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James Doyle Sell Mining Collection

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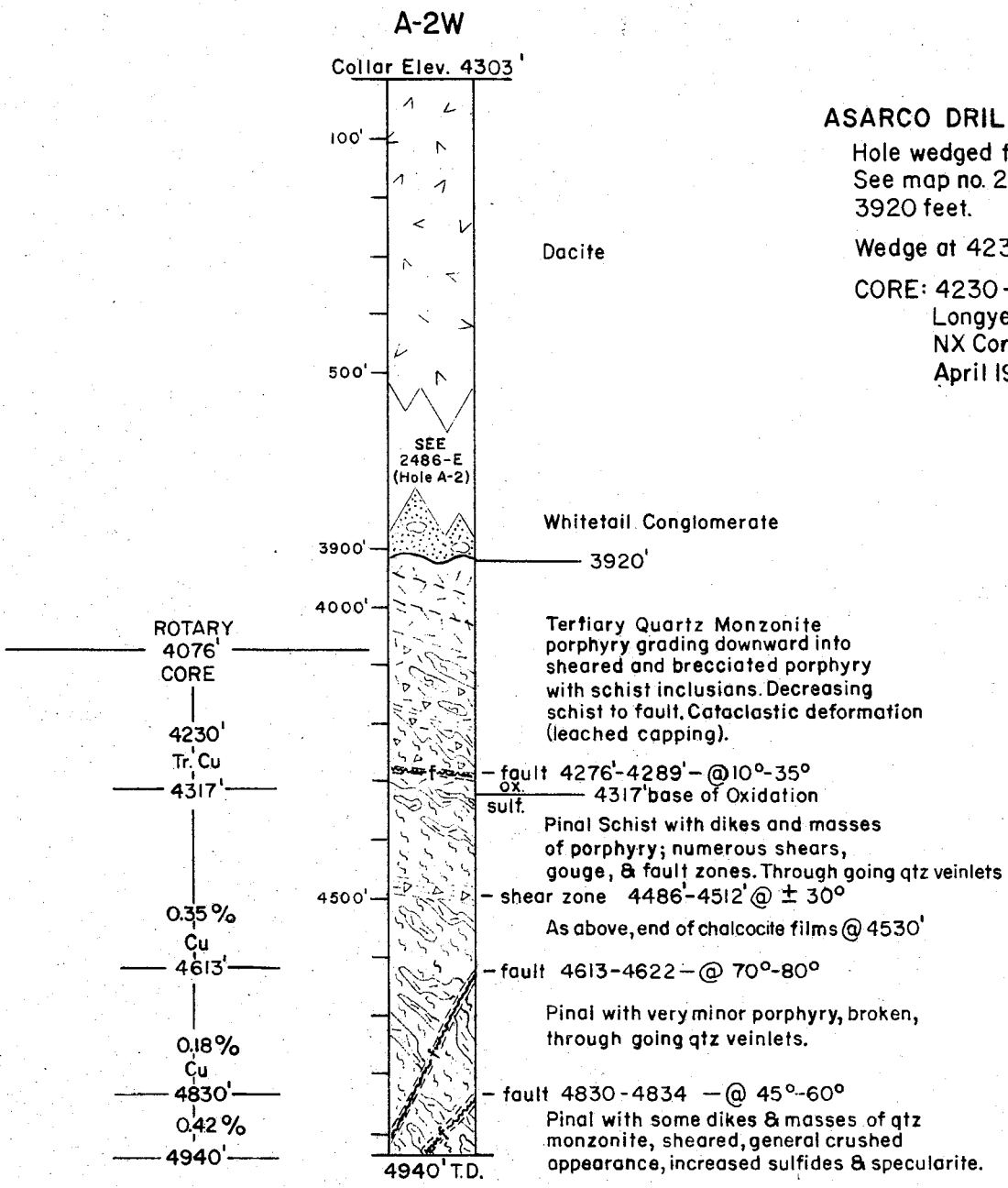


ASARCO DRILL HOLE A-2W (Wedge)

Hole wedged from previous Hole A-2.
See map no. 2486-E for units above 3920 feet.

Wedge at 4230 feet.

CORE: 4230-4940 feet
Longyear TRK-44
NX Coring
April 19-May 17, 1972

NOTE: Individual assays for the hole is found in Assay Report, dated May 26, 1972.

T 1 S, R 13 E.
NW 1/4 NE 1/4 SE 1/4 of Sec. 22

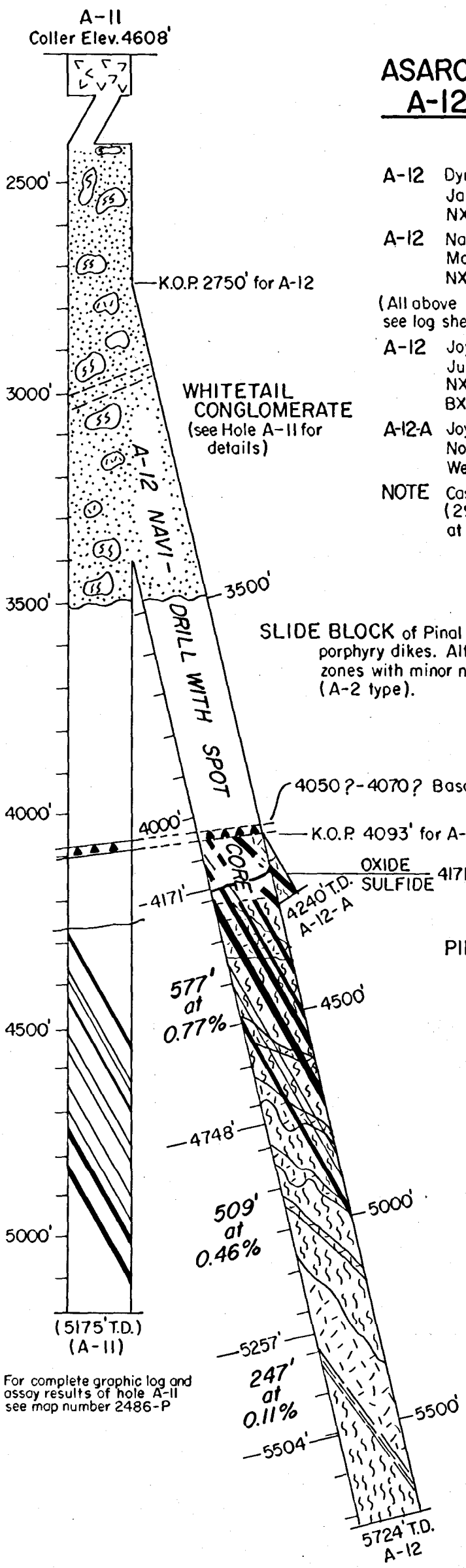
GRAPHIC LOG & ASSAY RESULTS of DRILL HOLE A-2W

SUPERIOR EAST PROJECT

GILA & PINAL COUNTIES, ARIZONA

SCALE 1" = 300'

J.D.S. July 8, 1972



For complete graphic log and assay results of hole A-11 see map number 2486-P

ASARCO DRILL HOLES
A-12 and A-12-A

A-12 Dyna-drill, Thompson & Associates
Jan. 14, 1980 – March 5, 1980
NX 2750' – 2879' (terminated)

A-12 Navi-drill, Christensen (Boyles)
March 12, 1981 – June 1, 1981
NX 2879' – 4217'

(All above with Joy Manufacturing Company drillers; see log sheet for spot cores)

A-12 Joy Manufacturing Company
June 2, 1981 – November 10, 1981
NX 4217' – 5085'
BX 5085' – 5724' T.D.

A-12-A Joy Manufacturing Company
November 11, 1981 – December 19, 1981
Wedge hole, BX 4093' – 4240' T.D.

NOTE Casing left in Hole A-12, 2185' of BX casing (2900'-5085'), and wedge of A-12-A set at 4095' (base)

SLIDE BLOCK of Pinal Schist intruded by Laramide biotite feldspar porphyry dikes. Altered and hematite replaced gouge-breccia zones with minor native copper. Oxidized, leached capping (A-2 type).

PINAL SCHIST cut by Laramide feldspar porphyry dikes at 45°–60°.

Top portion, 4070'?-4171', oxidized with some brecciation and faults, some oxidized remnant chalcocite and native copper.

Sulfide zone contains disseminated py-cc-bn and qtz-cc-bn veins, changing below 4750' to qtz-py-cp-bn veins and below 5050' to qtz-py-cp veins decreasing with depth. All in variable quartz-sericite alteration veins and halos with some K-spar type below 5300'. Numerous breccia and shear zones throughout.

NOTE: Individual assay for hole A-12 and A-12-A may be found in assay report dated January 15, 1982.

T. 1 S., R. 13 E.
NW¼ NW¼ SW¼ of Sec. 23

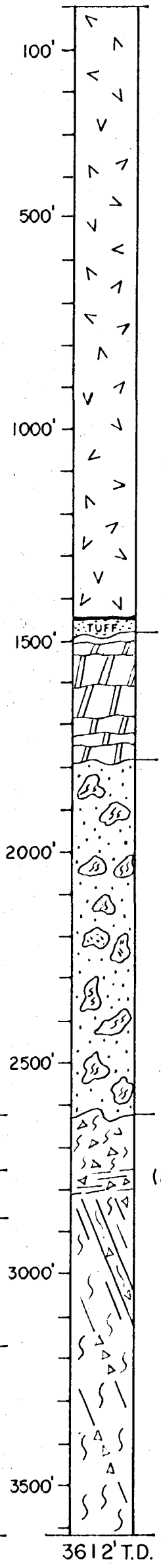
GRAPHIC LOG & ASSAY RESULTS
OF
DRILL HOLES
A-12 and A-12-A
SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

SCALE 1" = 300'

J.D. Sell Jan. 1982

mn 2486 s dam 1/82

ASARCO DRILL HOLE AI-2



CORE:
Surface — 3' — (6¼"RB)
3' – 1961' NC
1961' – 2831½' NX
2831½-3612' BX

Joy Manufacturing Co.
Joy-22, HD.
Surface - 3612'
April 1, 1980 - Sept. 8 1980

NOTE: Casing left in hole
4": Surface - 3' (w/cap)
NX: 1600' - 1961' (361')
BX: 2420½ - 2831½
(411' including 5' NXE core barrel, bit, & shell)

DACITE

EARLIER VOLCANICS

Andesite basalt flows with oxidized tops, some reddish, some autobrecciated & gas bubbles.

WHITE TAIL CONGLOMERATE

1"-3" clasts of pre-Tw, subangular, set in matrix of sand and grit of same.

1780'-1859' M: 30% red brown to gray brown.
ACP: 99% sc (15% alt.), tr db, tr p€gr.

1859'-2140' M: 30% light grey green to med. brown.
ACP: 70 sc, 30 db, tr dsq, gr.

2140'-2322' M: 25% greenish brown to lgt. med. brown.
ACP: 60 sc, 35 db, 5 dsq.

2322'-2603' M: 35%, brick red to adobe brown.
ACP: 87 sc, 12 db, 1 p€gr, tr dsq.

2603'-2616' M: 55%, reddish brown.
ACP: 99 sc, 1 p€gr.

PINAL SCHIST, oxidized, hematite-specularite, steep breccias, sulfides below 2709'.

(2748½'-2794') Basal Fault Zone @ flattish bx angles; sulfides.

PINAL SCHIST, oxidized to partially oxidized to 2920', sulfides to 3030', remainder partially oxidized. Better quartz-sericite alteration bands in better mineral zones. Breccias, steep angles throughout. Weak K-spar veining extends from 3150' to end of hole.

NOTE: Individual assays are found in Assay Report dated Aug. 14, 1981.

T. 1 S. R. 13 E.

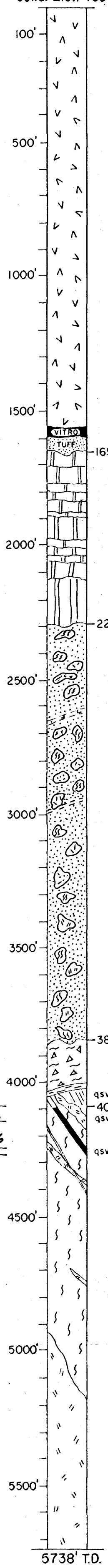
SW ¼ NE ¼ SW ¼ SE ¼ of Sec. 23

GRAPHIC LOG & ASSAY RESULTS
of
DRILL HOLE AI-2
RAWHIDE PROJECT
PINAL COUNTY, ARIZONA

SCALE 1" = 300'

J.D. Sell June 1981

MVK-2700 A



ASARCO DRILL HOLE A-14

ROTARY: Surface - 1534'
8": Surface - 20'
6": 20'-1534'
CMX DRILLING CO.
June 20, 1980 - July 2, 1980

CORE: 1534'-2891' NC
2891'-5493' NX
5493'-5738' T.D. BX
JOY MANUFACTURING Co.
Sept. 19, 1980 - March 9, 1981

NOTE: *Casing left in hole:*
7': Surface - 20'
4 1/2: Surface - 1534'
NX: Surface - 2891'
BX: 3750'-5493 w/shoe
Six sack Portland cement plug set at 3000'.

DACITE

EARLIER VOLCANICS

Andesitic basalt flows of 5' to 162' overlain by oxidized rubble-breccia tops of 6' to 60' for total thickness of flow units of 17'-168'

WHITETAIL CONGLOMERATE

1/2"-4" clasts set in gritty-sand matrix.
Minor Cu° below 2700 feet.

2289'-2325'	M: 53%; dirty to tan brown.
	ACP: 47%; 90 sc, 8 pЄ sed, 2 pЄgr.
2325'-2493'	M: 60%; green tan to green grey.
	ACP: 40%, 60 sc, 30 pЄ sed, 10 pЄgr.
2493'-2577'	M: 58%; org-red-tan greenish with pumice zone at base.
	ACP: 42%; 97 sc, 2 db, 1 pЄ sed.
2577'-2728'	M: 10%; dark brown w/lense of fresh lime-stone @ 2630'
	ACP: 90%; 85 sc, 15 db, tr pЄ sed.
2728'-3000'	M: 20%; dark to green brown.
	ACP: 80%; 56 sc, 39 db, 5 pЄ sed.
3000'-3487'	M: 15%; med. dark brown.
	ACP: 85%; 70 sc, 17 db, 8 pЄgr, 5 Lr. gr.
3487'-3841'	M: 20%; brick red brown.
	ACP: 80%; 92 sc, 8 Lr. gr, tr pЄgr.

A-2 TYPE SLIDE BLOCK of Pinal Schist w/altered bands & some aplite & qfp w/alteration-mineral. ALL OXIDIZED.

BASAL FAULT ZONE @ 10°-15° (4006'-4015'), gouge-bx.

PINAL SCHIST cut by aplitic porphyry & quartz-feldspar porphyry, all cut by steep dipping quartz-sericite bands containing variable amounts of chalcocite, chalcopyrite, & pyrite, Some hematite bands, pyrite increasing with depth.
1/8"-1/4" vns & narrow bx zones w/cc end 4149'

Below 5150', secondary K-feldspar & green sericite became noticeable component in schist & bfp, porphyry; quartz-sericite banding with minor mineral became scattered.

% Cu

4096'
53 @ 0.53%
4149'
99 @ 0.28%
4248'
21 @ 1.20%
4269'

173-947

Scattered assays range from 0.02-0.08 % Cu w/0.2-0.4 % in qsv zones.

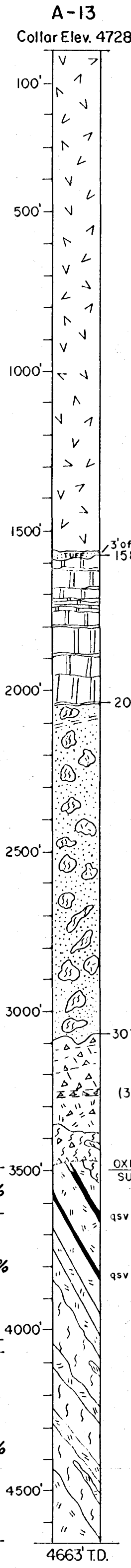
NOTE: Individual assays are found in Assay Report dated Aug. 10, 1981.

T. 1 S. R. 13 E.

N LINE of NW1/4 NE1/4 SE1/4 SE1/4 of Sec. 22

GRAPHIC LOG & ASSAY RESULTS
of
DRILL HOLE A-14
SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
SCALE 1" = 300'

J.D. Sell Aug. 1981 MVK-2486-R



ASARCO DRILL HOLE A-13

Surface — 10' — (6¼ RB)

CORE: 10' – 2363' NC
2363'–4663' NX

Joy Manufacturing Co.
Joy-36, TM.
Surface –4663'
March 8, 1980 - Sept. 8, 1980

NOTE: Casing left in hole
4": Surface -10' (w/cap)
NX: 1723'-2363' (640')

DACITE

EARLIER VOLCANICS

Andesitic basalt flows with oxidized tops, autobrecciation.
All portions generally fractured.

WHITE TAIL CONGLOMERATE

1"-4" subangular clasts set in gritty-sandy matrix.
Minor Cu° below 2250'; tuff lense @ 10°-15° (2090')

2036'-2070' M: 35%, med. dark brown, reddish cast.
ACP: 65%; 100 sc

2070'-2285' M: 21%, green grey to green brown.
ACP: 79%; 88 sc, 12 db

2285'-2600' M: 15%, med. brown to green brown.
ACP: 85%; 70 sc, 28 db, 2 pC sed.

2600'-3071' M: 20%, red brown.
ACP: 80%; 95 sc, 5 db

A-2 TYPE SLIDE BLOCK of Pinal Schist cut by high angled qtz-seri bands w/1-2% hematite limonite w/numerous flattish breccia & gouge zones throughout.
(3242'-3260') Flattish breccia-gouge; possibly basal fault zone.

PINAL SCHIST & MONZONITE, broken brecciated & gougy to 3471; but all cut by variable quartz-sericite-sulfide (or oxidized) bands in overall strong quartz-sericite alteration. Bands & breccia zones generally at steep, +60° angle to core axis.
Quartz-sulfide veins & breccias.

NOTE: Individual assays are found in Assay Report dated Aug. 5, 1981.

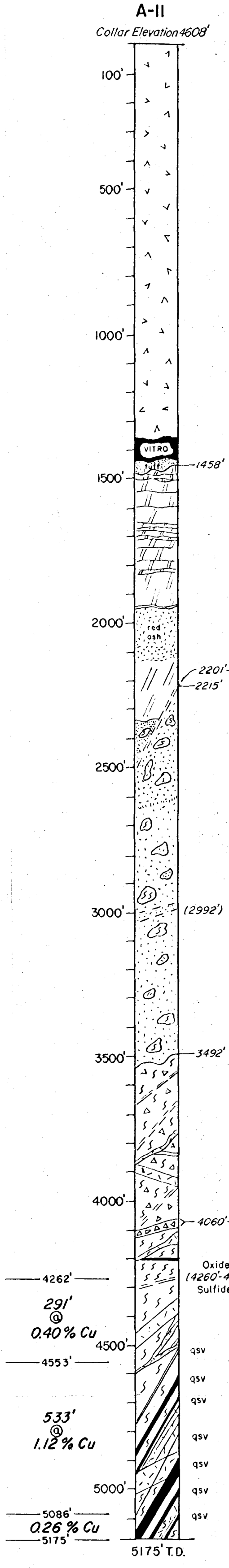
T. 1 S. R. 13 E.

SW ¼ SW ¼ SE ¼ SW ¼ of Sec. 23

GRAPHIC LOG & ASSAY RESULTS
of
DRILL HOLE A-13
SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
SCALE 1" = 300'

J.D. Sell Aug. 1981

MVK-2486 Q



ASARCO DRILL HOLE A-11

CORE: Surface - 2580' NC
2580' - 3772' NX
3772' - 4857' BX
4857' - 5175' AX

Joy Manufacturing Co.
Joy-22, HD
Surface - 5175'
8/2/78 - 6/20/79

NOTE: Casing left in hole
137' of 4"; Surface (0-137')
2550' of NX Casing (30'-2580')
840' of BX Casing (2932'-3772')
1102' of AX Casing, ie BX Rods, (3755-4857') (including barrel & bit)

DACITE

EARLIER VOLCANICS

Andesitic basalt flows of 6-283' in thickness with rubble or oxidized tops. Lower flow has 187' of red ash underlain by 96' of blue black basalt of "Olberg ash & Blue Basalt" type.

WHITETAIL CONGLOMERATE

Sandy to gritty matrix lenses, with lenses of tuffaceous material, containing clasts of pre-Whitetail units. Minor Cu°.

2215 - 2601' red, muddy brown w/greenish matrix 35 %
Clasts: 98 ½ sc, 1 db, ½ Schultze
2601 - 2607' tuff bed
2607 - 2960' dark brown to dirty green matrix 24 %
Clasts: 77 sc, 18 db, 5 Apache
2960 - 2992' sandy grit w/schist & diabase debris
2992 - 3060' mud red brown matrix 32 %
Clasts: 49 Schultze, 41 sc, 7 db, 3 Apache
3060 - 3492' dark red to orange red matrix 19 %
Clasts: 73 sc, 20 db, 7 Schultze, tr Apache

SLIDE BLOCK of Pinal Schist intruded by Laramide biotite feldspar porphyry & diorite porphyry dikes

Altered & hematite replaced gouge - bx zones with minor Cu°. Oxidized, leached capping.

PINAL SCHIST cut by Laramide biotite feldspar porphyry dikes.

Top portion oxidized, leached capping, w/oxidized qsv zones, tr native copper remaining, probably a moved block in part. 15° fault zone @ 4260 - 4262' is oxide-sulfide contact.

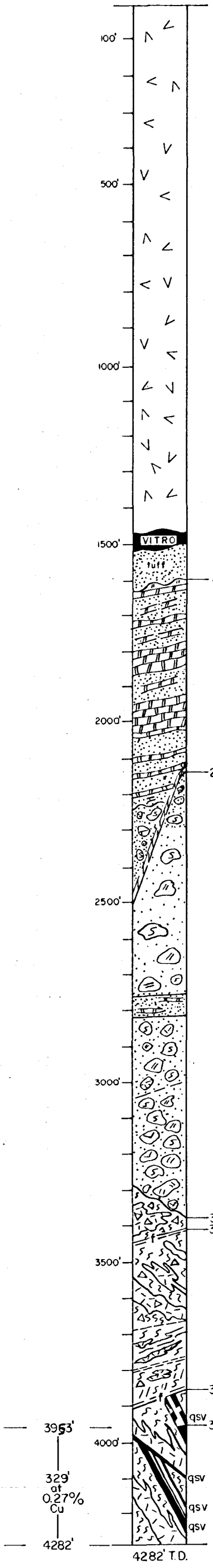
Sulfide zone contains disseminated py-cc-bn & quartz-sulfide veins (py-bn) in quartz-sericite altered wallrock, bands, & breccia zones, generally at + 60° inclination.

NOTE: Individual assays are found in Assay Report dated July 13, 1979

T. 1 S. R. 13 E.
NW ¼ NW ¼ SW ¼ of Sec. 23

GRAPHIC LOG & ASSAY RESULTS
of
DRILL HOLE A-11
SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

A-10
Collar Elev. 4585'



ASARCO DRILL HOLE A-10

Joy Drilling Company
Joy Heavy Duty HD-22
May 5 - August 3, 1977
November 15 - December 28, 1977
5" rock bit surface - 11'
NC core 11' - 2437'
NX core 2437' - 3417'
BX core 3417' - 3968'
AX core 3968' - 4282' T.D.

NOTE: Casing left in hole
11' of 4.5" surface-11'
141' of NX 2296'-2437'
222' of BX 3195'-3417'
also BX rods from 3380'-3968'

DACITE. Medium chocolate brown to dense orange brown to olive brown.

Fragmental content increases

Vitrophyre unit 1468'-1492'

Crystal tuff, brown at top grading to grey at base

EARLIER VOLCANICS. Dense green black andesitic-basalt flows with oxidized tops, vesicular, with increasing red and red-black cinder ash towards base of total unit. Flows dip up to 25°. Individual units of cinders and flows vary from 70-150' in thickness.

2114'-2117', Steep angular shearing cross fault

WHITETAIL CONGLOMERATE

2138'-2230' M: 26.5% dark brown to grey green, sandy grit
ACP: 51.5% sch, 39.5% pЄsed, 5% pЄgr, 2.5% db, 1% Paleozoic, dipping 5-10°

2230'-2390' M: 82% green to green grey brown with tuff lenses 10°
ACP: 89% sch, 9% pЄsed, 2% db, trace of pЄgr and Paleozoic

2390'-2752' M: 20.5% brown to green brown, sandy grit
ACP: 71% sch, 24% db, 4% pЄsed, and 1% bolsa with fresh-water lime

(2752'-2814') Mixture of limey siltstone-mudstone and fresh-water lime with 52.5% green brown matrix and grit of 61.5% sch, 26% Schultze border, 11.5% db, and 1% pЄsed at 5°-10°

2814'-3375' M: 19% dark to reddish brown, sandy grit
ACP: 76.5% sch, 15% db, 6.5% Schultze and blk porphyry, 2% pЄsed with minor Cu°, dipping 20°-40°

M-1A TYPE S.B. 83% border Schultze and 23% schist in 23% matrix of brick-red sandy grit. Rests on 15°-20° fault surface. Totally oxidized.

A-2 TYPE S.B. Broken and crushed units of Pinal schist cut by Laramide biotite feldspar and Laramide black porphyry. Qtz-sericite and biotitizations of units with remnant cuprite and chalcocite. Totally oxidized. Cut by flat faults.

3859' (basal fault zone at 20°)

PINAL SCHIST Cut by a number of Laramide quartz feldspar porphyry and black porphyry dikes and sills. Units cut by quartz-sericite bands with disseminated and vein mineralization at 30°-60°.

3953' oxidized / sulfide

NOTE: Individual assays are found in ASSAY REPORT dated January 13, 1978

T. 1 S. R. 13 E.
NW 1/4 SE 1/4 SE 1/4 of Sec. 22

GRAPHIC LOG & ASSAY RESULTS
of
DRILL HOLE A-10
SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
SCALE 1" = 300'

J.D.S. Jan., 1978

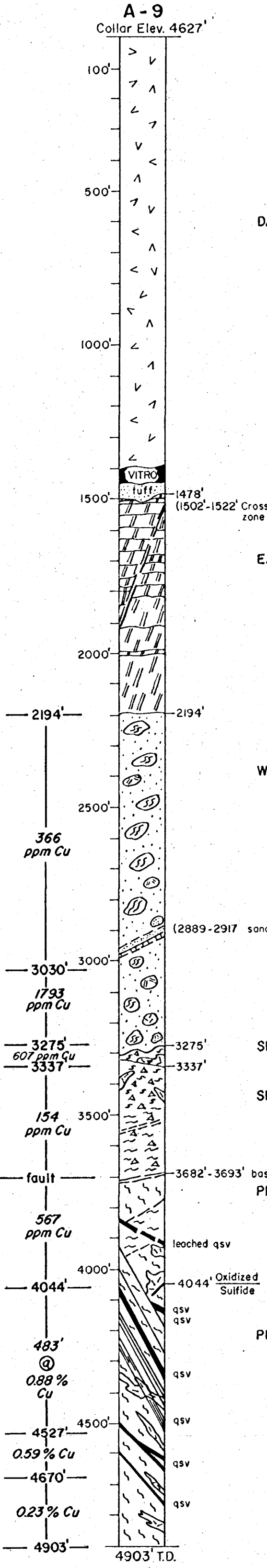
mn 2486-o dam

ASARCO DRILL HOLE A-9

CORE: Surface - 2357' NC
2357' - 3624' NX
3624' - 4903' BX
T.D.

Joy Manufacturing Co.
Joy-22, Heavy Duty Rig
Jan. 7 - May 4, 1977

*NOTE: Casing left in hole: 10' of 4"; Surface-10'
464' of NX; 1893'-2357'
586' of Bx; 3038'-3624'*



DACITE

(1502'-1522' Cross-fault zone at 70°)

EARLIER VOLCANICS

Andesitic - basalt flows, 5' - 45' thick, with few 100' - 200' thick units, separated by rubble and/or oxidized tops.

Cross - fault probably has around 100' feet of vertical offset, with dominant horizontal component (- 20° slickensides).

WHITETAIL CONGLOMERATE

Clasts, few qmp & blk qm, set in sandy, gritty, granular, tuffaceous matrix. Minor Cu°.

2194' - 2600' M: 19 % brown to tan and green brown.
ACP: 97 1/2 % sc, 2 1/2 % db

2600' - 2889' M: 23 %, brown to green brown to green.
ACP: 65 % sc, 25 % db, 10 % pЄ qtz & Pioneer.

(2889 - 2917 sandy-grit of db & gr debris; w/ fresh water lms unit)

2917' - 3000' M: 17 1/2 %, chocolate to dark brown
ACP: 54 % sc, 45 1/2 % Schultze gr, 1/2 % db.

3000' - 3275' M: 17 % dark brown w/ reddish cast
ACP: 65 % sc, 21 % db, 11 % Schultze,
3 % Єqtzite minor leached clasts.

SLIDE BLOCK of M-1A Type. Lqm w/ chilled borders intruding pЄ schist. Both cut by qtz veins. Totally oxidized. Broken w/ 10-40 % red-brown "adobe" matrix. Rests on 45 % slip surface.

SLIDE BLOCK of A-2 Type. Broken, sheared, gougy, brecciated pЄ schist w/ few brecciated Lqmp dikes. "Leached Capping" w/ tr to 2 % limonite, minor cuprite & black hematite above fault at 3521' - 3539'. 10 % - 40 % hematite below fault. Quartz-sericite & qtz veining throughout.

(3682' - 3693' basal fault zone at 10°

PINAL SCHIST w/ minor granite aplite dikes. Minor hematite, 1 % - 5 %, mainly along schistosity. Cut by inclined breccia zones & quartz-sericite bands w/ remnant chalcocite (3900) also qtz veining at 60°. Schistosity changes across minor faults.

PINAL SCHIST w/ minor porphyry & biotite feldspar porphyry dikes.

qsv, quartz sulfide veins, w/ weakly developed quartz mosses, often brecciated w/ crushed bornite - chalcocite & pyrite.

Intense quartz-sericite banding subparallel to the 45° - 60° qsv zones & subparallel to schistosity at 5° - 30°.

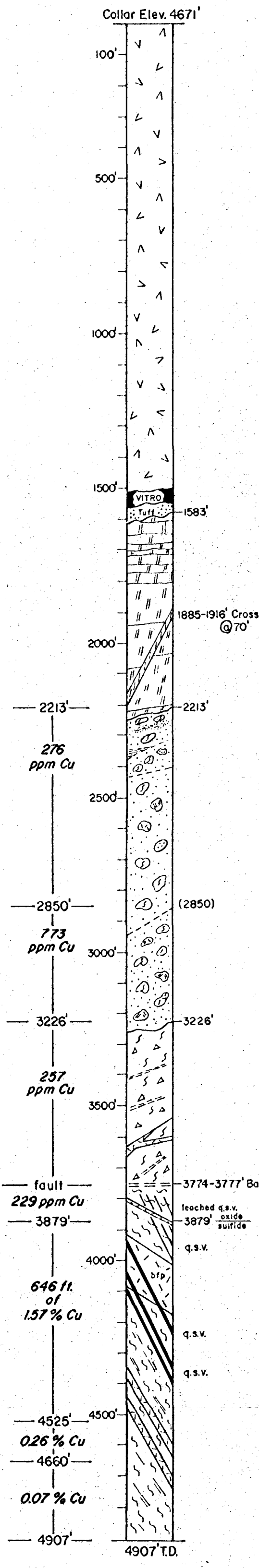
Breccia & gauge zones throughout in similar orientation.

NOTE: Individual assays are found in Assay Report dated May 24, 1977.

T. 1 S. R. 13 E.
SW 1/4 NW 1/4 SW 1/4 of Sec. 23

GRAPHIC LOG & ASSAY RESULTS
of
DRILL HOLE A-9
SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
SCALE 1" = 300'

J.D.S. May 1977
ALR 2486-M



ASARCO DRILL HOLE A-8

CORE: Surface - 1971' NC
1971' - 3197' NX
3197' - 4907' BX

Joy Manufacturing Co.
Joy-22
Surface - 1971'
Aug. 8 - Sept. 15, 1976

Joy-22 Heavy Duty
1971' - 4907' T.D.
Sept. 16 - Dec. 29, 1976

NOTE: Casing left in hole.
11 ft. of 4" surface (0-11'),
523 ft. of NX (1448-1971'),
697 ft. of BX (2500-3197')

DACITE

EARLIER VOLCANICS

Andesite - basalt flows of 15-50' thickness with rubble and/or oxidized tops.

1885-1916' Cross fault zone @ 70°

WHITETAIL CONGLOMERATE

Sandy to gritty lenses and matrix with tuffaceous lenses, with clasts of pre-Whitetail units. Minor Cu°.

2213-2400' Muddy light brown to light green matrix 42 %.
Clasts: 95 % sc, 5 % p€ qtzite.

2400-2850' Medium green to green-brown matrix 30 %.
Clasts: 77 % sc, 21 % db, 2 % p€ qtzite.

2850-3226' Medium brown to red-brown at base, matrix 25 %.
Clasts: 66 % sc, 20 % db, 13 % Schultze and porphyry, 1 % p€ qtzite, tr Tbx. (numerous alt. clasts)

SLIDE BLOCK of Pinal Schist intruded by Laramide granitic aplite.

Altered and hematite replaced schist breccia, with minor gouge and "matrix" zones. Oxidized with tr. Cu° (Leached Capping).

3774-3777' Basal fault and gouge zone, oxidized, slickensides. @ 15°-20°

PINAL SCHIST, cut by Laramide biotite feldspar porphyry (Lbfp)

Top portion oxidized with FeOx and containing remnant chalcocite in quartz-sericite alteration.

Lbfp at 3879-3885' is a 30° dipping structure with gouge at top and bottom.

Sulfide zone is variably altered with quartz-sericite bands following schistosity at 10°-20° and cut across at 30°-60°. Bands also cut Lbfp.

Mineralization, disseminated and thin veins, follow schistosity and cut across at 60°. Most quartz-sulfide veins (q.s.v.) cut at 60°. Chalcocite is main copper sulfide to 3958 where bornite appears and becomes dominant below with continued chalcocite.

Schist contains numerous crushed-gouge zones with chalcocite-bornite.

Minor pyrite throughout with trace of chalcopyrite appearing at bottom of hole.

NOTE: Individual assays are found in Assay Report dated Feb. 10, 1977.

T. 1 S., R. 13 E.
NW 1/4 SW 1/4 SW 1/4 of Sec. 23

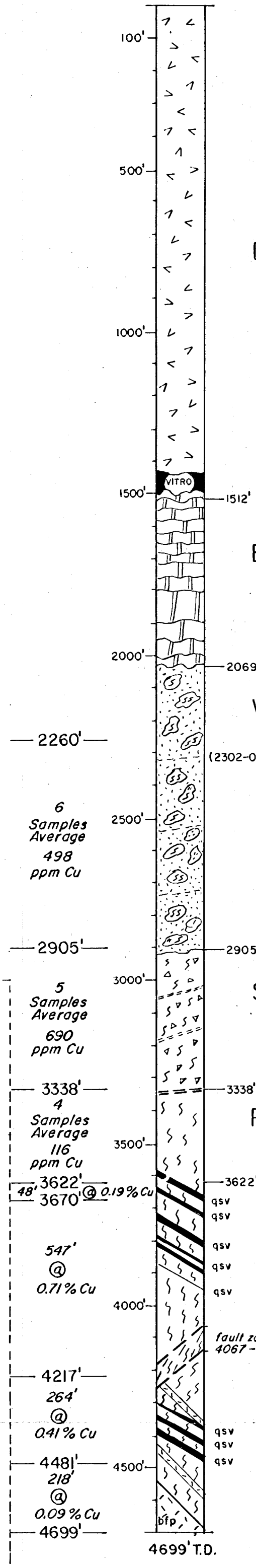
GRAPHIC LOG & ASSAY RESULTS
of
DRILL HOLE A-8
SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
SCALE 1" = 300'

J.D.S.

Feb. 1977
MVK 2486-K

A-15

Collar Elev. 4628'



ASARCO DRILL HOLE-15

Surface-11' Rock Bit 6'4"

CORE: 11-1101 NC
1101-2029 NX
2029-4699 BX

JOY MANUFACTORING CO.
JOY-22, Heavy Duty,
Surface-2029'
Feb. 16-April 6, 1983
2029-4699 T.D.
April 2-July 6, 1984

NOTE: Casing left in hole.
11' of 4" Surface (0-11')
650' of NX (441'-1101')
529' of BX (1500'-2029')

DACITE

EARLIER VOLCANICS

Andesite-basalt flows of 12'-98' thickness with rubble or oxidized tops.

WHITETAIL CONGLOMERATE

Sandy to gritty to muddy matrix with clasts of pre-Whitetail units. Minor Cu°

2069'-2302'	green tan grit matrix 25%, Clasts: 99+% sch, tr. qtzite, tr. db.
2302'-2304'	marker bed, fresh water lms w/ash grit matrix.
2304'-2520'	green brown to brown matrix 27%, Clasts: 63% sch, 27% db, 8% qtzite, 2% pЄ sh-lms
2520'-2720'	reddish muddy brown matrix 21%, Clasts: 76% sch, 22% db, 2% qtzite
2720'-2905'	reddish adobe to dark brown matrix 26%, Clasts: 65% sch, 18% db, 16% Lr gr porp, 1% pЄ lms

SLIDE BLOCK

of A-2 type. Pinal schist, altered, oxidized leached capping type, with hematite, specularite, & some native copper. gouge-breccia zones throughout.

PINAL SCHIST

cut by minor Laramide biotite feldspar porphyry, (Lbfp), dikes.

Top portion oxidized of very poor leached capping characteristics which continues to 3670' where the first 45° dipping structures with cc-bornite is encountered.

Sulfide zones of bx-gouge bordering qtz-sericite and qtz veins with variable mineral content of cc-bornite, (qtz-sulf veins qsv) grading downward into cp below 4200' minor pyrite throughout. Zones dipping generally 30° or less.

NOTE: Individual assays are found in Assay Report dated Aug. 24, 1984

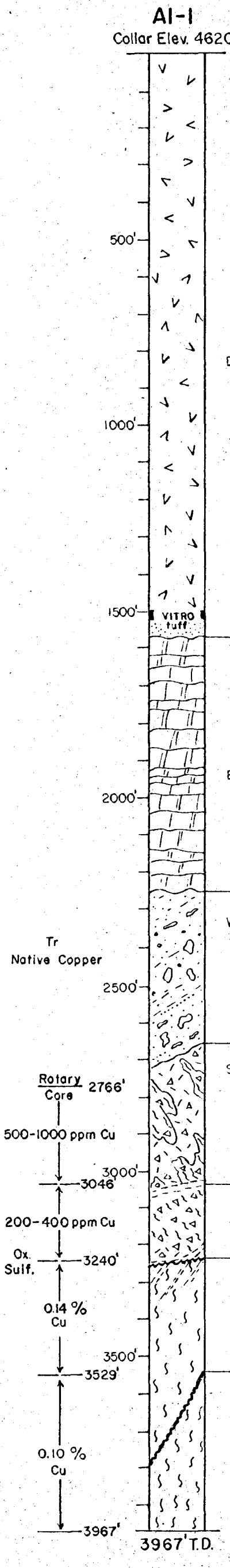
T. 1 S., R. 13 E.
NE 1/4, SW 1/4, SW 1/4 of Sec. 23

GRAPHIC LOG & ASSAY RESULTS

DRILL HOLE A-15
SUPERIOR EAST PROJECT
Pinal County, Arizona
SCALE: 1" = 300'

J.D. Sell July, 1984

MVK 2486-T



RAWHIDE PROJECT

ASARCO / INSPIRATION JOINT VENTURE

Hole AI-1

Rotary: Surface – 2766 Feet

Howard Turner Drill Master
w/Air Package
July 18 - Aug. 12, 1973
9" - 5 5/8" Hole

Core: 2766 - 3967 Feet

Boyles CP-50
Oct. 1 - Nov. 21, 1973
NC and NX Core

Summary of Weighted Averages in Sulfide Intercept:

3240-3529', 289 feet @ 1381 ppm Cu, 9 ppm Pb, 52 ppm Zn, and 31 ppm Mo.

