountains
Santa Cruz County, AZ

The results of the ferric-acid leach tests from three drill intercepts on the Thunder Mountain project have been received.

The drill holes, BB-2, -3, and -4, had variable amounts of chalcocite (primary), enargite, bornite, and minor chalcopyrite in a quartz sericite altered volcanic breccia unit.

Table 1 lists the results of the study and indicates that the acid-leach, using minor additions (3 gpl.) of ferric iron, recovers between 20% and 42% of the copper values. Sample BB-2 was tested using the 3 gpl ferric iron addition, which gave 20% copper recovery, and using 10 gpl ferric iron addition where the copper recovery dropped to 18%. Sample BB-3 at 3 gpl ferric iron addition was 24% recovery, and sample BB-4 at 3 gpl ferric iron addition was 42% recovery.

Additional comments may be forthcoming from D.E. Crowell on the problem of recovery.

Attachment A is Metcon's results.

1/9/91 DEC will recontact Met-Con + get on with it.
Something to do with ferrous/ferric ratio et al. JDS.
DEC to write note.
Also whole rock numbers should be forthcoming.

James D. Sell

James D. Sell

JDS:mek
Atts.

cc: R.L. Brown
W.L. Kurtz
D.E. Crowell

Table 1. Ferric acid leach test results - Thunder Mountain Project, using 3 gpl ferric acid addition.

Hole No.	Footage	Original Calculated Assay, % Cu	New Composite Head Assay, % Cu	Metcon Calculated Head Assay, % Cu	% Copper Recovery
BB-2	40-140	0.47	0.37	0.41	20.3
BB-3	14-90	0.60	0.25	0.27	26.0
BB-4	10-190	0.47	0.35	0.36	42.0

Attachment A

ACID LEACH TEST RESULTS
ASARCO

SAMPLE	vol/wt (ml/g)	ASSAYS (%) Cu	Fe	CONTENT Cu (mg)	RECOVERY (%Cu)	ACID CONSUMPTION (lb/lb)	(lb/ton)
BB-2A							
PLS	1300	0.032	0.370	416.0	20.30	27.54	45.83
TAILS	495	0.330	3.050	1633.5			
Calc Hd		0.410	3.382				
Assay Hd		0.370	2.900				
BB-2B							
PLS	1340	0.028	0.885	375.2	18.23	20.45	30.70
TAILS	495	0.340	3.050	1683.0			
Calc Hd		0.412	3.391				
Assay Hd		0.370	2.900				
BB-3							
PLS	1390	0.025	0.325	347.5	26.02	24.17	33.60
TAILS	494	0.200	3.100	988.0			
Calc Hd		0.267	3.366				
Assay Hd		0.250	3.400				
BB-4							
PLS	1340	0.056	0.330	750.4	41.97	13.08	39.27
TAILS	494	0.210	1.950	1037.4			
Calc Hd		0.358	2.211				
Assay Hd		0.350	2.200				
AVERAGE		0.335	2.85		26.63	21.31	37.35

Metcon Research Inc.
1844 W. Grant Road. Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 03-Dec-90

PROJECT M-239

TEST No. 1

SAMPLE No 1 BB-2A

FEED BB-2A pulverized sample (-100 mesh)

BY E.I./I.L.

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
PULVERIZATION		100.00						
ACID LEACH -0	4	25.00	0.8	3 gpl			3.00	12.12
ACID LEACH -24	4	24.81	0.6		27.54	45.83		12.12

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu (mg)	Fe	DISTRIBUTION % %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1300	0.032		0.370	416.0		1810	20.30		10.71
LEACH TAILS	495		0.330		3.050	1633.5		15098	79.70		89.29
CALC HEAD	500		0.410		3.382	2049.5		16908	100.00		100.00
HEAD ASSAY			0.370		2.900	1850		14500			

Metcon Research Inc.
1844 W. Grant Road, Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 03-Dec-90

PROJECT M-239

TEST No. 2

SAMPLE No 2 BB-2B

FEED BB-2B pulverized sample (-100 mesh)

BY E.I./J.L.

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
PULVERIZATION		100.00						
ACID LEACH -0	4	25.00	0.7	10 gpl			10.00	40.40
ACID LEACH -24	4	24.81	0.5		20.45	30.70		40.40

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu (mg)	Fe	DISTRIBUTION% %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1340	0.028		0.885	375.2		1859	18.23		10.96
LEACH TAILS	495		0.340		3.050	1683.0		15098	81.77		89.04
CALC HEAD	500		0.412		3.391	2058.2		16957	100.00		100.00
HEAD ASSAY			0.370		2.900	1850		14500			

Metcon Research Inc.
1844 W. Grant Road, Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 03-Dec-90

PROJECT 3 BB-3

TEST No. 3

SAMPLE No BB-3

FEED pulverized sample (-100 mesh)

BY E.I./J.L.

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
PULVERIZATION		100.00						
ACID LEACH -0	4	25.00	0.7	3 gpl			3.00	12.15
ACID LEACH -24	4	24.81	0.5		24.17	33.60		12.15

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu (mg)	Fe	DISTRIBUTION % %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1390	0.025		0.325	347.5		1517.5	26.02		9.02
LEACH TAILS	494		0.200		3.100	988.0		15314	73.98		90.98
CALC HEAD	500		0.267		3.366	1335.5		16832	100.00		100.00
HEAD ASSAY			0.250		3.400	1250		17000			

Metcon Research Inc.
1844 W. Grant Road, Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 03-Dec-90

PROJECT 4 BB-4

TEST No. 4

SAMPLE No BB-4

FEED pulverized sample (-100 mesh)

BY E.I./J.L.