3529-3967', 438 feet @ 990 ppm Cu, 18 ppm Pb, 57 ppm Zn, and 21 ppm Mo.

3240-3967', 727 feet @ 1145 ppm Cu, 14 ppm Pb, 55 ppm Zn, and 25 ppm Mo.

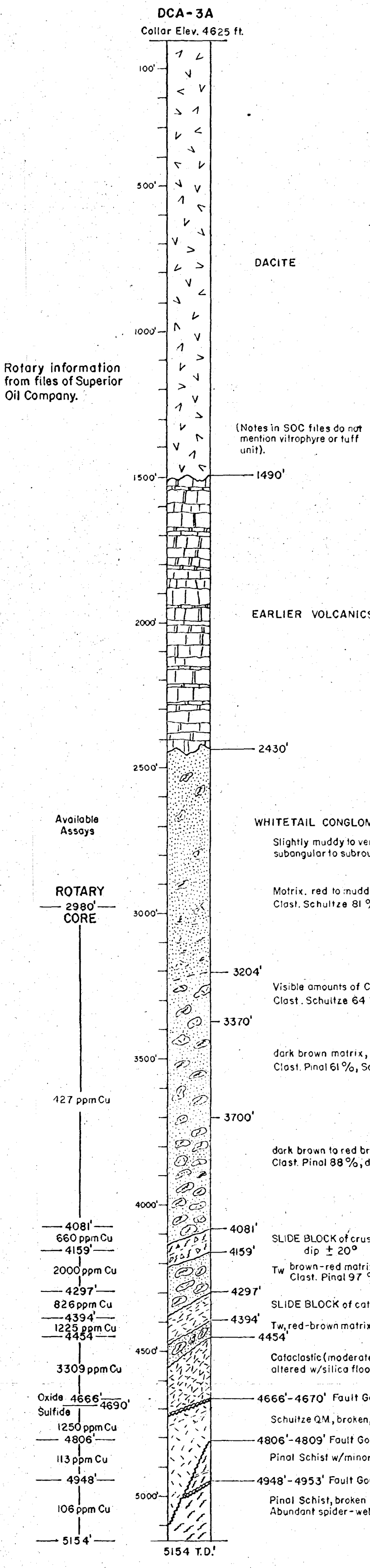
T 1 S, R 13 E.

SE 1/4 SW 1/4 NE 1/4 of Sec. 23

GRAPHIC LOG & ASSAY RESULTS of DRILL HOLE AI-1

RAWHIDE PROJECT

(ASARCO / ICC Joint Venture)



DRILL HOLE DCA-3A

ROTARY Miami Copper-Superior Oil
Surface-3000 ft.
Rotary-mud
May 7-June 21, 1965

CORE ASARCO
2980-5154 ft.
Boyles, CP-50
NX Core
July 2-October 16, 1974

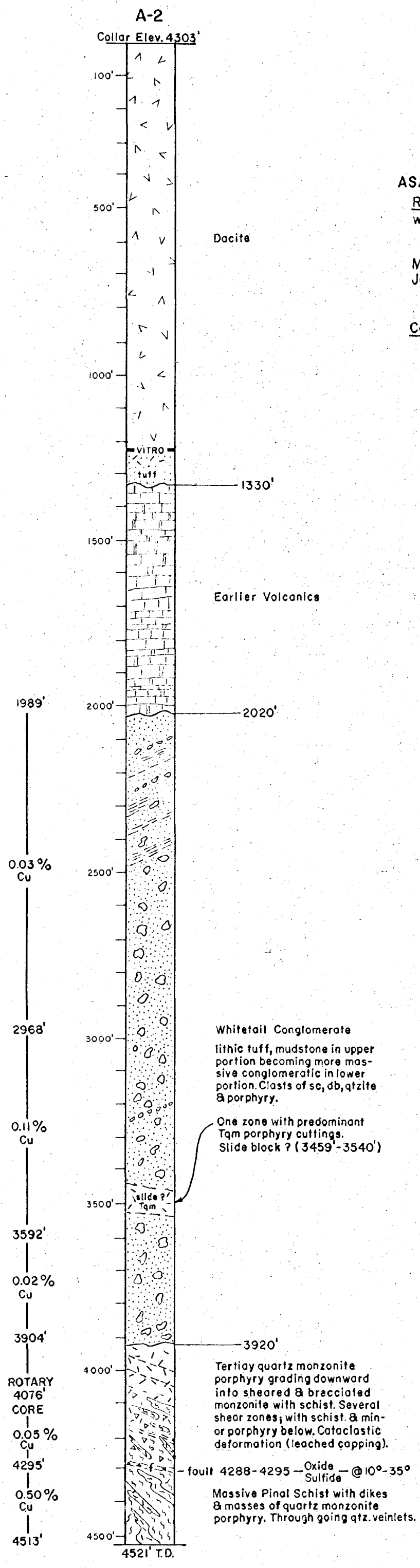
NOTE: Core barrel & rods lost from 4150' to 4338'. Hole cemented up to 4089'. A new hole was deviated at 4089' and continued to terminal depth at 5154'.

T 1 S, R 13 E
SW ¼ NE ¼ NW ¼ of Sec. 23

GRAPHIC LOG & ASSAY RESULTS of DRILL HOLE DCA-3A

SUPERIOR EAST PROJECT

GILA & PINAL COUNTIES, ARIZONA
SCALE 1" = 300'
J.D.S. July 8, 1974
MVK 2486-H



ASARCO DRILL HOLE A-2

Rotary: Surface-4076 feet
with spot cores at 2559-2574
3540-3550
4075-4076
Mayhew 3000, air drilled
January 13-February 7, 1972
8¾"-6¼" hole.

Core: 4076-4521 feet
Longyear TRK-44
NX Coring
March 4-18, 1972

NOTE: Hole lost w/corebarrel & rods in bottom. See Hole A-2W (map # 2486-F) for wedged hole.

Individual assays for the hole are found in Assay Report, dated March 24, 1972.

T 1 S, R 13 E.
NW ¼ NE ¼ SE ¼ of Sec. 22

GRAPHIC LOG & ASSAY RESULTS of DRILL HOLE A-2

SUPERIOR EAST PROJECT

GILA & PINAL COUNTIES, ARIZONA
SCALE 1" = 300'
J.D.S. July 8, 1972

2486-E

Exploration
New Business Development
BHP Minerals

February 15, 1995

Mr. Jim Sell
ASARCO
2762 W. Holladay St.
Tucson, AZ 85746

Jim-

The data package on Superior East you sent BHP Minerals is enclosed as you requested.

This is all of the information we have in the Salt Lake file. I trust our office in Tucson has returned any data they had in their files as well.

Hope to see you soon as we pursue other areas of mutual interest.

Sincerely,

Bob

Bob Schafer

cc: Dave Spatz

3/31/94

Mr. Robert W. Schafer
Regional Manager
Western U.S. Exploration
BHP Minerals International, Inc.
5330 South 900 East
Suite 200
Salt Lake City, Utah 84117

Superior East Project
Graphic Logs/Assays of
Drill Holes
Pinal Co., AZ.

Dear Bob:

I send you the following holes with the graphic log and assay results. Holes A-2, A-2W, A-8, A-9, A-10, A-11, A-12 & A-12A, A-13, A-14, A-15, AI-1, AI-2, and DCA-3A.

The location of the holes are on the attached drill hole-station map.

The completed hole A-16 and the short hole A-17 have not been drafted into this form.

Glad you are still interested.

Thanks for your comments on the paper.

Give me a call on anything else.

Sincerely

James D Sell

FILE

DATE: February 14, 1994
TO: B.W. Schafer
FROM: R.H. Thole
SUBJECT: **RECOMMENDATION TO ACQUIRE OPERATING INTEREST IN THE HELVETIA PORPHYRY COPPER (MO-AU-AG) DEPOSIT, PIMA COUNTY, ARIZONA**

REF: Creasey, S.C., and Quick, G.L., 1955, Copper Deposits of Part of Helvetia Mining District, Pima County, Arizona:A Contribution to Economic Geology, U.S. Geol. Survey Bull. 1072-F, P. 301-323.

Anzalone, S.A., and Brown, R.L., 1992, Geology of the Helvetia Copper Deposit - Arizona: SME Preprint 92-61.

B. Schafer, D. Spatz and I spent one day with S.A. Anzalone and James D. Sell of ASARCO in data and field review of the Helvetia porphyry copper resource, located 50 km southeast of Tucson, Arizona. This porphyry copper system consists of four areas of copper mineralization: Rosemont, Peach-Elgin, Broadtop Butte and Copper World. A considerable amount of excellent geological work has been completed at Helvetia over the past 75 years in particular since 1963 when Anaconda and Anamax carried out an extensive mapping and drilling program that resulted in the delineation of the Rosemont area porphyry copper deposit, a major North American copper resource. Anamax sold the property to a real estate company in 1986 for $800,000, which in turn sold it to ASARCO in 1988 for $1,000,000. Recently, ASARCO decided to consider BHP as potential joint venture developer and operator of Helvetia. This decision resulted from a conversation between B. Schafer and Fred Greybeal where Bob inquired into the availability of ASARCO's Superior East property or any other ASARCO property for joint venture participation.

In my judgement Helvetia represents an excellent and unique opportunity for BHP to become an operator of a potentially "world class" North American porphyry copper mine. Mineralization is primarily pyrometasomatic, and zoning of hydrothermal alteration and sulfide mineral assemblages are reported to be similar to those at the Twin Buttes and Mission copper mines located approximately 32km west of Helvetia. Approximately 450 drill holes have been drilled at Helvetia with about 150 vertical and angle diamond drill-holes defining the Rosemont resource, estimated at 362Mt of sulfide mineralization assaying 0.61% Cu, 0.019% Mo, and 0.25 opt Ag based on a 0.30% Cu cutoff. In addition, 66 million tons of copper oxide mineralization assaying 0.53% Cu was estimated. Using preliminary Anamax data, the waste to ore ratio is approximately 3:1. The Peach-Elgin area has been penetrated by 81 churn and diamond drill-holes. Based on a 0.30% Cu cutoff 46 million tons at 0.58% Cu is indicated at Peach-Elgin with a waste to ore ratio of less than 3:1. S. Anzalone pointed out that copper oxides at somewhat less than 0.3% Cu are common in the overburden to the copper resources, however, ~~their~~ value has not been considered in the ore reserve estimates and financial analyses made to date. In

addition, S. Anzalone stated that mining similar skarn ores at Twin Buttes and Mission was successful in significantly increasing ore grades and tonnages over those grades and tonnages initially indicated by exploration drilling. He also stated that gold was not assayed in the drilling at Helvetia, however, recent cursory spot sampling by ASARCO indicates gold credits from about 0.01 to 0.06 opt. This was somewhat confirmed by my own calculation of an average gold credit of 0.005 opt Au, calculated from production records of 227,333 tons of ore produced between 1908 and 1950 from a number of small historic mines in the Helvetia area. Assuming the conservative 362Mt resource at 0.61% Cu, 3:1 waste to ore ratio and $0.85/lb CU, ASARCO calculated a 15% ROI.

Limited metallurgical testing on samples from the Rosemont area indicates that the sulfide mineralization is amenable to concentration by standard flotation methods. These tests produced a copper concentrate assaying 33.5% Cu with payable precious metal credits. A considerable tonnage of oxide copper mineralization is certainly present throughout the deposit and although no test work has been completed the oxide material should be amenable to treatment by SX-EW methods.

On a cursory review of potential BHP JV participation at Helvetia foreseeable problem areas seem to be limited. Areas of concern which should be considered are listed as follows:

-Mineralization at Helvetia is hosted by skarns whose distribution is complicated by complex folding and fault offsets. Ore reserves need to be recalculated by BHP taking into full consideration the influence of favorable lithologies and structure in controlling the distribution of the orebody/orebodies. I understand ASARCO is currently generating an updated ore reserve estimate and we should concurrently calculate our own estimate.

-Historic production records indicate a significant gold credit to the Helvetia copper mineralization, and our one day field evaluation appears to confirm widespread oxide copper over the Rosemont/Peach-Elgin area. A substantial gold credit to ore and the occurrence of significant oxide copper in overburden will positively impact the financial analysis of this resource. Analysis of oxide copper and gold in the form of spot checks of existing core and sample pulps is warranted at an early stage.

-Although the property seems to be situated favorably environmentally, an environmental review should be completed as soon as possible. The Helvetia property consists of over 20 patented claims, private ranch land, leases and some unpatented claims, with established rights to several water wells. The property is in an established mining district in proximity to operating mines, a nearby cement plant and power lines. Although the property is on the outskirts of Tucson and lies several miles from Hwy 10, the potential mine operation will be almost totally hidden by surrounding low lying hills.

A positive recommendation to pursue JV participation is based on the following:

-Helvetia is possibly the largest undeveloped porphyry copper resource known in the U.S. Although drill-indicated reserves approach 500Mt, potential is judged excellent to increase these reserves to about 800Mt or 1Bt. A limited 5 to 10 hole drill program should indicate if this ore reserve expansion is possible at an early date.

-The deposit exhibits above average copper grades with substantial Mo and Ag credits and indication of significant gold credit.

-Potential is considered good for substantial oxide copper in the overburden to the copper reserve. The grade and tonnage of copper oxides in overburden to the copper orebodies needs to be determined at an early stage. It is probable that this material will be amenable to low cost SX-EW extraction and will produce an early return on investment upon early pre-ore stripping of overburden.

-ASARCO calculated a preliminary 15% ROI based on $ 0.85/lb Cu, 3:1 strip ratio, and conservative tonnage and ore grade estimates. Potential is judged to be excellent for considerable oxide copper in overburden and a possible gold credit in copper ore that would help generate an early return on investment and positively impact the ROI for the Helvetia operation.

-ASARCO has completed only limited work at Helvetia since it was acquired in 1988 for $1 million. I believe there is a good possibility that we can enter into an option to develop the property with only a staged work commitment and earn-in agreement. A first year program might be structured such that we agree to spend about $1million to re-evaluate existing data, assay existing core for overburden oxide copper and establish gold grade of ore zones, and to drill about ten holes to confirm the existing ore grade and tonnage and to establish potential for developing additional reserves. Once this stage is completed with positive results the program may be advanced to a fast track development drilling phase.

Based on the above I recommend joint venture participation with ASARCO pending a positive review of the Helvetia data. This review should include compilation and generation of data establishing a preliminary gold grade of potential ore, oxide copper content and tonnage potential of overburden to ore, and recalculation of ore reserves giving full consideration to the geology and structure of the deposit.

ASARCO

Exploration Department
Frederick T. Graybeal
Chief Geologist

January 16, 1986

Mr. J. D. Sell, Manager
Southwestern Exploration
Division
Tucson, Arizona

Superior East Project
Pinal County, AZ

Dear Mr. Sell:

Thank you for your letters of December 20 and December 23 which compile the results of drilling to date at Superior East. I have no problems with your recommendation for hole A-16. I would note that at this point in the evolution of the project I would not be inclined to constrain drill hole locations according to grid coordinates. At this point we are still exploring a system which is imperfectly known and geologic constraints should govern all drilling.

Very truly yours,

F. T. Graybeal

F. T. Graybeal

cc: W. L. Kurtz

ASARCO

Southwestern Exploration Division

JDS

December 20, 1985

F. T. Graybeal
New York Office

Revised Sections - Plans
and Mineral Inventory
Superior East Project
Pinal County, Arizona

Summary & Conclusions

Using the drill hole intercepts, I have constructed new cross-sections (Attachments A through D) and elevation plans (Attachments E through P) for the sulfide zone at Superior East. The sections-plans were constructed using the constraints based on the drill intercepts, indicated faulting, and compatible shape-outline of the mineral grades.

The result is a three-dimensional elliptical body which is floored with a relatively sharp 0.3 copper line and having a variable 0.7% and 0.5% copper shells expanding outward on the sides and over the top of the plus 1% copper body. The shells taper off as they approach the basal 0.3% copper zone.

The three sections have also been restored to their pre-faulting configuration for visual interpretation and indicate that half of the deposit has been destroyed by deep leaching (Attachments Q through S).

The question of a flattish fault in the leached capping sequence was not addressed in this exercise, but it is noted that leached quartz sulfide vein zones are found only above the indicated high grade zone and restricted to the capping below the postulated flat fault as shown in earlier cross-sections.

A rough estimate, based on the new sections-plans configurations, suggests a mineral inventory as follows:

101 million tons @ +1.0% (used 1.1% Cu)
42 million tons @ 0.7-1.0% (used 0.85% Cu)
61 million tons @ 0.5-0.7% (used 0.60% Cu)

or

143 million tons @ 1.03% copper

or

204 million tons @ 0.90% copper.

Using the configuration model, as shown in the plans, three areas are indicated as having the potential for the +1% copper intervals. They are:

1. In a 180° arc with radius of 800 feet, west, south, and east of Hole A-8, 500-700 feet of intercept starting at plus 1000 foot elevation, or around 3600 feet below the surface is indicated.

2. In an ellipse with Holes A-8 and A-9 along the axis, and extending 600-800 feet outward from these holes, 600-800 feet of intercept starting at plus 600-700 foot elevation, or around 4000 feet in depth from the surface is indicated.

3. A deep zone extending 500-600 feet in a 180° arc west, north and east of Hole A-11. An indicated 800-1000 feet of plus 1% copper starting at around sea level, or 4600 feet below the surface is indicated by the configuration.

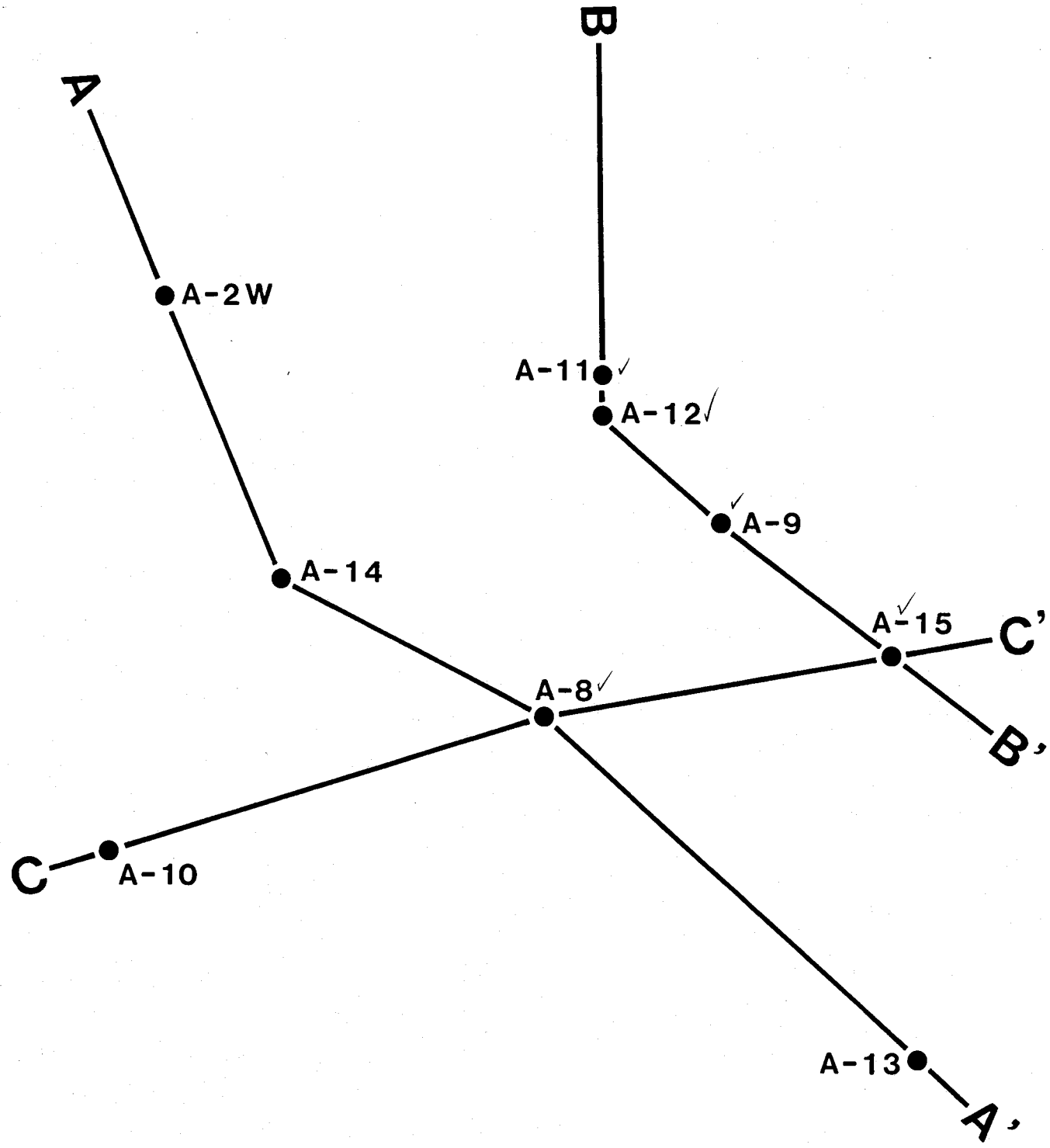
The above exercise is an attempt to place the drill intercepts into a plausible configuration using the method of cross-sections and plans of mineral grades to suggest the third dimensional expression. Any truths found by drilling will be a surprise.

James D. Sell

James D. Sell

JDS:mek
Attachments

cc: W. L. Kurtz

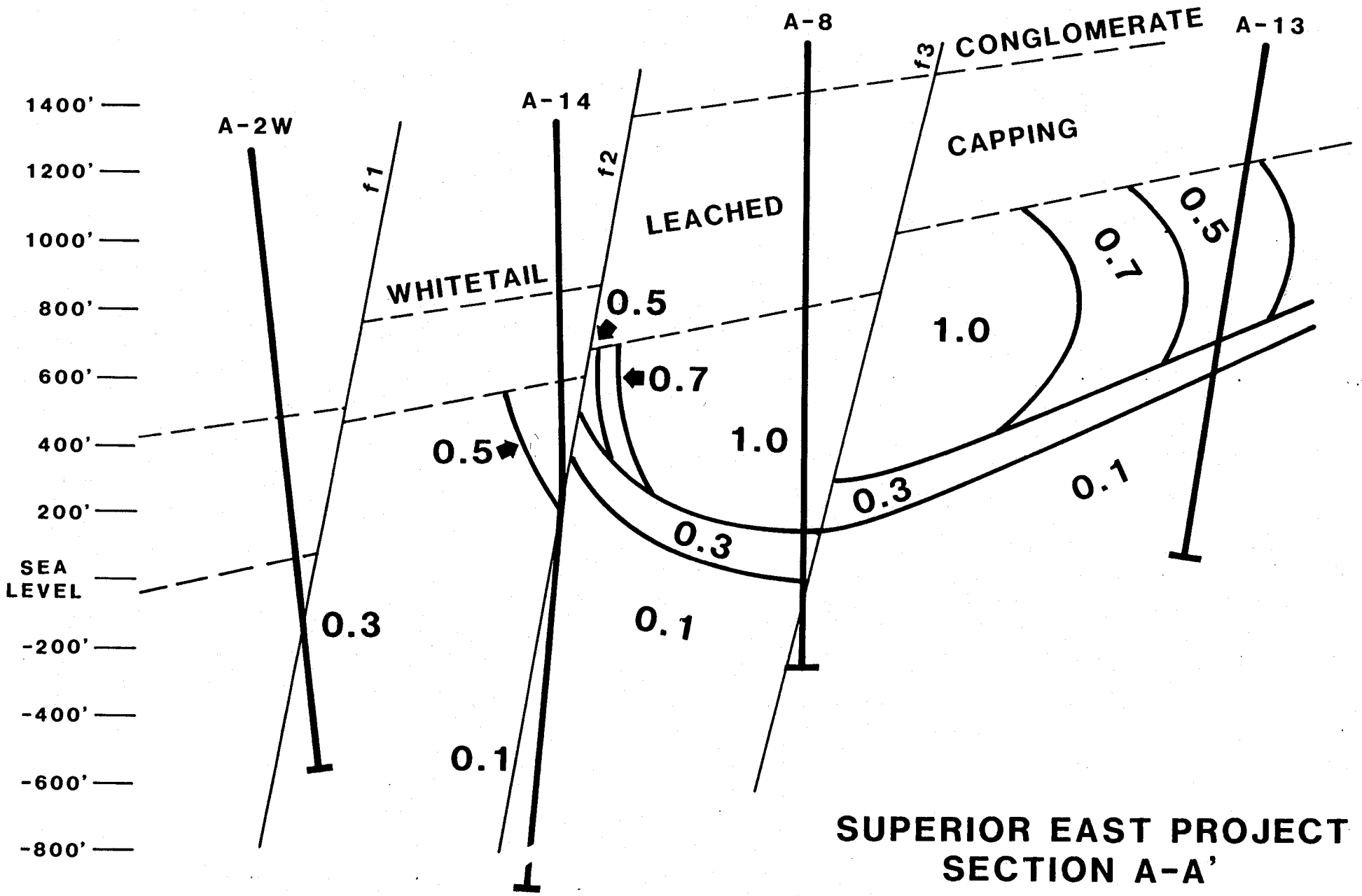


SECTION LINES

1" = 400'

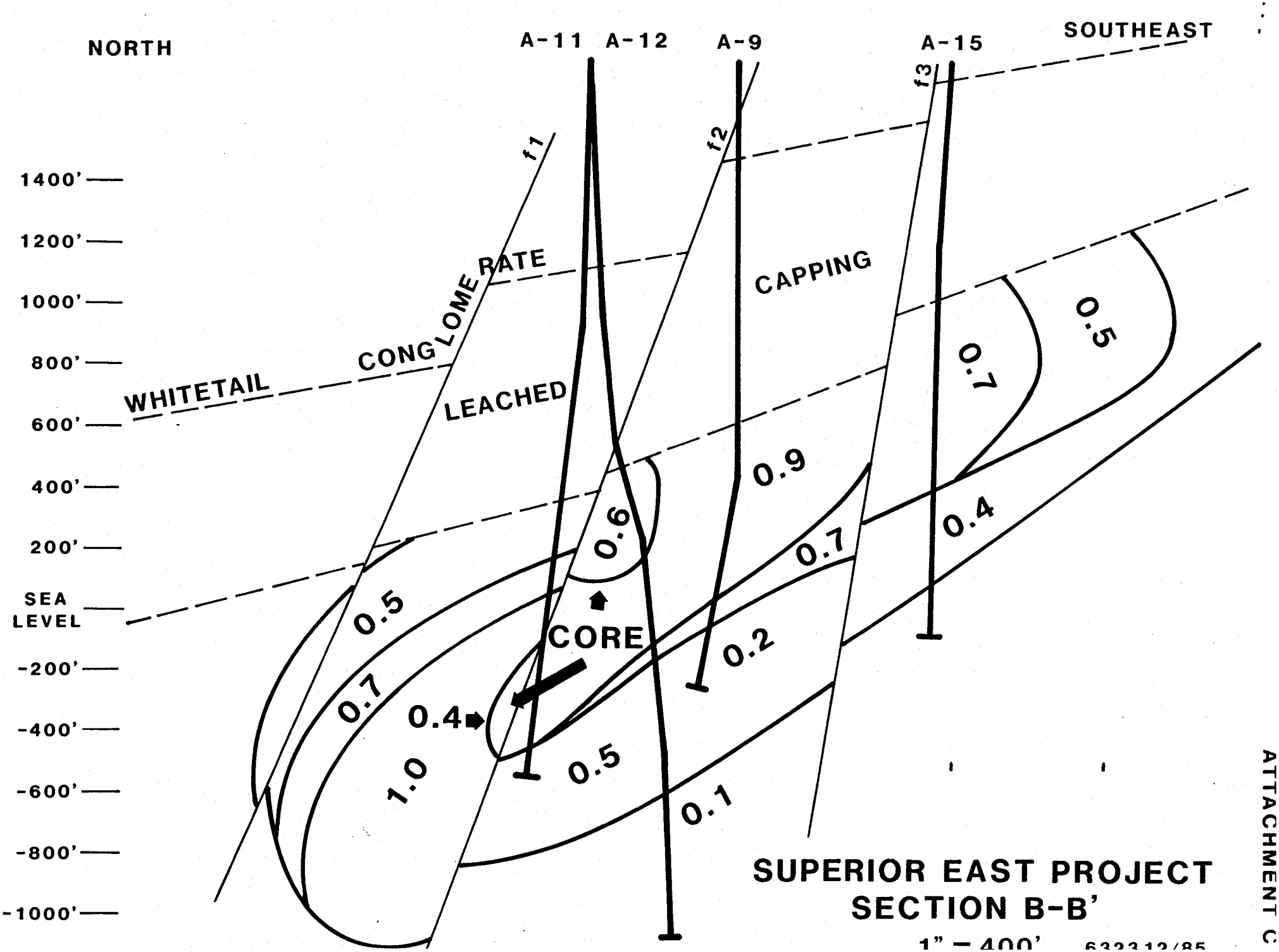
SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

6321 12/85



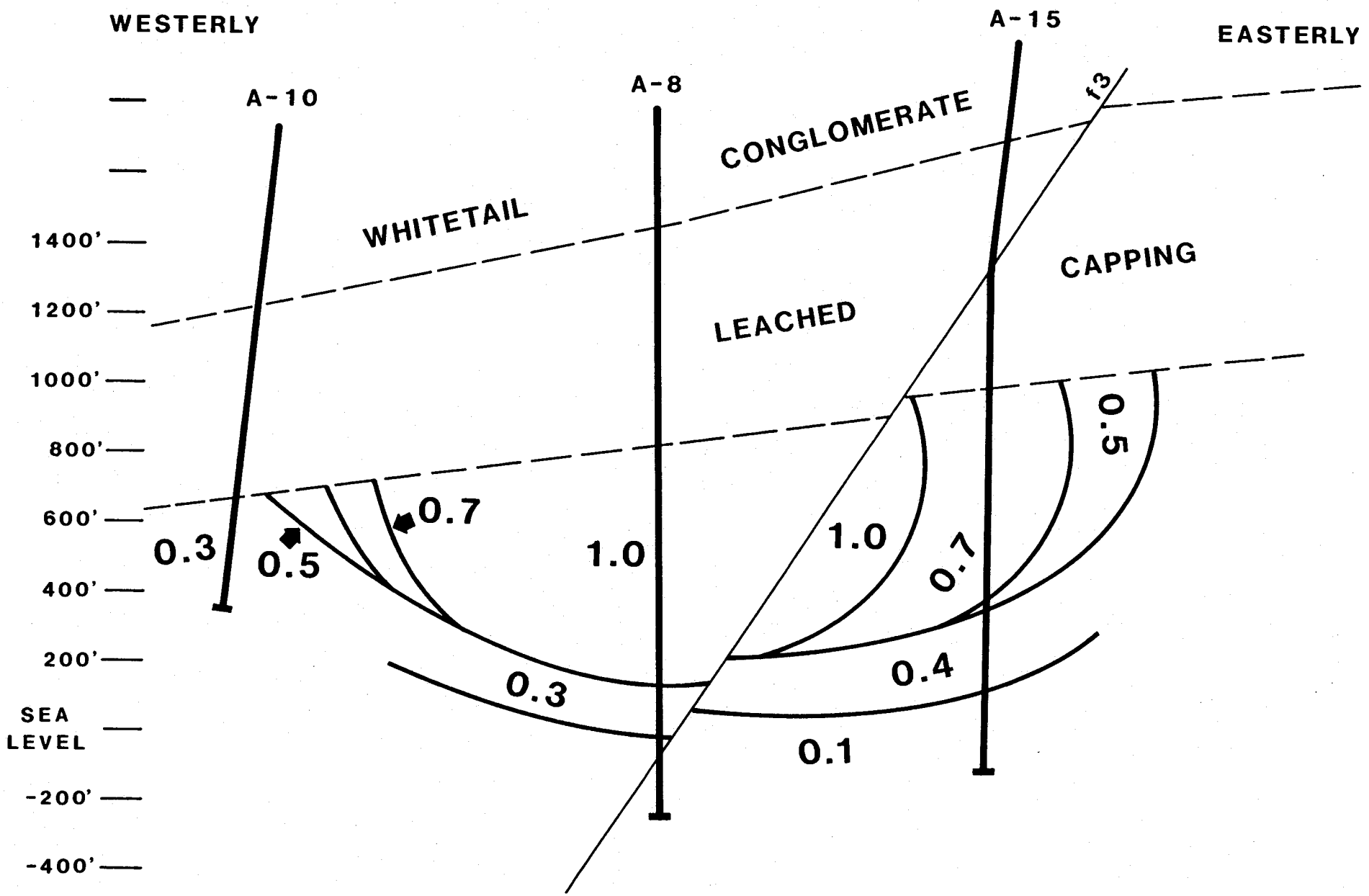
SUPERIOR EAST PROJECT
SECTION A-A'

ATTACHMENT B



SUPERIOR EAST PROJECT
SECTION B-B'
1" = 400'

ATTACHMENT C



SUPERIOR EAST PROJECT
SECTION C-C'

1" = 400'

ATTACHMENT

ASARCO

Southwestern Exploration Division

December 3, 1979

SUPERIOR EAST PROJECT
Pinal County, Arizona

A pro-forma feasibility study has been made which shows the following after tax internal rates of return:

	Project With Property Obligations		
Cu price	$1.00	1.30	1.60
DCFROR	19.29%	27.33%	33.74%

Feasibility was based on the following criteria:

Reserves: Primary orebody - high grade disseminated and fracture vein controlled.

100,000,000 tons @ 1.50% Cu
110,000,000 tons @ 1.36% Cu
} 90% mined grade, 110% mined tons.

Mining: See attached sketch for configuration of orebody (J.D.Sell) with a presumed strike of 4,000', 300' wide and 1,000' thick. Block caving used for a mining system rated at 20,000 tpd with a 16-year life.

Milling: Standard flotation flow sheet for 20,000 tpd producing high grade concentrates.

Capital Costs: See attached estimate by George Percival.

Mine preproduction	$140,300,000
Mill	100,000,000
Engineering	4,000,000
Working Capital	8,700,000
	$253,000,000

NSR: Smelter costs based on predominate bornite concentrates.

Cu price	smelter	grade	tpd	NSR/lb	rec'y	NSR/ton
$1.00	.26	1.36 -	20 -	.74 -	.95	= 19.12
1.30	"	"	"	1.04	"	= 26.87
1.60	"	"	"	1.34	"	= 34.63

>>>

Operating Costs: See attached estimate by George Percival.

	Project with with property obligations		
	Cu $1.00	$1.30	$1.60
Direct mining	3.71	3.71	3.71
Indirect mining	1.48	1.48	1.48
Direct milling	1.49	1.49	1.49
Indirect milling	0.59	0.59	0.59
Management fee	0.05	0.05	0.05
3% royalty	0.57	0.81	1.04
	7.89	8.13	8.36
Without royalty	7.32	7.32	7.32

Also attached are print-outs and work sheets for the above three rates of return.

Property obligations include:

1) 3% NSR to CanUS Ltd upon production until $20,000,000 paid;

2) 0.05 per ton management fee;

3) Mining agreement with Continental Materials based on net profit lease. Net profits shared 80-20% after payback of all pre-mining expenses (including exploration), plus 1% over the prime rate, less $500,000 deductible. This also covers post-mining operation capital costs.

RBC
R. B. Crist.

RBC:jlh
attachments
c.c. W.L.Kurtz
F.T.Graybeal
J.D.Sell
G.Percival

New York, January 2, 1980

MEMORANDUM FOR: Mr. R. L. Hennebach

Arizona
Superior East Project

Attached for general interest is a summary by Mr. Crist which hypothesizes with respect to possible feasibility of the type of copper deposit we are hoping to confirm by further exploration drilling at Superior East. Using very rough assumptions, it would appear that such a deposit might produce a 15% ROI at $1.00 copper, and a considerably better return at higher prices.

It should be clearly understood that the only conclusion which can be drawn from this purely speculative exercise is that further exploration drilling is warranted. Definitive feasibility studies, even of a preliminary nature, would of course require a great deal more engineering work and input, and in any case could not be made until a mineral reserve has been proven and delineated. We hope that the planned drilling for 1980 and 1981 will accomplish this.

Original Signed
T. C. Osborne
T. C. Osborne

Attachments

(Crist memo and attachments)

cc: CFBarber)
RdeJOsborne) w/copy of Crist memo.
NVisnes)

bcc: WLKurtz)
PTGraybeal)
CWCampbell) w/o att.
TEScartaccini)

FROM: W. L. KURTZ

SUPERIOR EAST

To: T C Osborne

Attached is Bob Crist's pro-forma feasibility on Superior East as requested by your letter of August 30, 1974.

This shows what +1% copper can do for you and certainly justifies an accelerated drill program at Superior East.

[signature]

ASARCO

Southwestern Exploration Division

November 27, 1979

Superior East Project
Pinal County, Arizona

A pro-forma feasibility study has been made which shows the following after tax internal rates of return:

	Total Project			Project with Property Obligations		
Cu price	$1.00	1.30	1.60	$1.00	1.30	1.60
DCFROR	16.12%	24.33%	30.74%	15.27%	22.96%	27.95%

Feasibility was based on the following criteria:

Reserves: Primary orebody - high grade disseminated and fracture vein controlled.

100,000,000 tons @ 1.25% Cu
110,000,000 tons @ 1.14% Cu
} 90% mined grade, 110% mined tons.

Mining: See attached sketch for configuation of orebody (J.D.Sell) with a presumed strike of 4,000', 300' wide and 1,000' thick. Block caving used for a mining system rated at 20,000 tpd with a 16-year life.

Milling: Standard flotation flow sheet for 20,000 tpd producing high grade concentrates.

Capital Costs: See attached estimate by George Percival.

Mine preproduction	$140,300,000
Mill	100,000,000
Engineering	4,000,000
Working Capital	8,700,000
	$253,000,000

NSR: See A.J.Kroha's estimate to adjust for George Percival's comment (chalcopyrite concentrates estimated at 0.33/lb smelting).

Cu price	smelter	Grade	tpd	NSR/lb	Rec'y	NSR/ton
$1.00	.26	1.14	20	.74	.95	= 16.03
1.30	"	"	"	1.04	"	= 22.53
1.60	"	"	"	1.34	"	= 29.02

>>>

Operating Costs: See attached estimate by George Percival.

	Total Project per ton	Project with with property obligations Cu $1.00	$1.30	$1.60
Direct mining	$3.71	3.71	3.71	3.71
Indirect "	1.48	1.48	1.48	1.48
Direct milling	1.49	1.49	1.49	1.49
Indirect "	0.59	0.59	0.59	0.59
Management fee	--	0.05	0.05	0.05
3% royalty	--	0.48	0.68	0.87
	$7.27	7.80	8.00	8.19

Also attached are print-outs and work sheets for the above six rates of return and a copy of the initial request.

Property obligations include:

1) 3% NSR to CanUS Ltd upon production until $20,000,000 paid;

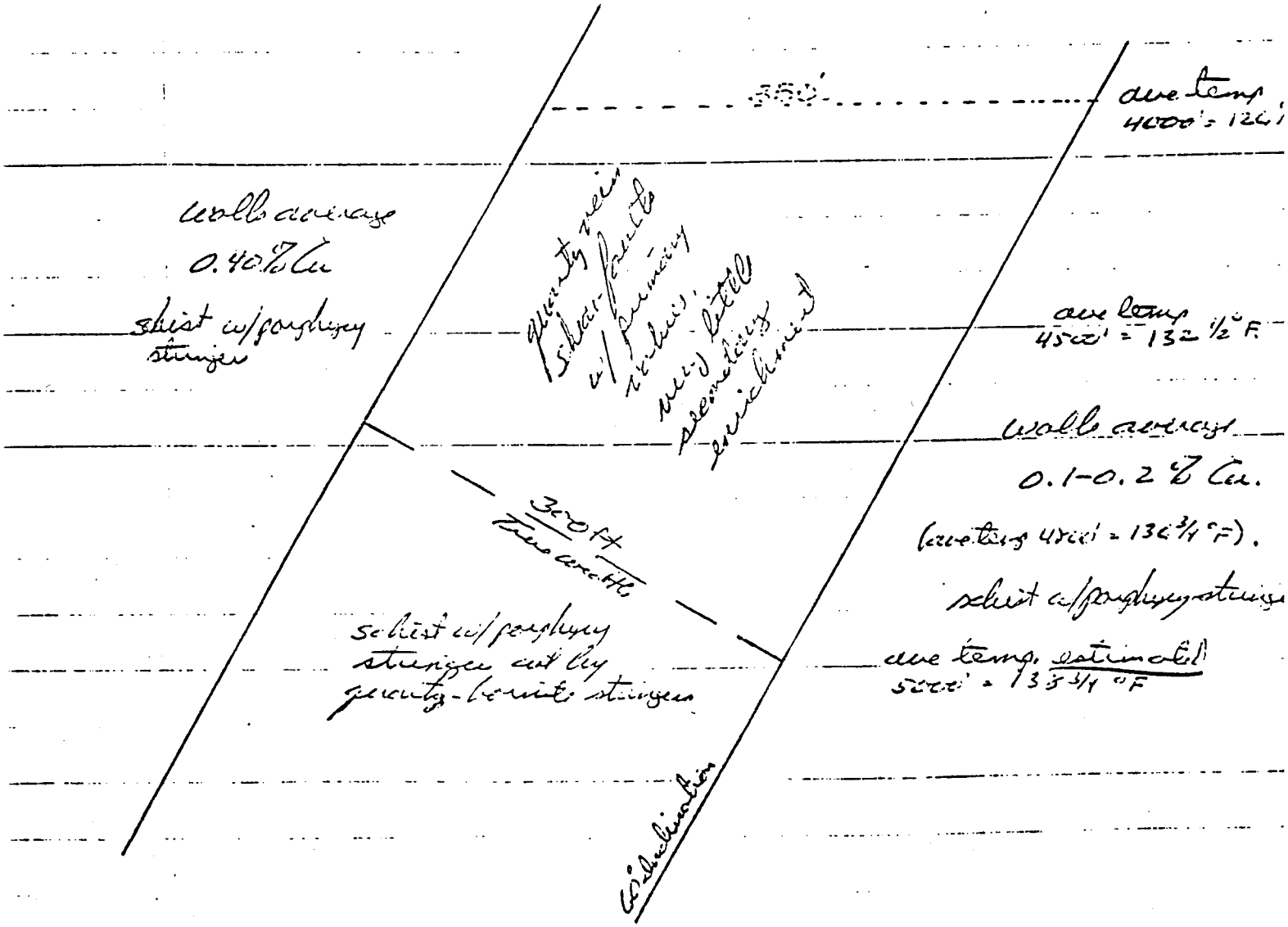
2) 0.05 per ton management fee;

3) Mining agreement with Continental Materials based on net profit lease. Net profits shared 80-20% after payback of all pre-mining expenses (including exploration), plus 1% over the prime rate, less $500,000 deductible. This also covers post-mining operation captial costs.

R.B.C.
R. B. Crist.

RBC:jlh
attachment
c.c. W.L.Kurtz
F.T.Graybeal ✓
J.D.Sell
G.Percival

Top of ore below surface ranges from 3879' to 4262' and 4000' depth on average.



Ag ranges: 0.41 oz/ton, upper values; to 0.75 oz/ton "

Au ranges: 0.009 oz/ton, " " ; to 0.015 oz/ton "

ASARCO

Southwestern Mining Department

November 20, 1979

Mr. R. B. Crist
Tucson Office

SUPERIOR EAST

This study is a quick analysis of the Superior East prospect based on meager information and must not be considered as final. Ore reserves are not fully defined. Under these circumstances opinions can vary considerably but an attempt has been made to establish some cost parameters.

The ore consists of bornite in a quartz vein complex in a schistose rock. The vein does have gougy areas but it is not certain that this material will cave readily but an assumption has been made that block caving will be the mining system as at this time it is doubtful that a more costly system will be feasible.

In general, two production shafts will be sunk to ±5,000 feet with operating levels at the 4,000 and 5,000 elevations. Levels will be interconnected with ramps within the mine to establish a stoping level at 4,500' elevation initially. By preliminary calculations the orebody dips at 60° and this necessitates the shorter caving lift of ±500 feet. Trackless electric equipment will be used throughout the operation wherever possible to alleviate the ventilation problems caused by 140°F temperatures. Electric rail haulage is contemplated on the 5,000' level to the production shafts.

Drainage is considered to be minimal.

The extreme temperatures will necessitate refrigeration and adequate ventilation which will require detailed study.

The Net Smelter Return as listed on the guide sheet should be reviewed with the Smelting Department. The deduction shown is applicable to a chalcopyrite concentrate but not a bornite concentrate which will be much higher grade in copper.

Pre-development costs are not estimated and will include exploration costs, roads, permits, etc.

MINE PRE-PRODUCTION DEVELOPMENT COSTS

Two (2) production shafts 5,000' @ $5,000 (completed with sets, etc.)	-	$ 50,000,000
One (1) service shaft with waste hoisting 5,000 x $4,000	-	20,000,000
Two (2) ventilation raises 4,000' @ $800	-	6,400,000
4,000' level development 12,000' @ $400	-	4,800,000
5,000' level development 18,000' @ $400	-	7,200,000
Inter-level ramps (4,000' level to 5,000' level)	-	1,000,000
Stope preparation (raises, drawpoints, undercutting, etc.)	-	8,000,000
Core drilling 20,000' @ $30	-	600,000
Mine equipment	-	12,000,000
Surface facilities (buildings, headframe, hoists, etc.)	-	19,900,000
Ventilation & refrigeration	-	2,000,000 (?)
Water Supply (wells, delivery, power, distribution, etc.)	-	1,800,000
Tailings disposal	-	2,500,000
Power supply	-	4,100,000
Sub Total		$140,300,000
MILL		
Capital Cost (20,000 tons @ $5,000)	-	$100,000,000
Sub Total	-	$240,300,000
Engineering & Construction Fees	-	$ 4,000,000
Grand Total	-	$244,300,000
WORKING CAPITAL	-	$ 8,700,000
TOTAL	-	$253,000,000

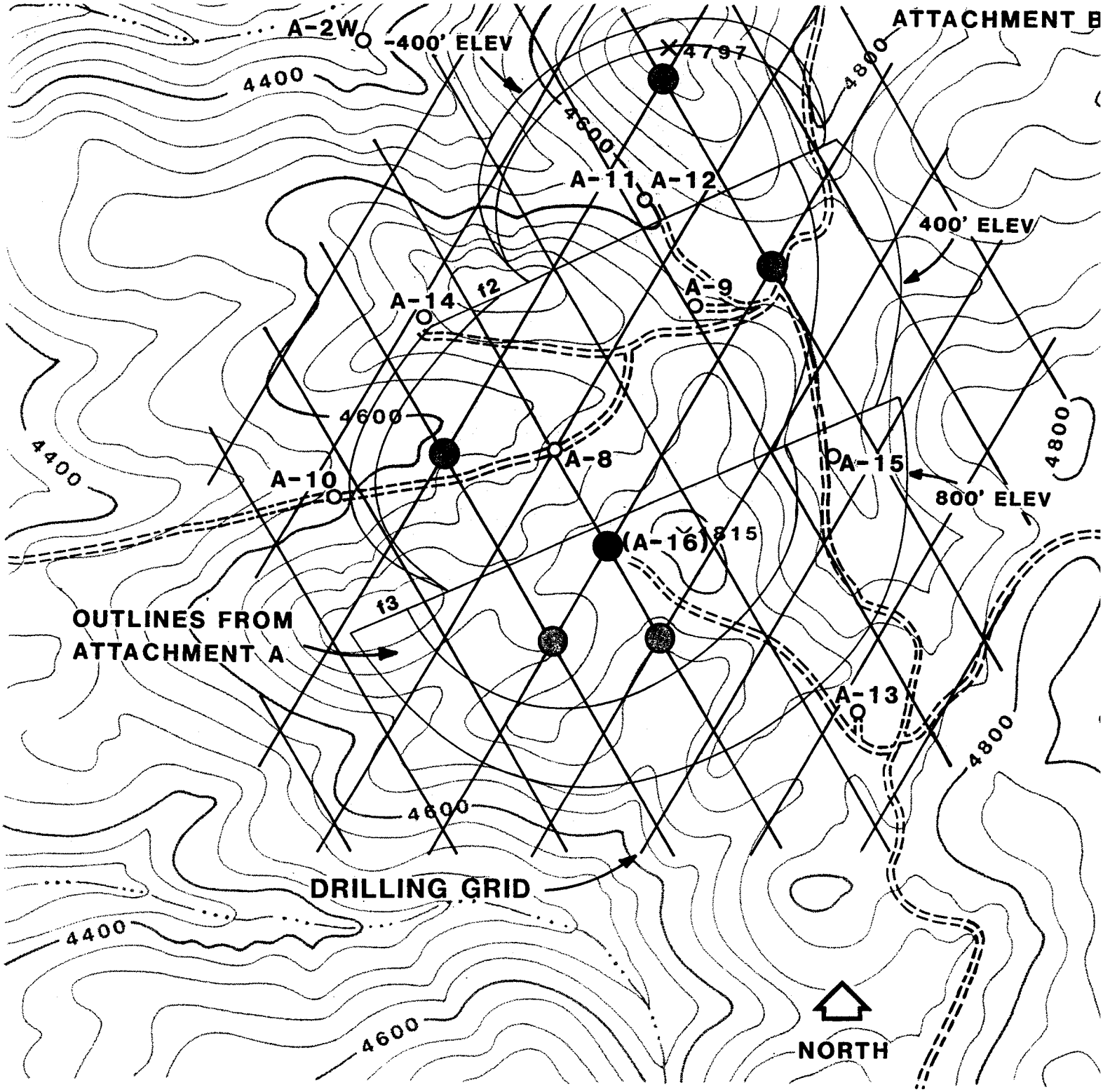
By interpolating information from various sources, the 1979 operating costs for this block caving system are estimated as follows:

Direct Mining	-	$3.71/ton
Indirect "	-	1.48/ton
Direct Milling	-	1.49/ton
Indirect "	-	0.59/ton
Total	-	$7.27/ton

George Percival

GP/mc
attach.

cc: TEScartaccini - w/attach.



- ASARCO hole & designation
- Proposed hole (A-16 prepared)
- Grid site recomendation
- Existing road system

T. 1 S., R. 13 E.

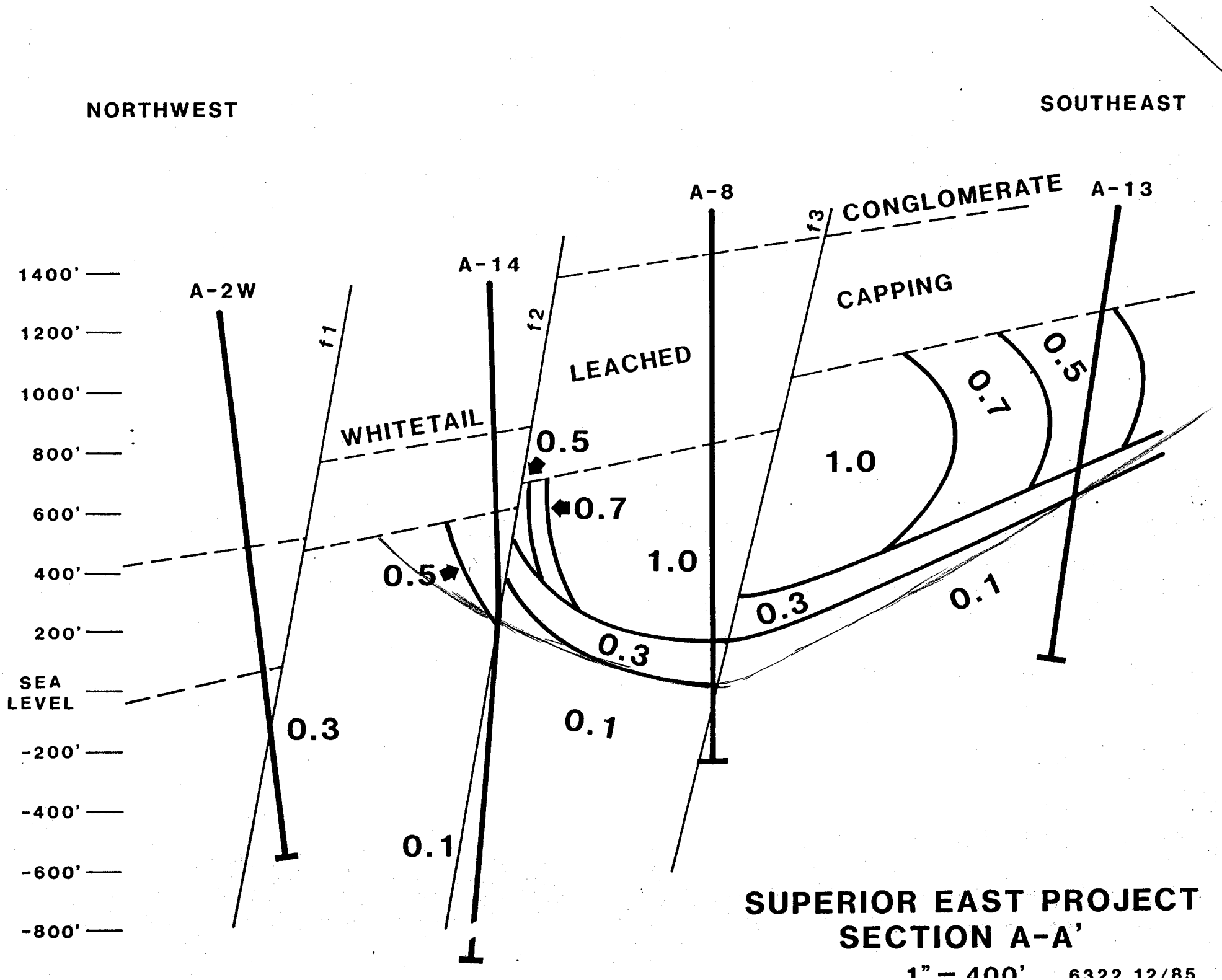
DRILL GRID AND ROADS

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

1" = 500'

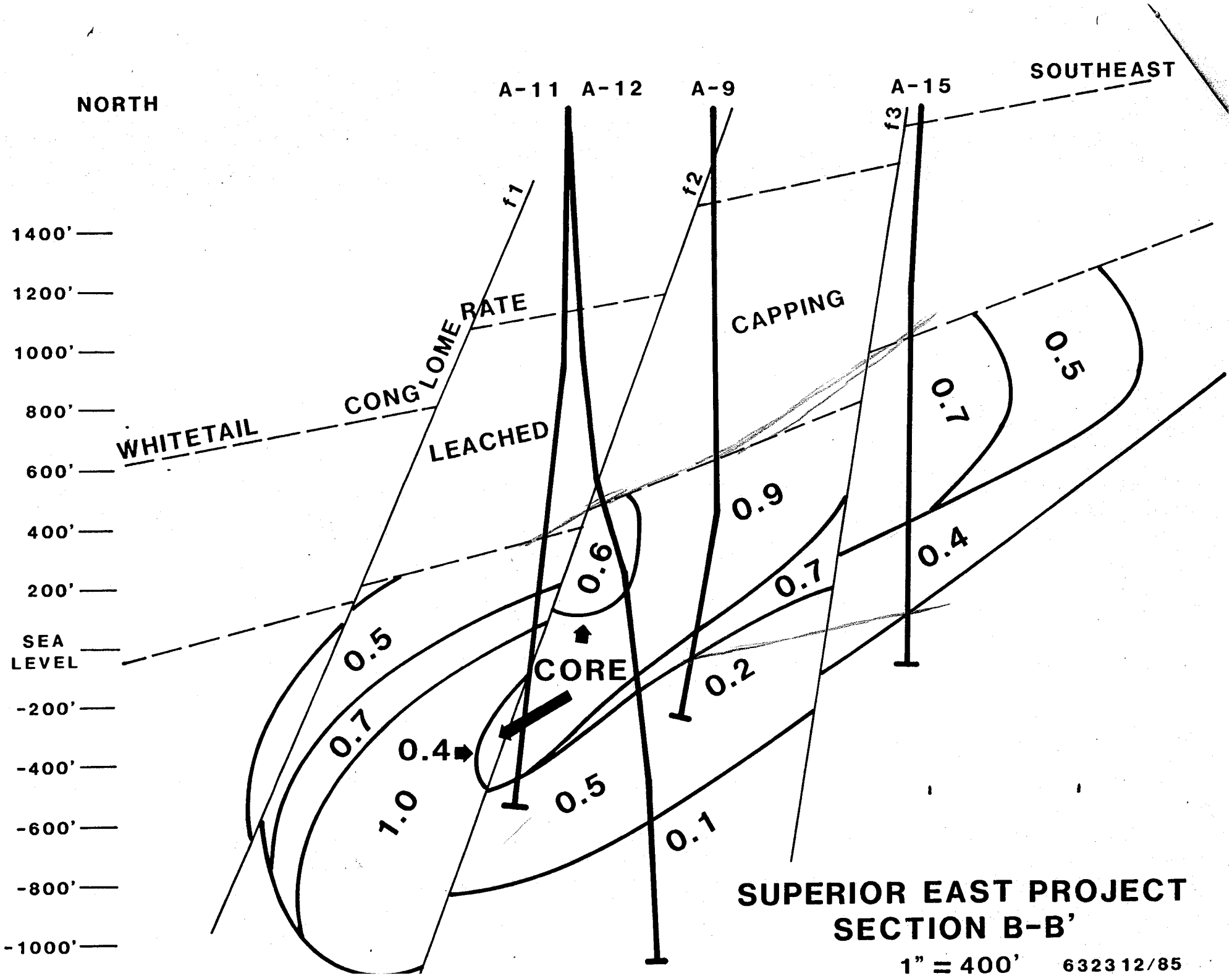
JDS DEC 1985

6341 12/85



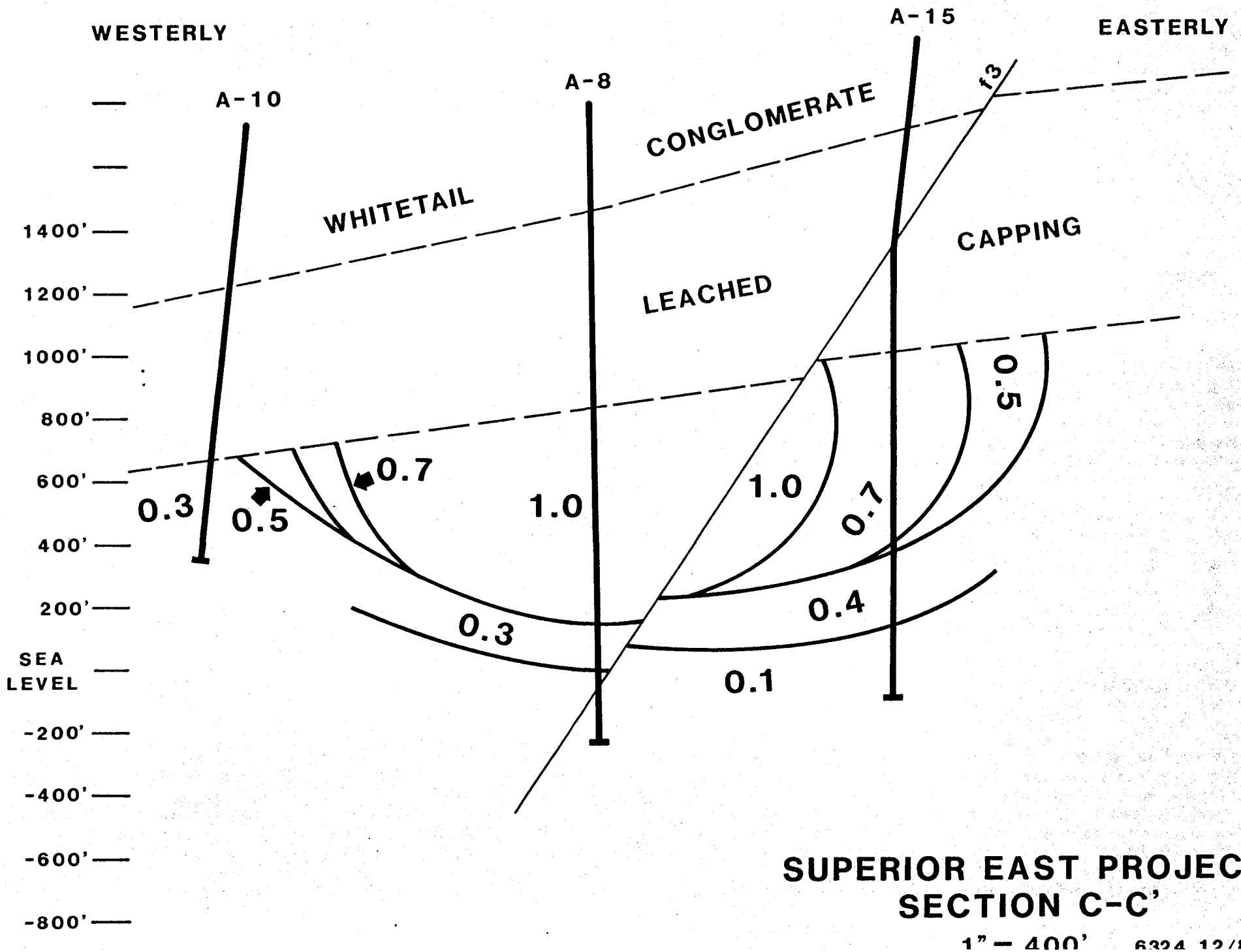
SUPERIOR EAST PROJECT
SECTION A-A'

1" = 400' 6322 12/85



SUPERIOR EAST PROJECT
SECTION B-B'

1" = 400' 632312/85



SUPERIOR EAST PROJECT
SECTION C-C'

1" = 400' 6324 12/85

general abundant biotite. The Lbfp may form some larger masses but generally comprise a myriad of small dikes and sills. The 6) black porphyry is a distinct type and is found as small dikes and sills in a few holes. The hole A-4, near Devil's Canyon and some 6500 feet southwest of hole A-10, encountered black porphyry fragments in the Devil's Canyon fault gouge, which was then followed by 30 feet of Pinal Schist intruded by dikes of black porphyry, followed by 54 feet of massive black porphyry to the total depth. Aplitic phases of the various classifications are also known.

Four cross-section lines have been constructed through the various drill holes. Figure 3 is a plot of the section lines on plan showing the drill hole locations.

Attachment A is the western cross-section A-A', from northwest to southeast, through drill holes A-2W, A-14, A-8, and A-13. Drill hole A-2W was the initial hole to intercept significant quartz-sericite alteration containing disseminated chalcocite mineralization. In hole A-2W 27 feet of leached capping material was under a flat fault, followed by 296 feet of 0.35% copper values. A steep-angled fault was then penetrated (the cross-fault, as designated in later studies) and a low-grade section of 217 feet of 0.18% copper was cut. Values then picked up and 110 feet of 0.42% copper was recovered before the hole was lost by drill rod twist-off. As this was the second time the hole had suffered a twist-off, the hole was abandoned at 4940 feet. The hole is probably at the western edge of the main mineralization, and on the cross-section A-A' the 0.4% copper zone is projected to drop off shortly below where the hole was terminated. However, hole A-2W is the only hole in the project area to be of overall quartz sericite alteration without the quartz sulfide vein zones found elsewhere, and the mineralization is chalcocite with no visible bornite as found elsewhere. It is the only hole in the area which is reminiscent of the "porphyry copper" phyllic alteration as seen in most of the operating open-pits.

Going southerly along the cross-section, the next hole is A-14 which had 81 feet of leached capping below the low angle fault, followed by a thin 173 feet of 0.47% copper (including a base of 21 feet of 1.20% copper), followed by 1469 feet of less than 0.10% copper. This hole is also thought to be fringe-type mineralization to the blanket mineralization, but it does contain bornite-chalcocite in quartz-sulfide veins enclosed by quartz sericite selvage zones.

Further to the southeast is hole A-8 which is the discovery hole of significant thickness and grade--646 feet averaging 1.57% copper. Massive exsolution-textured bornite-chalcocite mineralization as well as a more disseminated form were found in the quartz sulfide veins enclosed in quartz-sericite selvage bands. The sulfide mineralization was found under 102 feet of leached capping below the flat fault. Below the main sulfide intercept is 135 feet of 0.26% copper followed by 247 feet of 0.07% copper to total depth.

Some 1200 feet southeast (at the mineralized horizon level) of hole A-8 is the intercept in hole A-13. This distance is several times the interval than the previous distances between holes. The hole had 237 feet of leached capping below the flat fault, followed by 138 feet of 0.38% copper, and then 392 feet of 0.67% copper was cut. This in turn was followed by 633 feet of overall

very low grade material. Very similar quartz sulfide veins (of bornite-chalcocite), in quartz-sericite alteration halos, were found in hole A-13 as per the previous two holes. This continuation of mineralization type suggests an elongate blanket zone extending from A-14 thru A-8 and beyond A-13 which is 500-650 foot thick containing 0.7 to plus 1.0% copper mineralization.

Along the section A-A', the porphyry types below the flat fault show quartz monzonite types in hole A-2W of about 20-25% of the total footage cut. In hole A-14 the porphyry is of a quartz monzonite porphyry type, with some 40% porphyry material among the top 0.5% copper values, then dropping to about nil for the next 900 feet in low-grade copper values before becoming continuous porphyry for the bottom 556 feet of the hole all of which has very low copper values. Hole A-8 with its excellent grade and thickness had biotite feldspar porphyry units which total around 25% of the aggregate thickness. The southern A-13 hole is back in quartz monzonite porphyry and has a thick 400 foot section of quartz monzonite porphyry (about half of which contains the best mineralized section). Above the massive section, the upper part contains about 50% porphyry material while below is only about 25% porphyry material, all being quartz monzonite.

In contrast to the porphyry distribution below the flat fault, a change is noted in the type and distribution of porphyry in the slide block material above the fault. The slide block is of the A-2 type or leached capping variety. In hole A-2W the slide block is made up of 80% quartz monzonite type, but in hole A-14 it is 25% biotite feldspar porphyry with some aplitic dikes; in hole A-8 it contains only a few granite aplite dikes, and finally in A-13 no porphyry was found in the slide block material. This overall distribution suggests a northwesterly transport direction along the section A-A'.

The low angle fault, along section, is dipping 15°-25° to the northwest and truncates the oxidized, in-place leached capping. The leached capping is 239 feet thick in hole A-13 versus 28 feet thick in hole A-2W.

Offset of the flat fault and the oxide-sulfide contact by the northeast-striking cross fault is suggested to be some 400-500 feet with downdrop on the north.

Attachment B is the eastern cross-section B-B' which also is constructed from northwest to southeast. Section B-B' again starts at hole A-2W, goes southeast through holes A-11, A-12, A-9, then a long 2900 foot interval to hole AI-2.

From the suspected fringe hole of A-2W, the section proceeds across a fault (the cross-fault) to hole A-11 which had 171 feet of oxidized capping under the flat fault. Then there is 291 feet of 0.40% copper, then 533 feet of 1.12% copper, and 89 feet of 0.26% copper to the bottom of the hole. Hole A-12 was a directional-controlled hole, followed by conventional coring in the sulfide zone. Under the flat fault only 103 feet of leached capping was found before 317 feet of 0.64% copper followed by 260 feet of 0.92% copper. As mentioned previously, hole A-12 was continued to cut the projection of the A-11 qsv system at depth but instead encountered 509 feet of 0.46% copper with

a drop-off to 247 feet of 0.11% and 220 feet of 0.02% copper to the total depth. Hole A-12 is the longest intercept yet cut of material averaging in excess of 0.50% copper--having 1086 feet of 0.62% copper average. The hole is similar to A-11 in that a lower grade zone overlies the higher grade zone.

Adjacent to the southeast is hole A-9 which had a very thick section of leached capping under the flat fault. The oxidized zone was 350 feet thick and then the sulfide zone started immediately with a 483 foot length of 0.88% copper, followed by 143 feet of 0.59%, followed by 233 feet of 0.23% copper to the termination of the hole.

In looking at section B-B', this central zone of higher grade values, i.e., the total "ore column," includes 913 feet of 0.81% copper in hole A-11, 577 feet of 0.77% in A-12 (or 1086 feet of 0.62%), and 626 feet of 0.81% copper in hole A-9 (or 859 feet of 0.65%). In detail it appears that the higher grade portion of 0.9% to 1.0% copper climbs from the base of the interval in hole A-11 to the top of the interval in hole A-9.

Hole AI-2 was drilled 2900 feet southeast of hole A-9, and under the flat fault there was 56 feet of leached capping material underlain by 310 feet of 0.37% copper; it bottomed in 452 feet of less than 0.10% copper.

Although weaker alteration-mineralization was found in hole AI-2, the quartz sulfide veins were again present and this is suggestive that the hole is within the major postulated alteration-mineralization zone. The hole contained a lot of brecciated material and was partially oxidized to its total depth. Both features are undoubtedly increased due to the proximity of the major north-trending Rawhide Canyon fault.

The porphyry distribution within the in-place units below the flat fault along section B-B' is as follows: hole A-2W has 20-25% quartz monzonite types. This changes to biotite feldspar porphyry types in the three central "ore" holes [hole A-11 contains around 30%, this decreases to 15% in hole A-12, and to 8% in hole A-9 in the ore zone portion]. The deep, lower portion of hole A-12 has 60-65% biotite feldspar porphyry and is similar to the deep section of hole A-14. The faraway hole AI-2 contains no porphyry types.

Above the flat fault, a thick section of A-2 type leached capping slide block material was found in holes A-2W, A-11, A-12, and A-9. The slide block averaged some 470 feet thick at these points compared to only 177 feet thick in hole AI-2. Only hole A-9 had any (66 feet) of the fresher Schultz granite M-1A type of slide block material. However, it is of interest that within the Whitetail Conglomerate section of hole A-2W is an 80 foot thickness of the M-1A type material apparently emplaced as a landslide derived block.

Porphyry types in the slide block material suggests a change from the 80% quartz monzonite variety in hole A-2W to only 2% biotite feldspar porphyry plus 4% black porphyry in the area of holes A-11 and A-12, and 3% quartz monzonite type in hole A-9, while hole AI-2 had no porphyry. All of the above is in A-2 type slide block material. The M-1A type slide block material in hole A-9 was 63% weakly altered granite type and it is suggested that a similar high percent is found in the M-1A type within the Whitetail Conglomerate in hole A-2W.

The cross-fault structure in section B-B' is suggested to have about 450-500 feet of north-down displacement of the slide block material. This amount is similar to the suggested oxide-sulfide contact displacement as shown previously in section A-A'. However, in section B-B', the oxide-sulfide contact and flat fault have displacements of only 50 and 200 feet. Differential movement along the cross-fault as well as thickness variations of slide block material may account for the apparent changes.

Another fault problem is suggested in the area of holes A-11, A-12, and A-9 where the flat fault is apparently offset some 300 feet (with a similar amount on the top contact of the slide block material) but the oxide-sulfide contact needs only about 50 feet for a match-up. Undoubtedly, more match-up problems will become apparent as the number of data points increases.

In section B-B', note that the thicker section of oxidized leached capping below the flat fault is in the area of holes A-11, A-12, and A-9 where the best underlying alteration-mineralization is also found. This oxidized zone is apparently being truncated by the flat fault both to the northwest in hole A-2W and to the southeast in hole AI-2.

Attachment C is the southern section C-C' from southwest to northeast through the area of drill holes A-10, A-8, A-9, and AI-1.

On the southwest, the hole A-10 below the flat fault had 94 feet of leached capping overlying 58 feet of 0.41% copper, then 168 feet of 0.18%, followed by 70 feet of 0.44%, and 33 feet of 0.07% copper to the bottom of the hole. As the section suggests, hole A-10 is a fringe hole to the better mineralization found to the northeast in hole A-8. There, under the flat fault, 102 feet of leached capping was followed by 646 feet of 1.57% copper, then 135 feet of 0.26%, and 247 feet of 0.07% copper to total depth.

The other good hole, A-9 to the northeast, had a thick 450 feet of leached capping overlying 483 feet of 0.88%, followed by 143 feet of 0.59%, then 233 feet of 0.23% copper to the base of drilling. The two intercepts of A-8 and A-9 compare favorably and it is unknown how far to the northeast the mineralization continues. The next hole northeast of hole A-9 is located 3340 feet away and is designated AI-1. Hole AI-1 had 192 feet of leached capping under the flat fault, followed by 291 feet of 0.14% copper. The Rawhide Canyon fault cut the hole at that point and from there to the bottom of the hole was 438 feet of 0.10% copper.

Along section C-C', the porphyries show some 10% biotite feldspar type and some black porphyry in hole A-10, and both increase in the final 30 feet of the hole. To the northeast, in hole A-8, the biotite feldspar type increases to an average of 25% in the main mineral zone although no porphyry was found in the 102 feet of leached capping below the flat fault. Further northeast, hole A-9 had a lesser amount, 5% to 7%, in the interval from the flat fault on down through the main mineral zone, followed by some increase toward the bottom of the hole. The distant northeast hole AI-1 had about 30% in the leached capping and this decreased to around 10% in the sulfide zone--all as the fresher Schultze granite type. Located 3800 feet further northeast (but not shown on section C-C') is a hole LB-4 which cored essentially fresh Schultze granite from below the dacite at 334 feet to the terminal depth of 4860 feet. A few aplitic dikes also cut this section of granite which is part of the main Schultze stock which extends toward Globe, Arizona.

Along the section C-C', the slide block material above the flat fault is of two types--1) the upper is the M-1A type of essentially fresh Schultze granite: hole A-10 had 30 feet of weakly altered granite, hole A-8 had none, A-9 had 63 feet of altered quartz monzonite type, and hole AI-1 had 396 feet of fresh Schultze granite type; 2) the A-2 type underlies the M-1A type, and is the altered leached capping type material. Considering only the A-2 type of slide block material, hole A-10 had 451 feet containing 25% biotite feldspar porphyry and 2% black porphyry type, hole A-8 had 551 feet with 4% Schultze granite aplite type, and hole A-9 had 354 feet with 3% quartz monzonite type. Hole AI-1 had 396 feet of 41% Schultze granite type. By viewing section C-C', it appears that the porphyry types and distributions reflect only a minor amount of lateral displacement of the slide block material--with a southwestward component relative to the section.

Also along section C-C', the flat fault is viewed as having a gentle dip component of around 5° to the southwest.

Attachment D is the northern section D-D' which extends from the southwest at hole A-10 northeast through holes A-14, A-11, and DCA-3A.

Hole A-10 is a fringe type with the best section being 296 feet of 0.29% copper. Hole A-14 further northeast is only slightly better with 173 feet of sulfide-bearing material averaging 0.47% copper. Continuing northeast, hole A-11 is within the better grade core zone and, under the flat fault, had 176 feet of leached capping followed by 291 feet at 0.40% copper, then 533 feet of 1.12% copper, and finally by 89 feet of 0.26% copper to the bottom of the hole. From inspection of the section D-D', it is expected that good grade copper values will extend for some distance to the northeast. However, by the time the section has traversed 2660 feet northeast of hole A-11 to the hole DCA-3A, the intersection there shows only 20 feet of leached capping material below the flat fault followed by 116 feet of 0.13% copper. The above values are separated from 348 feet of 0.01% below by the trace of a high-angle cross-fault.

Below the flat fault, the porphyry variation along section D-D', starting with the southwestern hole A-10, shows about 10% biotite feldspar porphyry with less than 3% overall of black porphyry. The lower part of A-10 had an increased percentage of biotite feldspar type. To the northeast in hole A-14, nearly 50% quartz monzonite is found in the leached capping and mineralized zone but this proportion drops rapidly to 2% for the next 898 feet; a massive 100% quartz monzonite porphyry mass extends for 556 feet to the bottom of the hole. On to the northeast, in hole A-11, the biotite feldspar porphyry is present as a 25% to 30% component from the flat fault down through the leached capping and mineral zone, and then it drops to 9% in the low grade values which extend to the terminal depth of the hole. The far northeast DCA-3A hole is 100% Schultze granite above the cross fault and only 3% Schultze granite below the cross fault.

Above the flat fault along section D-D' is a variable thickness of A-2 type leached capping and some M-1A type slide block material. Hole A-10 has 29 feet of M-1A type of weakly altered granite material, about 64% by volume, and that is underlain by 451 feet of A-2 type containing about 25% biotite feldspar plus 2% black porphyry. Hole A-14 has a thin 175 feet of A-2 type with again about 25% of the biotite feldspar porphyry type. Hole A-11 to the northeast has 593 feet of A-2 type with a makeup of 4% black porphyry plus 2% of the biotite feldspar porphyry type. Hole DCA-3A has 215 feet of 100% Schultze granite of the leached capping A-2 type. Also in hole DCA-3A are two separate slide blocks bounded by Whitetail Conglomerate. The upper one is 78 feet thick with its upper half being about 50% weakly altered quartz monzonite and the lower half being 100% quartz monzonite. The block also contains some remnant chalcocite and oxide copper values. The second, lower, slide block is 97 feet thick and is 98% quartz monzonite as typical leached capping.

Cross-section D-D' again suggests a westerly component to the offset of leached capping slide block versus the in-place block. The slide blocks within the Whitetail Conglomerate are on the downthrown side of the cross-fault and are derived from an altered-mineralized section of the leached capping system. This adds a suggestion that the mineralization zone extends significantly northeasterly of the A-11, A-9 area of drilling in order to supply the altered blocks to the DCA-3A area.

DISTRIBUTION OF ROCK TYPES

The direction and amount of movement of the slide block along and over the flat fault which lies on in-place units has been discussed in previous reports. With the increased data points a further assessment can be attempted. Table 3 lists the hole numbers, the thickness of material, the percentage of porphyry, and the type of porphyry for the leached capping A-2 type slide block area above the flat fault (Part A), and the same information for the underlying leached capping and the "ore column" interval of the in-place block (Part B).

TABLE 3 - Data of Thickness, % Porphyry, and Porphyry Type at Superior East

A. In A-2 Type Slide Block above Flat Fault

Hole	Thickness, Feet	% Porphyry	Type Porphyry
A-2W	369	81	Lqm
A-8	551	4	Tgr aplite
A-9	357	3	Lqm
A-10	453	25	Lbfp
		2	Black
A-11	593	2	Lbfp
		4	Black
A-12	570	Zero	---
A-13	189	Zero	---
A-14	174	25	Lbfp
AI-1	None (only M-1A type present)		---
AI-2	178	Zero	---
DCA-3A	216	100	Tgr

B. In Leached Capping plus "Ore Column" below Flat Fault in the In-place Block

Hole	Thickness, Feet	% Porphyry	Type Porphyry
A-2W	651	26	Lqm
A-8	883	24	Lbfp
A-9	977	5	Lbfp
A-10	390	10	Lbfp, minor Black
A-11	1001	26	Lbfp
A-12	678	17	Lbfp
A-13	769	72	Lqmp
A-14	254	41	Lqmp
AI-1	921	14	Tgr aplitic
AI-2	366	Zero	---
DCA-3A	136	100	Tgr

These data have been placed on Figure 4 with the in-place block as the base and the slide block as an overlay. Two possible tie areas are noted:
1) the position of the Precambrian Pinal schist-Laramide intrusive contact;
2) the amount and type of porphyry intrusive material.