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
PULVERIZATION		100.00						
ACID LEACH -0	4	25.00	0.7	3 gpl			3.00	12.12
ACID LEACH -24	4	24.81	0.4		13.08	39.27		12.12

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu (mg)	Fe	DISTRIBUTION %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1340	0.056		0.330	750.4		1422	41.97		12.86
LEACH TAILS	494		0.210		1.950	1037.4		9633	58.03		87.14
CALC HEAD	500		0.358		2.211	1787.8		11055	100.00		100.00
HEAD ASSAY			0.350		2.200	1750		11000			

Attachment A

ASARCO Incorporated

DEC 6 1990

SW Exploration

ACID LEACH TEST RESULTS
ASARCO

SAMPLE	vol/wt (ml/g)	A S S A Y S (%) Cu	Fe	CONTENT Cu (mg)	RECOVERY (%Cu)	ACID CONSUMPTION (lb/lb)	(lb/ton)
BB-2A							
PLS	1300	0.032	0.370	416.0	20.30	27.54	45.83
TAILS	495	0.330	3.050	1633.5			
Calc Hd		0.410	3.382				
Assay Hd		0.370	2.900				
BB-2B							
PLS	1340	0.028	0.885	375.2	18.23	20.45	30.70
TAILS	495	0.340	3.050	1683.0			
Calc Hd		0.412	3.391				
Assay Hd		0.370	2.900				
BB-3							
PLS	1390	0.025	0.325	347.5	26.02	24.17	33.60
TAILS	494	0.200	3.100	988.0			
[illegible] Hd		0.267	3.366				
Assay Hd		0.250	3.400				
BB-4							
PLS	1340	0.056	0.330	750.4	41.97	13.08	39.27
TAILS	494	0.210	1.950	1037.4			
Calc Hd		0.358	2.211				
Assay Hd		0.350	2.200				
AVERAGE		0.335	2.85		26.63	21.31	37.35

Move these over → on xerox pages. all sheets
MDS.

Metcon Research Inc.
1844 W. Grant Road, Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 03-Dec-90

PROJECT M-239

TEST No. 1

SAMPLE No 1 BB-2A

FEED BB-2A pulverized sample (-100 mesh)

BY E.I./J.L.

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
PULVERIZATION		100.00						
ACID LEACH -0	4	25.00	0.8	3 gpl			3.00	12.12
ACID LEACH -24	4	24.81	0.6		27.54	45.83		12.12

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu (mg)	Fe	DISTRIBUTION % %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1300	0.032		0.370	416.0		1810	20.30		10.71
LEACH TAILS	495		0.330		3.050	1633.5		15098	79.70		89.29
CALC HEAD	500		0.410		3.382	2049.5		16908	100.00		100.00
HEAD ASSAY			0.370		2.900	1850		14500			

Metcon Research Inc.
1844 W. Grant Road, Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 03-Dec-90

PROJECT M-239

TEST No. 2

SAMPLE No 2 BB-2B

FEED BB-2B pulverized sample (-100 mesh)

BY E.I./J.L.

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
PULVERIZATION		100.00						
ACID LEACH -0	4	25.00	0.7	10 gpl			10.00	40.40
ACID LEACH -24	4	24.81	0.5		20.45	30.70		40.40

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu (mg)	Fe	DISTRIBUTION % %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1340	0.028		0.885	375.2		1859	18.23		10.96
LEACH TAILS	495		0.340		3.050	1683.0		15098	81.77		89.04
CALC HEAD	500		0.412		3.391	2058.2		16957	100.00		100.00
HEAD ASSAY			0.370		2.900	1850		14500			

Metcon Research Inc.
1844 W. Grant Road, Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 03-Dec-90

PROJECT 3 BB-3

TEST No. 3

SAMPLE No BB-3

FEED pulverized sample (-100 mesh)

BY E.I./J.L.

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
ERIZATION		100.00						
ACID LEACH -0	4	25.00	0.7	3 gpl			3.00	12.15
ACID LEACH -24	4	24.81	0.5		24.17	33.60		12.15

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu (mg)	Fe	DISTRIBUTION %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1390	0.025		0.325	347.5		1517.5	26.02		9.02
LEACH TAILS	494		0.200		3.100	988.0		15314	73.98		90.98
CALC HEAD	500		0.267		3.366	1335.5		16832	100.00		100.00
HEAD ASSAY			0.250		3.400	1250		17000			

Metcon Research Inc.
1844 W. Grant Road, Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 03-Dec-90

TEST No. 4

FEED BB-4 pulverized sample (-100 mesh)

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

PROJECT 4 BB-4

SAMPLE No

BY E.I./J.L.

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
[illegible]RIZATION		100.00						
ACID LEACH -0	4	25.00	0.7	3 gpl			3.00	12.12
ACID LEACH -24	4	24.81	0.4		13.08	39.27		12.12

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu (mg)	Fe	DISTRIBUTION % %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1340	0.056		0.330	750.4		1422	41.97		12.86
LEACH TAILS	494		0.210		1.950	1037.4		9633	58.03		87.14
CALC HEAD	500		0.358		2.211	1787.8		11055	100.00		100.00
HEAD ASSAY			0.350		2.200	1750		11000			

12/17/90

To JDS

Date 12/17 Time 10:12 ☐ AM ☐ PM

WHILE YOU WERE OUT

Mr. D. Iasillo

of Meteor Research

Phone (623) - 1327

Area Code Number Extension

TELEPHONED	✓	PLEASE CALL	✓
CALLED TO SEE YOU		WILL CALL AGAIN	
WANTS TO SEE YOU		URGENT	
RETURNED YOUR CALL			

Message

M.

Operator

AMPAD EFFICIENCY®

REORDER #23-000

Thunder Mtn

Shipping delay.

BB-2 (10-1-90), -3 (11-5-90), -4 (10-1-90)) Composite of all 3 for Whole Rock Analysis

SiO_2	68.4	*
Na_2O	0.05	
K_2O	4.0	✓
MgO	0.45	
Al_2O_3	13.5	✓
Fe_2O_3	5.0	✓
Metals	3-5	
hydrolitl	?	
~~CaO~~	~~0.35~~	

check Doney on rock composition

JDS

ASARCO

Exploration Department
Southwestern United States Division

January 10, 1991

Mr. Harold J. Downey
H.J. Downey, Inc.
1803 E. 10th St.
Tucson, AZ 85719

Whole Rock Analysis
Composite of BB-2, -3, & -4
Thunder Mountain Project
Santa Cruz County, Arizona

Dear Harold:

As you will note from the Skyline report attached, the whole rock values only add up to ±90%. Skyline and Metcon are unable to come up with the missing 10%.