Only generalizations can be made with the control available, but as a start the percentages have been outlined of the Laramide biotite feldspar porphyry (Lbfp) as this unit appears to be related to the ore zone type. In viewing the base-overlay, the overall suggestion is that the moved block was transported northwesterly to westerly some 500-1000 feet. The schist-intrusive contact was south of A-13 in the in-place block and appears to be north of A-13 in the transported slide block. A review of the distribution of the 25% Lbfp material suggests a more westerly to perhaps southwesterly component. The occurrence of black porphyry was found in hole A-10 in-place units as well as being in slide block material in the same hole A-10 and in the more distant A-11 hole.

ASARCO

Southwestern Exploration Division

December 3, 1979

SUPERIOR EAST PROJECT
Pinal County, Arizona

A pro-forma feasibility study has been made which shows the following after tax internal rates of return:

	Project With Property Obligations		
Cu price	$1.00	1.30	1.60
DCFROR	19.29%	27.33%	33.74%

Feasibility was based on the following criteria:

Reserves: Primary orebody - high grade disseminated and fracture vein controlled.

100,000,000 tons @ 1.50% Cu
110,000,000 tons @ 1.36% Cu
} 90% mined grade, 110% mined tons.

Mining: See attached sketch for configuration of orebody (J.D.Sell) with a presumed strike of 4,000', 300' wide and 1,000' thick. Block caving used for a mining system rated at 20,000 tpd with a 16-year life.

Milling: Standard flotation flow sheet for 20,000 tpd producing high grade concentrates.

Capital Costs: See attached estimate by George Percival.

Mine preproduction	$140,300,000
Mill	100,000,000
Engineering	4,000,000
Working Capital	8,700,000
	$253,000,000

NSR: Smelter costs based on predominate bornite concentrates.

Cu price	smelter	grade	tpd	NSR/lb	rec'y	NSR/ton
$1.00	.26	1.36	20	.74	.95	= 19.12
1.30	"	"	"	1.04	"	= 26.87
1.60	"	"	"	1.34	"	= 34.63

>>>

Operating Costs: See attached estimate by George Percival.

	Project with with property obligations		
	Cu $1.00	$1.30	$1.60
Direct mining	3.71	3.71	3.71
Indirect mining	1.48	1.48	1.48
Direct milling	1.49	1.49	1.49
Indirect milling	0.59	0.59	0.59
Management fee	0.05	0.05	0.05
3% royalty	0.57	0.81	1.04
	7.89	8.13	8.36
Without royalty	7.32	7.32	7.32

Also attached are print-outs and work sheets for the above three rates of return.

Property obligations include:

1) 3% NSR to CanUS Ltd upon production until $20,000,000 paid;

2) 0.05 per ton management fee;

3) Mining agreement with Continental Materials based on net profit lease. Net profits shared 80-20% after payback of all pre-mining expenses (including exploration), plus 1% over the prime rate, less $500,000 deductible. This also covers post-mining operation capital costs.

RBC
R. B. Crist.

RBC:jlh
attachments
c.c. W.L.Kurtz
F.T.Graybeal
J.D.Sell
G.Percival

~~[illegible]~~ - [illegible] → [illegible]
Siles.

RECEIVED

JAN 4 1980

S. W. U. S. EXPL. DIV.

New York, January 2, 1980

MEMORANDUM FOR: Mr. R. L. Hennebach

Arizona
Superior East Project

Attached for general interest is a summary by Mr. Crist which hypothesizes with respect to possible feasibility of the type of copper deposit we are hoping to confirm by further exploration drilling at Superior East. Using very rough assumptions, it would appear that such a deposit might produce a 15% ROI at $1.00 copper, and a considerably better return at higher prices.

It should be clearly understood that the only conclusion which can be drawn from this purely speculative exercise is that further exploration drilling is warranted. Definitive feasibility studies, even of a preliminary nature, would of course require a great deal more engineering work and input, and in any case could not be made until a mineral reserve has been proven and delineated. We hope that the planned drilling for 1980 and 1981 will accomplish this.

Original Signed By
T. C. Osborne
T. C. Osborne

Attachments

(Crist memo and attachments)

cc: CFBarber)
RdeJOsborne) w/copy of Crist memo.
NVisnes)

bcc: WLKurtz)
✓FTGraybeal) w/o att.
CWCampbell)
TEScartaccini)

FROM: W. L. KURTZ

JDSelf → FTG

To: TCOsborne

SUPERIOR EAST

Attached is Bob Christ's pro-forma feasibility on Superior East as requested by your letter of August 30, 1974.

This shows what +1% copper can do for you and certainly justifies an accelerated drill program at Superior East.

[redacted]

ASARCO

Southwestern Exploration Division

November 27, 1979

Superior East Project
Pinal County, Arizona

A pro-forma feasibility study has been made which shows the following after tax internal rates of return:

	Total Project			Project with Property Obligations		
Cu price	$1.00	1.30	1.60	$1.00	1.30	1.60
DCFROR	16.12%	24.33%	30.74%	15.27%	22.96%	27.95%

Feasibility was based on the following criteria:

Reserves: Primary orebody - high grade disseminated and fracture vein controlled.

100,000,000 tons @ 1.25% Cu
110,000,000 tons @ 1.14% Cu
} 90% mined grade, 110% mined tons.

Mining: See attached sketch for configuation of orebody (J.D.Sell) with a presumed strike of 4,000', 300' wide and 1,000' thick. Block caving used for a mining system rated at 20,000 tpd with a 16-year life.

Milling: Standard flotation flow sheet for 20,000 tpd producing high grade concentrates.

Capital Costs: See attached estimate by George Percival.

Mine preproduction	$140,300,000
Mill	100,000,000
Engineering	4,000,000
Working Capital	8,700,000
	$253,000,000

NSR: See A.J.Kroha's estimate to adjust for George Percival's comment (chalcopyrite concentrates estimated at 0.33/lb smelting).

Cu price	smelter	Grade	tpd	NSR/lb	Rec'y	NSR/ton
$1.00	.26	1.14	20	.74	.95	= 16.03
1.30	"	"	"	1.04	"	= 22.53
1.60	"	"	"	1.34	"	= 29.02

>>>

Operating Costs: See attached estimate by George Percival.

	Total Project per ton	Project with with property obligations Cu $1.00	$1.30	$1.60
Direct mining	$3.71	3.71	3.71	3.71
Indirect "	1.48	1.48	1.48	1.48
Direct milling	1.49	1.49	1.49	1.49
Indirect "	0.59	0.59	0.59	0.59
Management fee	--	0.05	0.05	0.05
3% royalty	--	0.48	0.68	0.87
	$7.27	7.80	8.00	8.19

Also attached are print-outs and work sheets for the above six rates of return and a copy of the initial request.

Property obligations include:

1) 3% NSR to CanUS Ltd upon production until $20,000,000 paid;

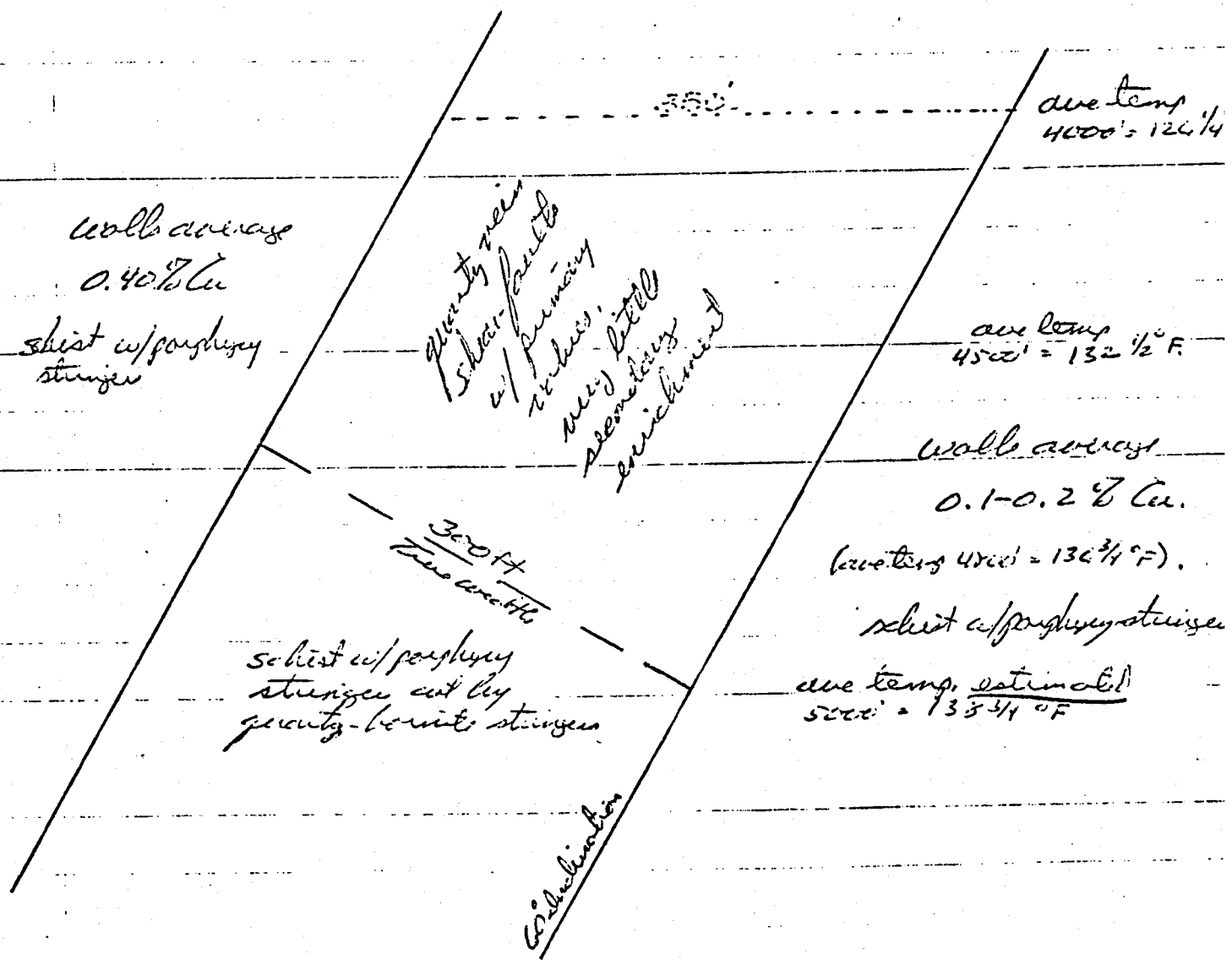
2) 0.05 per ton management fee;

3) Mining agreement with Continental Materials based on net profit lease. Net profits shared 80-20% after payback of all pre-mining expenses (including exploration), plus 1% over the prime rate, less $500,000 deductible. This also covers post-mining operation captial costs.

R.B.C.
R. B. Crist.

RBC:jlh
attachment
c.c. W.L.Kurtz
F.T.Graybeal ✓
J.D.Sell
G.Percival

Top of ore below surface ranges from 3879' to 4262' over 4000' depth of average.



(3 holes) (1 hole)

Ag ranges: 0.41 oz/ton, upper assays; to 0.75 oz/ton deeper

Au ranges: 0.009 oz/ton, " " ; to 0.015 oz/ton " "

ASARCO

Southwestern Mining Department

November 20, 1979

Mr. R. B. Crist
Tucson Office

SUPERIOR EAST

This study is a quick analysis of the Superior East prospect based on meager information and must not be considered as final. Ore reserves are not fully defined. Under these circumstances opinions can vary considerably but an attempt has been made to establish some cost parameters.

The ore consists of bornite in a quartz vein complex in a schistose rock. The vein does have gougy areas but it is not certain that this material will cave readily but an assumption has been made that block caving will be the mining system as at this time it is doubtful that a more costly system will be feasible.

In general, two production shafts will be sunk to ±5,000 feet with operating levels at the 4,000 and 5,000 elevations. Levels will be interconnected with ramps within the mine to establish a stoping level at 4,500' elevation initially. By preliminary calculations the orebody dips at 60° and this necessitates the shorter caving lift of ±500 feet. Trackless electric equipment will be used throughout the operation wherever possible to alleviate the ventilation problems caused by 140°F temperatures. Electric rail haulage is contemplated on the 5,000' level to the production shafts.

Drainage is considered to be minimal.

The extreme temperatures will necessitate refrigeration and adequate ventilation which will require detailed study.

The Net Smelter Return as listed on the guide sheet should be reviewed with the Smelting Department. The deduction shown is applicable to a chalcopyrite concentrate but not a bornite concentrate which will be much higher grade in copper.

Pre-development costs are not estimated and will include exploration costs, roads, permits, etc.

MINE PRE-PRODUCTION DEVELOPMENT COSTS

Two (2) production shafts 5,000' @ $5,000 (completed with sets, etc.)	-	$ 50,000,000
One (1) service shaft with waste hoisting 5,000 x $4,000	-	20,000,000
Two (2) ventilation raises 4,000' @ $800	-	6,400,000
4,000' level development 12,000' @ $400	-	4,800,000
5,000' level development 18,000' @ $400	-	7,200,000
Inter-level ramps (4,000' level to 5,000' level)	-	1,000,000
Stope preparation (raises, drawpoints, undercutting, etc.)	-	8,000,000
Core drilling 20,000' @ $30	-	600,000
Mine equipment	-	12,000,000
Surface facilities (buildings, headframe, hoists, etc.)	-	19,900,000
Ventilation & refrigeration	-	2,000,000 (?)
Water supply (wells, delivery, power, distribution, etc.)	-	1,800,000
Tailings disposal	-	2,500,000
Power supply	-	4,100,000
Sub Total		$140,300,000
MILL		
Capital Cost (20,000 tons @ $5,000)	-	$100,000,000
Sub Total	-	$240,300,000
Engineering & Construction Fees	-	$ 4,000,000
Grand Total	-	$244,300,000
WORKING CAPITAL	-	$ 8,700,000
TOTAL	-	$253,000,000

By interpolating information from various sources, the 1979 operating costs for this block caving system are estimated as follows:

Direct Mining	-	$3.71/ton
Indirect "	-	1.48/ton
Direct Milling	-	1.49/ton
Indirect "	-	0.59/ton
Total	-	$7.27/ton

George Percival

GP/mc
attach.

cc: TEScartaccini - w/attach.

35-37% Cu – concentrate grade

Cu 700-20,97.5% = 663# ($1.00) 663.00

TC = 79.86
RC 633 (.12391) = 78.44 158.30

504.70

$\frac{700 - 663 + 158.30}{700} = 27.90$ ¢/lb

E. SUPERIOR TOTAL PROJECT PROFORMA FEASIBILITY CU 1.00 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-30141.242
3	-45000.000	-33373.270
4	-60000.000	-38320.449
5	-98000.000	-53901.215
6	63936.000	30283.848
7	63936.000	26079.793
8	62996.000	22129.148
9	52345.000	15835.074
10	51127.000	13319.508
11	50061.000	11231.309
12	49129.000	9492.094
13	48313.000	8038.609
14	47599.000	6820.371
15	47599.000	5873.555
16	47599.000	5058.176
17	47599.000	4355.992
18	47599.000	3751.287
19	47599.000	3230.525
20	47599.000	2782.058
21	47599.000	2395.848
TOTAL	569635.000	-58.789

RETURN ON INVESTMENT = 16.120 PCT.

(000 omitted) 11/26/79

Superior East – Total Project
Proforma Feasibility
Cu 1.00 Grade 1.25%

11/2-1/79

YR	CAP. INV NSR	OPR. COST	CASH FLOW Before TAX	DEPREC.	DEPLET.	TAXABLE INCOME	INC TAX	CASH FLOW After TAX
1	-15,000							
2	-35,000							
3	-45,000							
4	-60,000							
5	-98,000							
6	+117,[illegible]	53,871	63,936	31,625	16,161	16,150	7,429	63,936
7				27,672	17,551	18,731	8,616	63,936
8				24,213		22,170	10,198	62,996
9				21,186		25,197	11,591	52,345
10				18,538		27,845	12,809	51,127
11				16,221		30,162	13,875	50,061
12				14,193		32,190	14,807	49,129
13				12,419		33,964	15,623	48,313
14				10,867		35,516	16,337	47,599
15								
16								
17								
18								
19								
20								
21								

2 yr carryover

INV. Tax Credit 10%	25,300	17871	9255	63,936	Return of Cap.
	7,429	8616	[illegible]	920	4.2 yrs
	17,871	9255	-943	63,016	

E. SUPERIOR TOTAL PROJECT PROFORMA FEASIBILITY CU 1.30 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-28150.898
3	-45000.000	-29111.254
4	-60000.000	-31219.352
5	-98000.000	-41013.133
6	111333.000	37475.289
7	84214.000	22799.723
8	82623.000	17991.625
9	81231.000	14227.070
10	80013.000	11271.414
11	78947.000	8944.945
12	78014.000	7109.496
13	77198.000	5658.434
14	76484.000	4509.047
15	76484.000	3626.680
16	76484.000	2916.980
17	76484.000	2346.160
18	76484.000	1887.043
19	76484.000	1517.771
20	76484.000	1220.760
21	76484.000	981.871
TOTAL	1032445.00	-10.196

RETURN ON INVESTMENT = 24.330 PCT.

Proforma Feasibility
Cu 1.30 Grade 1.25%

Yr	Opr Cost	Cash Flow Before Tax	Deprec.	Deplet.	Taxable Income	Inc Tax	Cash Flow After Tax
- 15,000							
- 35,000							
- 45,000							
- 60,000							
- 98,000							
+ 164,442	53,071	111,371	31,625	24,663	55083	25,338	111,333
			27,672		59 036	27,157	84,214
			24,213		62,495	28,748	82,623
			21,186		65,522	30,140	81,231
			18,538		68,170	31,358	80,013
			16,221		70,487	32,424	78,947
			14,193		72,515	33,357	78,014
			12,419		74,289	34,173	77,198
			10,867		75,841	34,887	76,48

Inv. tax credit 25,300

Return of Capital
2.25 yrs.

E. SUPERIOR TOTAL PROJECT PROFORMA FEASIBILITY CU 1.60 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-26770.691
3	-45000.000	-26326.652
4	-60000.000	-26848.867
5	-98000.000	-33542.262
6	140223.000	36709.383
7	113105.000	22648.070
8	111513.000	17079.152
9	110121.000	12900.379
10	108903.000	9758.059
11	107837.000	7390.656
12	106904.000	5604.031
13	106088.000	4253.676
14	105374.000	3231.644
15	105374.000	2471.810
16	105374.000	1890.630
17	105374.000	1446.100
18	105374.000	1106.088
19	105374.000	846.021
20	105374.000	647.102
21	105374.000	494.953
TOTAL	1494686.00	-10.507

RETURN ON INVESTMENT = 30.740 PCT.

Superior EAST - Total Project
Pro forma Feasibility
CO 1.6 Grade 1.25 %

p INV.

NSR	OPR Cost	Cash Flow Before Tax	DEPREC.	DEPLET.	Taxable Income	Inc. Tax	Cash Flow After Tax
-15,000							
-35,000							
-45,000							
-60,000							
-98,000							
+211,878	53,071	158,807	31,625	31,782	95,400	43,884	140,223
			27,672		99,353	45,702	113,105
			24,213		102,812	47,294	111,513
			21,186		105,839	48,686	110,121
			18,538		108,487	49,904	108,903
			16,221		110,804	50,970	107,837
			14,193		112,832	51,903	106,904
			12,419		114,605	52,719	106,088
			10,867		116,158	53,433	105,374

INV. Tax Cred 25,300

Return of Capital

2 yrs.

E. SUPERIOR (WITH OBLIGATIONS) PROFORMA FEAS. CU 1.00 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-30363.508
3	-45000.000	-33867.277
4	-60000.000	-39174.449
5	-98000.000	-55508.773
6	60067.000	29515.855
7	60067.000	25605.855
8	60067.000	22213.816
9	51285.000	16453.617
10	48795.000	13580.953
11	48372.000	11679.730
12	48917.000	10246.660
13	46932.000	8528.555
14	44604.000	7031.762
15	44604.000	6100.254
16	44604.000	5292.145
17	44604.000	4591.086
18	44604.000	3982.899
19	44604.000	3455.278
20	44604.000	2997.551
21	44604.000	2600.462
TOTAL	528334.000	-37.300

RETURN ON INVESTMENT = 15.270 PCT.

11/26/79

Superior East - with Property obligations
Proforma Feasibility
Cu $1.00 Grade 1.25%

CAP INV NSR YR	OPR. COST	Cash Flow Before Tax	ASARCO 80% of Net Profits After Payback of All Pre-mining-including Expln. plus 1% int. over Prime Rate - $500,000 deductible DEPREC. ALL	Depletion 97%-100%	Taxable inc. 80% N.P.	CANUS 3% NSR 3% Deplet $20,000,000 Limit	Cont. Mate 20% N.P $500,000 deductible		ASARCO Inc. TAX	ASARCO Cash Flow After Tax	Payback ACCUM.
1 - 15,000											
2 - 35,000											
3 - 45,000											
4 - 60,000											
5 - 98,100											
6 + 117,002	56,940	60,067	31,625	13,374	14,548	(426) 3,510	500		6,692	60,067	
7			27,672	15,711	16,684	(436) 3,510	-		7,675	60,067	
8			24,213	17,024	18,830	(627) 3,510	-		8,661	60,067	180,201
9			21,186	"	21,857	3,510	-		8,782	51,285	231,486
10			18,538	"	24,505	3,510	-		11,272	48,795	280,281
11	55,884	61,123	16,221	17,182	27,720	(2690) 2,450	-		12,751	48,372	328,650
12	53,436	63,571	14,193	17,551	31,851	-	-		14,654	48,917	377,567
13			12,419		31,410	-	2,190		14449	46,932	(32,433) 410,000
14			10,867		28,122	-	7031		12,936	44,604	
15						-					
16						-					
17						-					
18						-					
19						-					
20						-					
21						-					
						20,006	58,238				

Payback 100% of Net Profits,
less $500,000 for 253,000 Cap.
2000 Expl.

Inv. Tax Credit 25,300.

6692	25,300	10,054
7675	23,028	1,272

E. SUPERIOR (WITH OBLIGATIONS) PROFORMA FEAS. CU 1.30 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-28464.562
3	-45000.000	-29763.602
4	-60000.000	-32274.586
5	-98000.000	-42871.828
6	104532.000	37190.469
7	81713.000	23643.402
8	78612.000	18498.828
9	77220.000	14778.203
10	77857.000	12117.855
11	71178.000	9009.699
12	70027.000	7208.859
13	69019.000	5778.379
14	68137.000	4639.344
15	68137.000	3773.054
16	68137.000	3068.524
17	68137.000	2495.549
18	68137.000	2029.563
19	68137.000	1650.589
20	68137.000	1342.380
21	68137.000	1091.722
TOTAL	922254.000	-57.958

RETURN ON INVESTMENT = 22.960 PCT.

Superior East - with royalty obligation
Proforma Feasibility
Cu $1.30 Grade 1.25%

Cu, Inv.

Yr	NSR	Opr Cost	Cash Flow Before Taxes	ASARCO 80% of Net Profits After Payback of All Pre-Prod. Costs plus 1% over Payment. $500,000 deductible. All Deprec.	(97-100%) Depletion	80% N.P. Taxable Inc.	Canus 3% NSR 3% Depl.	Coal Mtn. 20% N.P. 500,000 - Deduct.	ASARCO Inc. Tax	ASARCO Cash Flow After Tax	Payback Accum.
1 - 15,000		—									
2 - 35,000		—									
3 - 35,000		—									
4 - 6[illegible],000		—									
5 - 78,000		—									
6 - 164,44[illegible]		58,400	106,042	31,625	22,193	5[illegible],718	4,633 2466	500	23,79[illegible]	106,532	
7		"	"	27,612	"	56,171	4,633 "	—	25,839	81,713	
8		"	"	24,213	"	59,690	4,633 "	—	27,430	78,61[illegible]	264,857
9		"	"	21,181	"	62,657	4,633 "	—	28,82[illegible]	77,22[illegible]	3[illegible]2,077
10		55,007	109,435	18,538	24,433	64,604	1,468 238	1,860	27,718	77,657	416,000
11		53,436	111,006	16,221	24,6[illegible]	56,1[illegible]5	—	14,024	25,8[illegible]	71,17[illegible]	
12				14,193		57,718	—	14,429	26,550	70,027	
13				12,419		59,136	—	14,784	27,203	69,019	
14				10,867		60,378	—	15,095	27,774	68,137	
15							—				
16							—				
17							—				
18							—				
19							—				
20							—				
21							—				
							20,000	60,872			

Inv. Tax credit 25,300

E. SUPERIOR (WITH OBLIGATIONS) PROFORMA FEAS. CU 1.60 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-27354.430
3	-45000.000	-27487.285
4	-60000.000	-28643.773
5	-98000.000	-36564.930
6	110588.000	32248.262
7	109040.000	24850.996
8	107448.000	19138.855
9	103645.000	14428.645
10	96033.000	10448.582
11	95172.000	8092.930
12	94019.000	6248.441
13	93012.000	4831.195
14	92130.000	3740.043
15	92130.000	2923.050
16	92130.000	2284.525
17	92130.000	1785.482
18	92130.000	1395.453
19	92130.000	1090.624
20	92130.000	852.382
21	92130.000	666.184
TOTAL	1292997.00	-24.605

RETURN ON INVESTMENT = 27.950 PCT.

11/26/69 Superior East - with property assignments

Proforma Feasibility

Cu 1.60 Grade 1.25 %

ASARCO

80% of N.P. After Payback

#	NSR	OPR Cost	CASH Flow Before Taxes	DEPREC	Depletion	80% N.P. TAXABLE INC.	CANUS 3% NSR 3% DEPL	CONT MTE 20% N.P. (300,000 ded)	ASARCO DUC TAX	ASARCO CASH Flow After Tax	Payback ACCUM
1	-12 000										
2	-35 000										
3	-45 000										
4	-60 000										
5	-98 000										
6	+2 111 875	59 787	152 091	31 625	30,829	89 137	6,356 1043	500	41,003	110,588	
7		"	"	27 672		93,590	6,356 "		43,051	109,[illegible]	245,192
8		"	"	24 213		97,049	6,356 "		44,643	107,448	352,646
9		54 367	157 511	21 186		95,611	932	9,885	43,981	103,645	+[illegible]
10		53 436	158 442	18 538		87,900		21,975	40,434	96,[illegible]	
11				16 221		89,114		22,278	40,992	95,172	
12				14 193		90,736		22,684	41,739	94,[illegible]	
13				12 419		92,153		23,039	42,391	93,012	
14				10 867		93,397		23,349	42,963	92,130	
15											
16											
17											
18											
19											
20											
21											
							20,000	123,912			

Invest Tax Credit 35,200

[illegible] 2,754

ASARCO

RECEIVED

SEP 4 - 1979

EXPLORATION DEPARTMENT

Exploration Department
T. C. Osborne
Vice President

August 30, 1979

Mr. W. L. Kurtz
Tucson Office

Arizona
Superior East Project

Dear Mr. Kurtz:

I'm in agreement with the opinion expressed by Mr. Graybeal's memorandum of August 6 which I know you share, to the effect that exploration of the A-8 discovery has reached the point at which acceleration of drilling is warranted in order to determine tonnage and grade. Although I reserve the right to quibble about details later on, in general you and Mr. Graybeal should plan to include provision for the program in your 1980 budget proposal. I agree two drills should be the minimum during the first year, and we might wish to increase this to three or even four drills during 1981 if the 1980 results are favorable.

We would likely have no difficulty finding a joint venture partner to share cost of the program if we desired, but my initial thought is that the financial commitment is within our capabilities and it will be best to proceed alone.

In considering the proposal, we need a firmer handle on possible economics of the deposit. Therefore, I would like to have from you not later than December 1 a pro forma feasibility outline using horseback figures, for a model of 100 million tons at 1.25% Cu above the 5,000' level. I expect Mr. Skidmore or others in the Mining Department can help you with estimates of development and operating block cave — and capital costs derived from Sacaton studies. The scenario should assume that drilling has been completed and Year 1 starts with development shaft sinking. Use 1979 capital and operating costs and work out potential after-tax internal rates of return for various copper prices. The analysis should show returns both for the total project and for Asarco's share after provision for Continental's net proceeds royalty. If any questions arise, please call.

Very truly yours,

T. C. Osborne

cc: FTGraybeal

ASARCO

Southwestern Exploration Division

March 10, 1982

To: W. D. Payne

From: J. D. Sell

Summary and Interpretation of Drilling Results thru Holes A-14 and AI-2, Porphyry Copper Area-Superior East Project, Pinal County, Arizona

I submit the following report as an update on the geology-alteration-mineralization, and include a preliminary mineral inventory for the porphyry copper exploration area of the Superior East Project. The last report covers the holes A-9 and A-10 (Interim Report, May 30, 1978) and part of hole A-11 (Drilling Thoughts, May 10, 1979; and Thought Reinterpretation, June 6, 1979). Since those reports, holes A-11, A-12, A-13, A-14, and AI-2 have been completed.

SUMMARY

The picture now emerging is one of a major porphyry copper system containing chalcocite-bornite mineralization in a thick blanket-like form which has now been partially outlined by drill holes.

A higher grade core zone, as exemplified by holes A-8, A-9 and A-11, contains values ranging from 0.81% to 1.57% copper over thicknesses of 600 to 800 feet. This core is open to the north, east, and south. The composite zone is about 750 feet wide (NE) by 1300 feet long (NW) and averages 700 feet in thickness with a probable tonnage approaching 54 million tons at an average of 0.95% copper. The central drilled zone may extend to include an additional tonnage of 70 million with a somewhat lower average. Thirteen hundred feet southeast of hole A-8 is hole A-13 which contained 530 feet of 0.58% copper and is probably approaching the cutoff of better mineralization in this direction. Table 1 of the text contains an expanded analysis of the mineral reserve potential which may be in excess of 1500 feet wide and 3000 feet long, with a 200-500 million tons of block caving potential at various cutoff grades.

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ASARCO

Southwestern Exploration Division

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REPORT ON: SUMMARY AND INTERPRETATION OF DRILLING RESULTS, PORPHYRY COPPER AREA, SUPERIOR EAST PROJECT

BY: J. D. Sell

SUMMARY

The mineral inventory and projections of the porphyry copper area are summarized on Figure 1 and in Table 1.

The central core zone outlined by holes A-8, A-9, A-11, and A-12 may contain about 54 million tons at an average grade of 0.95% copper. Based on the contour plot (Fig. 1), it may be expected that an additional 70 million tons of perhaps 0.80% copper will be outlined. This in turn may be surrounded by lower grade material--as per hole A-13 which contains a thickness of 530 feet of 0.58% copper. If this grade material does surround the core zone, it could increase the overall tonnage to exceed 200 million tons. The ultimate grade and position of cutoff values will be determined by future drilling.

A three-hole pattern, A-2W, A-10, and A-14 are apparent limiting holes to the west. These holes have variable mineralized thicknesses ranging from 200-300' to over 600' of 0.3 to 0.4% copper. A fourth indicative hole is AI-2 located over 3000 feet east-southeast of hole A-8. AI-2 contained 310 feet of 0.37% copper and adds credence to the concept of a very large plus 0.3% copper zone as a perimeter around the central mineralization. As calculated in Table 1, this expanded mineralized zone is around 500 million tons of plus 0.5% copper.

RECOMMENDATION

It is recommended that a five-hole program be initiated on an 800 foot equilateral triangular grid (Fig. 2) to the north, east, and south of hole A-8. Holes A-9 and A-13 are in proximity to the 800-foot grid system. The completion of these holes will strongly indicate the overall size and grade potential of this portion of the Superior East Project.

OVERVIEW

The initial hole in the central core area was hole A-8 which encountered sulfides at an elevation of +793 feet above sealevel, i.e., 3879 feet below the drill collar. The sulfide intercept was 646 feet of 1.57% copper followed by 135 feet of 0.26% copper, followed by 247 feet of 0.07% copper. The sulfides were overlain by 102 feet of leached capping type oxidized material terminated by a very low angle fault structure. This in turn was overlain by 551 feet of brecciated and oxidized material of leached capping characteristics

TABLE 1 - Tons and Grade of Probable and Indicated Mineralization, Superior East

Hole Influence*	Probable	Plus	Indicated
A-8, Red	11,200,000 at 1.50		
A-11, Orange	31,600,000 at 0.80	Plus	20,600,000 at 0.80
A-9, A-12, Blue	10,800,000 at 0.80	Plus	50,300,000 at 0.80
Subtotal 1	53,600,000 at 0.95	Plus	70,900,000 at 0.80

1) Total of Subtotal 1: 124,500,000 tons at 0.86% copper

A-13, Green	8,800,000 at 0.60	Plus	79,300,000 at 0.60
Subtotal 2	8,800,000 at 0.60	Plus	79,300,000 at 0.60

2) Total of Subtotal 2: 88,100,000 tons at 0.60% copper

3) Total of Subtotal 1 & 2: 212,600,000 tons at 0.75% copper

A-2, Yellow	36,100,000 at 0.30		
A-10, Yellow	27,100,000 at 0.30	Plus	Remainder of Yellow Area:
A-14, Yellow	5,500,000 at 0.40		184,300,000 at 0.32
AI-2, Yellow	15,400,000 at 0.35		
Subtotal 3	84,100,000 at 0.32	Plus	184,300,000 at 0.32

4) Total of Subtotal 3: 268,400,000 tons at 0.32% copper

5) GRAND TOTAL of Subtotals 1, 2, & 3: 481,000,000 tons at 0.51% copper

*See Figure 1 for location and color scheme of blocks.

which is interpreted to be a transported slide block. The best mineralization is among quartz veins and in quartz-sericite alteration zones collectively called qsv zones (quartz-sulfide vein zones). These zones are inclined steeply ($\pm 70^{\circ}$). Bornite-chalcocite mineralization is most prominent with some secondary chalcocite at the top portion of the sulfide intercept and chalcopyrite becoming noticeable toward the base of the intercept.

The qsv features drop off with depth as does the grade and the concept from holes A-8, A-9, A-10, and A-11 was that various parts of one or more qsv systems had been cut by the drilling. Most holes encountered "ore grade" and qsv features in the sulfide zone immediately under the oxidized capping. However, hole A-11 first had 291 feet of 0.40% copper (as sulfide) prior to cutting 553 feet of 1.12% copper which was followed by 89 feet of 0.26% copper. This finding supported the qsv concept of several high grade (+1% copper) qsv structures separated by lower grade (0.40% copper) material.

At the time, the data points were not sufficient to allow a unique solution as to dip and strike of the qsv system(s) although it was probable that they were striking northeasterly and had a dip either northerly or southerly. Hole A-12 was recommended to be started within hole A-11 and be drilled by directional controlled machines to the south and thus provide an intercept between the qsv structure found in A-9 and the qsv structure found in A-11, or to prove that the qsv was the same, but quite wide, structure.

During the investigation for suitable deviation drills, several contractors were selected and a Dyna-drill contractor was engaged to drill the hole A-12. Difficulties were soon apparent and the contract was terminated before any new information was gained.

Hole A-13 was then drilled some 1500 feet southeasterly from A-8 and again qsv structures were cut and in the sulfide zone 138 feet of 0.32% copper, followed by 392 feet of 0.67% copper, followed by 33 feet of 0.23% copper, followed by 601 feet of 0.05% copper were cut by drilling. The interesting 563 feet of 0.56% copper found suggested either the fortuitous placement of the drill hole to intercept another qsv widely separated from the A-8 area system, or that we were dealing with a more widespread area of mineralization than previously speculated. Concurrently, hole AI-2 located some 2100 feet east-northeast of hole A-13 encountered 310 feet of 0.37% copper, all of which was partially oxidized--probably as a result of being near the projection of the Rawhide Canyon fault. Although totally in Pinal Schist, hole AI-2 nevertheless again suggested widespread mineralization.

Hole A-14 was drilled to provide an intercept central to the triangular pattern established by holes A-8 (southeast), A-10 (southwest) and A-2W (northerly). Under a section of leached and oxidized qsv structures, hole A-14 encountered sulfides of 53 feet at 0.53%, followed by 99 feet at 0.28%, followed by 21 feet at 1.21% (total of 173 feet at 0.47%), followed by 1469 feet which averaged less than 0.05% copper. The finding of the upper 173 feet of qsv type material could be integrated into the pattern of several qsv systems. But when the hole was continued the following 1469 feet and failed

to intercept a projected qsv system cut by A-8 and A-10 to the south, it became very difficult to project qsv systems other than by assigning a south-dipping component.

Interest in a controlled directional hole to the south out of A-11 again became a feasible way to test the orientation and dip direction of the qsv systems. The hole A-12 was reentered by a company using a Navi-drill machine which successfully placed the hole in proximity to the target area about halfway between the A-11 and A-9 intercepts. Under the oxidized cap a sulfide intercept of 577 feet averaging 0.77% copper followed by 509 feet of 0.46% copper was cut by the core drilling. The hole was continued 467 feet in material averaging less than 0.10% copper. Quartz-sulfide veins were again dominant in the portion containing good copper mineralization and on these an oriented core study was undertaken. The core study consistently suggested a southerly component of dip with a northeasterly strike direction to the quartz vein. The schistosity was also oriented and suggested an overall east-northeast strike direction. Assuming this ENE schistosity to be constant, a number of cores were studied from other holes and most suggested southerly dips to the qsv structures--even in hole A-13.

Hole A-12 essentially confirmed the existence of a blanket-like form of chalcocite-bornite mineralization which is mostly within quartz-sericite and quartz vein alteration zones and which is present under a leached-capping type of oxidized material similar to the sulfide zone. This oxide zone is nearly devoid of copper oxides or native copper except very near the upper limits of sulfides.

This blanket is now suggestive of being a part of a large zone of porphyry copper type mineralization of the dimensions and grade described earlier. Continued confirmation should proceed by drilling vertical holes from the surface in an acceptable pattern for evaluation.

DESCRIPTION AND INTERPRETATION OF INTEGRATED DRILL RESULTS

Introduction. Table 2 is a listing of all the drill holes in the porphyry copper area showing: the collar elevation, the depth to the top of the premineral material, the base of the low angle fault, the top of sulfide, the various mineral intercepts, and the total depth of the hole, along with the equivalent altitudes* of those points. Also listed is the amount and type of porphyry units within the above listed intercepts. The porphyry designations will undoubtedly be clarified in further study, but the following general types were noted. 1) Tgr (granite) is the freshest type and is similar to the outcropping Schultze granite, which contains large phenocrysts, found just east of the project area. A weakly altered and small-phenocryst type was designated as 2) Lgr (granite), while more monzonitic units were labeled as 3) Lqm (quartz monzonite) and 4) Lqmp (quartz monzonite porphyry). These are all relatively large masses although dikes of various thickness have been noted. The 5) Lbfp (biotite feldspar porphyry) is the most common type within the main mineralized zone and is a equigranular phenocryst type with

*Ref. mean sea level

general abundant biotite. The Lbfp may form some larger masses but generally comprise a myriad of small dikes and sills. The 6) black porphyry is a distinct type and is found as small dikes and sills in a few holes. The hole A-4, near Devil's Canyon and some 6500 feet southwest of hole A-10, encountered black porphyry fragments in the Devil's Canyon fault gouge, which was then followed by 30 feet of Pinal Schist intruded by dikes of black porphyry, followed by 54 feet of massive black porphyry to the total depth. Aplitic phases of the various classifications are also known.

Four cross-section lines have been constructed through the various drill holes. Figure 3 is a plot of the section lines on plan showing the drill hole locations.