Can you think of anything else which you might have observed in the core which needs to be considered?

Sincerely,

CaO was not determined
Skyline will recalculate
Metcon for their opinion
also: H_2O free & combined is generally on 1-2% of total.
Total weight is based on the oxide equivalent ie SiO_2, Al_2O_3, FeO total, MgO, CaO etc
1/11/90

James D. Sell

James D. Sell
Manager, SWED

JDS:mek
Att.

cc: W.L. Kurtz

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010

K D Engineering Co., Inc.
1844 W. Grant Road, Suite 106
Tucson, Arizona 85745

Santa Cruz Co, AZ
~~Tel:~~ (602) 573-0063
Facsimile: (602) 882-5141
Telex 284623 KDE UR

ASARCO Inco. pr...
JAN 9 1991
SW Exploration

FAX MESSAGE

DATE: January 9, 1990 TIME: 4:10 P.M.

TO: ASARCO

Attn: Mr James Sell

FAX NUMBER: 792-3934

FROM: METCON RESEARCH INC.

OF PAGES INCLUDING THIS SHEET: 3

IF ALL PAGES ARE NOT RECEIVED, PLEASE CALL IMMEDIATELY: 602-573-0063

COMMENTS: Dear Mr Sell.

Enclosed are the Whole rock analyses for the Composite sample. A copy of our report will be sent to your attention by mail.

Very Truly Yours,

Eugenio Darillo

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. UXM 328
December 14, 1990
1703-1706

METCON RESEARCH INC.
1844 W. Grant Road, #106
Tucson, AZ 85745

ASARCO Incorporated
JAN 9 1991
SW Exploration

Analysis of 4 Pulp Samples

ITEM	SAMPLE NO.	ID	Cu (%)	nsCu (%)	Fe (%)
1	1703	BB-2	.37	.001	2.90
2	1704	BB-3	.25	<.001	3.40
3	1705	BB-4	.35	.010	2.20
4	1706	Composite*	.33	.004	2.83

ITEM	SAMPLE NO.		FIRE ASSAY Au (oz/t)	Ag (oz/t)	Mo (%)
4	1706	Composite*	<.002	.19	<.001

* Equal wight composite from BB-2, 3 and 4

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NO.	As (%)	Sb (%)	SiO2 (%)
4	1706 Composite*	.08	<.01	68.4

ITEM	SAMPLE NO.	Al2O3 (%)	MgO (%)	Na2O (%)
4	1706	13.5	.45	.05

ITEM	SAMPLE NO.	K2O (%)	Fe2O3 (%)	FeO (%)
4	1706	4.0	5.0	.15

* Equal weight composite from BB-2, 3 & 4

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

JDS

ASARCO

Exploration Department
Southwestern United States Division
James D. Sell
Manager

January 11, 1991

Mr. Eugenio Iasillo
METCON Research, Inc.
1844 West Grant Road
Suite 106
Tucson, AZ 85745

RI 9311
Application to BB-Leach
Thunder Mtn. Project
Santa Cruz County, AZ

Dear Eugenio:

Thank you for chatting with me on the use of surfactants in heap leaching of copper to improve recoveries.

At your request, I attach a Xerox copy of the RI 9311. Let me know what you think on using some of the BB-Leach tests.

Sincerely,

James D. Sell

James D. Sell

JDS:mek
Att.

cc: W.L. Kurtz (w/o att.)
D.E. Crowell (w/o att.)

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010

JAS

ASARCO

Southwestern Exploration Division

January 11, 1991

D.E. Crowell

USBM RI 9311
Leaching Chalcopyrite

I see in RI 9311 that certain nonionic surfactants can double the extraction rate of copper in dump leach conditions.

Do you have any further information on the validity of these tests? Can the surfactants have any place in the leaching tests being conducted on the BB samples at Thunder Mountain Project?

James D. Sell

JDS:mek

James D. Sell

cc: W.L. Kurtz

JDS

ASARCO

Southwestern Exploration Division

January 25, 1991

W.L. Kurtz

METCON Research Inc.
Results - Acid Leach Testing
Rejects BB-2, 3, and 4
Thunder Mountain Project
Santa Cruz County, AZ

The test results from ferric-acid leach, bottle roll tests have been received from METCON (Study EI-004-91, January 22, 1991).

In Table 2.1, the estimated % copper is the numerical average from the individual ten foot samples from the interval as reported earlier by Skyline Labs.

Metcon prepared a new head assay (actual % copper value, Table 2.1) from the composite which they prepared for the ferric-acid leach tests. I have no feedback as to why the lower values in the prepared composite.

The low, 20-40%, recovery of copper by ferric-acid leach is not encouraging.

After consulting with D.E. Crowell, perhaps further testing will be conducted using a change of the iron form or using surfactants to evaluate increased leach recoveries.

James D. Sell

James D. Sell

JDS:mek
Att.

cc: F.T. Graybeal (w/att.)
D.E. Crowell (w/o att.)

METCON Research Inc.

1844 W. Grant Road, Suite 106
Tucson, Arizona 85745

Tel: (602) 623-1327
Telex 284623 KDE UR

22 January 1991
EI-004-91

ASARCO Inc.
1150 N. 7th Avenue
Tucson, AZ 85705

ASARCO Incorporated

JAN 24 1991

SW Exploration

Attn: Mr. Don Crowell

Subject: Acid Leach Testing
Rejects BB-2, 3 and 4
Thunder Mountain Project

Dear Mr. Crowell:

This letter report details recent acid leach test work performed on various copper ore interval samples from the Thunder Mountain Project located in the Santa Cruz County in Arizona.

1.0 INTRODUCTION

During the month of November, three sets of interval samples were delivered to Metcon Research, Inc. The main purpose of this study was to make a preliminary assessment on the amenability of these copper ore samples to sulfuric acid leaching. The procedures employed and the results obtained during this investigation are outlined herein.

2.0 SUMMARY

A series of leach tests conducted on three composite samples of pulverized material indicated that dissolution of copper values contained in these samples was not effective. The total copper extractions observed ranged from 20 to 40 percent. The best extraction was obtained in the BB-4 sample, followed by the BB-3 sample (at approximately 26 percent). The BB-2 sample showed consistently lower extraction levels despite additional ferric sulfate added to one of the tests.

The estimated and actual copper contents of the samples tested are tabulated in the following table.

TABLE 2.1
THUNDER MOUNTAIN PROJECT

Sample Description	Footage	Estimated % Cu	Actual % Cu
BB-2	40-140	0.47	0.37
BB-3	14-90	0.60	0.25
BB-4	10-190	0.47	0.35

The analytical data developed for the head samples indicated that 99 percent of the copper contained in these samples is present as sulfide copper.

A summary of the results obtained in this investigation is presented in Table 2.2

TABLE 2.2
ACID LEACH TESTS
SUMMARY OF RESULTS

Sample Description	Head Assays % Cu	% Fe	Extraction % Cu	Acid Consumption lb/ton	lb/lb	Test Conditions
BB-2	0.37	2.90	20.30	45.83	27.54	3 gpl ferric
BB-2	0.37	2.90	18.23	30.70	20.45	10 gpl ferric
BB-3	0.25	3.40	26.02	33.60	24.17	3 gpl ferric
BB-4	0.35	2.20	41.97	39.27	13.08	3 gpl ferric
	0.34		26.63			

The data tabulated above indicates that the ore samples tested have a relatively low copper content, the amount of copper solubilized over a 24 hour leach period represents approximately 20 to 40 percent of the total copper contained in these samples. It should be noted that the test work conducted in these samples is considered preliminary, since a single test was conducted on each sample with the exception of BB-2. In the BB-2 sample, two levels of ferric sulfate were tested without a significant impact in copper extraction. Approximately 30 to 40 percent of the ferric added was reduced to ferrous during leaching.

The acid consumptions observed were low. The acid consumptions were equivalent to 30.7 to 45.8 lbs of sulfuric acid per ton of ore.

3.0 METALLURGICAL PROCEDURES

The procedures utilized for sample preparation and acid leach testing are described in the following paragraphs.

1. A set of three composite samples were prepared by combining each suite of interval samples into individual equal weight composite samples. An overall sample was prepared from the individual composite samples and whole rock analysis were performed.

2. Each composite sample was crushed to minus 1/4 inch then pulverized and blended. A 1000 gram sample was riffle split for metallurgical testing and head assay. All reject samples were saved for future testing.

3. A 500 gram sample of minus 100 mesh ore was combined with 1000 ml of 100 gram per liter sulfuric acid and 3 grams per liter ferric sulfate solution.

4. The initial pH was measured and the slurry was then placed on a bottle roll apparatus. The pH and acid concentration in the leach solution were noted at the beginning and end of the test. The total retention time was 24 hours.

5. After 24 hours, the leach residue and solutions were separated by filtration.

6. The leached residue and pregnant plus wash solutions were assayed for copper, iron and metallurgical calculation were performed. A cumulative acid consumption was calculated for each test. Specific analytical and test parameters data from these tests may be obtained from the test data sheets attached to this report.

4.0 RESULTS AND DISCUSSION

The results obtained from acid leaching of 500 gram test charges of pulverized ore obtained from these composite samples are summarized in the following paragraphs. A tabular summary of the results is attached hereto.

Inspection of the tabulated results indicates that the composite samples prepared from the samples submitted will yield overall copper recoveries of approximately 40 percent or lower. The average total copper grade for these samples was 0.34 percent with over 99 percent reporting as sulfide copper.

The composite samples BB-2 and BB-4 exhibited the highest acid consumption at approximately 40 lbs of sulfuric acid per ton of ore. A relatively low acid consumption was observed for composite sample BB-3 at approximately 34 lbs per ton ore.

We appreciate being given the opportunity to provide technical assistance for this project and await your comments regarding this report. Should you have any questions in regard to the information contained herein, please do not hesitate to call.

Very truly yours,

Eugenio Iasillo

Eugenio Iasillo
Process Engineer

cc: James D. Sell

EI/jck

ACID LEACH TEST RESULTS
ASARCO

SAMPLE	vol/wt (ml/g)	ASSAYS (%) Cu	Fe	CONTENT Cu (mg)	EXTRACTION (%Cu)	ACID CONSUMPTION (lb/lbCu)	(lb/ton)
BB-2A							
Preg+Wash	1300	0.032	0.370	416.0	20.30	27.54	45.83
TAILS	495	0.330	3.050	1633.5			
Calc Hd		0.410	3.382				
Assay Hd		0.370	2.900				
BB-2B							
Preg+Wash	1340	0.028	0.885	375.2	18.23	20.45	30.70
TAILS	495	0.340	3.050	1683.0			
Calc Hd		0.412	3.391				
Assay Hd		0.370	2.900				
BB-3							
Preg+Wash	1390	0.025	0.325	347.5	26.02	24.17	33.60
TAILS	494	0.200	3.100	988.0			
Calc Hd		0.267	3.366				
Assay Hd		0.250	3.400				
BB-4							
Preg+Wash	1340	0.056	0.330	750.4	41.97	13.08	39.27
TAILS	494	0.210	1.950	1037.4			
Calc Hd		0.358	2.211				
Assay Hd		0.350	2.200				
AVERAGE		0.335	2.85		26.63	21.31	37.35

Metcon Research Inc.
1844 W. Grant Road, Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 12-Dec-90

PROJECT M-239

TEST No. 1

SAMPLE No 1 BB-2A

FEED BB-2A pulverized sample (-100 mesh)

BY E.I./J.L.