Attachment A is the western cross-section A-A', from northwest to southeast, through drill holes A-2W, A-14, A-8, and A-13. Drill hole A-2W was the initial hole to intercept significant quartz-sericite alteration containing disseminated chalcocite mineralization. In hole A-2W 27 feet of leached capping material was under a flat fault, followed by 296 feet of 0.35% copper values. A steep-angled fault was then penetrated (the cross-fault, as designated in later studies) and a low-grade section of 217 feet of 0.18% copper was cut. Values then picked up and 110 feet of 0.42% copper was recovered before the hole was lost by drill rod twist-off. As this was the second time the hole had suffered a twist-off, the hole was abandoned at 4940 feet. The hole is probably at the western edge of the main mineralization, and on the cross-section A-A' the 0.4% copper zone is projected to drop off shortly below where the hole was terminated. However, hole A-2W is the only hole in the project area to be of overall quartz sericite alteration without the quartz sulfide vein zones found elsewhere, and the mineralization is chalcocite with no visible bornite as found elsewhere. It is the only hole in the area which is reminiscent of the "porphyry copper" phyllic alteration as seen in most of the operating open-pits.

Going southerly along the cross-section, the next hole is A-14 which had 81 feet of leached capping below the low angle fault, followed by a thin 173 feet of 0.47% copper (including a base of 21 feet of 1.20% copper), followed by 1469 feet of less than 0.10% copper. This hole is also thought to be fringe-type mineralization to the blanket mineralization, but it does contain bornite-chalcocite in quartz-sulfide veins enclosed by quartz sericite selvage zones.

Further to the southeast is hole A-8 which is the discovery hole of significant thickness and grade--646 feet averaging 1.57% copper. Massive exsolution-textured bornite-chalcocite mineralization as well as a more disseminated form were found in the quartz sulfide veins enclosed in quartz-sericite selvage bands. The sulfide mineralization was found under 102 feet of leached capping below the flat fault. Below the main sulfide intercept is 135 feet of 0.26% copper followed by 247 feet of 0.07% copper to total depth.

Some 1200 feet southeast (at the mineralized horizon level) of hole A-8 is the intercept in hole A-13. This distance is several times the interval than the previous distances between holes. The hole had 237 feet of leached capping below the flat fault, followed by 138 feet of 0.38% copper, and then 392 feet of 0.67% copper was cut. This in turn was followed by 633 feet of overall

very low grade material. Very similar quartz sulfide veins (of bornite-chalcocite), in quartz-sericite alteration halos, were found in hole A-13 as per the previous two holes. This continuation of mineralization type suggests an elongate blanket zone extending from A-14 thru A-8 and beyond A-13 which is 500-650 foot thick containing 0.7 to plus 1.0% copper mineralization.

Along the section A-A', the porphyry types below the flat fault show quartz monzonite types in hole A-2W of about 20-25% of the total footage cut. In hole A-14 the porphyry is of a quartz monzonite porphyry type, with some 40% porphyry material among the top 0.5% copper values, then dropping to about nil for the next 900 feet in low-grade copper values before becoming continuous porphyry for the bottom 556 feet of the hole all of which has very low copper values. Hole A-8 with its excellent grade and thickness had biotite feldspar porphyry units which total around 25% of the aggregate thickness. The southern A-13 hole is back in quartz monzonite porphyry and has a thick 400 foot section of quartz monzonite porphyry (about half of which contains the best mineralized section). Above the massive section, the upper part contains about 50% porphyry material while below is only about 25% porphyry material, all being quartz monzonite.

In contrast to the porphyry distribution below the flat fault, a change is noted in the type and distribution of porphyry in the slide block material above the fault. The slide block is of the A-2 type or leached capping variety. In hole A-2W the slide block is made up of 80% quartz monzonite type, but in hole A-14 it is 25% biotite feldspar porphyry with some aplitic dikes; in hole A-8 it contains only a few granite aplite dikes, and finally in A-13 no porphyry was found in the slide block material. This overall distribution suggests a northwesterly transport direction along the section A-A'.

The low angle fault, along section, is dipping 15°-25° to the northwest and truncates the oxidized, in-place leached capping. The leached capping is 239 feet thick in hole A-13 versus 28 feet thick in hole A-2W.

Offset of the flat fault and the oxide-sulfide contact by the northeast-striking cross fault is suggested to be some 400-500 feet with downdrop on the north.

Attachment B is the eastern cross-section B-B' which also is constructed from northwest to southeast. Section B-B' again starts at hole A-2W, goes southeast through holes A-11, A-12, A-9, then a long 2900 foot interval to hole AI-2.

From the suspected fringe hole of A-2W, the section proceeds across a fault (the cross-fault) to hole A-11 which had 171 feet of oxidized capping under the flat fault. Then there is 291 feet of 0.40% copper, then 533 feet of 1.12% copper, and 89 feet of 0.26% copper to the bottom of the hole. Hole A-12 was a directional-controlled hole, followed by conventional coring in the sulfide zone. Under the flat fault only 103 feet of leached capping was found before 317 feet of 0.64% copper followed by 260 feet of 0.92% copper. As mentioned previously, hole A-12 was continued to cut the projection of the A-11 qsv system at depth but instead encountered 509 feet of 0.46% copper with

a drop-off to 247 feet of 0.11% and 220 feet of 0.02% copper to the total depth. Hole A-12 is the longest intercept yet cut of material averaging in excess of 0.50% copper--having 1086 feet of 0.62% copper average. The hole is similar to A-11 in that a lower grade zone overlies the higher grade zone.

Adjacent to the southeast is hole A-9 which had a very thick section of leached capping under the flat fault. The oxidized zone was 350 feet thick and then the sulfide zone started immediately with a 483 foot length of 0.88% copper, followed by 143 feet of 0.59%, followed by 233 feet of 0.23% copper to the termination of the hole.

In looking at section B-B', this central zone of higher grade values, i.e., the total "ore column," includes 913 feet of 0.81% copper in hole A-11, 577 feet of 0.77% in A-12 (or 1086 feet of 0.62%), and 626 feet of 0.81% copper in hole A-9 (or 859 feet of 0.65%). In detail it appears that the higher grade portion of 0.9% to 1.0% copper climbs from the base of the interval in hole A-11 to the top of the interval in hole A-9.

Hole AI-2 was drilled 2900 feet southeast of hole A-9, and under the flat fault there was 56 feet of leached capping material underlain by 310 feet of 0.37% copper; it bottomed in 452 feet of less than 0.10% copper.

Although weaker alteration-mineralization was found in hole AI-2, the quartz sulfide veins were again present and this is suggestive that the hole is within the major postulated alteration-mineralization zone. The hole contained a lot of brecciated material and was partially oxidized to its total depth. Both features are undoubtedly increased due to the proximity of the major north-trending Rawhide Canyon fault.

The porphyry distribution within the in-place units below the flat fault along section B-B' is as follows: hole A-2W has 20-25% quartz monzonite types. This changes to biotite feldspar porphyry types in the three central "ore" holes [hole A-11 contains around 30%, this decreases to 15% in hole A-12, and to 8% in hole A-9 in the ore zone portion]. The deep, lower portion of hole A-12 has 60-65% biotite feldspar porphyry and is similar to the deep section of hole A-14. The faraway hole AI-2 contains no porphyry types.

Above the flat fault, a thick section of A-2 type leached capping slide block material was found in holes A-2W, A-11, A-12, and A-9. The slide block averaged some 470 feet thick at these points compared to only 177 feet thick in hole AI-2. Only hole A-9 had any (66 feet) of the fresher Schultz granite M-1A type of slide block material. However, it is of interest that within the Whitetail Conglomerate section of hole A-2W is an 80 foot thickness of the M-1A type material apparently emplaced as a landslide derived block.

Porphyry types in the slide block material suggests a change from the 80% quartz monzonite variety in hole A-2W to only 2% biotite feldspar porphyry plus 4% black porphyry in the area of holes A-11 and A-12, and 3% quartz monzonite type in hole A-9, while hole AI-2 had no porphyry. All of the above is in A-2 type slide block material. The M-1A type slide block material in hole A-9 was 63% weakly altered granite type and it is suggested that a similar high percent is found in the M-1A type within the Whitetail Conglomerate in hole A-2W.

The cross-fault structure in section B-B' is suggested to have about 450-500 feet of north-down displacement of the slide block material. This amount is similar to the suggested oxide-sulfide contact displacement as shown previously in section A-A'. However, in section B-B', the oxide-sulfide contact and flat fault have displacements of only 50 and 200 feet. Differential movement along the cross-fault as well as thickness variations of slide block material may account for the apparent changes.

Another fault problem is suggested in the area of holes A-11, A-12, and A-9 where the flat fault is apparently offset some 300 feet (with a similar amount on the top contact of the slide block material) but the oxide-sulfide contact needs only about 50 feet for a match-up. Undoubtedly, more match-up problems will become apparent as the number of data points increases.

In section B-B', note that the thicker section of oxidized leached capping below the flat fault is in the area of holes A-11, A-12, and A-9 where the best underlying alteration-mineralization is also found. This oxidized zone is apparently being truncated by the flat fault both to the northwest in hole A-2W and to the southeast in hole AI-2.

Attachment C is the southern section C-C' from southwest to northeast through the area of drill holes A-10, A-8, A-9, and AI-1.

On the southwest, the hole A-10 below the flat fault had 94 feet of leached capping overlying 58 feet of 0.41% copper, then 168 feet of 0.18%, followed by 70 feet of 0.44%, and 33 feet of 0.07% copper to the bottom of the hole. As the section suggests, hole A-10 is a fringe hole to the better mineralization found to the northeast in hole A-8. There, under the flat fault, 102 feet of leached capping was followed by 646 feet of 1.57% copper, then 135 feet of 0.26%, and 247 feet of 0.07% copper to total depth.

The other good hole, A-9 to the northeast, had a thick 450 feet of leached capping overlying 483 feet of 0.88%, followed by 143 feet of 0.59%, then 233 feet of 0.23% copper to the base of drilling. The two intercepts of A-8 and A-9 compare favorably and it is unknown how far to the northeast the mineralization continues. The next hole northeast of hole A-9 is located 3340 feet away and is designated AI-1. Hole AI-1 had 192 feet of leached capping under the flat fault, followed by 291 feet of 0.14% copper. The Rawhide Canyon fault cut the hole at that point and from there to the bottom of the hole was 438 feet of 0.10% copper.

Along section C-C', the porphyries show some 10% biotite feldspar type and some black porphyry in hole A-10, and both increase in the final 30 feet of the hole. To the northeast, in hole A-8, the biotite feldspar type increases to an average of 25% in the main mineral zone although no porphyry was found in the 102 feet of leached capping below the flat fault. Further northeast, hole A-9 had a lesser amount, 5% to 7%, in the interval from the flat fault on down through the main mineral zone, followed by some increase toward the bottom of the hole. The distant northeast hole AI-1 had about 30% in the leached capping and this decreased to around 10% in the sulfide zone--all as the fresher Schultze granite type. Located 3800 feet further northeast (but not shown on section C-C') is a hole LB-4 which cored essentially fresh Schultze granite from below the dacite at 334 feet to the terminal depth of 4860 feet. A few aplitic dikes also cut this section of granite which is part of the main Schultze stock which extends toward Globe, Arizona.

Along the section C-C', the slide block material above the flat fault is of two types--1) the upper is the M-1A type of essentially fresh Schultze granite: hole A-10 had 30 feet of weakly altered granite, hole A-8 had none, A-9 had 63 feet of altered quartz monzonite type, and hole AI-1 had 396 feet of fresh Schultze granite type; 2) the A-2 type underlies the M-1A type, and is the altered leached capping type material. Considering only the A-2 type of slide block material, hole A-10 had 451 feet containing 25% biotite feldspar porphyry and 2% black porphyry type, hole A-8 had 551 feet with 4% Schultze granite aplite type, and hole A-9 had 354 feet with 3% quartz monzonite type. Hole AI-1 had 396 feet of 41% Schultze granite type. By viewing section C-C', it appears that the porphyry types and distributions reflect only a minor amount of lateral displacement of the slide block material--with a southwestward component relative to the section.

Also along section C-C', the flat fault is viewed as having a gentle dip component of around 5° to the southwest.

Attachment D is the northern section D-D' which extends from the southwest at hole A-10 northeast through holes A-14, A-11, and DCA-3A.

Hole A-10 is a fringe type with the best section being 296 feet of 0.29% copper. Hole A-14 further northeast is only slightly better with 173 feet of sulfide-bearing material averaging 0.47% copper. Continuing northeast, hole A-11 is within the better grade core zone and, under the flat fault, had 176 feet of leached capping followed by 291 feet at 0.40% copper, then 533 feet of 1.12% copper, and finally by 89 feet of 0.26% copper to the bottom of the hole. From inspection of the section D-D', it is expected that good grade copper values will extend for some distance to the northeast. However, by the time the section has traversed 2660 feet northeast of hole A-11 to the hole DCA-3A, the intersection there shows only 20 feet of leached capping material below the flat fault followed by 116 feet of 0.13% copper. The above values are separated from 348 feet of 0.01% below by the trace of a high-angle cross-fault.

Below the flat fault, the porphyry variation along section D-D', starting with the southwestern hole A-10, shows about 10% biotite feldspar porphyry with less than 3% overall of black porphyry. The lower part of A-10 had an increased percentage of biotite feldspar type. To the northeast in hole A-14, nearly 50% quartz monzonite is found in the leached capping and mineralized zone but this proportion drops rapidly to 2% for the next 898 feet; a massive 100% quartz monzonite porphyry mass extends for 556 feet to the bottom of the hole. On to the northeast, in hole A-11, the biotite feldspar porphyry is present as a 25% to 30% component from the flat fault down through the leached capping and mineral zone, and then it drops to 9% in the low grade values which extend to the terminal depth of the hole. The far northeast DCA-3A hole is 100% Schultze granite above the cross fault and only 3% Schultze granite below the cross fault.

Above the flat fault along section D-D' is a variable thickness of A-2 type leached capping and some M-1A type slide block material. Hole A-10 has 29 feet of M-1A type of weakly altered granite material, about 64% by volume, and that is underlain by 451 feet of A-2 type containing about 25% biotite feldspar plus 2% black porphyry. Hole A-14 has a thin 175 feet of A-2 type with again about 25% of the biotite feldspar porphyry type. Hole A-11 to the northeast has 593 feet of A-2 type with a makeup of 4% black porphyry plus 2% of the biotite feldspar porphyry type. Hole DCA-3A has 215 feet of 100% Schultze granite of the leached capping A-2 type. Also in hole DCA-3A are two separate slide blocks bounded by Whitetail Conglomerate. The upper one is 78 feet thick with its upper half being about 50% weakly altered quartz monzonite and the lower half being 100% quartz monzonite. The block also contains some remnant chalcocite and oxide copper values. The second, lower, slide block is 97 feet thick and is 98% quartz monzonite as typical leached capping.

Cross-section D-D' again suggests a westerly component to the offset of leached capping slide block versus the in-place block. The slide blocks within the Whitetail Conglomerate are on the downthrown side of the cross-fault and are derived from an altered-mineralized section of the leached capping system. This adds a suggestion that the mineralization zone extends significantly northeasterly of the A-11, A-9 area of drilling in order to supply the altered blocks to the DCA-3A area.

DISTRIBUTION OF ROCK TYPES

The direction and amount of movement of the slide block along and over the flat fault which lies on in-place units has been discussed in previous reports. With the increased data points a further assessment can be attempted. Table 3 lists the hole numbers, the thickness of material, the percentage of porphyry, and the type of porphyry for the leached capping A-2 type slide block area above the flat fault (Part A), and the same information for the underlying leached capping and the "ore column" interval of the in-place block (Part B).

TABLE 3 - Data of Thickness, % Porphyry, and Porphyry Type at Superior East

A. In A-2 Type Slide Block above Flat Fault

Hole	Thickness, Feet	% Porphyry	Type Porphyry
A-2W	369	81	Lqm
A-8	551	4	Tgr aplite
A-9	357	3	Lqm
A-10	453	25	Lbfp
		2	Black
A-11	593	2	Lbfp
		4	Black
A-12	570	Zero	---
A-13	189	Zero	---
A-14	174	25	Lbfp
AI-1	None (only M-1A type present)		---
AI-2	178	Zero	---
DCA-3A	216	100	Tgr

B. In Leached Capping plus "Ore Column" below Flat Fault in the In-place Block

Hole	Thickness, Feet	% Porphyry	Type Porphyry
A-2W	651	26	Lqm
A-8	883	24	Lbfp
A-9	977	5	Lbfp
A-10	390	10	Lbfp, minor Black
A-11	1001	26	Lbfp
A-12	678	17	Lbfp
A-13	769	72	Lqmp
A-14	254	41	Lqmp
AI-1	921	14	Tgr aplitic
AI-2	366	Zero	---
DCA-3A	136	100	Tgr

These data have been placed on Figure 4 with the in-place block as the base and the slide block as an overlay. Two possible tie areas are noted:
1) the position of the Precambrian Pinal schist-Laramide intrusive contact;
2) the amount and type of porphyry intrusive material.

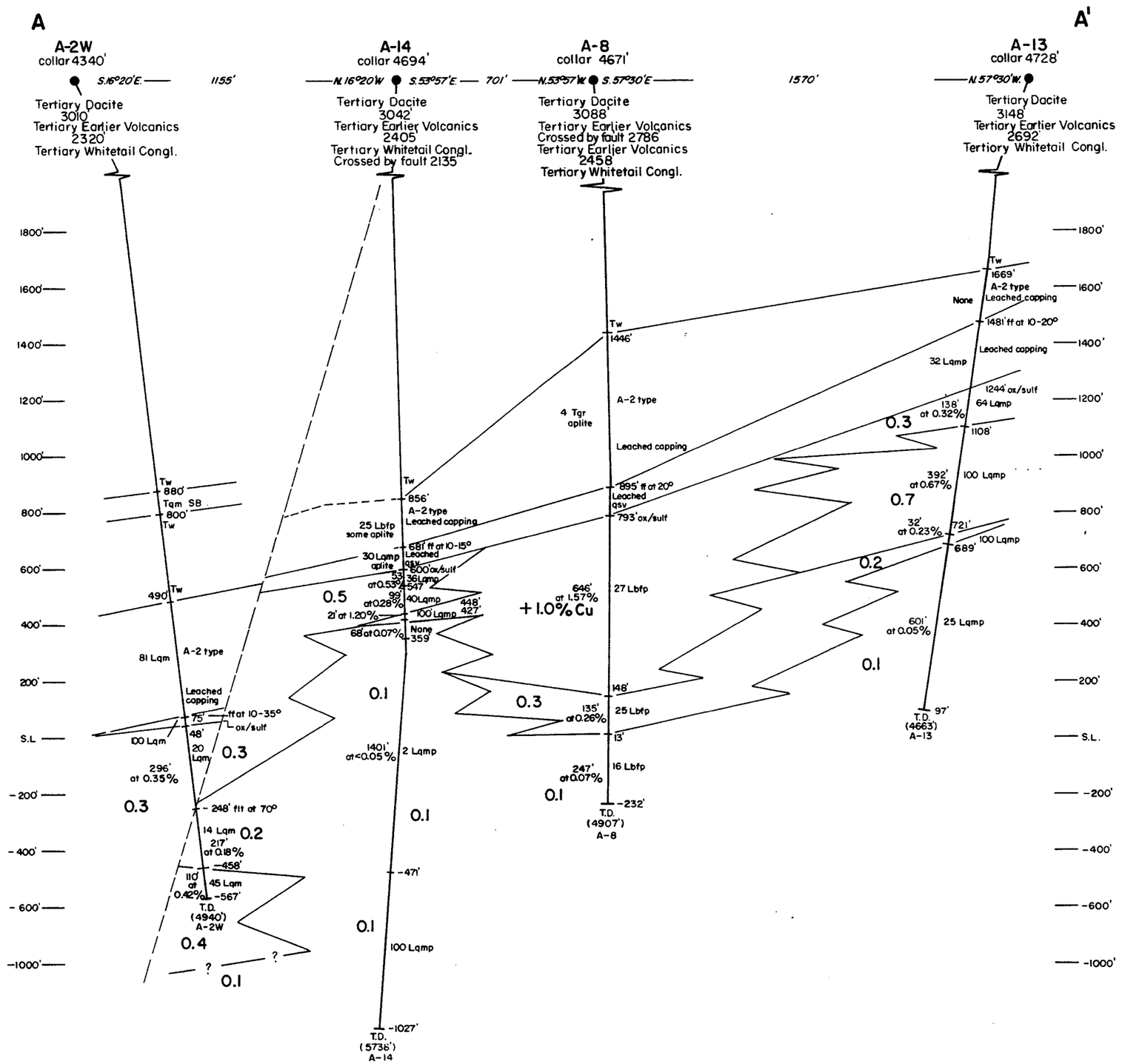
Only generalizations can be made with the control available, but as a start the percentages have been outlined of the Laramide biotite feldspar porphyry (Lbfp) as this unit appears to be related to the ore zone type. In viewing the base-overlay, the overall suggestion is that the moved block was transported northwesterly to westerly some 500-1000 feet. The schist-intrusive contact was south of A-13 in the in-place block and appears to be north of A-13 in the transported slide block. A review of the distribution of the 25% Lbfp material suggests a more westerly to perhaps southwesterly component. The occurrence of black porphyry was found in hole A-10 in-place units as well as being in slide block material in the same hole A-10 and in the more distant A-11 hole.

TABLE 2 - Drill Data Intercept Points; Drill Depths Converted to True Sea-Level Elevations

Hole Number	A-2W		A-8		A-9		A-10		A-11		A-12 & A-12-A		A-13	
Depth	Drill	True	Drill	True	Drill	True	Drill	True	Drill	True	Drill	True	Drill	True
Collar of Hole, Feet	Zero	+4340	Zero	+4671	Zero	+4640	Zero	+4585	Zero	+4608	Zero	+4608	Zero	+4728
Top of Premineral, Feet	3920	+ 490	3226	+1446	3275	+1366	3375	+1221	3492	+1118	3500	+1111	3071	+1669
M-1A Type SB w/Porphyry % & Base Elevation	---	---	---	---	63 Lqm	+1304	64 Lgr	+1191	---	---	---	---	---	---
A-2 Type SB, Leached Capping, w/Porphyry %	81 Lqm		4 Tgr aplite		3 Lqm		25 Lbfp & 2 Blk		2 Lbfp & 4 Blk		None?		None	
Base of Flattish Fault, Feet	4289	+ 75	3777	+ 895	3693	+ 949	3859	+ 740	4085	+ 525	4070	+ 550	3260	+1481
Flat Fault Inclination, Degrees	10-35		20		10		20		15-20		15-20		10-20	
% and Type of Porphyry	100 Lqm		None		3 Lgr		3 Lbfp		23 Lbfp		30 Lbfp		32 Lbfp	
Top of Sulfide, Feet	4317	+ 48	3879	+ 793	4044	+ 599	3953	+ 646	4262	+ 349	4171	+ 453	3499	+1244
Feet and % Copper	296-0.35	292	646-1.57	645	483-0.88	480	58-0.41	55	291-0.40	289	317-0.64	306	138-0.32	136
% and Type of Porphyry	20 Lqm		27 Lbfp		8 Lbfp		22 Lbfp		37 Lbfp		21 Lbfp		64 Lqmp	
Intercept Interval	4613	- 244	4525	+ 148	4527	+ 119	4011	+ 591	4553	+ 60	4488	+ 147	3637	+1108
Feet and % Copper	217-0.18	214	135-0.26	135	143-0.59	141	168-0.18	159	533-1.12	528	260-0.92	255	392-0.67	387
% and Type of Porphyry	14 Lqm		25 Lbfp		3 Lbfp		7 Lbfp & 3 Blk		2 Lbfp		7 Lbfp		100 Lqmp	
									4737	- 120				
									30 Lbfp					
Intercept Interval	4830	- 458	4660	+ 13	4670	- 22	4179	+ 432	5086	- 468	4748	- 108	4029	+ 721
Feet and % Copper	110-0.42	109	247-0.07	245	233-0.23	228	70-0.44	66	89-0.26	84	509-0.46	506	33-0.23	32
% and Type of Porphyry	45 Lqm		16 Lbfp		13 Lbfp & Lqm		10 Lbfp		9 Lbfp		9 Lbfp		100 Lqmp	
Intercept Interval	4940	- 567	4907	- 232	4903	- 250	4249	+ 366	5175	- 552	5257	- 614	4062	+ 689
Feet and % Copper	———		———		———		33-0.07	31	———		247-0.11	246	601-0.05	592
% and Type of Porphyry							64 Lbfp				60 Lbfp		25 Lqmp	
Intercept Interval							4282	+ 335			5504	- 859	4663	+ 97
Feet and % Copper							———				220-<0.02	220	———	
% and Type of Porphyry											66 Lbfp			
Intercept Interval											5724	-1079		
Feet and % Copper											———			
% and Type of Porphyry														
Total Depth	4940	- 567	4907	- 232	4903	- 250	4282	+ 335	5175	- 552	5724	-1079	4663	+ 97

? - Drill Data Intercept Points; Drill Depths Converted to True Sea-Level Elevations

A-9		A-10		A-11		A-12 & A-12-A		A-13		A-14		AI-1		AI-2		DCA-3A	
:ill	True	Drill	True	Drill	True	Drill	True	Drill	True	Drill	True	Drill	True	Drill	True	Drill	True
:ro	+4640	Zero	+4585	Zero	+4608	Zero	+4608	Zero	+4728	Zero	+4694	Zero	+4630	Zero	+4715	Zero	+4640
:75	+1366	3375	+1221	3492	+1118	3500	+1111	3071	+1669	3841	+ 856	2650	+1980	2616	+2110	4454	+ 226
Lqm	+1304	64 Lgr	+1191	---	---	---	---	---	---	---	---	41 Tgr	+1584	---	---	---	---
Lqm		25 Lbfp & 2 Blk		2 Lbfp & 4 Blk		None?		None		25 Lbfp		---	---	None		100 Tgr	
93	+ 949	3859	+ 740	4085	+ 525	4070	+ 550	3260	+1481	4015	+ 681	3046	+1584	2794	+1933	4670	+ 11
10		20		15-20		15-20		10-20		10-15		10-30		Very low,5?		20	
Lgr		3 Lbfp		23 Lbfp		30 Lbfp		32 Lbfp		30 Lqmp		30 Tgr		None		100 Tgr	
44	+ 599	3953	+ 646	4262	+ 349	4171	+ 453	3499	+1244	4096	+ 600	3238	+1392	2850	+1877	4690	- 8
-0.88	480	58-0.41	55	291-0.40	289	317-0.64	306	138-0.32	136	53-0.53	53	291-0.14	291	310-0.37	302	116-0.13	115
bfp		22 Lbfp		37 Lbfp		21 Lbfp		64 Lqmp		36 Lqmp		10 Tgr aplite		None		100 Tgr	
27	+ 119	4011	+ 591	4553	+ 60	4488	+ 147	3637	+1108	4149	+ 547	3529	+1101	3160	+1575	4806	- 123
-0.59	141	168-0.18	159	533-1.12	528	260-0.92	255	392-0.67	387	99-0.28	99	438-0.10	438	452-<0.10	433	348-0.01	342
bfp		7 Lbfp & 3 Blk		2 Lbfp		7 Lbfp		100 Lqmp		40 Lqmp		10 Tgr aplite		None		3 Tgr	
				4737	- 120												
				30 Lbfp													
70	- 22	4179	+ 432	5086	- 468	4748	- 108	4029	+ 721	4248	+ 448	3967	+ 663	3612	+1142	5154	- 465
-0.23	228	70-0.44	66	89-0.26	84	509-0.46	506	33-0.23	32	21-1.20	21	———		———		———	
p & Lqm		10 Lbfp		9 Lbfp		9 Lbfp		100 Lqmp		100 Lqmp				Note: All of sulfide zone is partially oxidized to total depth of hole.			
03	- 250	4249	+ 366	5175	- 552	5257	- 614	4062	+ 689	4269	+ 427						
———		33-0.07	31	———		247-0.11	246	601-0.05	592	68-0.07	68						
		64 Lbfp				60 Lbfp		25 Lqmp		None							
		4282	+ 335			5504	- 859	4663	+ 97	4337-<0.05	+ 359						
		———				220-<0.02	220	———		1401-<0.05	1386						
						66 Lbfp				2 Lqmp							
										5169	- 471						
										100 Lqmp							
						5724	-1079			5738	-1027						
						———				———							
03	- 250	4282	+ 335	5175	- 552	5724	-1079	4663	+ 97	5738	-1027	3967	+ 663	3612	+1142	5154	- 465



TO ACCOMPANY REPORT

DATED 3-10-82

BY J.D.Sell

ATTACHMENT A

SECTION A-A'
THRU
HOLES A-2W, A-14, A-8 & A-13
looking northeast

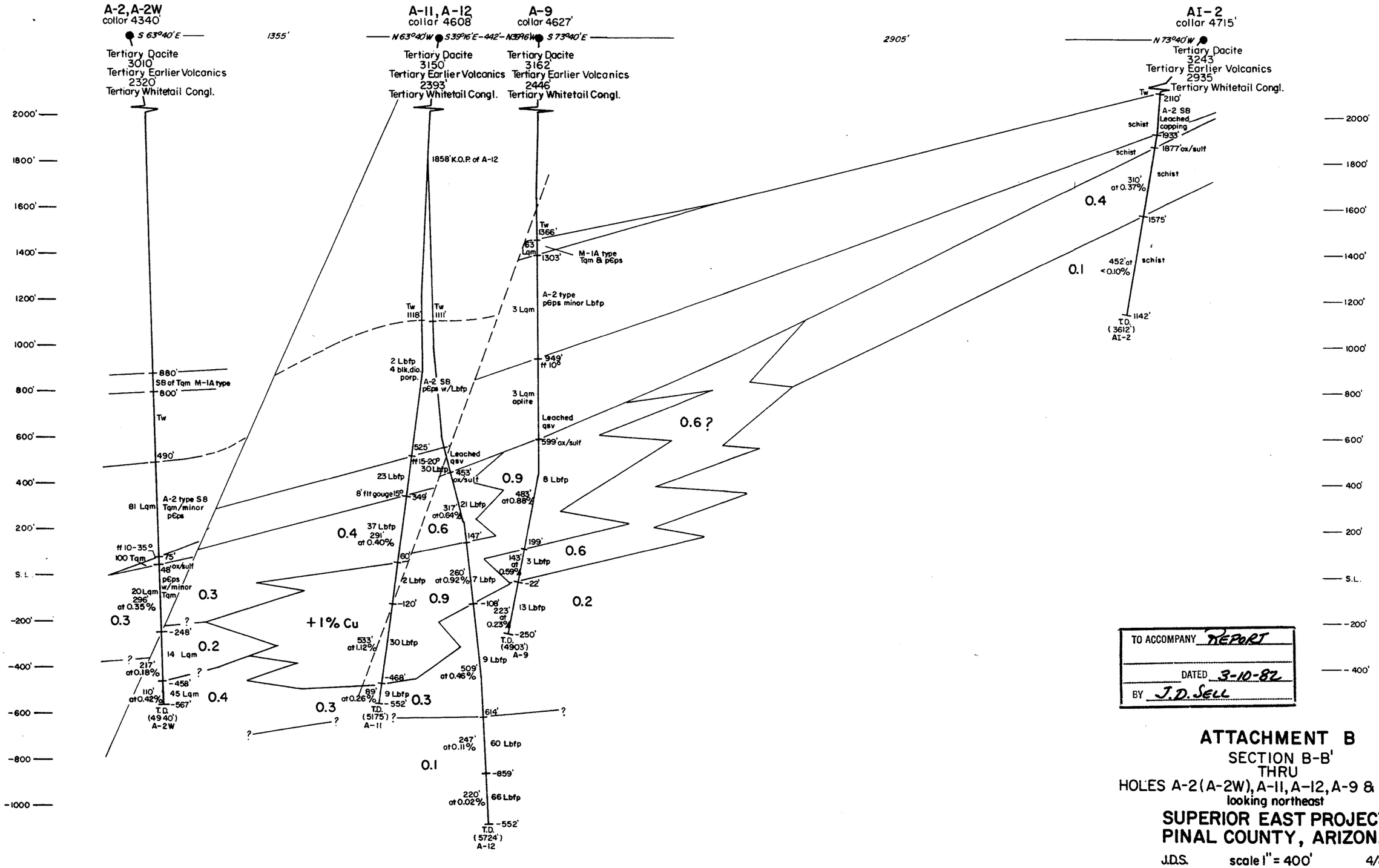
SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

J.D.S. scale 1" = 400' 4/82

mn 5377 dam 4/82

B

B'



TO ACCOMPANY REPORT

DATED 3-10-82

BY J.D. SELL

ATTACHMENT B

SECTION B-B'
THRU
HOLES A-2 (A-2W), A-11, A-12, A-9 & AI-2
looking northeast

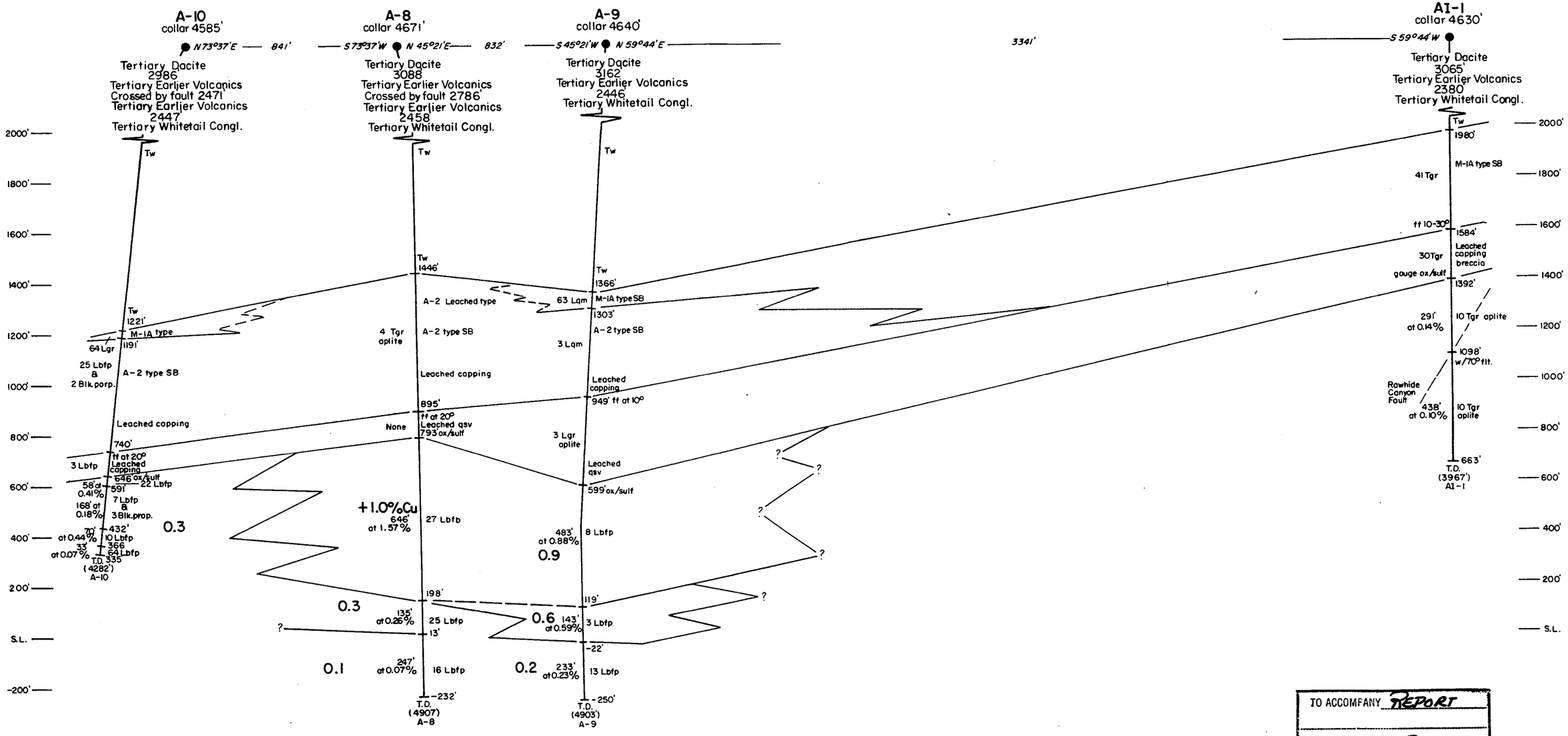
SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

J.D.S. scale 1" = 400' 4/82

mn5378 dam 4/82

C

C'



TO ACCOMPANY REPORT

DATED 3-10-82

BY J.D. Sell

ATTACHMENT C

SECTION C-C'
THRU
HOLES A-10, A-8, A-9, AI-1
looking northwest

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

J.D.S. scale 1" = 400' 4/82

mn 5379 dam 4/82

D

D'

A-10
Collar 4585'
N.20°40'E — 695'
Tertiary Dacite
2986
Tertiary Earlier Volcanics
Crossed by fault 2471
Tertiary Earlier Volcanics
2447
Tertiary Whitetail Congl.
Tw
Tw 1221'
64 Lgr bx
M-1A type SB
1191'
25 Lbfp + 2 Blk.porp.
A-2 type SB
Leached capping 740' ff at 20°
3 Lbfp
Leached capping 646' ox/sulf
58' at 0.41%
22 Lbfp 591'
168' at 0.18%
7 Lbfp + 3 Blk. porp.
0.3
70' at 0.44%
432'
10 Lbfp
33' at 0.07%
366' 64 Lbfp 335'
0.1
T.D. (4282') A-10

A-14
Collar 4694'
S 20°40'W — N 60°E — 1023'
Tertiary Dacite
3042'
Tertiary Earlier Volcanics
2405'
Tertiary Whitetail Congl.
Tw
Tw 856'
A-2 type SB
25 Lbfp + aplite
Leached capping 681' ff 10°-15°
30 Lamp aplite
Leached gsv 600' ox/sulf
53' at 0.53%
36 Lamp 547'
99' at 0.28%
40 Lamp 448'
21' at 1.20%
427' — 100 Lamp
68' at 0.07%
None 359'
0.5
0.4
1401' at <0.05%
2 Lamp
+1.0
< 0.1
-471'
100 Lamp
-1027'
T.D. (5738') A-14

A-11
Collar 4608'
S 60°W — N 23°30'E — 2660'
Tertiary Dacite
3150'
Tertiary Earlier Volcanics
Crossed by fault 2407
Tertiary Earlier Volcanics
2393'
Tertiary Whitetail Congl.
Tw
Tw 1118'
A-2 type SB
2 Lbfp + 4 Blk porp
Leached capping 525' ff 15°-20°
23 Lbfp
Leached 349' ox/sulf
291' at 0.40%
37 Lbfp
0.4
60'
?
533' at 1.12%
23 Lbfp
+1.0% Cu
?
-463'
89' at 0.28%
9 Lbfp -552'
0.3
T.D. (5175') A-11
?

DCA-3A
Collar 4640'
S 23°30'W
Tertiary Dacite
3150'
Tertiary Earlier Volcanics
2210'
Tertiary Whitetail Congl.
Tw
Tw 559'
SB bx
top 1/2 sch. w/cc
bottom 1/2 wk. alt. qm w/ox Cu
481'
Tw 343'
SB bx 246'
98% qm as leached capping
Tw 226'
100 Tgr
brecciated leached capping A-2 type
11' at 20°
100 Tgr 116'
at 0.13%
8' ox/sulf.
123' also steep + 70° flt
<0.1
0.1
348' at ±0.01%
3 Tgr
-465'
T.D. (5154) DCA-3A

2000' 1800' 1600' 1400' 1200' 1000' 800' 600' 400' 200' S.L. -200' -400' -600' -800' -1000'

TO ACCOMPANY REPORT
DATED 3-10-82
BY J.D. Sell

ATTACHMENT D

SECTION D-D'
THRU
HOLES A-10, A-14, A-11 & DCA-3A
looking northwest

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

J.D.S. scale 1" = 400' 4/82

mn 5380 dam 4/82

DCA-3A

FIGURE 1

AI-1

AI-2

y

EXPLANATION

A-8 ● Drill hole and number at top of sulfides

Solid Color Probable mineralization

Outlined Color–Indicated limits of mineralization

r 650 foot column of 1.50% copper

o 800 foot column of 0.80% copper

b 600' foot column of 0.80% copper

g 500' foot column of 0.60% copper

y A-2 area= 600 foot column of 0.30% copper
A-10 area= 300 foot column of 0.30% copper
A-14 area= 200 foot column of 0.40% copper
AI-2 area= 300 foot column of 0.35% copper
Outlined area= 300 foot column of 0.32% copper

TO ACCOMPANY REPORT
DATED 3-10-82
BY J. D. SELL

N

CONTOUR PLOT OF THICKNESS-GRADE OF MINERAL INTERCEPTS

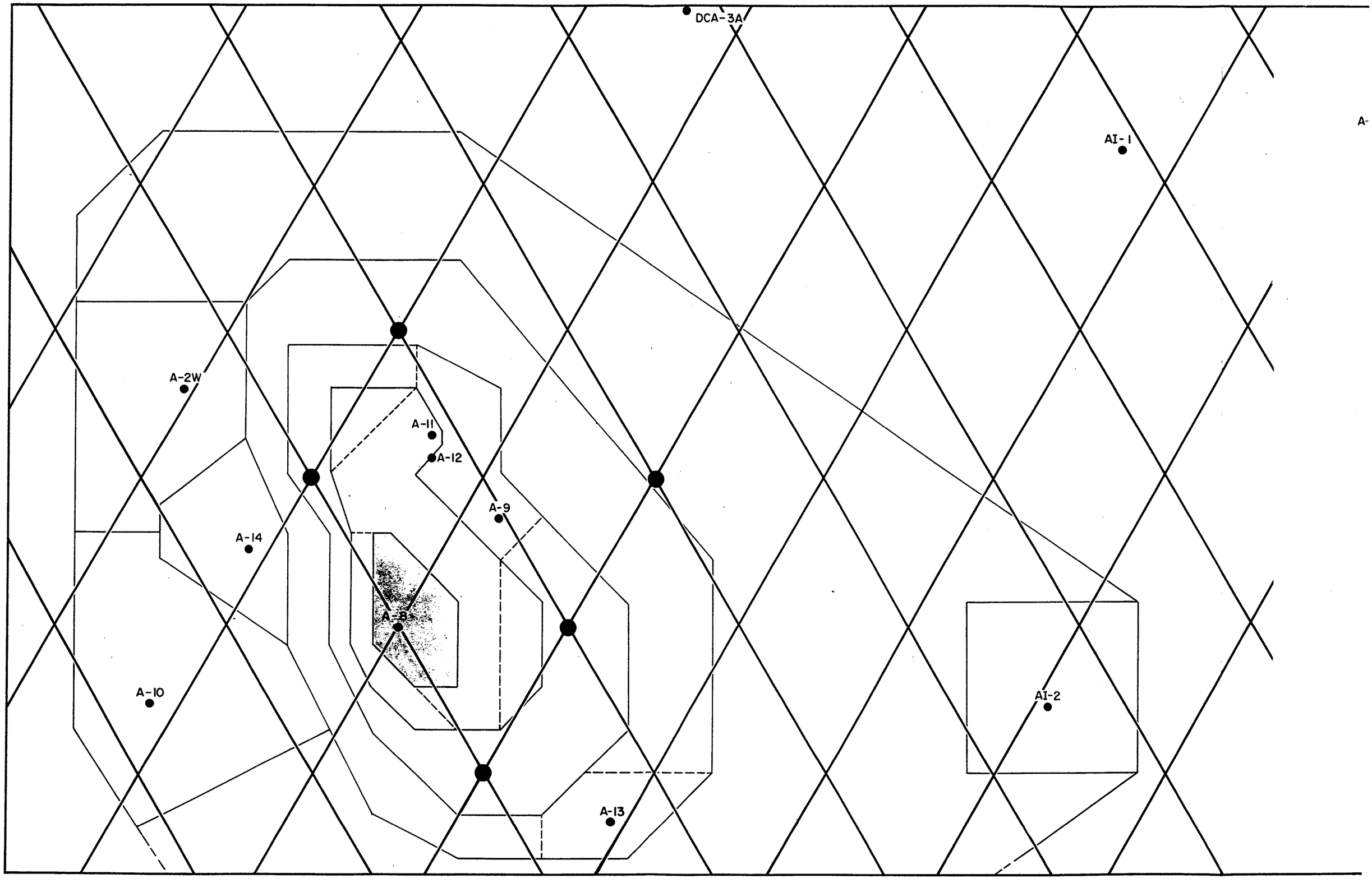
SUPERIOR EAST PROJECT

PINAL COUNTY, ARIZONA

scale 1" = 400'

J.D.Sell Feb,1982

mn5381 dam 4/82


DCA-3A
AI-1
A-2W
A-11
A-12
A-9
A-14
A-8
A-10
AI-2
A-13

DCA-3A

AI-1

A-

Solid

Outlin

A-2W

A-11

A-12

A-9

A-14

y

b

A-8

r

y

A-10

o

y

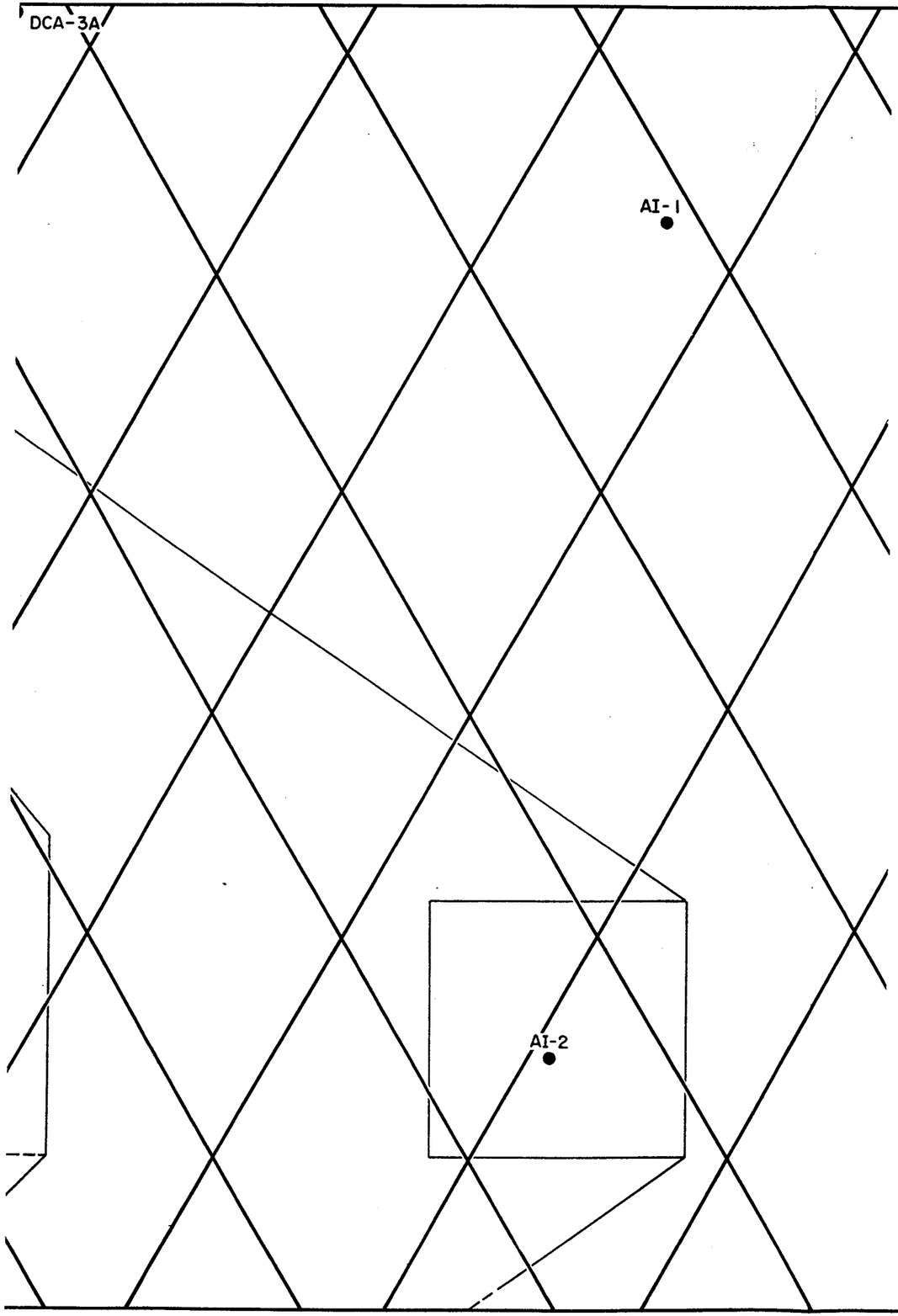
A-13

g

AI-2

y

FIGURE 2



——EXPLANATION——

A-8 ● Drill hole and number at top of sulfides

● Proposed drill hole

TO ACCOMPANY REPORT
DATED 3-10-82
BY J.D. Sell

N

800-FOOT
EQUILATERAL TRANGULAR GRID
FROM HOLE A-8

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

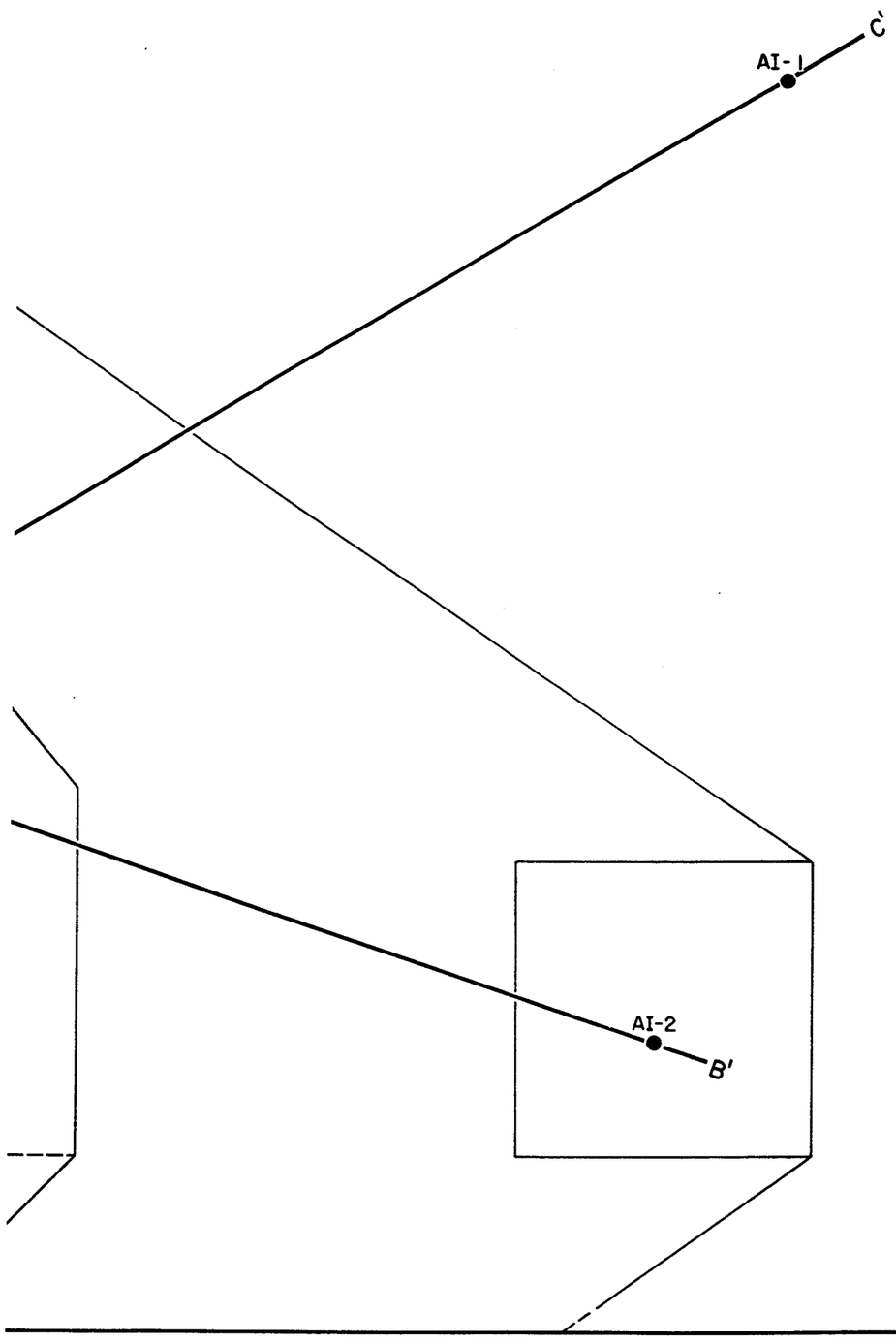
scale 1" = 400'

J.D.Sell Feb,1982

mn 5382 dam 4/82

DCA-3A

FIGURE 3



——EXPLANATION——

A-8 ● Drill hole and number at top of sulfides

TO ACCOMPANY REPORT
DATED 3-10-82
BY J. D. SELL

N

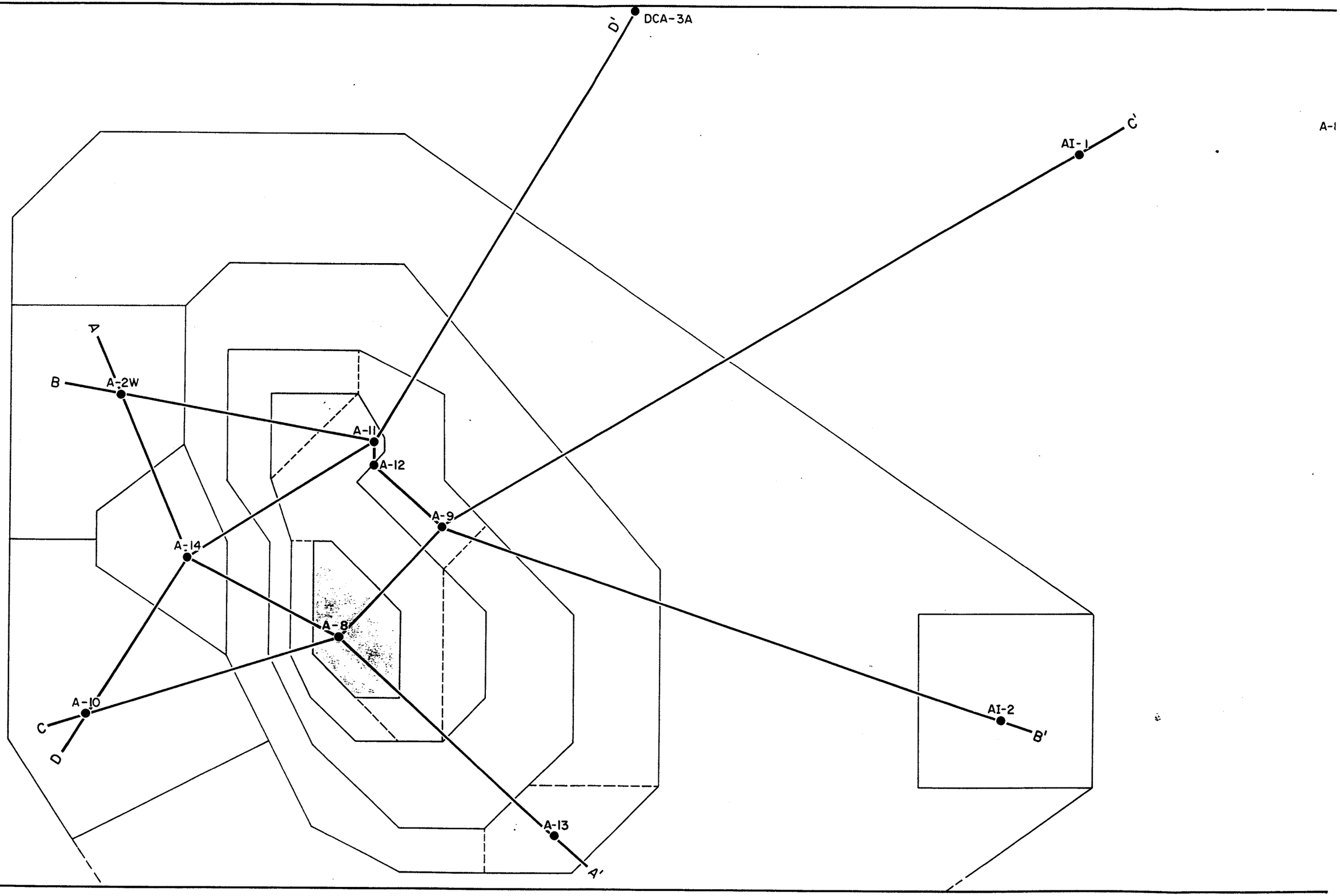
CROSS-SECTION LINES

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

scale 1" = 400'

J.D.Sell Feb,1982

mn 5383 dam 4/82


D'
DCA-3A
C'
AI-1
A
B
A-2W
A-11
A-12
A-9
A-14
A-8
A-10
C
D
AI-2
B'
A-13
A'

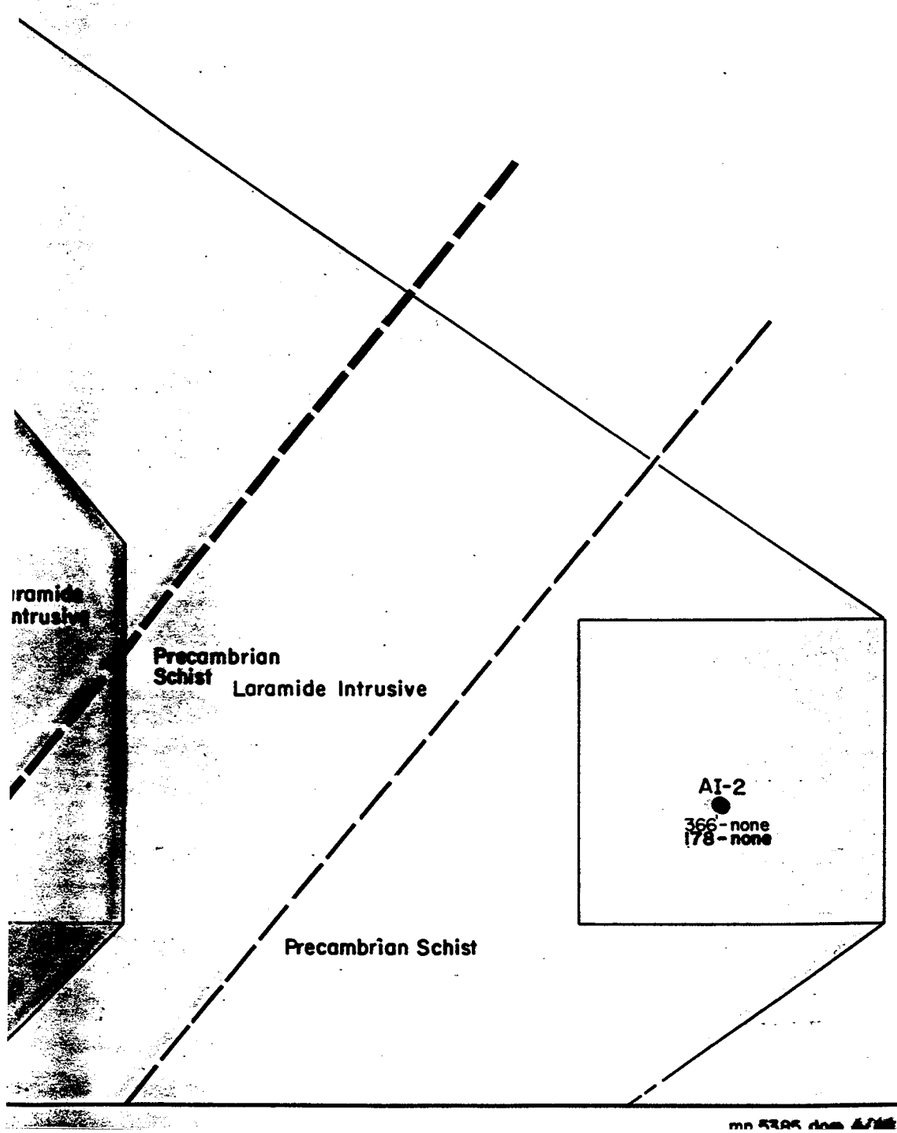
DCA-3A
136'-100gr
216'-100Tgr

OVERLAY TO FIGURE 4

FIGURE 4

DISTRIBUTION OF ROCK TYPE
A-2 TYPE SLIDE BLOCK
THICKNESS-% PORPHYRY-TYPE PORPHYRY

AI-1
921'-14 gr
M-1A SB only



——EXPLANATION——

A-8 ● Drill hole and number at top of sulfides
see text for abreviations

TO ACCOMPANY REPORT
DATED 3-10-82
BY J.D.Sell

N

DISTRIBUTION OF ROCK TYPE
IN-PLACE LEACHED CAPPING
PLUS "ORE COLUMN"
THICKNESS-% PORPHYRY-TYPE PORPHYRY

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

scale 1" = 400'

J.D.Sell Feb,1982

mn 5384 dam 4/82

OVERLAY TO FIGURE 4

DISTRIBUTION OF ROCK TYPE
A-2 TYPE SLIDE BLOCK
THICKNESS-% PORPHYRY-TYPE PORPHYRY

DCA-3A
136'-100gr
216'-100Tgr

AI-1
921'-14 gr

A-2W
651'-26 qm
369'-81 qm

2 Lbfp

A-11
1001'-26 bfp
595'-2 bfp

A-12
678'-17 bfp
570'-none

A-9
977'-5 bfp

A-14
254'-
41 qmp
174'-25 bfp

15-25 Lbfp

Laramide Intrusive

Precambrian Schist

Laramide Intrusive

25 Lbfp

A-10
390'-10 bfp
tr. Blk
483'-25 bfp
2 Blk

5-10 Lbfp

AI-2
366'-none
178'-none

Precambrian Schist

A-13
72

Exploration
New Business Development
BHP Minerals

February 6, 1995

Mr. Jim Sell
ASARCO
2762 W. Holladay St.
Tucson, AZ 85746

Jim-

The data package on Superior East you sent BHP Minerals is enclosed as you requested.

This is all of the information we have in the Tucson file. I have asked our office in Salt Lake City to return any data they may have in their files as well.

Hope to see you soon as we pursue other areas of mutual interest.

Sincerely,

David Spatz

cc: R. Schafer

DMS/hst

ASARCO

Southwestern Exploration Division

JDS

December 20, 1985

F. T. Graybeal
New York Office

Revised Sections - Plans
and Mineral Inventory
Superior East Project
Pinal County, Arizona

Summary & Conclusions

Using the drill hole intercepts, I have constructed new cross-sections (Attachments A through D) and elevation plans (Attachments E through P) for the sulfide zone at Superior East. The sections-plans were constructed using the constraints based on the drill intercepts, indicated faulting, and compatible shape-outline of the mineral grades.

The result is a three-dimensional elliptical body which is floored with a relatively sharp 0.3 copper line and having a variable 0.7% and 0.5% copper shells expanding outward on the sides and over the top of the plus 1% copper body. The shells taper off as they approach the basal 0.3% copper zone.

The three sections have also been restored to their pre-faulting configuration for visual interpretation and indicate that half of the deposit has been destroyed by deep leaching (Attachments Q through S).

The question of a flattish fault in the leached capping sequence was not addressed in this exercise, but it is noted that leached quartz sulfide vein zones are found only above the indicated high grade zone and restricted to the capping below the postulated flat fault as shown in earlier cross-sections.

A rough estimate, based on the new sections-plans configurations, suggests a mineral inventory as follows:

101 million tons @ +1.0% (used 1.1% Cu)
42 million tons @ 0.7-1.0% (used 0.85% Cu)
61 million tons @ 0.5-0.7% (used 0.60% Cu)

or

143 million tons @ 1.03% copper

or

204 million tons @ 0.90% copper.

Using the configuration model, as shown in the plans, three areas are indicated as having the potential for the +1% copper intervals. They are:

1. In a 180° arc with radius of 800 feet, west, south, and east of Hole A-8, 500-700 feet of intercept starting at plus 1000 foot elevation, or around 3600 feet below the surface is indicated.

2. In an ellipse with Holes A-8 and A-9 along the axis, and extending 600-800 feet outward from these holes, 600-800 feet of intercept starting at plus 600-700 foot elevation, or around 4000 feet in depth from the surface is indicated.

3. A deep zone extending 500-600 feet in a 180° arc west, north and east of Hole A-11. An indicated 800-1000 feet of plus 1% copper starting at around sea level, or 4600 feet below the surface is indicated by the configuration.

The above exercise is an attempt to place the drill intercepts into a plausible configuration using the method of cross-sections and plans of mineral grades to suggest the third dimensional expression. Any truths found by drilling will be a surprise.

James D. Sell

James D. Sell

JDS:mek
Attachments

cc: W. L. Kurtz

ASARCO

Southwestern Exploration Division

December 3, 1979

SUPERIOR EAST PROJECT
Pinal County, Arizona

A pro-forma feasibility study has been made which shows the following after tax internal rates of return:

	Project With Property Obligations		
Cu price	$1.00	1.30	1.60
DCFROR	19.29%	27.33%	33.74%

Feasibility was based on the following criteria:

Reserves: Primary orebody - high grade disseminated and fracture vein controlled.

100,000,000 tons @ 1.50% Cu
110,000,000 tons @ 1.36% Cu
} 90% mined grade, 110% mined tons.

Mining: See attached sketch for configuration of orebody (J.D.Sell) with a presumed strike of 4,000', 300' wide and 1,000' thick. Block caving used for a mining system rated at 20,000 tpd with a 16-year life.

Milling: Standard flotation flow sheet for 20,000 tpd producing high grade concentrates.

Capital Costs: See attached estimate by George Percival.

Mine preproduction	$140,300,000
Mill	100,000,000
Engineering	4,000,000
Working Capital	8,700,000
	$253,000,000

NSR: Smelter costs based on predominate bornite concentrates.

Cu price	smelter	grade	tpd	NSR/lb	rec'y	NSR/ton
$1.00	.26	1.36 -	20 -	.74 -	.95	= 19.12
1.30	"	"	"	1.04	"	= 26.87
1.60	"	"	"	1.34	"	= 34.63

>>>

Operating Costs: See attached estimate by George Percival.

	Project with with property obligations		
	Cu $1.00	$1.30	$1.60
Direct mining	3.71	3.71	3.71
Indirect mining	1.48	1.48	1.48
Direct milling	1.49	1.49	1.49
Indirect milling	0.59	0.59	0.59
Management fee	0.05	0.05	0.05
3% royalty	0.57	0.81	1.04
	7.89	8.13	8.36
Without royalty	7.32	7.32	7.32

Also attached are print-outs and work sheets for the above three rates of return.

Property obligations include:

1) 3% NSR to CanUS Ltd upon production until $20,000,000 paid;

2) 0.05 per ton management fee;

3) Mining agreement with Continental Materials based on net profit lease. Net profits shared 80-20% after payback of all pre-mining expenses (including exploration), plus 1% over the prime rate, less $500,000 deductible. This also covers post-mining operation capital costs.

RBC
R. B. Crist.

RBC:jlh
attachments
c.c. W.L.Kurtz
F.T.Graybeal
J.D.Sell
G.Percival

~~RECENT~~ - JD ~~ZEH~~ → FYG Sles.

RECEIVED

JAN 4 1980

S. W. U. S. EXPL. DIV.

New York, January 2, 1980

MEMORANDUM FOR: Mr. R. L. Hennebach

Arizona
Superior East Project

Attached for general interest is a summary by Mr. Crist which hypothesizes with respect to possible feasibility of the type of copper deposit we are hoping to confirm by further exploration drilling at Superior East. Using very rough assumptions, it would appear that such a deposit might produce a 15% ROI at $1.00 copper, and a considerably better return at higher prices.

It should be clearly understood that the only conclusion which can be drawn from this purely speculative exercise is that further exploration drilling is warranted. Definitive feasibility studies, even of a preliminary nature, would of course require a great deal more engineering work and input, and in any case could not be made until a mineral reserve has been proven and delineated. We hope that the planned drilling for 1980 and 1981 will accomplish this.

Original Signed By
T. C. Osborne
T. C. Osborne

Attachments

(Crist memo and attachments)

cc: CFBarber)
RdeJOsborne) w/copy of Crist memo.
NVisnes)

bcc: WLKurtz)
✓FTGraybeal) w/o att.
CWCampbell)
TEScartaccini)

FROM: W. L. KURTZ

JDSelf → FTG

To: TCOsborne

SUPERIOR EAST

Attached is Bob Coist's pro-forma feasibility on Superior East as requested by your letter of August 30, 1974.

This shows what +1% copper can do for you and certainly justifies an accelerated drill program at Superior East.

[redacted]

ASARCO

Southwestern Exploration Division

November 27, 1979

Superior East Project
Pinal County, Arizona

A pro-forma feasibility study has been made which shows the following after tax internal rates of return:

	Total Project			Project with Property Obligations		
Cu price	$1.00	1.30	1.60	$1.00	1.30	1.60
DCFROR	16.12%	24.33%	30.74%	15.27%	22.96%	27.95%

Feasibility was based on the following criteria:

Reserves: Primary orebody - high grade disseminated and fracture vein controlled.

100,000,000 tons @ 1.25% Cu
110,000,000 tons @ 1.14% Cu } 90% mined grade, 110% mined tons.

Mining: See attached sketch for configuation of orebody (J.D.Sell) with a presumed strike of 4,000', 300' wide and 1,000' thick. Block caving used for a mining system rated at 20,000 tpd with a 16-year life.

Milling: Standard flotation flow sheet for 20,000 tpd producing high grade concentrates.

Capital Costs: See attached estimate by George Percival.

Mine preproduction	$140,300,000
Mill	100,000,000
Engineering	4,000,000
Working Capital	8,700,000
	$253,000,000

NSR: See A.J.Kroha's estimate to adjust for George Percival's comment (chalcopyrite concentrates estimated at 0.33/lb smelting).

Cu price	smelter	Grade	tpd	NSR/lb	Rec'y	NSR/ton
$1.00	.26	1.14	20	.74	.95	= 16.03
1.30	"	"	"	1.04	"	= 22.53
1.60	"	"	"	1.34	"	= 29.02

>>>

Operating Costs: See attached estimate by George Percival.

	Total Project per ton	Project with with property obligations Cu $1.00	$1.30	$1.60
Direct mining	$3.71	3.71	3.71	3.71
Indirect "	1.48	1.48	1.48	1.48
Direct milling	1.49	1.49	1.49	1.49
Indirect "	0.59	0.59	0.59	0.59
Management fee	--	0.05	0.05	0.05
3% royalty	--	0.48	0.68	0.87
	$7.27	7.80	8.00	8.19

Also attached are print-outs and work sheets for the above six rates of return and a copy of the initial request.

Property obligations include:

1) 3% NSR to CanUS Ltd upon production until $20,000,000 paid;

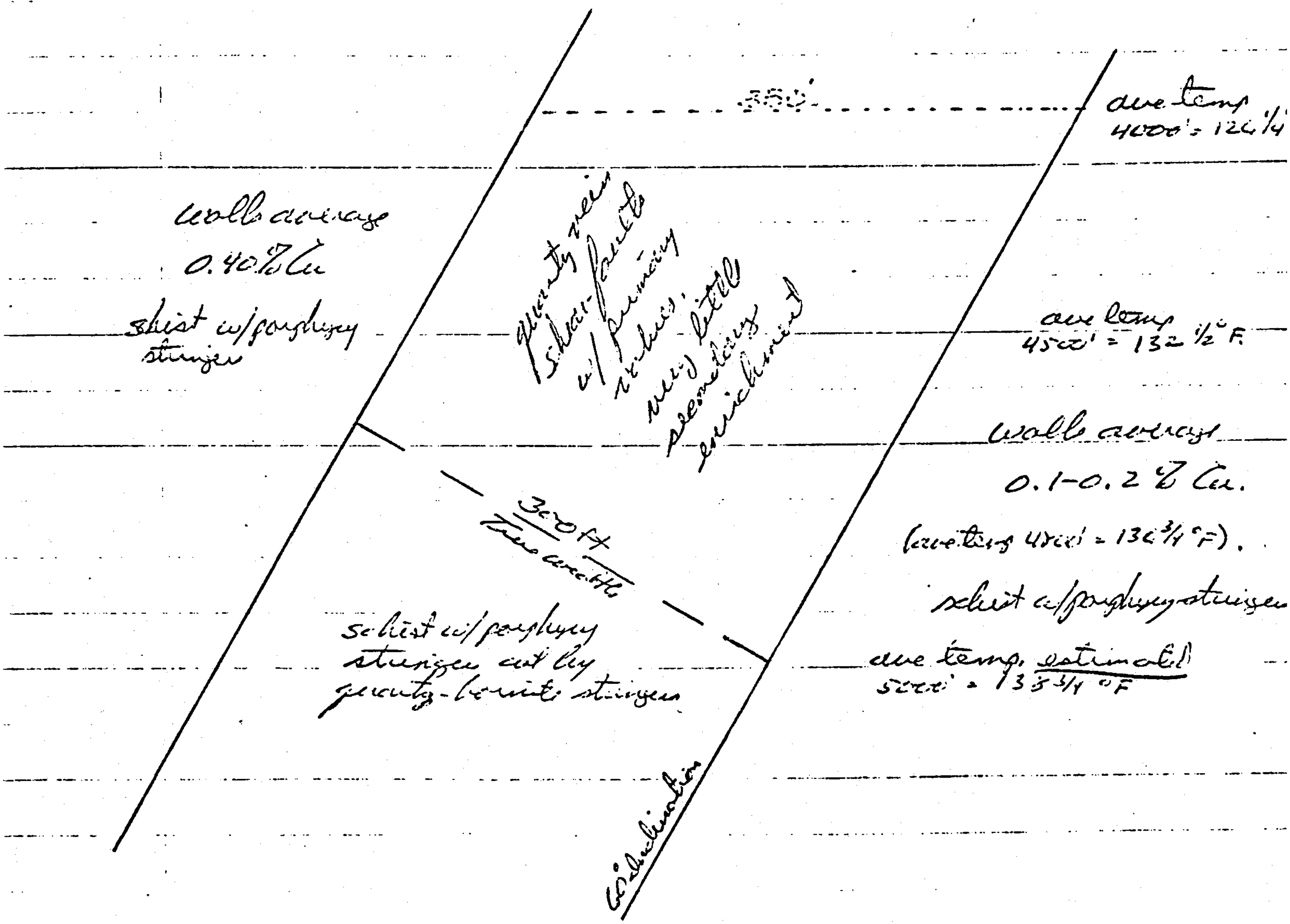
2) 0.05 per ton management fee;

3) Mining agreement with Continental Materials based on net profit lease. Net profits shared 80-20% after payback of all pre-mining expenses (including exploration), plus 1% over the prime rate, less $500,000 deductible. This also covers post-mining operation captial costs.

R.B.C.
R. B. Crist.

RBC:jlh
attachment
c.c. W.L.Kurtz
F.T.Graybeal ✓
J.D.Sell
G.Percival

Top of ore below surface ranges from 3879' to 4262' use 4000' depth as average.



(3 holes) (1 hole)

Ag ranges: 0.41 oz/ton, upper areas; to 0.75 oz/ton deeper

Au ranges: 0.009 oz/ton, " " ; to 0.015 oz/ton " "

ASARCO

Southwestern Mining Department

November 20, 1979

Mr. R. B. Crist
Tucson Office

SUPERIOR EAST

This study is a quick analysis of the Superior East prospect based on meager information and must not be considered as final. Ore reserves are not fully defined. Under these circumstances opinions can vary considerably but an attempt has been made to establish some cost parameters.

The ore consists of bornite in a quartz vein complex in a schistose rock. The vein does have gougy areas but it is not certain that this material will cave readily but an assumption has been made that block caving will be the mining system as at this time it is doubtful that a more costly system will be feasible.

In general, two production shafts will be sunk to ±5,000 feet with operating levels at the 4,000 and 5,000 elevations. Levels will be interconnected with ramps within the mine to establish a stoping level at 4,500' elevation initially. By preliminary calculations the orebody dips at 60° and this necessitates the shorter caving lift of ±500 feet. Trackless electric equipment will be used throughout the operation wherever possible to alleviate the ventilation problems caused by 140°F temperatures. Electric rail haulage is contemplated on the 5,000' level to the production shafts.

Drainage is considered to be minimal.

The extreme temperatures will necessitate refrigeration and adequate ventilation which will require detailed study.

The Net Smelter Return as listed on the guide sheet should be reviewed with the Smelting Department. The deduction shown is applicable to a chalcopyrite concentrate but not a bornite concentrate which will be much higher grade in copper.

Pre-development costs are not estimated and will include exploration costs, roads, permits, etc.

MINE PRE-PRODUCTION DEVELOPMENT COSTS

Two (2) production shafts 5,000' @ $5,000 (completed with sets, etc.)	-	$ 50,000,000
One (1) service shaft with waste hoisting 5,000 x $4,000	-	20,000,000
Two (2) ventilation raises 4,000' @ $800	-	6,400,000
4,000' level development 12,000' @ $400	-	4,800,000
5,000' level development 18,000' @ $400	-	7,200,000
Inter-level ramps (4,000' level to 5,000' level)	-	1,000,000
Stope preparation (raises, drawpoints, undercutting, etc.)	-	8,000,000
Core drilling 20,000' @ $30	-	600,000
Mine equipment	-	12,000,000
Surface facilities (buildings, headframe, hoists, etc.)	-	19,900,000
Ventilation & refrigeration	-	2,000,000 (?)
Water supply (wells, delivery, power, distribution, etc.)	-	1,800,000
Tailings disposal	-	2,500,000
Power supply	-	4,100,000
Sub Total		$140,300,000

MILL

Capital Cost (20,000 tons @ $5,000)	-	$100,000,000
Sub Total	-	$240,300,000
Engineering & Construction Fees	-	$ 4,000,000
Grand Total	-	$244,300,000
WORKING CAPITAL	-	$ 8,700,000
TOTAL	-	$253,000,000

By interpolating information from various sources, the 1979 operating costs for this block caving system are estimated as follows:

Direct Mining	-	$3.71/ton
Indirect "	-	1.48/ton
Direct Milling	-	1.49/ton
Indirect "	-	0.59/ton
Total	-	$7.27/ton

George Percival

GP/mc
attach.

cc: TEScartaccini - w/attach.

35-37% Cu – concentrate grade

Cu 700-20,97.5% = 663# ($1.00) 663.00

TC = 79.86
RC 633 (.12391) = 78.44 158.30

504.70

$\frac{700 - 663 + 158.30}{700} = 27.90$ ¢/lb

E. SUPERIOR TOTAL PROJECT PROFORMA FEASIBILITY CU 1.00 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-30141.242
3	-45000.000	-33373.270
4	-60000.000	-38320.449
5	-98000.000	-53901.215
6	63936.000	30283.848
7	63936.000	26079.793
8	62996.000	22129.148
9	52345.000	15835.074
10	51127.000	13319.508
11	50061.000	11231.309
12	49129.000	9492.094
13	48313.000	8038.609
14	47599.000	6820.371
15	47599.000	5873.555
16	47599.000	5058.176
17	47599.000	4355.992
18	47599.000	3751.287
19	47599.000	3230.525
20	47599.000	2782.058
21	47599.000	2395.848
TOTAL	569635.000	-58.789

RETURN ON INVESTMENT = 16.120 PCT.