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
PULVERIZATION		100.00						
ACID LEACH -0	4	25.00	0.8	3 gpl			3.00	12.12
ACID LEACH -24	4	24.81	0.6		27.54	45.83		12.12

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu	(mg) Fe	DISTRIBUTION% %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1300	0.032	0.0004	0.370	416	5	1810	20.30	100.00	10.71
LEACH TAILS	495		0.330	0.0000	3.050	1634	0	15098	79.70	0.00	89.29
CALC HEAD	500		0.410	0.0010	3.382	2050	5	16908	100.00	100.00	100.00
HEAD ASSAY			0.370	0.0010	2.900	1850	5	14500			

Metcon Research Inc.
1844 W. Grant Road, Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 12-Dec-90

PROJECT M-239

TEST No. 2

SAMPLE No 2 BB-2B

FEED BB-2B pulverized sample (-100 mesh)

BY E.I./J.L.

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
PULVERIZATION		100.00						
ACID LEACH -0	4	25.00	0.7	10 gpl			10.00	40.40
ACID LEACH -24	4	24.81	0.5		20.45	30.70		40.40

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu	(mg) Fe	DISTRIBUTION % %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1340	0.028	0.0004	0.885	375	5	1859	18.23	100.00	10.96
LEACH TAILS	495		0.340	0.0000	3.050	1683	0	15098	81.77	0.00	89.04
CALC HEAD	500		0.412	0.0010	3.391	2058	5	16957	100.00	100.00	100.00
HEAD ASSAY			0.370	0.0010	2.900	1850	5	14500			

Metcon Research Inc.
1844 W. Grant Road, Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 12-Dec-90

PROJECT 3 BB-3

TEST No. 3

SAMPLE No BB-3

FEED pulverized sample (-100 mesh)

BY E.I./J.L.

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
PULVERIZATION		100.00						
ACID LEACH -0	4	25.00	0.7	3 gpl			3.00	12.15
ACID LEACH -24	4	24.81	0.5		24.17	33.60		12.15

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu	(mg) Fe	DISTRIBUTION% %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1390	0.025	0.0004	0.325	348	5	1517	26.02	100.00	9.02
LEACH TAILS	494		0.200	0.0000	3.100	988	0	15314	73.98	0.00	90.98
CALC HEAD	500		0.267	0.0010	3.366	1336	5	16832	100.00	100.00	100.00
HEAD ASSAY			0.250	0.0010	3.400	1250	5	17000			

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1844 W. Grant Road, Suite #106
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(602) 623-1327

DATE: 12-Dec-90

PROJECT 4 BB-4

TEST No. 4

SAMPLE No BB-4

FEED pulverized sample (-100 mesh)

BY E.I./J.L.

OBJECTIVE Ferric-Acid leach (100 gram per liter acid leach solution)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	Ferric	ACID CUMULATIVE CONSUMP (lb/lb)	(lb/Ton)	Ferric Added (g)	lb/lb CUMUL CONSUMP
PULVERIZATION		100.00						
ACID LEACH -0	4	25.00	0.7	3 gpl			3.00	12.12
ACID LEACH -24	4	24.81	0.4		13.08	39.27		12.12

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS %Cu	%n.s.Cu	%Fe	TOTAL CONTENT Cu (mg)	n.s.Cu	(mg) Fe	DISTRIBUTION % %Cu	%n.s.Cu	%Fe
PULP /SOLN	1500										
PREG +WASH		1340	0.056	0.0037	0.330	750	50	1422	41.97	1000.00	12.86
LEACH TAILS	494		0.210	0.0000	1.950	1037	0	9633	58.03	0.00	87.14
CALC HEAD	500		0.358	0.0100	2.211	1788	50	11055	100.00	1000.00	100.00
HEAD ASSAY			0.350	0.0100	2.200	1750	50	11000			

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. UXM 328
December 14, 1990
1703-1706

METCON RESEARCH INC.
1844 W. Grant Road, #106
Tucson, AZ 85745

Analysis of 4 Pulp Samples

ITEM	SAMPLE NO.	ID	Cu (%)	nsCu (%)	Fe (%)
1	1703	BB-2	.37	.001	2.90
2	1704	BB-3	.25	<.001	3.40
3	1705	BB-4	.35	.010	2.20
4	1706	Composite*	.33	.004	

ITEM	SAMPLE NO.		FIRE ASSAY Au (oz/t)	FIRE ASSAY Ag (oz/t)	Mo (%)
4	1706	Composite*	<.002	.19	<.001

* Equal weight composite from BB-2, 3 and 4

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
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ITEM	SAMPLE NO.	As (%)	Sb (%)	SiO2 (%)
4	1706 Composite*	.08	<.01	68.4

ITEM	SAMPLE NO.	Al2O3 (%)	MgO (%)	Na2O (%)
4	1706	13.5	.45	.05

ITEM	SAMPLE NO.	K2O (%)	Fe2O3 (%)	FeO (%)
4	1706	4.0	5.0	.15

* Equal weight composite from BB-2, 3 & 4

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

Don Crowell

Bucket Breccia Leach 2/1/91

ferric iron lead) agitated bottle roll
5-7 days

go ahead

Mary Xerox for RLB — Dick: Sell/Crowell decided to try some column leach with additive and this work has been started.
Kurtz 2/8/91

JDSell

ASARCO

Exploration Department
R. L. Brown
Vice President

RECEIVED
FEB 8 1991
EXPLORATION DEPARTMENT

February 4, 1991

Mr. W.L. Kurtz
Tucson Office

Thunder Mountain Project
Arizona

Dear Mr. Kurtz:

I have here a copy of Mr. Sell's January 5th memorandum to you in which it reports discouraging results in bottle role test on rejects from holes BB2 et al. Mr. Sell suggests that he now wishes to conduct further tests using another procedure. My view is that we should put this work aside for the time being and concentrate on the gold work now in progress in western Arizona and in the Mohave.