(000 omitted) 11/26/79

Superior East – Total Project
Proforma Feasibility
Cu 1.00 Grade 1.25%

Yr	Cap. Inv / NSR	Opr. Cost	Cash Flow Before Tax	Deprec.	Deplet.	Taxable Income	Inc Tax	Cash Flow After Tax
1	-15,000							
2	-35,100							
3	-45,000							
4	-60,000							
5	-98,000							
6	+117,007	53,071	63,936	31,625	16,161	16,150	7,429	63,936
7				27,672	17,551	18,731	8,616	63,936
8				24,213		22,170	10,198	63,996
9				21,186		25,199	11,591	52,345
10				18,538		27,845	12,809	51,127
11				16,221		30,162	13,875	50,061
12				14,193		32,190	14,807	49,129
13				12,419		33,964	15,623	48,313
14				10,867		35,516	16,337	47,599
15								
16								
17								
18								
19								
20								
21								

2 yr carryover [illegible]

Inv. Tax Credit 10%

25,300	17871	9255	63,936
7,429	8616	[illegible]	[illegible]
17,871	9255	- 943	63,116

Return [illegible]
4.2 yrs

E. SUPERIOR TOTAL PROJECT PROFORMA FEASIBILITY CU 1.30 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-28150.898
3	-45000.000	-29111.254
4	-60000.000	-31219.352
5	-98000.000	-41013.133
6	111333.000	37475.289
7	84214.000	22799.723
8	82623.000	17991.625
9	81231.000	14227.070
10	80013.000	11271.414
11	78947.000	8944.945
12	78014.000	7109.496
13	77198.000	5658.434
14	76484.000	4509.047
15	76484.000	3626.680
16	76484.000	2916.980
17	76484.000	2346.160
18	76484.000	1887.043
19	76484.000	1517.771
20	76484.000	1220.760
21	76484.000	981.871
TOTAL	1032445.00	-10.196

RETURN ON INVESTMENT = 24.330 PCT.

Proforma Feasibility
Cu 1.30 Grade 1.25%

Yr	OPR Cost	Cash Flow Before Tax	Deprec.	Deplet.	Taxable Income	Inc Tax	Cash Flow After Tax
- 15,000							
- 35,000							
- 45,000							
- 60,000							
- 98,000							
+ 164,442	53,071	111,371	31,625	24,663	55,083	25,338	111,333
			27,672		59,036	27,157	84,214
			24,213		62,495	28,748	82,623
			21,186		65,522	30,140	81,231
			18,538		68,170	31,358	80,013
			16,221		70,487	32,424	78,947
			14,193		72,515	33,357	78,014
			12,419		74,289	34,173	77,198
			10,867		75,841	34,887	76,48

Inv. Tax Credit 25,300

Return of Capital
2.25 yrs.

E. SUPERIOR TOTAL PROJECT PROFORMA FEASIBILITY CU 1.60 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-26770.691
3	-45000.000	-26326.652
4	-60000.000	-26848.867
5	-98000.000	-33542.262
6	140223.000	36709.383
7	113105.000	22648.070
8	111513.000	17079.152
9	110121.000	12900.379
10	108903.000	9758.059
11	107837.000	7390.656
12	106904.000	5604.031
13	106088.000	4253.676
14	105374.000	3231.644
15	105374.000	2471.810
16	105374.000	1890.630
17	105374.000	1446.100
18	105374.000	1106.088
19	105374.000	846.021
20	105374.000	647.102
21	105374.000	494.953
TOTAL	1494686.00	-10.507

RETURN ON INVESTMENT = 30.740 PCT.

Superior East - Total Project
Proforma Feasibility
CO 1.66 Grade 1.25 %

p' INV.

NSR

	OPR COST	CASH FLOW Before TAX	DEPREC.	DEPLET.	TAXABLE INCOME	INC. TAX	CASH FLOW After TAX
-15,000							
-35,000							
-45,000							
-60,000							
-98,000							
+211,878	53,071	158,807	31,625	31,782	95,400	43,884	140,223
			27,672		99,353	45,702	113,105
			24,213		102,812	47,294	111,513
			21,186		105,839	48,686	110,121
			18,538		108,487	49,904	108,903
			16,221		110,804	50,970	107,837
			14,193		112,832	51,903	106,904
			12,419		114,605	52,719	106,088
			10,867		116,158	53,433	105,374

INV. TAX Cred 25,300

Return of Capital

2 yrs.

E. SUPERIOR (WITH OBLIGATIONS) PROFORMA FEAS. CU 1.00 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-30363.508
3	-45000.000	-33867.277
4	-60000.000	-39174.449
5	-98000.000	-55508.773
6	60067.000	29515.855
7	60067.000	25605.855
8	60067.000	22213.816
9	51285.000	16453.617
10	48795.000	13580.953
11	48372.000	11679.730
12	48917.000	10246.660
13	46932.000	8528.555
14	44604.000	7031.762
15	44604.000	6100.254
16	44604.000	5292.145
17	44604.000	4591.086
18	44604.000	3982.899
19	44604.000	3455.278
20	44604.000	2997.551
21	44604.000	2600.462
TOTAL	528334.000	-37.300

RETURN ON INVESTMENT = 15.270 PCT.

11/26/79

Superior East - with Property obligations
Proforma Feasibility
Cu $1.00 Grade 1.25%

1

YR - CAP INV / NSR	OP. COST	Cash Flow Before Tax	ASARCO — 80% of Net Profits after Payback of all Pre-mining including Explor. plus 1% int. over Prime Rate $500,000 deductible — DEPREC. ALL	Depletion 97%-100%	Taxable Inc. 80% N.P	CANUS 3% NSR 3% Deplet $20,000,000 Limit	Cont. Mutz 20% N.P $500,000 deductible		ASARCO Inc. Tax	ASARCO Cash Flow After Tax	Payback Accum.
1 - 15,000											
2 - 35,000											
3 - 45,000											
4 - 60,000											
5 - 98,100											
6 + 117,007	56,940	60,067	31,625	13,394	14,548	(426) 3,510	500		6,692	60,067	
7			27,672	15,711	16,684	(426) 3,510	-		7,675	60,067	
8			24,213	17,024	18,830	(527) 3,510	-		8,661	60,067	180,201
9			21,186	"	21,857	3,510	-		8,782	51,285	231,486
10			18,538	"	24,505	3,510	-		11,272	48,795	280,281
11	55,884	61,123	16,221	17,182	27,720	(3690) 2,450	-		12,751	48,372	328,650
12	53,436	63,571	14,193	17,551	31,857	-	-		14,654	48,917	377,567
13			12,419		31,410	-	2,190		14,449	46,982	(32,433) 410,000
14			10,867		28,122	-	7031		15,936	44,604	
15						-					
16						-					
17						-					
18						-					
19						-					
20						-					
21						-					
						20,006	58,238				

Payback 100% of Net Profits, less $500,000 for 253,000 Cap.
6,000 Expl.

Inv. Tax Credit 25,300.

6692	25,300	10,054
7675	23,028	1,272

E. SUPERIOR (WITH OBLIGATIONS) PROFORMA FEAS. CU 1.30 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-28464.562
3	-45000.000	-29763.602
4	-60000.000	-32274.586
5	-98000.000	-42871.828
6	104532.000	37190.469
7	81713.000	23643.402
8	78612.000	18498.828
9	77220.000	14778.203
10	77857.000	12117.855
11	71178.000	9009.699
12	70027.000	7208.859
13	69019.000	5778.379
14	68137.000	4639.344
15	68137.000	3773.054
16	68137.000	3068.524
17	68137.000	2495.549
18	68137.000	2029.563
19	68137.000	1650.589
20	68137.000	1342.380
21	68137.000	1091.722
TOTAL	922254.000	-57.958

RETURN ON INVESTMENT = 22.960 PCT.

Superior East – with property obligations
Proforma Feasibility
Cu $1.30 Grade 1.25%

Cap. Inv.

ASARCO
80% of NET Profits After Payback of ALL Pre-Prod Costs plus 1% over Permitted $500,000 deductible.

Yr. NSR	OPR Cost	Cash Flow Before Taxes	ALL DEPREC.	(97–100%) DEPLETION	80% N.P. Taxable Inc.	CANUS 3% NSR 3% Deplet.	Cont. Mtn. 20% N.P. 500,000 – Deduct.	ASARCO INC. TAX	ASARCO Cash Flow After Tax	Payback Accum.
1 – 15,000	—									
2 – 35,000?	—									
3 – [illegible],000	—									
4 – 6[illegible],000	—									
5 – 78,000?	—									
6 – 164,44[illegible]	58,400	106 042	31,625	22 197?	54,718?	4,633 (2461)	500	23,791?	106,532	
7	"	"	27,612	"	56 171	4,633 "	—	25,839?	81,713	
8	"	"	24 213	"	59 690	4,633 "	—	27,430	78,61[illegible]	254,857
9	"	"	21 186	"	62 657	4,633 "	—	28,922?	77,229?	332,077
10	55,007?	109 435	18 538	24 433	64,664	1,466 (238)	1,660?	27,716	77,657?	410,000
11	53,436	111 006	16 221	24 6[illegible]	56,[illegible]	—	14,024	25,8[illegible]	71,17[illegible]	
12			14 193		57 718	—	14,429	26 550	70,027	
13			12 419		59 136	—	14,784	27 203	69,019	
14			10 867		60 378	—	15,095	27,774	68,137	
15						—				
16						—				
17						—				
18						—				
19						—				
20						—				
21						—				
						20,000	60,872			

INV. Tax credit 25,300

E. SUPERIOR (WITH OBLIGATIONS) PROFORMA FEAS. CU 1.60 GRADE 1.25 11-26-79

YEAR	CASH FLOW	D.C.F.
1	-15000.000	-15000.000
2	-35000.000	-27354.430
3	-45000.000	-27487.285
4	-60000.000	-28643.773
5	-98000.000	-36564.930
6	110588.000	32248.262
7	109040.000	24850.996
8	107448.000	19138.855
9	103645.000	14428.645
10	96033.000	10448.582
11	95172.000	8092.930
12	94019.000	6248.441
13	93012.000	4831.195
14	92130.000	3740.043
15	92130.000	2923.050
16	92130.000	2284.525
17	92130.000	1785.482
18	92130.000	1395.453
19	92130.000	1090.624
20	92130.000	852.382
21	92130.000	666.184
TOTAL	1292997.00	-24.605

RETURN ON INVESTMENT = 27.950 PCT.

11/26/79 Superior Unit - with property considerations

Proforma Feasibility

Cu 1.60 Grade 1.25 %

ASARCO

20% of N.P. After Payback

YR	NSR	OPR. Cost	CASH FLOW Before TAXES	DEPREC	Depletion	80% N.P. TAXABLE INC.	CANUS 3% NSR 3% DEPL	Cont MTR 20% N.P. (500,000 ded)	ASARCO DUE TAX	ASARCO CASH FLOW After Tax	Payback ACCUM
1	-12'000										
2	-35'000										
3	-45'000										
4	-60 000										
5	-98 000										
6	+2,11,879	59 787	152 091	31 625	30,829	89,137	6,356 (1043)	500	41,003	110,588	
7		"	"	27 672		93,590	6,356 "		43,051	109,[illegible]	225,192
8		"	"	24 213		97,049	6,356 "		44,643	107,448	332,640
9		54 367	157 511	21 186		95,611	932	9,885	43,981	103,645	[illegible]
10		53 436	158 442	18538		87,900		21,975	40,424	96,[illegible]	
11				16 221		89,114		22,278	40,972	95,172	
12				14 193		90,736		22,684	41,739	94,[illegible]	
13				12 419		92,153		23,039	42,391	93,012	
14				10865		93,397		23,349	42,963	92,130	
15											
16											
17											
18											
19											
20											
21							20,000	123,912			

Invest Tax Credit 20,000

[illegible] 3,354

ASARCO

RECEIVED

SEP 4 - 1979

EXPLORATION DEPARTMENT

Exploration Department
T. C. Osborne
Vice President

August 30, 1979

Mr. W. L. Kurtz
Tucson Office

Arizona
Superior East Project

Dear Mr. Kurtz:

I'm in agreement with the opinion expressed by Mr. Graybeal's memorandum of August 6 which I know you share, to the effect that exploration of the A-8 discovery has reached the point at which acceleration of drilling is warranted in order to determine tonnage and grade. Although I reserve the right to quibble about details later on, in general you and Mr. Graybeal should plan to include provision for the program in your 1980 budget proposal. I agree two drills should be the minimum during the first year, and we might wish to increase this to three or even four drills during 1981 if the 1980 results are favorable.

We would likely have no difficulty finding a joint venture partner to share cost of the program if we desired, but my initial thought is that the financial commitment is within our capabilities and it will be best to proceed alone.

In considering the proposal, we need a firmer handle on possible economics of the deposit. Therefore, I would like to have from you not later than December 1 a pro forma feasibility outline using horseback figures, for a model of 100 million tons at 1.25% Cu above the 5,000' level. I expect Mr. Skidmore or others in the Mining Department can help you with estimates of development and operating block cave — and capital costs derived from Sacaton studies. The scenario should assume that drilling has been completed and Year 1 starts with development shaft sinking. Use 1979 capital and operating costs and work out potential after-tax internal rates of return for various copper prices. The analysis should show returns both for the total project and for Asarco's share after provision for Continental's net proceeds royalty. If any questions arise, please call.

Very truly yours,

T. C. Osborne

cc: FTGraybeal

ASARCO

Southwestern Exploration Division

NA → file

March 10, 1982

To: W. D. Payne

From: J. D. Sell

Summary and Interpretation of Drilling Results thru Holes A-14 and AI-2, Porphyry Copper Area-Superior East Project, Pinal County, Arizona

I submit the following report as an update on the geology-alteration-mineralization, and include a preliminary mineral inventory for the porphyry copper exploration area of the Superior East Project. The last report covers the holes A-9 and A-10 (Interim Report, May 30, 1978) and part of hole A-11 (Drilling Thoughts, May 10, 1979; and Thought Reinterpretation, June 6, 1979). Since those reports, holes A-11, A-12, A-13, A-14, and AI-2 have been completed.

SUMMARY

The picture now emerging is one of a major porphyry copper system containing chalcocite-bornite mineralization in a thick blanket-like form which has now been partially outlined by drill holes.

A higher grade core zone, as exemplified by holes A-8, A-9 and A-11, contains values ranging from 0.81% to 1.57% copper over thicknesses of 600 to 800 feet. This core is open to the north, east, and south. The composite zone is about 750 feet wide (NE) by 1300 feet long (NW) and averages 700 feet in thickness with a probable tonnage approaching 54 million tons at an average of 0.95% copper. The central drilled zone may extend to include an additional tonnage of 70 million with a somewhat lower average. Thirteen hundred feet southeast of hole A-8 is hole A-13 which contained 530 feet of 0.58% copper and is probably approaching the cutoff of better mineralization in this direction. Table 1 of the text contains an expanded analysis of the mineral reserve potential which may be in excess of 1500 feet wide and 3000 feet long, with a 200-500 million tons of block caving potential at various cutoff grades.

or 392' @ 06'

James D. Sell

JDS:mek

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ASARCO

Southwestern Exploration Division

March 10, 1982

REPORT ON: SUMMARY AND INTERPRETATION OF DRILLING RESULTS, PORPHYRY COPPER AREA, SUPERIOR EAST PROJECT

BY: J. D. Sell

SUMMARY

The mineral inventory and projections of the porphyry copper area are summarized on Figure 1 and in Table 1.

The central core zone outlined by holes A-8, A-9, A-11, and A-12 may contain about 54 million tons at an average grade of 0.95% copper. Based on the contour plot (Fig. 1), it may be expected that an additional 70 million tons of perhaps 0.80% copper will be outlined. This in turn may be surrounded by lower grade material--as per hole A-13 which contains a thickness of 530 feet of 0.58% copper. If this grade material does surround the core zone, it could increase the overall tonnage to exceed 200 million tons. The ultimate grade and position of cutoff values will be determined by future drilling.

A three-hole pattern, A-2W, A-10, and A-14 are apparent limiting holes to the west. These holes have variable mineralized thicknesses ranging from 200-300' to over 600' of 0.3 to 0.4% copper. A fourth indicative hole is AI-2 located over 3000 feet east-southeast of hole A-8. AI-2 contained 310 feet of 0.37% copper and adds credence to the concept of a very large plus 0.3% copper zone as a perimeter around the central mineralization. As calculated in Table 1, this expanded mineralized zone is around 500 million tons of plus 0.5% copper.

RECOMMENDATION

It is recommended that a five-hole program be initiated on an 800 foot equilateral triangular grid (Fig. 2) to the north, east, and south of hole A-8. Holes A-9 and A-13 are in proximity to the 800-foot grid system. The completion of these holes will strongly indicate the overall size and grade potential of this portion of the Superior East Project.

OVERVIEW

The initial hole in the central core area was hole A-8 which encountered sulfides at an elevation of +793 feet above sealevel, i.e., 3879 feet below the drill collar. The sulfide intercept was 646 feet of 1.57% copper followed by 135 feet of 0.26% copper, followed by 247 feet of 0.07% copper. The sulfides were overlain by 102 feet of leached capping type oxidized material terminated by a very low angle fault structure. This in turn was overlain by 551 feet of brecciated and oxidized material of leached capping characteristics

TABLE 1 - Tons and Grade of Probable and Indicated Mineralization, Superior East

Hole Influence*	Probable	Plus	Indicated
A-8, Red	11,200,000 at 1.50		
A-11, Orange	31,600,000 at 0.80	Plus	20,600,000 at 0.80
A-9, A-12, Blue	10,800,000 at 0.80	Plus	50,300,000 at 0.80
Subtotal 1	53,600,000 at 0.95	Plus	70,900,000 at 0.80

1) Total of Subtotal 1: 124,500,000 tons at 0.86% copper

A-13, Green	8,800,000 at 0.60	Plus	79,300,000 at 0.60
Subtotal 2	8,800,000 at 0.60	Plus	79,300,000 at 0.60

2) Total of Subtotal 2: 88,100,000 tons at 0.60% copper

3) Total of Subtotal 1 & 2: 212,600,000 tons at 0.75% copper

A-2, Yellow	36,100,000 at 0.30		
A-10, Yellow	27,100,000 at 0.30	Plus	Remainder of Yellow Area:
A-14, Yellow	5,500,000 at 0.40		184,300,000 at 0.32
AI-2, Yellow	15,400,000 at 0.35	____	_____
Subtotal 3	84,100,000 at 0.32	Plus	184,300,000 at 0.32

4) Total of Subtotal 3: 268,400,000 tons at 0.32% copper

5) GRAND TOTAL of Subtotals 1, 2, & 3: 481,000,000 tons at 0.51% copper

*See Figure 1 for location and color scheme of blocks.

which is interpreted to be a transported slide block. The best mineralization is among quartz veins and in quartz-sericite alteration zones collectively called qsv zones (quartz-sulfide vein zones). These zones are inclined steeply ($\pm 70^{\circ}$). Bornite-chalcocite mineralization is most prominent with some secondary chalcocite at the top portion of the sulfide intercept and chalcopyrite becoming noticeable toward the base of the intercept.

The qsv features drop off with depth as does the grade and the concept from holes A-8, A-9, A-10, and A-11 was that various parts of one or more qsv systems had been cut by the drilling. Most holes encountered "ore grade" and qsv features in the sulfide zone immediately under the oxidized capping. However, hole A-11 first had 291 feet of 0.40% copper (as sulfide) prior to cutting 553 feet of 1.12% copper which was followed by 89 feet of 0.26% copper. This finding supported the qsv concept of several high grade (+1% copper) qsv structures separated by lower grade (0.40% copper) material.

At the time, the data points were not sufficient to allow a unique solution as to dip and strike of the qsv system(s) although it was probable that they were striking northeasterly and had a dip either northerly or southerly. Hole A-12 was recommended to be started within hole A-11 and be drilled by directional controlled machines to the south and thus provide an intercept between the qsv structure found in A-9 and the qsv structure found in A-11, or to prove that the qsv was the same, but quite wide, structure.

During the investigation for suitable deviation drills, several contractors were selected and a Dyna-drill contractor was engaged to drill the hole A-12. Difficulties were soon apparent and the contract was terminated before any new information was gained.

Hole A-13 was then drilled some 1500 feet southeasterly from A-8 and again qsv structures were cut and in the sulfide zone 138 feet of 0.32% copper, followed by 392 feet of 0.67% copper, followed by 33 feet of 0.23% copper, followed by 601 feet of 0.05% copper were cut by drilling. The interesting 563 feet of 0.56% copper found suggested either the fortuitous placement of the drill hole to intercept another qsv widely separated from the A-8 area system, or that we were dealing with a more widespread area of mineralization than previously speculated. Concurrently, hole AI-2 located some 2100 feet east-northeast of hole A-13 encountered 310 feet of 0.37% copper, all of which was partially oxidized--probably as a result of being near the projection of the Rawhide Canyon fault. Although totally in Pinal Schist, hole AI-2 nevertheless again suggested widespread mineralization.

Hole A-14 was drilled to provide an intercept central to the triangular pattern established by holes A-8 (southeast), A-10 (southwest) and A-2W (northerly). Under a section of leached and oxidized qsv structures, hole A-14 encountered sulfides of 53 feet at 0.53%, followed by 99 feet at 0.28%, followed by 21 feet at 1.21% (total of 173 feet at 0.47%), followed by 1469 feet which averaged less than 0.05% copper. The finding of the upper 173 feet of qsv type material could be integrated into the pattern of several qsv systems. But when the hole was continued the following 1469 feet and failed

to intercept a projected qsv system cut by A-8 and A-10 to the south, it became very difficult to project qsv systems other than by assigning a south-dipping component.

Interest in a controlled directional hole to the south out of A-11 again became a feasible way to test the orientation and dip direction of the qsv systems. The hole A-12 was reentered by a company using a Navi-drill machine which successfully placed the hole in proximity to the target area about halfway between the A-11 and A-9 intercepts. Under the oxidized cap a sulfide intercept of 577 feet averaging 0.77% copper followed by 509 feet of 0.46% copper was cut by the core drilling. The hole was continued 467 feet in material averaging less than 0.10% copper. Quartz-sulfide veins were again dominant in the portion containing good copper mineralization and on these an oriented core study was undertaken. The core study consistently suggested a southerly component of dip with a northeasterly strike direction to the quartz vein. The schistosity was also oriented and suggested an overall east-northeast strike direction. Assuming this ENE schistosity to be constant, a number of cores were studied from other holes and most suggested southerly dips to the qsv structures--even in hole A-13.

Hole A-12 essentially confirmed the existence of a blanket-like form of chalcocite-bornite mineralization which is mostly within quartz-sericite and quartz vein alteration zones and which is present under a leached-capping type of oxidized material similar to the sulfide zone. This oxide zone is nearly devoid of copper oxides or native copper except very near the upper limits of sulfides.

This blanket is now suggestive of being a part of a large zone of porphyry copper type mineralization of the dimensions and grade described earlier. Continued confirmation should proceed by drilling vertical holes from the surface in an acceptable pattern for evaluation.

DESCRIPTION AND INTERPRETATION OF INTEGRATED DRILL RESULTS

Introduction. Table 2 is a listing of all the drill holes in the porphyry copper area showing: the collar elevation, the depth to the top of the premineral material, the base of the low angle fault, the top of sulfide, the various mineral intercepts, and the total depth of the hole, along with the equivalent altitudes* of those points. Also listed is the amount and type of porphyry units within the above listed intercepts. The porphyry designations will undoubtedly be clarified in further study, but the following general types were noted. 1) Tgr (granite) is the freshest type and is similar to the outcropping Schultze granite, which contains large phenocrysts, found just east of the project area. A weakly altered and small-phenocryst type was designated as 2) Lgr (granite), while more monzonitic units were labeled as 3) Lqm (quartz monzonite) and 4) Lqmp (quartz monzonite porphyry). These are all relatively large masses although dikes of various thickness have been noted. The 5) Lbfp (biotite feldspar porphyry) is the most common type within the main mineralized zone and is a equigranular phenocryst type with

*Ref. mean sea level

general abundant biotite. The Lbfp may form some larger masses but generally comprise a myriad of small dikes and sills. The 6) black porphyry is a distinct type and is found as small dikes and sills in a few holes. The hole A-4, near Devil's Canyon and some 6500 feet southwest of hole A-10, encountered black porphyry fragments in the Devil's Canyon fault gouge, which was then followed by 30 feet of Pinal Schist intruded by dikes of black porphyry, followed by 54 feet of massive black porphyry to the total depth. Aplitic phases of the various classifications are also known.

Four cross-section lines have been constructed through the various drill holes. Figure 3 is a plot of the section lines on plan showing the drill hole locations.

Attachment A is the western cross-section A-A', from northwest to southeast, through drill holes A-2W, A-14, A-8, and A-13. Drill hole A-2W was the initial hole to intercept significant quartz-sericite alteration containing disseminated chalcocite mineralization. In hole A-2W 27 feet of leached capping material was under a flat fault, followed by 296 feet of 0.35% copper values. A steep-angled fault was then penetrated (the cross-fault, as designated in later studies) and a low-grade section of 217 feet of 0.18% copper was cut. Values then picked up and 110 feet of 0.42% copper was recovered before the hole was lost by drill rod twist-off. As this was the second time the hole had suffered a twist-off, the hole was abandoned at 4940 feet. The hole is probably at the western edge of the main mineralization, and on the cross-section A-A' the 0.4% copper zone is projected to drop off shortly below where the hole was terminated. However, hole A-2W is the only hole in the project area to be of overall quartz sericite alteration without the quartz sulfide vein zones found elsewhere, and the mineralization is chalcocite with no visible bornite as found elsewhere. It is the only hole in the area which is reminiscent of the "porphyry copper" phyllic alteration as seen in most of the operating open-pits.

Going southerly along the cross-section, the next hole is A-14 which had 81 feet of leached capping below the low angle fault, followed by a thin 173 feet of 0.47% copper (including a base of 21 feet of 1.20% copper), followed by 1469 feet of less than 0.10% copper. This hole is also thought to be fringe-type mineralization to the blanket mineralization, but it does contain bornite-chalcocite in quartz-sulfide veins enclosed by quartz sericite selvage zones.

Further to the southeast is hole A-8 which is the discovery hole of significant thickness and grade--646 feet averaging 1.57% copper. Massive exsolution-textured bornite-chalcocite mineralization as well as a more disseminated form were found in the quartz sulfide veins enclosed in quartz-sericite selvage bands. The sulfide mineralization was found under 102 feet of leached capping below the flat fault. Below the main sulfide intercept is 135 feet of 0.26% copper followed by 247 feet of 0.07% copper to total depth.

Some 1200 feet southeast (at the mineralized horizon level) of hole A-8 is the intercept in hole A-13. This distance is several times the interval than the previous distances between holes. The hole had 237 feet of leached capping below the flat fault, followed by 138 feet of 0.38% copper, and then 392 feet of 0.67% copper was cut. This in turn was followed by 633 feet of overall

very low grade material. Very similar quartz sulfide veins (of bornite-chalcocite), in quartz-sericite alteration halos, were found in hole A-13 as per the previous two holes. This continuation of mineralization type suggests an elongate blanket zone extending from A-14 thru A-8 and beyond A-13 which is 500-650 foot thick containing 0.7 to plus 1.0% copper mineralization.

Along the section A-A', the porphyry types below the flat fault show quartz monzonite types in hole A-2W of about 20-25% of the total footage cut. In hole A-14 the porphyry is of a quartz monzonite porphyry type, with some 40% porphyry material among the top 0.5% copper values, then dropping to about nil for the next 900 feet in low-grade copper values before becoming continuous porphyry for the bottom 556 feet of the hole all of which has very low copper values. Hole A-8 with its excellent grade and thickness had biotite feldspar porphyry units which total around 25% of the aggregate thickness. The southern A-13 hole is back in quartz monzonite porphyry and has a thick 400 foot section of quartz monzonite porphyry (about half of which contains the best mineralized section). Above the massive section, the upper part contains about 50% porphyry material while below is only about 25% porphyry material, all being quartz monzonite.

In contrast to the porphyry distribution below the flat fault, a change is noted in the type and distribution of porphyry in the slide block material above the fault. The slide block is of the A-2 type or leached capping variety. In hole A-2W the slide block is made up of 80% quartz monzonite type, but in hole A-14 it is 25% biotite feldspar porphyry with some aplitic dikes; in hole A-8 it contains only a few granite aplite dikes, and finally in A-13 no porphyry was found in the slide block material. This overall distribution suggests a northwesterly transport direction along the section A-A'.

The low angle fault, along section, is dipping 15°-25° to the northwest and truncates the oxidized, in-place leached capping. The leached capping is 239 feet thick in hole A-13 versus 28 feet thick in hole A-2W.

Offset of the flat fault and the oxide-sulfide contact by the northeast-striking cross fault is suggested to be some 400-500 feet with downdrop on the north.

Attachment B is the eastern cross-section B-B' which also is constructed from northwest to southeast. Section B-B' again starts at hole A-2W, goes southeast through holes A-11, A-12, A-9, then a long 2900 foot interval to hole AI-2.

From the suspected fringe hole of A-2W, the section proceeds across a fault (the cross-fault) to hole A-11 which had 171 feet of oxidized capping under the flat fault. Then there is 291 feet of 0.40% copper, then 533 feet of 1.12% copper, and 89 feet of 0.26% copper to the bottom of the hole. Hole A-12 was a directional-controlled hole, followed by conventional coring in the sulfide zone. Under the flat fault only 103 feet of leached capping was found before 317 feet of 0.64% copper followed by 260 feet of 0.92% copper. As mentioned previously, hole A-12 was continued to cut the projection of the A-11 qsv system at depth but instead encountered 509 feet of 0.46% copper with

a drop-off to 247 feet of 0.11% and 220 feet of 0.02% copper to the total depth. Hole A-12 is the longest intercept yet cut of material averaging in excess of 0.50% copper--having 1086 feet of 0.62% copper average. The hole is similar to A-11 in that a lower grade zone overlies the higher grade zone.

Adjacent to the southeast is hole A-9 which had a very thick section of leached capping under the flat fault. The oxidized zone was 350 feet thick and then the sulfide zone started immediately with a 483 foot length of 0.88% copper, followed by 143 feet of 0.59%, followed by 233 feet of 0.23% copper to the termination of the hole.

In looking at section B-B', this central zone of higher grade values, i.e., the total "ore column," includes 913 feet of 0.81% copper in hole A-11, 577 feet of 0.77% in A-12 (or 1086 feet of 0.62%), and 626 feet of 0.81% copper in hole A-9 (or 859 feet of 0.65%). In detail it appears that the higher grade portion of 0.9% to 1.0% copper climbs from the base of the interval in hole A-11 to the top of the interval in hole A-9.

Hole AI-2 was drilled 2900 feet southeast of hole A-9, and under the flat fault there was 56 feet of leached capping material underlain by 310 feet of 0.37% copper; it bottomed in 452 feet of less than 0.10% copper.

Although weaker alteration-mineralization was found in hole AI-2, the quartz sulfide veins were again present and this is suggestive that the hole is within the major postulated alteration-mineralization zone. The hole contained a lot of brecciated material and was partially oxidized to its total depth. Both features are undoubtedly increased due to the proximity of the major north-trending Rawhide Canyon fault.

The porphyry distribution within the in-place units below the flat fault along section B-B' is as follows: hole A-2W has 20-25% quartz monzonite types. This changes to biotite feldspar porphyry types in the three central "ore" holes [hole A-11 contains around 30%, this decreases to 15% in hole A-12, and to 8% in hole A-9 in the ore zone portion]. The deep, lower portion of hole A-12 has 60-65% biotite feldspar porphyry and is similar to the deep section of hole A-14. The faraway hole AI-2 contains no porphyry types.

Above the flat fault, a thick section of A-2 type leached capping slide block material was found in holes A-2W, A-11, A-12, and A-9. The slide block averaged some 470 feet thick at these points compared to only 177 feet thick in hole AI-2. Only hole A-9 had any (66 feet) of the fresher Schultz granite M-1A type of slide block material. However, it is of interest that within the Whitetail Conglomerate section of hole A-2W is an 80 foot thickness of the M-1A type material apparently emplaced as a landslide derived block.

Porphyry types in the slide block material suggests a change from the 80% quartz monzonite variety in hole A-2W to only 2% biotite feldspar porphyry plus 4% black porphyry in the area of holes A-11 and A-12, and 3% quartz monzonite type in hole A-9, while hole AI-2 had no porphyry. All of the above is in A-2 type slide block material. The M-1A type slide block material in hole A-9 was 63% weakly altered granite type and it is suggested that a similar high percent is found in the M-1A type within the Whitetail Conglomerate in hole A-2W.

The cross-fault structure in section B-B' is suggested to have about 450-500 feet of north-down displacement of the slide block material. This amount is similar to the suggested oxide-sulfide contact displacement as shown previously in section A-A'. However, in section B-B', the oxide-sulfide contact and flat fault have displacements of only 50 and 200 feet. Differential movement along the cross-fault as well as thickness variations of slide block material may account for the apparent changes.

Another fault problem is suggested in the area of holes A-11, A-12, and A-9 where the flat fault is apparently offset some 300 feet (with a similar amount on the top contact of the slide block material) but the oxide-sulfide contact needs only about 50 feet for a match-up. Undoubtedly, more match-up problems will become apparent as the number of data points increases.

In section B-B', note that the thicker section of oxidized leached capping below the flat fault is in the area of holes A-11, A-12, and A-9 where the best underlying alteration-mineralization is also found. This oxidized zone is apparently being truncated by the flat fault both to the northwest in hole A-2W and to the southeast in hole AI-2.

Attachment C is the southern section C-C' from southwest to northeast through the area of drill holes A-10, A-8, A-9, and AI-1.

On the southwest, the hole A-10 below the flat fault had 94 feet of leached capping overlying 58 feet of 0.41% copper, then 168 feet of 0.18%, followed by 70 feet of 0.44%, and 33 feet of 0.07% copper to the bottom of the hole. As the section suggests, hole A-10 is a fringe hole to the better mineralization found to the northeast in hole A-8. There, under the flat fault, 102 feet of leached capping was followed by 646 feet of 1.57% copper, then 135 feet of 0.26%, and 247 feet of 0.07% copper to total depth.

The other good hole, A-9 to the northeast, had a thick 450 feet of leached capping overlying 483 feet of 0.88%, followed by 143 feet of 0.59%, then 233 feet of 0.23% copper to the base of drilling. The two intercepts of A-8 and A-9 compare favorably and it is unknown how far to the northeast the mineralization continues. The next hole northeast of hole A-9 is located 3340 feet away and is designated AI-1. Hole AI-1 had 192 feet of leached capping under the flat fault, followed by 291 feet of 0.14% copper. The Rawhide Canyon fault cut the hole at that point and from there to the bottom of the hole was 438 feet of 0.10% copper.

Along section C-C', the porphyries show some 10% biotite feldspar type and some black porphyry in hole A-10, and both increase in the final 30 feet of the hole. To the northeast, in hole A-8, the biotite feldspar type increases to an average of 25% in the main mineral zone although no porphyry was found in the 102 feet of leached capping below the flat fault. Further northeast, hole A-9 had a lesser amount, 5% to 7%, in the interval from the flat fault on down through the main mineral zone, followed by some increase toward the bottom of the hole. The distant northeast hole AI-1 had about 30% in the leached capping and this decreased to around 10% in the sulfide zone--all as the fresher Schultze granite type. Located 3800 feet further northeast (but not shown on section C-C') is a hole LB-4 which cored essentially fresh Schultze granite from below the dacite at 334 feet to the terminal depth of 4860 feet. A few aplitic dikes also cut this section of granite which is part of the main Schultze stock which extends toward Globe, Arizona.

Along the section C-C', the slide block material above the flat fault is of two types--1) the upper is the M-1A type of essentially fresh Schultze granite: hole A-10 had 30 feet of weakly altered granite, hole A-8 had none, A-9 had 63 feet of altered quartz monzonite type, and hole AI-1 had 396 feet of fresh Schultze granite type; 2) the A-2 type underlies the M-1A type, and is the altered leached capping type material. Considering only the A-2 type of slide block material, hole A-10 had 451 feet containing 25% biotite feldspar porphyry and 2% black porphyry type, hole A-8 had 551 feet with 4% Schultze granite aplite type, and hole A-9 had 354 feet with 3% quartz monzonite type. Hole AI-1 had 396 feet of 41% Schultze granite type. By viewing section C-C', it appears that the porphyry types and distributions reflect only a minor amount of lateral displacement of the slide block material--with a southwestward component relative to the section.

Also along section C-C', the flat fault is viewed as having a gentle dip component of around 5° to the southwest.

Attachment D is the northern section D-D' which extends from the southwest at hole A-10 northeast through holes A-14, A-11, and DCA-3A.

Hole A-10 is a fringe type with the best section being 296 feet of 0.29% copper. Hole A-14 further northeast is only slightly better with 173 feet of sulfide-bearing material averaging 0.47% copper. Continuing northeast, hole A-11 is within the better grade core zone and, under the flat fault, had 176 feet of leached capping followed by 291 feet at 0.40% copper, then 533 feet of 1.12% copper, and finally by 89 feet of 0.26% copper to the bottom of the hole. From inspection of the section D-D', it is expected that good grade copper values will extend for some distance to the northeast. However, by the time the section has traversed 2660 feet northeast of hole A-11 to the hole DCA-3A, the intersection there shows only 20 feet of leached capping material below the flat fault followed by 116 feet of 0.13% copper. The above values are separated from 348 feet of 0.01% below by the trace of a high-angle cross-fault.

Below the flat fault, the porphyry variation along section D-D', starting with the southwestern hole A-10, shows about 10% biotite feldspar porphyry with less than 3% overall of black porphyry. The lower part of A-10 had an increased percentage of biotite feldspar type. To the northeast in hole A-14, nearly 50% quartz monzonite is found in the leached capping and mineralized zone but this proportion drops rapidly to 2% for the next 898 feet; a massive 100% quartz monzonite porphyry mass extends for 556 feet to the bottom of the hole. On to the northeast, in hole A-11, the biotite feldspar porphyry is present as a 25% to 30% component from the flat fault down through the leached capping and mineral zone, and then it drops to 9% in the low grade values which extend to the terminal depth of the hole. The far northeast DCA-3A hole is 100% Schultze granite above the cross fault and only 3% Schultze granite below the cross fault.

Above the flat fault along section D-D' is a variable thickness of A-2 type leached capping and some M-1A type slide block material. Hole A-10 has 29 feet of M-1A type of weakly altered granite material, about 64% by volume, and that is underlain by 451 feet of A-2 type containing about 25% biotite feldspar plus 2% black porphyry. Hole A-14 has a thin 175 feet of A-2 type with again about 25% of the biotite feldspar porphyry type. Hole A-11 to the northeast has 593 feet of A-2 type with a makeup of 4% black porphyry plus 2% of the biotite feldspar porphyry type. Hole DCA-3A has 215 feet of 100% Schultze granite of the leached capping A-2 type. Also in hole DCA-3A are two separate slide blocks bounded by Whitetail Conglomerate. The upper one is 78 feet thick with its upper half being about 50% weakly altered quartz monzonite and the lower half being 100% quartz monzonite. The block also contains some remnant chalcocite and oxide copper values. The second, lower, slide block is 97 feet thick and is 98% quartz monzonite as typical leached capping.

Cross-section D-D' again suggests a westerly component to the offset of leached capping slide block versus the in-place block. The slide blocks within the Whitetail Conglomerate are on the downthrown side of the cross-fault and are derived from an altered-mineralized section of the leached capping system. This adds a suggestion that the mineralization zone extends significantly northeasterly of the A-11, A-9 area of drilling in order to supply the altered blocks to the DCA-3A area.

DISTRIBUTION OF ROCK TYPES

The direction and amount of movement of the slide block along and over the flat fault which lies on in-place units has been discussed in previous reports. With the increased data points a further assessment can be attempted. Table 3 lists the hole numbers, the thickness of material, the percentage of porphyry, and the type of porphyry for the leached capping A-2 type slide block area above the flat fault (Part A), and the same information for the underlying leached capping and the "ore column" interval of the in-place block (Part B).