Yours very truly,

R.L. Brown

R.L. Brown

RLB:lj

ASARCO Incorporated 180 Maiden Lane New York, N.Y. 10038 (212) 510-2000
Telex:RCA 232378 Cable: MINEDEPART Fax: (212) 510-1978

JDS

ASARCO

Southwestern Exploration Division

April 1, 1991

R.L. Brown
New York Office

Acid-Ferric leach tests
Bucket Breccia Holes
Thunder Mountain Project
Santa Cruz County, Arizona

D.E. Crowell has sent his comments on the recent six-day acid-ferric leach tests performed on a composite sample from the main upper zone of holes BB-2, -3, and -4.

The composite calculate copper grade head was 0.343% Cu, and at the end of the six-day cycle, only 29% of the copper was extracted. Mr. Crowell concludes that this ore is refractory to acid/ferric leaching.

The mineralized zone has not been closed off, nor the lower part sufficiently explored, and the post-October 1991 $100,000 work commitment to Thunder Mountain might be directed toward outlining this near surface mineralization.

James D Sell

James D. Sell

JDS:mek
Att.

cc: W.L. Kurtz

ASARCO

Mineral Beneficiation Department
Tucson, Arizona

March 14, 1991

Mr. J. D. Sell, Manager
Southwestern US Division
Exploration Department
TUCSON OFFICE

Thunder Mountain Project

Enclosed is the Metcon report on extended leach times on a composite sample of Bucket Breccia ore. As noted, the longer leach time with high ferric ion did not accomplish much except to consume a lot more acid and ferric sulfate. With only 29% copper extraction after a six-day leach on minus 100-mesh ore, we have to conclude that this ore is refractory to acid/ferric leaching.

D. E. Crowell

DEC:brw
Enclosure
cc: TDH/File - MISC. 2F

ASARCO Incorporated

MAR 1 9 1991

SW Exploration

Misc 2F

METCON Research Inc.

1844 W. Grant Road, Suite 106
Tucson, Arizona 85745

Tel: (602) 623-1327
Telex 284623 KDE UR

5 March, 1991
JL-030-91

ASARCO Inc.
1150 N. 7th Avenue
Tucson, AZ 85705

Attn: Mr. Don Crowell

MINERAL
MAR 13 1991
BENEFICIATION DEPT.

Subject: Continued Acid Leach Testing
Composite BB-2,BB-3, and BB-4 sample,
Elevated Ferric Concentration
Thunder Mountain Project

Dear Mr. Crowell:

This letter report details recent continued acid leach testwork performed on a composite sample of 3 copper ore interval samples, BB-2, BB-3, and BB-4, as described in Metcon Report EI-004-91 dated 1-22-91.

1.0 INTRODUCTION

On 7 February 1991, an equal weight composite sample of copper ore samples BB-2, BB-3, and BB-4 was subjected to a sulfuric acid-ferric iron bottle roll leach test. The purpose of this test was to determine whether elevated ferric iron concentrations in the leach solution could improve the extraction of copper from the sample. The procedures employed and the results obtained during this investigation are outlined herein.

2.0 SUMMARY

A 200 gram composite sample of BB-2, BB-3, and BB-4 was subjected to a 6 day sulfuric acid bottle roll leach test. The leach solution consisted initially of 98 grams per liter sulfuric acid and approximately 6.1 grams per liter ferric iron. Over the leach period, an additional 3.12 grams of ferric iron were added to maintain the concentration at approximately 5 grams per liter. This resulted in a ferric iron consumption of 56.17 lb per ton of ore treated, this is approximately 16 lb per ton greater than the highest ferric iron consumption reported in previous tests.

The results for this test and the previous test are compared in Table 2.1.

T.D.H.
MAR 13 1991

D.E.C.
MAR 13 1991

Table 2.1

ACID LEACH TESTS
SUMMARY OF RESULTS

Sample Description	Head Assays %Cu	Head Assays %Fe	Extraction %Cu	Acid Consumption lb/ton	Acid Consumption lb/lb	Test Conditions
Composite	0.33	2.95	28.98	123.28	61.96	maintain slurry at 5 gpl ferric--6 days
BB-2	0.37	2.90	20.30	45.83	27.54	3 gpl ferric
BB-2	0.37	2.90	18.23	30.70	20.45	10 gpl ferric
BB-3	0.25	3.40	26.02	33.60	24.17	3 gpl ferric
BB-4	0.35	2.20	41.97	39.27	13.08	3 gpl ferric

The increased ferric iron concentration in the leach solution did not improve copper extraction. Approximately 28.98 percent was extracted through sulfuric acid leach. This represents an approximate increase of 2.35 percent over the average 26.63 percent extraction obtained in the previous tests.

Sulfuric acid consumption increased significantly from an average 37.35 lb sulfuric acid per ton of ore calculated from the former tests to 123.28 lb acid per ton of ore. This may be due to a 6 day leaching period as opposed to a one day leach period.

3.0 METALLURGICAL PROCEDURES

A 200 gram composite sample of minus 100 mesh ore was combined with 410 milliliters of 98 gpl sulfuric acid and 6.1 grams per liter iron as ferric.

The initial pH was measured and the slurry was then placed on a bottle roll apparatus. The pH and acid concentration in the leach solution were noted at the beginning and end of the test. The total retention time was 6 days.

After leaching, the leached residue and solutions were assayed for copper and iron, and metallurgical calculations were performed. A cumulative acid consumption was calculated for the test. Specific analytical data and test parameters from this test may be obtained from the test data sheets attached to this report.

Ferric iron concentration was monitored intermittently during this time and sufficient ferric sulfate was added to maintain a minimum of 5 grams per liter ferric concentration.

4.0 RESULTS AND DISCUSSION

The results obtained from the acid leach of a 200 gram composite of BB-2, 3, and 4 are summarized in the following paragraphs. A tabular summary of the results is attached hereto.

Inspection of the results indicates that the increased ferric iron concentration did not facilitate copper extraction. Although 4.30 grams per liter of iron were present as ferric iron at the end of the test, only 28.98 percent of the copper was extracted, compared to an average 26.63 percent in the previous tests. Ferric iron consumption was 56.17 lb per ton (this corresponds to a reagent grade ferric sulfate consumption of 251.37 lb per ton).

Due to the extended leaching time, sulfuric acid consumption increased from an average 37.35 lb per ton ore in the previous test to 123.28 lb per ton ore in the composite sample test.

Again, we appreciate the opportunity to assist you on this project. Should you have any questions, do not hesitate to call.

Very truly yours,

John E. Lee

John E. Lee
Chemical Engineer

cc: James D. Sell
JL/mmc

Metcon Research Inc.
1844 W. Grant Road, Suite #106
Tucson, AZ 85745
(602) 623-1327

DATE: 06-Mar-91

PROJECT M-239

TEST No. 1

SAMPLE No 1 COMPOSITE

FEED COMPOSITE pulverized sample (-100 mesh)

BY E.I./J.L.

OBJECTIVE Sulphuric Acid Leach(98 gpl acid - 6 gpl Ferric leach soln)

OPERATION -hr	CONDITIONS TIME	%SOLIDS	pHi/pHf	ACID LEACH SOLN CONC. (g/l)	SPECIFIC GRAVITY	ACID CONSUMPTION (lb/lbCu)	(lb/Ton)	Ferric Added (g)	CONSUMED (lbs/tn ore)
PULVERIZATION		100.00							
ACID LEACH -0	10:00 am	31.51	0.8	97.58	1.061			2.50	25.00
ACID LEACH -24	10:00 am							1.72	42.22
ACID LEACH -48	10:00 am								
ACID LEACH -72	10:00 am								
ACID LEACH -96	10:00 am							1.39	56.17
ACID LEACH -120	10:00 am								
ACID LEACH -144	10:00 am	30.96	0.9	32.00		61.96	123.28		56.17

PRODUCTS	WEIGHT grams	VOLUME mls	ASSAYS (%) Cu	n.s.Cu	Fe	TOTAL CONTENT (mg) Cu	n.s.Cu	Fe	DISTRIBUTION (%) Cu	n.s.Cu	Fe
SAMPLE	200										
LEACH SOLN	435	410									
PREG + WASH		865	0.023		0.630	199		5450	28.98		50.40
LEACH TAILS	195		0.250	0.007	2.750	488		5363	71.02		49.60
CALC HEAD			0.343		2.598	686		10812	100.00		100.00
HEAD ASSAY			0.330	0.004	2.950	660		5900			

HEAP LEACH MILL MODEL

This model is designed for evaluating deposits where a heap leach operation will be used to process gold and/or silver ore. Typical deposits where heap leaching is used are low-grade gold and silver oxide deposits. For this model, a gold deposit with a grade of 0.04 oz/st Au was assumed, with a recovery of 70%. The cost equations are valid for ore tonnage capacities of 1,000 to 20,000 st/d.

Mine-run ore is crushed in a jaw and cone crusher in series, screened, and stored in a fine ore bin. Trucks haul the ore to the heap leach pads, where bulldozers are occasionally used to contour or level the pile. A cyanide leach solution is sprayed on the leach pads, which percolates through the ore and is collected in a pregnant solution pond. Leached ore is washed and then moved to waste dumps. The pregnant solution is pumped to a series of carbon adsorption columns. Barren solution from the columns is returned to the leach pads. The loaded carbon is sent to stripping tanks. Pregnant strip solution from the tanks is sent to the electrowinning cells, where the gold is plated onto steel wool cathodes. Loaded cathodes are removed, treated with dilute sulfuric acid and sent to the refining furnace, where a doré is produced for shipment. Stripped carbon is regenerated in a kiln and returned to the circuit.

Figure 21 illustrates a simplified flowsheet for the heap leach mill. Costs are summarized in table 27.

Table 27.—Heap leach mill model

(capacity range 1,000-20,000 st/d)

Category	Capital cost, $	Operating cost, $/st
Labor	$316{,}200(X)^{0.354}$	$135(X)^{-0.562}$
Equipment ..	$60{,}100(X)^{0.629}$	$5.50(X)^{-0.357}$
Steel	$47{,}900(X)^{0.372}$	NAp
Fuel	NAp	$0.266(X)^{-0.013}$
Lube	NAp	$2.91(X)^{-0.350}$
Tires	NAp	$0.071(X)^{0.0}$
Construction material ...	$41{,}500(X)^{0.452}$	$1.08(X)^{0.0}$
Electricity ...	NAp	$13.7(X)^{-0.491}$
Reagents ...	NAp	$1.30(X)^{0.0}$
Sales tax ...	$6{,}610(X)^{0.583}$	$0.231(X)^{-0.040}$
Total	$296{,}500(X)^{0.512}$	$31.5(X)^{-0.223}$

NAp Not applicable.
X = Capacity of mill in short tons per day mill feed.

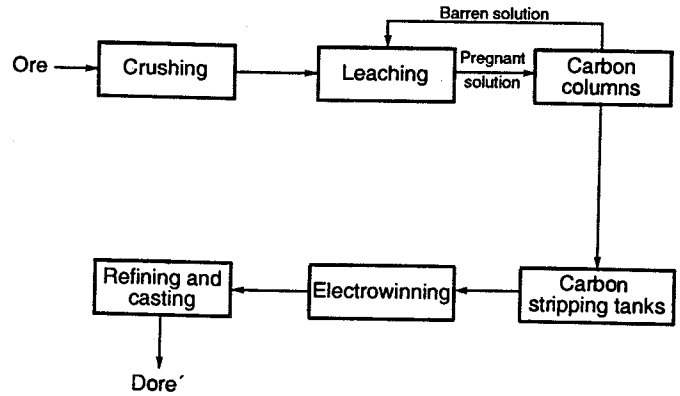

Figure 21.—Heap leach mill flowsheet.

SOLVENT EXTRACTION-ELECTROWINNING MILL MODEL

but No crushing ?

This model is designed for evaluating deposits where a solvent extraction-electrowinning (SX-EW) mill will be used to produce a copper cathode product. Typical applications of SX-EW mills are for leach solutions from oxide or chalcocite dump, waste, or in situ copper ores. The cost equations are valid for ore tonnage capacities of 6,000 to 70,000 st/d. Basic assumptions include an ore grade of 0.4% Cu and a recovery of 50%. The cost equations are based on X in st/d to be consistent with other cost sections. SX plants are usually expressed in gallons per minute (gal/min), and EW plants in lb/d Cu produced. For this model, to convert to lb/d Cu: (X)(4.0) = lb/d Cu produced. To convert to gal/min: (X)/15 = gal/min feed to plant.

The model is based on a typical configuration of heap leach pads, two extraction stages, and one strip stage. Pregnant leach solution is pumped to the solvent extraction circuit from the solution ponds. In the first extraction stage, mixer-settler solution is mixed with organic flowing from the second stage, extracting some of the copper. The solution is pumped to the second extraction stage where it is mixed with freshly stripped organic to recover the remaining copper. The barren solution (raffinate) flows from the second stage to the leach dumps.

The loaded organic is sent from the extraction section to the stripping section, where it is mixed with an acidic electrolyte from the electrowinning circuit. This electrolyte

strips the copper from the organic phase. After the mixture separates in settling tanks, the barren organic is returned to the second extraction stage. The copper-containing electrolyte flows to the strong electrolyte tanks, from which it is pumped to electrolyte filters to remove entrained organic. The clarified strong electrolyte is then fed to the electrowinning circuit.

The strong electrolyte passes through electrolyte interchangers, where heat from outgoing spent electrolyte preheats the incoming strong electrolyte. The strong electrolyte then goes to a circulation tank, where it is mixed with spent electrolyte from the electrowinning cells. Feed electrolyte is pumped continuously from the tank to the electrolytic cells. Electrolysis occurs in the cells, where insoluble lead-based anodes are used, and the copper is plated on cathodes of stainless steel or thin copper starter sheets.

Figure 22 illustrates a simplified flowsheet for the SX-EW plant. Costs are summarized in table 28. Since SX costs tend to vary in a typical geometric regression form, and the EW cost component of the plants tend to have a linear relationship, the capital cost equations in table 28 are in the form of the SX component plus the EW component to calculate the total SX-EW capital cost. To convert the costs expressed in $/st to $/lb Cu produced: ($/st)/4.0 = $/lb Cu produced.

Table 28.—Solvent extraction-electrowinning mill model

(capacity range 6,000-70,000 st/d)

Category	SX + EW capital cost, $	Operating cost, $/st
Labor	$2{,}510(X)^{0.571} + 89(X)$	$0.499(X)^{-0.146}$
Equipment . .	$4{,}810(X)^{0.600} + 228(X)$	$0.248(X)^{-0.144}$
Steel	$1{,}030(X)^{0.590} + 44(X)$	$0.105(X)^{-0.144}$
Lube	NAp	$0.058(X)^{-0.151}$
Construction material . . .	$5{,}640(X)^{0.602} + 272(X)$	NAp
Electricity . . .	NAp	$1.45(X)^{-0.145}$
Reagents . . .	NAp	$0.583(X)^{-0.143}$
Sales tax . . .	$688(X)^{0.600} + 32(X)$	$0.056(X)^{-0.144}$
Total	$14{,}600(X)^{0.596} + 665(X)$	$3.00(X)^{-0.145}$

NAp Not applicable.
X = Capacity of mill in short tons per day mill feed.

NOTE.—SX plant: gal/min = (X)/15.
EW plant: lb Cu produced = (X)(4.0).

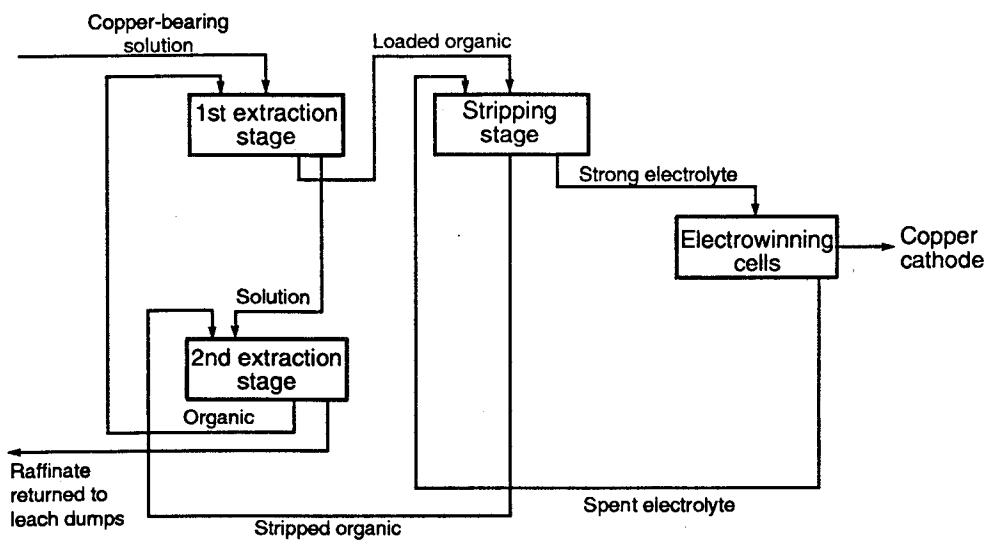

Figure 22.—Solvent extraction-electrowinning mill flowsheet. (Source: adapted from reference 29.)

SUMMARY

The use of these simplified cost models will allow an evaluator to make a quick prefeasibility type estimate for a mineral deposit. Capital and operating costs for a mine and mill can be estimated based on capacity of the operation in short tons per day. Adjustment factors are provided for haulage distance variation in open pits and variability of depth to bottom of ore body for underground mines. Guidelines for calculating daily capacity based on reserve tonnage are provided. Additionally, guidelines for estimating the costs of tailings ponds, powerlines, and road construction are included.

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Information Circular 9298

Simplified Cost Models For Prefeasibility Mineral Evaluations

By Thomas W. Camm

UNITED STATES DEPARTMENT OF THE INTERIOR
Manuel Lujan, Jr., Secretary

BUREAU OF MINES
T S Ary, Director