TABLE 3 - Data of Thickness, % Porphyry, and Porphyry Type at Superior East

A. In A-2 Type Slide Block above Flat Fault

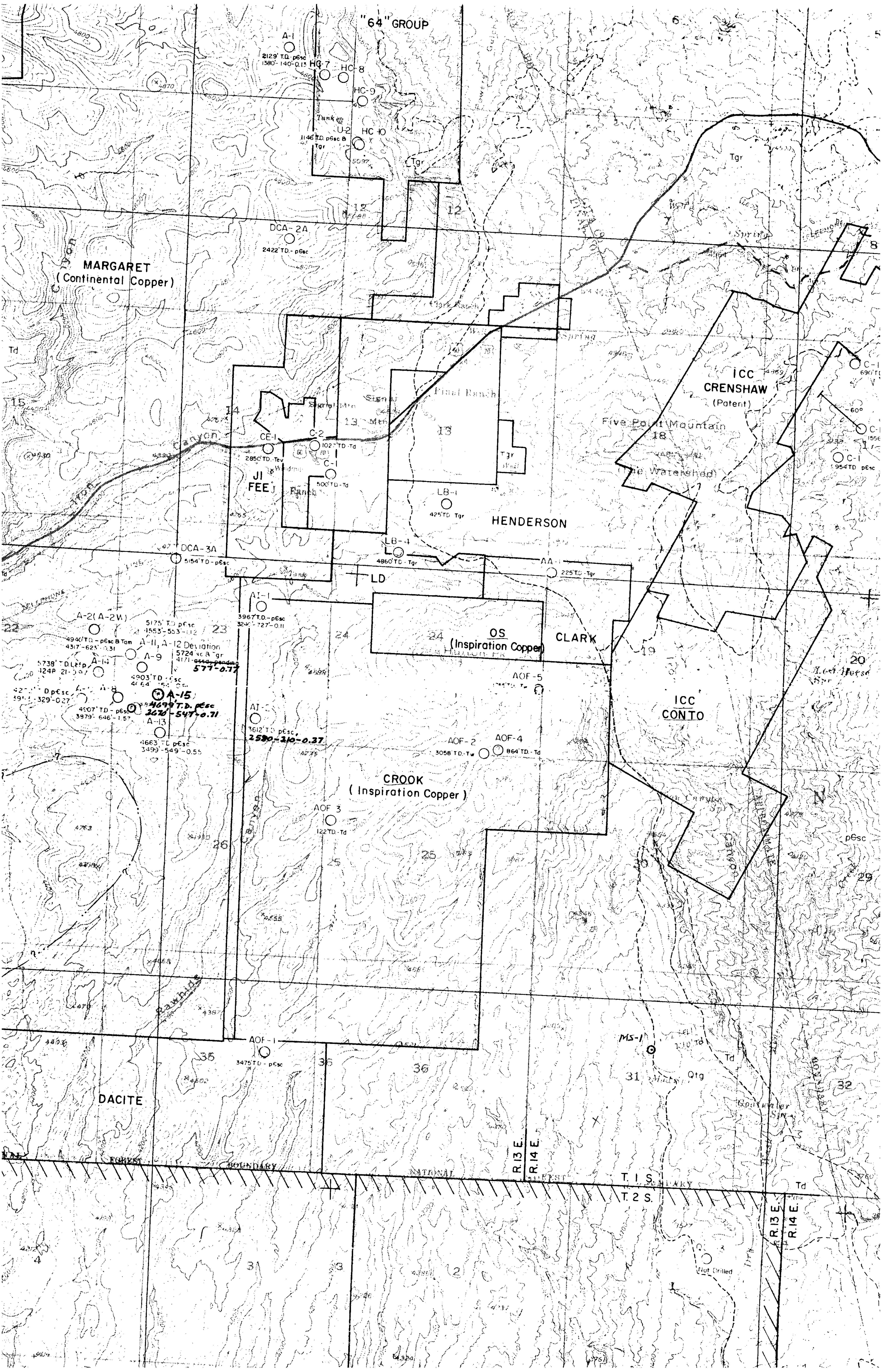
Hole	Thickness, Feet	% Porphyry	Type Porphyry
A-2W	369	81	Lqm
A-8	551	4	Tgr aplite
A-9	357	3	Lqm
A-10	453	25	Lbfp
		2	Black
A-11	593	2	Lbfp
		4	Black
A-12	570	Zero	---
A-13	189	Zero	---
A-14	174	25	Lbfp
AI-1	None (only M-1A type present)		---
AI-2	178	Zero	---
DCA-3A	216	100	Tgr

B. In Leached Capping plus "Ore Column" below Flat Fault in the In-place Block

Hole	Thickness, Feet	% Porphyry	Type Porphyry
A-2W	651	26	Lqm
A-8	883	24	Lbfp
A-9	977	5	Lbfp
A-10	390	10	Lbfp, minor Black
A-11	1001	26	Lbfp
A-12	678	17	Lbfp
A-13	769	72	Lqmp
A-14	254	41	Lqmp
AI-1	921	14	Tgr aplitic
AI-2	366	Zero	---
DCA-3A	136	100	Tgr

These data have been placed on Figure 4 with the in-place block as the base and the slide block as an overlay. Two possible tie areas are noted:
1) the position of the Precambrian Pinal schist-Laramide intrusive contact;
2) the amount and type of porphyry intrusive material.

Only generalizations can be made with the control available, but as a start the percentages have been outlined of the Laramide biotite feldspar porphyry (Lbfp) as this unit appears to be related to the ore zone type. In viewing the base-overlay, the overall suggestion is that the moved block was transported northwesterly to westerly some 500-1000 feet. The schist-intrusive contact was south of A-13 in the in-place block and appears to be north of A-13 in the transported slide block. A review of the distribution of the 25% Lbfp material suggests a more westerly to perhaps southwesterly component. The occurrence of black porphyry was found in hole A-10 in-place units as well as being in slide block material in the same hole A-10 and in the more distant A-11 hole.


"64" GROUP
A-1
2129' T.D. pЄsc
1380'-140-0.13
HC-7
HC-8
HC-9
U-2
HC-10
1146' T.D. pЄsc B
Tgr
DCA-2A
2422' T.D. - pЄsc
MARGARET
(Continental Copper)
Td
CE-1
2850' T.D. - Tev
C-2
1027' T.D. - Td
C-1
500' T.D. - Td
JI
FEE
LB-1
425' T.D. Tgr
HENDERSON
DCA-3A
5154' T.D. - pЄsc
LB-4
4860' T.D. - Tgr
LD
AA-1
225' T.D. - Tgr
AI-1
3967' T.D. - pЄsc
A-2 (A-2W)
5175' T.D. pЄsc
A-11, A-12 Deviation
5724' sc & Tgr
A-9
A-14
5738' T.D. Lt. p
4903' T.D. - pЄsc
A-8
A-15
4699' T.D. pЄsc
3670-547-0.71
577-0.77
A-13
4663' T.D. pЄsc
3499'-549'-0.55
AI-C
3612' T.D. pЄsc
2580-210-0.37
OS
(Inspiration Copper)
CLARK
AOF-5
ICC
CONTO
AOF-2
3058' T.D. - Tw
AOF-4
864' T.D. - Td
CROOK
(Inspiration Copper)
AOF 3
122' T.D. - Td
ICC
CRENSHAW
(Patent)
Five Point Mountain
C-1
954' T.D. pЄsc
pЄsc
AOF-1
3475' T.D. - pЄsc
DACITE
MS-1
Qtg
R.13 E.
R.14 E.
T. 1 S.
T. 2 S.
Not Drilled

MARGARET
(Continental Copper)

CROOK
(Inspiration Copper)

OS
(Inspiration Copper)

HENDERSON

CLARK

SUN

DACITE

HC-7
2129' T.D. pCsc
1380'-140'-0.13

HC-8

HC-9

HC-10

U-2
1146' T.D. pCsc & Tgr

DCA-2A
2422' T.D. - pCsc

DCA-3A
5154' T.D. - pCsc

M-1A
5322' TD - TPn

M-w
200' T.D. - Td

CE-1
2850' TD. - Tev

CE-2
1490' TD. - Td

C-1
500' TD - Td

C-2
1027' TD - Td

JI
FEE

LB-1
425' TD - Tgr

LB-4
4860' T.D. - Tgr

AA-1
225' T.D. - Tgr

LD

AI-1
3967' T.D. - pCsc
3240'-727'-0.11

AI-2
3612' T.D. pCsc
2580'-210'-0.27

A-2(A-2W)
5175' T.D. pCsc
4553'-553'-0.12
4940' T.D. - pCsc & Tqm
4317'-623'-0.31

A-11, A-12 Deviation
5724' pCsc & Tgr
4171'-assay pending
577'-0.77

A-14
5738' T.D. Ltrp
4248'-21-0.97

A-9
4903' T.D. pCsc
4064'-454'-0.90

A-15
4699' T.D. pCsc
2626'-547'-0.71

A-10, A-8
4907' T.D. - pCsc
3979'-646'-1.57

A-13
4663' T.D. pCsc
3499'-549'-0.55

A-7
6042' T.D. - TPn
4695'-375'-0.84

A-4
6664' TD - Tqm & pCsc
5089'-1460'-0.76

A-3
6008' T.D. Tw

A-6
1665' TD - Tw

AOF-1
3475' T.D. - pCsc

AOF-2
3058' T.D. - Tw

AOF-3
122' T.D. - Td

AOF-4
864' T.D. - Td

AOF-5
1755' T.D. - Tw

MS-1

MJ-11

KC-1

Pinal Ranch

Tgr

Td

Tqm subsurface

Tev

Qs

Qu(?)

Spring Canyon

Davis Canyon

Ravine

Pond

Tank

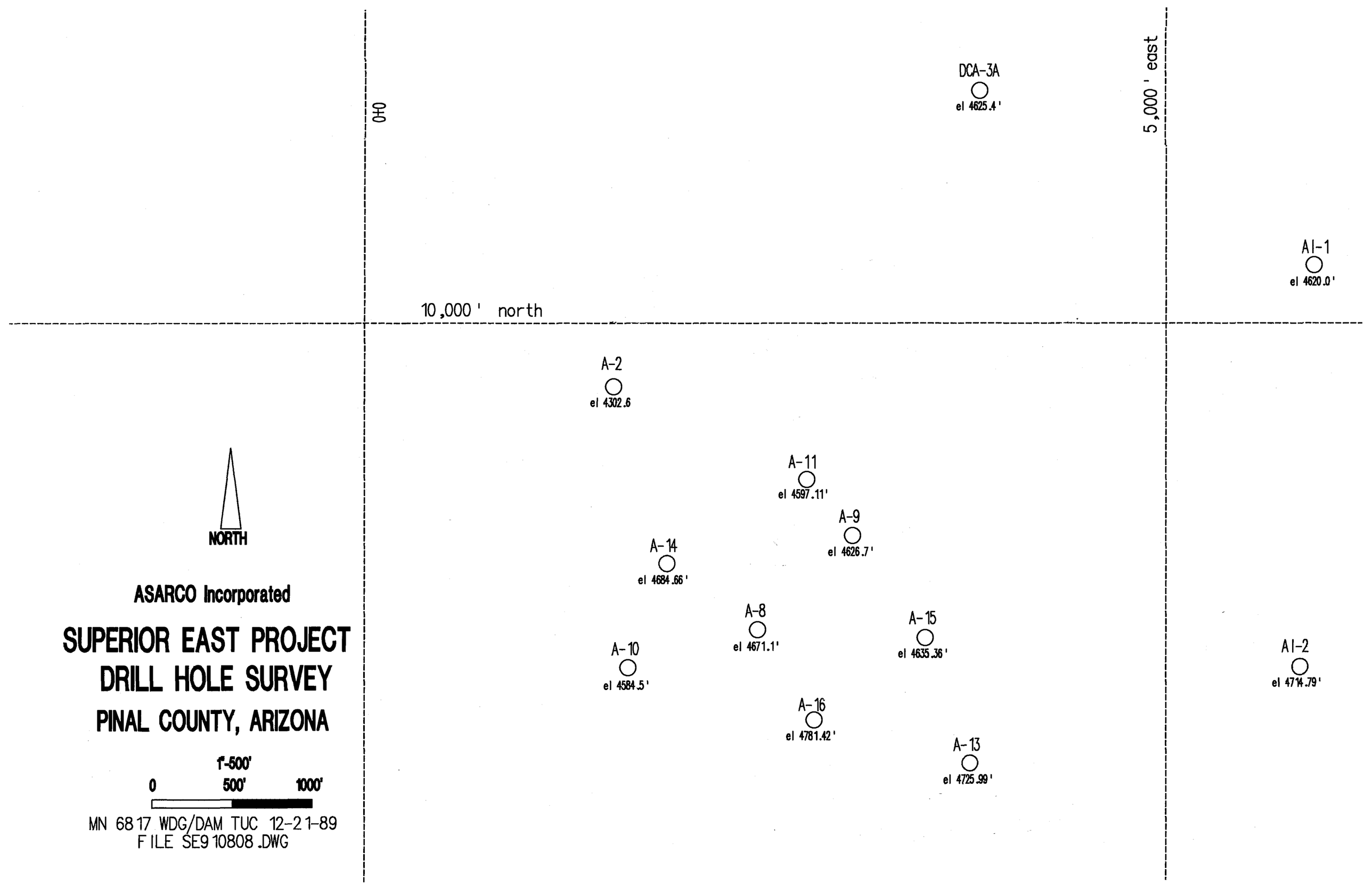
NATIONAL FOREST BOUNDARY

R.13 E.

R.14 E.

T. 1 S.

T. 2 S.



NORTH

ASARCO Incorporated

SUPERIOR EAST PROJECT
DRILL HOLE SURVEY
PINAL COUNTY, ARIZONA

1"-500'

0 500' 1000'

MN 6817 WDG/DAM TUC 12-21-89
FILE SE910808.DWG

EXPLANATION

A-8 ● Drill hole and number at top of sulfides

Solid Color Probable mineralization

Outlined Color–Indicated limits of mineralization

r 650 foot column of 1.50% copper

o 800 foot column of 0.80% copper

b 600' foot column of 0.80% copper

g 500' foot column of 0.60% copper

y A-2 area= 600 foot column of 0.30% copper
A-10 area= 300 foot column of 0.30% copper
A-14 area= 200 foot column of 0.40% copper
AI-2 area= 300 foot column of 0.35% copper
Outlined area= 300 foot column of 0.32% copper

424

UOP 415-329-5208

Robert Shaffer 801-261-1103

24th - 25

Fax 801-261-7437

21st revise Helvetica -.

CONFIDENTIALITY AGREEMENT

(Disclosure of Confidential Information)

THIS CONFIDENTIALITY AGREEMENT, dated this _____ day of June, 1992, is made and entered into by and between Coeur d'Alene Mines Corporation whose business address is 400 Coeur d'Alene Mines Building, 505 Front Avenue, P.O. Box 1, Coeur d'Alene, ID 83814, (hereinafter referred to as "COMPANY"), and ASARCO Incorporated, with offices at 180 Maiden Lane, New York, N.Y. 10038, together with its subsidiaries and affiliates (hereinafter referred to as "ASARCO");

W I T N E S S E T H

WHEREAS, ASARCO is willing to disclose certain confidential information to COMPANY in connection with COMPANY's interest in acquiring the Project, as described below, and solely for the purposes herein described and on the terms and conditions set forth below.

NOW THEREFORE, in consideration of the above premises, the information to be provided hereunder, and other good and valuable consideration the adequacy of which is hereby acknowledged, ASARCO and COMPANY hereby agree as follows:

I. Project

Project shall consist of all data and information relating to the Coeur and Galena Mining Operations of ASARCO located in Shoshone, Idaho.

II. Confidential Information

A. The COMPANY agrees to hold in confidence and not to use or disclose to any person without the prior written consent of Asarco: (i) any and all information disclosed to COMPANY by ASARCO relating directly or indirectly to the Project, and (ii) any and all confidential information whether or not specifically identified by ASARCO as confidential which is disclosed to COMPANY directly or indirectly by ASARCO, including, without limitation, the following: information relating to planning, mining, exploration, land, mineral rights, water rights, permits, financial aspects or projections, geologic data, and any and all analyses, reports, studies, costs, mining methods, strategies, results, processes, formulas, patterns, devices and trade secrets. All of the above shall hereinafter be collectively referred to as "Confidential Information"; provided, however, such term shall not include the following:

(1) Confidential Information that at the time of disclosure is in the public domain;

(2) Confidential Information that after disclosure is published or otherwise becomes part of the public domain through no fault of COMPANY (but only after, and only to the extent that, it is published or otherwise becomes part of the public domain);

(3) Confidential Information that COMPANY can show already was in the possession of COMPANY at the time of disclosure and that without any breach of any other third party agreement COMPANY is free to disclose to others; and

(4) Confidential Information that COMPANY can show was received by it after the time of disclosure from a third party who did not acquire it directly or indirectly from ASARCO, under an obligation of confidence.

B. For the purpose of this Section II, specific disclosures made to COMPANY shall not be deemed to be within the exceptions merely because they are embraced by general disclosure in the public domain or in the possession of COMPANY.

C. Nothing contained in this Section II shall deny COMPANY the right to use Confidential Information received from a third party who lawfully is in possession of such information.

D. COMPANY acknowledges that disclosure of Confidential Information could cause severe and irreparable harm to ASARCO. COMPANY further confirms that it might not be possible to measure such damages in money. Accordingly, COMPANY consents that, in the event of breach or threatened intentional breach by it of the provisions of this Agreement, ASARCO may seek in addition to any other rights or remedies to which it is entitled (including but not limited to, money damages), an injunction or restraining order, restraining COMPANY from doing or continuing to do or perform any acts constituting such breach or threatened breach.

III. Return of Confidential Information

COMPANY agrees that all Confidential Information that is in or on any medium and any other property, delivered by ASARCO, or made available to COMPANY or otherwise obtained for purposes related to this Confidentiality Agreement, is and remains the sole property of ASARCO. Without the prior written consent of ASARCO, COMPANY agrees not to make or to give permission to make, copies of any Confidential Information provided by ASARCO, or otherwise obtained by COMPANY or its employees, contractors or agents, provided, however, COMPANY may make such copies as are required for its internal review

process. Promptly upon conclusion of its evaluation, if COMPANY elects not to participate in the Project, and at any time upon demand by ASARCO, COMPANY shall return to ASARCO all Confidential Information and any all copies thereof.

IV. Project Discussions

It is understood that the discussions relating to the Project are confidential. No public announcement covering such discussions or concerning the existence thereof will be made by COMPANY except if required by law and upon two (2) days prior written notice to ASARCO. ASARCO may continue to make such announcements as are required by law, contract, the regulations of stock exchanges or its Project management purposes, but, except on two (2) days prior written notice to COMPANY, will endeavor to avoid specific references to COMPANY.

V. Employee Confidentiality

COMPANY agrees that it shall notify those COMPANY employees, contractors, attorneys and agents who will have access to Confidential Information that such information is subject to this agreement and further each person shall personally agree to comply with the terms hereof. In any event the COMPANY shall be responsible for any breach of this Confidentiality Agreement by any employee, contractor or agent of the COMPANY.

VI. Client-Broker Relationship

Nothing herein shall be construed as creating a client-broker or similar relationship between the COMPANY and ASARCO, and no broker's sales or finder's fee shall be payable to the COMPANY by ASARCO.

VII. Warranty

ASARCO makes no warranties, express or implied, concerning the validity, accuracy or completeness of the Confidential Information.

VIII. Further Assurances

COMPANY agrees to take such other actions and to execute such other documents from time to time as ASARCO feels are reasonably necessary or advisable to effectuate the intent hereof.

IX. Term

This Confidentiality Agreement shall terminate one (1) year from the date hereof.

X. General Provisions

The terms and conditions of this Confidentiality Agreement shall not be modified except as agreed in writing by the parties. This Confidentiality Agreement constitutes the entire agreement between the parties pertaining to the subject matter hereof and supersedes all prior and contemporaneous agreements and understandings of the parties in connection herewith. No waiver of any breach of this Confidentiality Agreement or of any of the terms hereof shall be effective unless such waiver is in writing and signed by the party against whom such waiver is claimed. No waiver of any breach shall be deemed to be a waiver of any other or subsequent breach. All unperformed obligations shall survive termination of this Confidentiality Agreement. This Confidentiality Agreement shall be interpreted in accordance with the laws of the State of Idaho and shall be subject to the exclusive jurisdiction of the courts of such state. In case any part of this Confidentiality Agreement should be determined to be invalid, illegal or unenforceable in any respect, the validity, legality or enforceability of the remaining provisions contained herein shall in no way be affected or impaired thereby.

IN WITNESS WHEREOF, the COMPANY and ASARCO have caused this Agreement to be executed by their respective duly authorized officers, the date first written above.

ASARCO Incorporated

By _____

Its _____

COEUR D'ALENE CORPORATION:

By _____

Its _____

Fax to Frank McAllister in Reno
Done 10/7/93 SDV

F. T. G.
OCT 4 1993

BHP Minerals International Inc.
5330 South 900 East
Suite 200
Salt Lake City, Utah 84117
Telephone (801) 261-1103
Facsimile (801) 261-7437

September 30, 1993

Gerald D. Van Voorhis
Vice President - Exploration
ASARCO Incorporated
180 Maiden Lane
New York, NY 10038

I talked to R de SO about this. He said we should consider this and to talk to FRM about it. SDV

BHP Minerals

G. D. V.

OCT 7 1993

Dear Mr. Van Voorhis:

It was a pleasure having the opportunity to speak with you earlier this week to discuss the possibility that BHP Minerals evaluate one or more of ASARCO's exploration and reserve properties for joint venture or purchase. ASARCO's long time exploration commitment in the Southwest has certainly been productive. Perhaps a different operating perspective will make one of the properties a near term producer.

As we discussed, BHP Minerals would been keenly interested in an opportunity to review the technical aspects of several properties. As I mentioned, Helvetia-Rosemont is one that is particularly interesting. I understand that ASARCO may be looking at the project as an inventoried reserve to come on-line as Mission-Pima are exhausted. As lead times to production are increasing due to environmental considerations and permitting activities, perhaps ASARCO's management would consider sharing some of the risks by bringing in a partner at this stage. *

Another property that may hold interest to BHP, and that we would like to have an opportunity to evaluate is ASARCO's Superior East project. We recognize that it is a covered deposit, but we are currently looking for such targets with our exploration activities.

At your recommendation, I would also appreciate having the opportunity to look at the Heddleston project in Montana. We would look at it as a developing exploration project, with an eye to expand the resource to several hundred million tons by deeper drilling and offset drilling, if warranted.

Lastly, Hugo Dummett, BHP's North American manager, suggested I inquire about the El Arco property in Baja California. What is its status relative to joint venture or sale?

I hope one of these projects makes sense to develop further, and that ASARCO will consider a working and business relationship with BHP as advantageous. I will gladly follow-up with Jim Sell on any of these opportunities at the appropriate time.

I hope you will give a call whenever in Salt Lake City, as I would enjoy the opportunity to meet and have lunch.

Sincerely,

Robert W. Schafer
Regional Manager
Western U. S. Exploration

cc: H. T. Dummett
D. M. Spatz

ASARCO Incorporated
180 Maiden Lane, New York, New York 10038
Phone: (212) 510–1871
Fax: (212) 510–1978

Please Deliver Following Pages To:

ATTENTION: SAL ANZALONE

COMPANY: _____

FAX NO: _____

FROM: G. D. VAN VOORHIS

DATE: _____

Of Pages Plus Cover Sheet 7
Please contact Doris Cuthbert at 212–510–1873 if you do not receive all the pages.

CONFIDENTIALITY AGREEMENT

(Disclosure of Confidential Information)

THIS CONFIDENTIALITY AGREEMENT, dated this _____ day of _____, 19_____, is made and entered into by and between BHP Minerals whose business address is 5330 South 900 East, Suite 200, Salt Lake City, Utah 84117, (hereinafter referred to as "COMPANY") and ASARCO Incorporated, with offices at 180 Maiden Lane, New York, New York 10038, together with its subsidiaries and affiliates (hereinafter referred to as "ASARCO");

W I T N E S S E T H

WHEREAS, ASARCO is willing to disclose certain confidential information to COMPANY in connection with COMPANY's interest in acquiring the Project, as described below, and solely for the purposes herein described and on the terms and conditions set forth below.

NOW THEREFORE, in consideration of the above premises, the information to be provided hereunder, and other good and valuable consideration the adequacy of which is hereby acknowledged, ASARCO and COMPANY hereby agree as follows:

I. Project

Project shall consist of all data and information relating to the Superior East Project of ASARCO located in Pinal County, Arizona.

II. Confidential Information

A. COMPANY agrees to hold in confidence and not to use or disclose to any person without the prior written consent of ASARCO: (1) any and all information disclosed to COMPANY by ASARCO relating directly or indirectly to the Project, and (2) any and all confidential information whether or not specifically identified by ASARCO as confidential which is disclosed to COMPANY directly or indirectly by ASARCO, including, without limitation, the following: information relating to planning, mining, exploration, land, mineral rights, water rights, permits, financial aspects or projections, geologic data, and any and all analyses, reports, studies, costs, mining methods, strategies, results, processes, formulas, patterns, devices, and trade secrets. All of the above shall hereinafter be collectively referred to as "Confidential Information"; provided, however, such term shall not include the following:

(1) Confidential Information that at the time of disclosure is in the public domain;

(2) Confidential Information that after disclosure is published or otherwise becomes part of the public domain through no fault of COMPANY (but only after, and only to the extent that, it is published or otherwise becomes part of the public domain);

(3) Confidential Information that COMPANY can show already was in the possession of COMPANY at the time of disclosure and that without any breach of any other third party agreement COMPANY is free to disclose to others; and

(4) Confidential Information that COMPANY can show was received by it after the time of disclosure from a third party who did not acquire it directly or indirectly from ASARCO, under an obligation of confidence.

B. For the purpose of this Section II, specific disclosures made to COMPANY shall not be deemed to be within the exceptions merely because they are embraced by general disclosure in the public domain or in the possession of COMPANY.

C. Nothing contained in this Section II shall deny COMPANY the right to use Confidential Information received from a third party who lawfully is in possession of such information.

D. COMPANY acknowledges that disclosure of Confidential Information could cause severe and irreparable harm to ASARCO. COMPANY further confirms that it might not be possible to measure such damages in money. Accordingly, COMPANY consents that, in the event of breach or threatened intentional breach by it of the provisions of this Agreement ASARCO may seek in addition to any other rights or remedies to which it is entitled (including, but not limited to, money damages), an injunction or restraining order, restraining COMPANY from doing or continuing to do or perform any acts constituting such breach or threatened breach.

III. Return of Confidential Information

COMPANY agrees that all Confidential Information that is in or on any medium and any other property, delivered by ASARCO, or made available to COMPANY or otherwise obtained for purposes related to this Confidentiality Agreement, is and remains the sole property of ASARCO. Without the prior written consent of ASARCO, COMPANY agrees not to make, or to give permission to make, copies of any Confidential Information provided by ASARCO, or otherwise

obtained by COMPANY or its employees, contractors, or agents; provided, however, COMPANY may make such copies as are required for its internal review process. Promptly upon conclusion of its evaluation, if COMPANY elects not to participate in the Project, and at any time upon demand by ASARCO, COMPANY shall return to ASARCO all Confidential Information and any and all copies thereof.

IV. Project Discussions

It is understood that the discussions relating to the Project are confidential. No public announcement covering such discussions or concerning the existence thereof will be made by COMPANY except if required by law and upon two (2) days prior written notice to ASARCO. ASARCO may continue to make such announcements as are required by law, contract, the regulations of stock exchanges, or its Project management purposes, but, except on two (2) days prior written notice to COMPANY, will endeavor to avoid specific references to COMPANY.

V. Employee Confidentiality

COMPANY agrees that it shall notify those COMPANY employees, contractors, attorneys, and agents who will have access to Confidential Information that such information is subject to this Agreement and, further, each person shall personally agree to comply with the terms hereof. In any event, the COMPANY shall be responsible for any breach of this Confidentiality Agreement by any employee, contractor, or agent of the COMPANY.

VI. Client-Broker Relationship

Nothing herein shall be construed as creating a client-broker or similar relationship between COMPANY and ASARCO, and no broker's sales or finder's fee shall be payable to COMPANY by ASARCO.

VII. Warranty

ASARCO makes no warranties, express or implied, concerning the validity, accuracy, or completeness of the Confidential Information.

VIII. Further Assurances

COMPANY agrees to take such other actions and to execute such other documents from time to time as ASARCO feels are reasonably necessary or advisable to effectuate the intent hereof.

IX. Area of Influence

All employees of COMPANY or its subsidiaries or affiliates shall be excluded from working within the property or within a zone one (1) mile in width adjoining the boundary of such property for a period of one (1) year from the date of this Agreement.

X. Term

This Confidentiality Agreement shall terminate one (1) year from the date hereof.

XI. General Provisions

The terms and conditions of this Confidentiality Agreement shall not be modified except as agreed in writing by the parties. This Confidentiality Agreement constitutes the entire agreement between the parties pertaining to the subject matter hereof and supersedes all prior and contemporaneous agreements and understandings of the parties in connection herewith. No waiver of any breach of this confidentiality Agreement or of any of the terms hereof shall be effective unless such waiver is in writing and signed by the party against whom such waiver is claimed. No waiver of any breach shall be deemed a waiver of any other or subsequent breach. All unperformed obligations shall survive termination of this confidentiality Agreement. This Confidentiality Agreement shall be interpreted in accordance with the laws of the State of Arizona and shall be subject to the exclusive jurisdiction of the courts of such state. In case any part of this Confidentiality Agreement should be determined to be invalid, illegal, or unenforceable in any respect, the validity, legality, or enforceability of the remaining provisions contained herein shall in no way be affected or impaired thereby.

IN WITNESS WHEREOF, COMPANY and ASARCO have caused this Agreement to be executed by their respective duly authorized officers, the date first written above.

ASARCO Incorporated	BHP Minerals
By_____	By_____
Its_____	Its_____

BHP Minerals International Inc.
5330 South 900 East
Suite 200
Salt Lake City, Utah 84117
Telephone (801) 261-1103
Facsimile (801) 261-7437

January 12, 1994

S. A. Anzalone
Chief Geologist
ASARCO Incorporated
P. O. Box 5747
Tucson, AZ 85703-0747

BHP Minerals

Dear Sal:

Please find enclosed 2 copies each of the Confidentiality Agreements for the Helvetia-Rosemont and Superior East projects.

Individuals in the BHP party will likely include:

Bob Schafer, Manager - Western U.S. Exploration
Hugo Dummett, Manager - North American/Central America/Diamond Exploration
Mike Anglin, Manager of Business Development
Bill Blenkhorn, Project Manager - Planning
Dave Spatz, Tucson District Geologist
Jim Nelson, Geologist

I look forward to meeting with you and Jim Sell during the evaluations.

As it stands currently, the group will meet in the late morning on 24 January 1994 with Jim Sell to review Superior East for the balance of the day. On the following day, 25 January, we would like to visit the Ray Mine Complex.

We would plan to return on 7-8 February to review Helvetia-Rosemont with you, including a surface tour of the property, and perhaps some discussion of possible synergies with the Mission Complex.

I look forward to getting together with you on the above dates, and appreciate your willingness to work with me in trying to get this scheduling to fit the travel schedules of so many people. Thanks very much.

Sincerely,

Bob

Robert W. Schafer
Regional Manager
Western U.S. Exploration

RWS/ls

CONFIDENTIALITY AGREEMENT

(Disclosure of Confidential Information)

THIS CONFIDENTIALITY AGREEMENT, dated this 12th day of January, 1994, is made and entered into by and between BHP Minerals whose business address is 5330 South 900 East, Suite 200, Salt Lake City, Utah 84117, (hereinafter referred to as "COMPANY") and ASARCO Incorporated, with offices at 180 Maiden Lane, New York, New York 10038, together with its subsidiaries and affiliates (hereinafter referred to as "ASARCO");

W I T N E S S E T H

WHEREAS, ASARCO is willing to disclose certain confidential information to COMPANY in connection with COMPANY's interest in acquiring the Project, as described below, and solely for the purposes herein described and on the terms and conditions set forth below.

NOW THEREFORE, in consideration of the above premises, the information to be provided hereunder, and other good and valuable consideration the adequacy of which is hereby acknowledged, ASARCO and COMPANY hereby agree as follows:

I. Project

Project shall consist of all data and information relating to the Superior East Project of ASARCO located in Pinal County, Arizona.

II. Confidential Information

A. COMPANY agrees to hold in confidence and not to use or disclose to any person without the prior written consent of ASARCO: (1) any and all information disclosed to COMPANY by ASARCO relating directly or indirectly to the Project, and (2) any and all confidential information whether or not specifically identified by ASARCO as confidential which is disclosed to COMPANY directly or indirectly by ASARCO, including, without limitation, the following: information relating to planning, mining, exploration, land, mineral rights, water rights, permits, financial aspects or projections, geologic data, and any and all analyses, reports, studies, costs, mining methods, strategies, results, processes, formulas, patterns, devices, and trade secrets. All of the above shall hereinafter be collectively referred to as "Confidential Information"; provided, however, such term shall not include the following:

(1) Confidential Information that at the time of disclosure is in the public domain;

(2) Confidential Information that after disclosure is published or otherwise becomes part of the public domain through no fault of COMPANY (but only after, and only to the extent that, it is published or otherwise becomes part of the public domain);

(3) Confidential Information that COMPANY can show already was in the possession of COMPANY at the time of disclosure and that without any breach of any other third party agreement COMPANY is free to disclose to others; and

(4) Confidential Information that COMPANY can show was received by it after the time of disclosure from a third party who did not acquire it directly or indirectly from ASARCO, under an obligation of confidence.

B. For the purpose of this Section II, specific disclosures made to COMPANY shall not be deemed to be within the exceptions merely because they are embraced by general disclosure in the public domain or in the possession of COMPANY.

C. Nothing contained in this Section II shall deny COMPANY the right to use Confidential Information received from a third party who lawfully is in possession of such information.

D. COMPANY acknowledges that disclosure of Confidential Information could cause severe and irreparable harm to ASARCO. COMPANY further confirms that it might not be possible to measure such damages in money. Accordingly, COMPANY consents that, in the event of breach or threatened intentional breach by it of the provisions of this Agreement ASARCO may seek in addition to any other rights or remedies to which it is entitled (including, but not limited to, money damages), an injunction or restraining order, restraining COMPANY from doing or continuing to do or perform any acts constituting such breach or threatened breach.

III. Return of Confidential Information

COMPANY agrees that all Confidential Information that is in or on any medium and any other property, delivered by ASARCO, or made available to COMPANY or otherwise obtained for purposes related to this Confidentiality Agreement, is and remains the sole property of ASARCO. Without the prior written consent of ASARCO, COMPANY agrees not to make, or to give permission to make, copies of any Confidential Information provided by ASARCO, or otherwise

obtained by COMPANY or its employees, contractors, or agents; provided, however, COMPANY may make such copies as are required for its internal review process. Promptly upon conclusion of its evaluation, if COMPANY elects not to participate in the Project, and at any time upon demand by ASARCO, COMPANY shall return to ASARCO all Confidential Information and any and all copies thereof.

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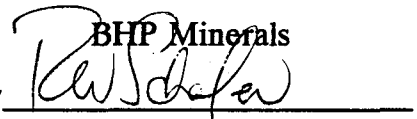
IN WITNESS WHEREOF, COMPANY and ASARCO have caused this Agreement to be executed by their respective duly authorized officers, the date first written above.

ASARCO Incorporated

By_____

Its_____

BHP Minerals

By 

Its Western U.S. Exploration Mgr

JDS — "Best to do on a minimum width of ore grade say +0.5 over 100' and then include "other" claims at lower grade. Even higher grade would be better — +.7%

xc: JRS/WDG

ASARCO

Southwestern Exploration Division

July 16, 1984

To: J. R. Stringham

From: J. D. Sell

Best Fit Claims
Superior East Project
Pinal County, AZ

As requested by W. L. Kurtz (memo attached), it is desirable to plot the mineral intercepts at Superior East and make a best fit for a claim block so that as many claims can be validated with the intercepts at hand.

I submit Map 77017-E-1 at a scale of 1" = 200', and a packet of drill hole plans showing the collars and the plus 0.2% mineral intercepts at a scale of approximately 1" = 200'. Also submitted is a list of the drill holes, the depth footage, total mineral footage, and the grade of that mineral footage.

As noted, this "validated claim map" should be completed as soon as possible.

Holes A-4 and A-7 are west of the plan map and have native copper instead of sulfide copper values.

James D. Sell

James D. Sell

JDS/cg

Attachments

cc: WLKurtz (w/o map)

ASARCO

Southwestern Exploration Division

JPS

November 7, 1984

F. T. Graybeal
New York Office

Sulfide & Native Copper Outlines
Superior East Project
Pinal County, AZ

I submit two maps showing the property position of the entire Superior East Project area. Plotted are the drill holes and the estimated outlines for grade-thickness parameters for the sulfide drilled zone and the native copper drill indicated zone. Possible and probable extensions, based on present interpretation, are also outlined. Contiguous claim blocks necessary to hold the possible extension outlines are also shown.

Map 1 - Sulfide Only

a) Solid red outline, core area drilled intercepts, contains between 160 million tons at +0.8% copper using a 600 foot high average column or 190 million tons at +0.8% copper using a 700 foot high column.

b) Dashed red extension outline is a possible expansion of the core area and would increase the tonnage to 340-390 million tons at +0.8% copper over 600-700 feet high within the outline.

c) Orange dashed outline shows possible marginal values which probably surround the core area and which would add between 280-330 million tons at +0.6% copper over a 500 foot high column.

Twenty-three (23) mining claims would cover the bulk of the area within the +0.6% sulfide copper outline. All are "Margaret" claims held under agreement with Continental Copper Company, outlined in green.

Map 2 - Native Copper plus Sulfide

The sulfide outline is the same as previously described and outlined on Map 1.

The native copper outlines have a parameter of +0.8% copper over a thickness of 300 feet west of the Devils Canyon fault and +0.8% copper over an estimated 200 feet of thickness east of the Devils Canyon fault.

Native Copper

a) Solid red outline, based on two core intercepts, west of the Devils Canyon fault.

   1) Asarco controlled claims contain 135 million tons.

   2) Newmont claims contain 175 million tons.

   3) Oak Flat Withdrawal contains 120 million tons.

b) Dashed red extension outline increases the total tonnage at the same parameters, west of the Devils Canyon fault.

   1) Asarco controlled claims contain 390 million tons.

   2) Newmont claims contain 350 million tons.

   3) Oak Flat Withdrawal contains 445 million tons.

c) Orange dashed outline is probable extension east of the Devils Canyon fault and could add 335 million tons at +0.8% copper over a 200 foot high column to the Asarco total, with an additional 60 million tons to the Newmont total.

Sixty-six (66) mining claims would hold the area of the total possible +0.8% native copper outline as shown by the present configuration. The claims include the Asarco "Dacite" group as well as the "Margaret" claims held by agreement with Continental Copper. The claim outline is shown in brown.

It should be noted that the claim outlines should be surveyed and amended if necessary to confirm their size and continuity. The total eighty-nine (89) claims of the two outlines, to cover the sulfide and native copper zones, are continuous and common to both outlines.

Article 4, page 3, of the Continental Copper-Asarco Agreement states:

..."Asarco may exclude from this agreement any one or more of the mining claims comprising the Property on giving notice to Copper. In case of any such exclusion or in case of termination of the entire agreement, if the assessment year for any mining claims affected thereby expires within two months from the date of such exclusion or termination, Asarco shall be obligated to perform and record the assessment work pertaining to such claims and this obligation shall survive any such exclusion or termination."

James D. Sell

JDS/cg

Attachments

cc: WLKurtz

TO ACCOMPANY Memo to D.D. Hughes
DATED 11/7/84
BY J.D. Sell

Possible +0.5% Cu Extension

Possible +0.8% Cu Extension

Sulfide Core +0.8% Cu

GILA and SALT RIVER BASELINE

NATIONAL FOREST BOUNDARY

J-1 RANCH grazing lease boundary

U.S. FOREST SERVICE OAK FLAT WITHDRAWAL

MAP I
SULFIDE OUTLINE

J.D. Sell 11/6/84

NORTH

CLAIM MAP
SUPERIOR EAST PROJECT

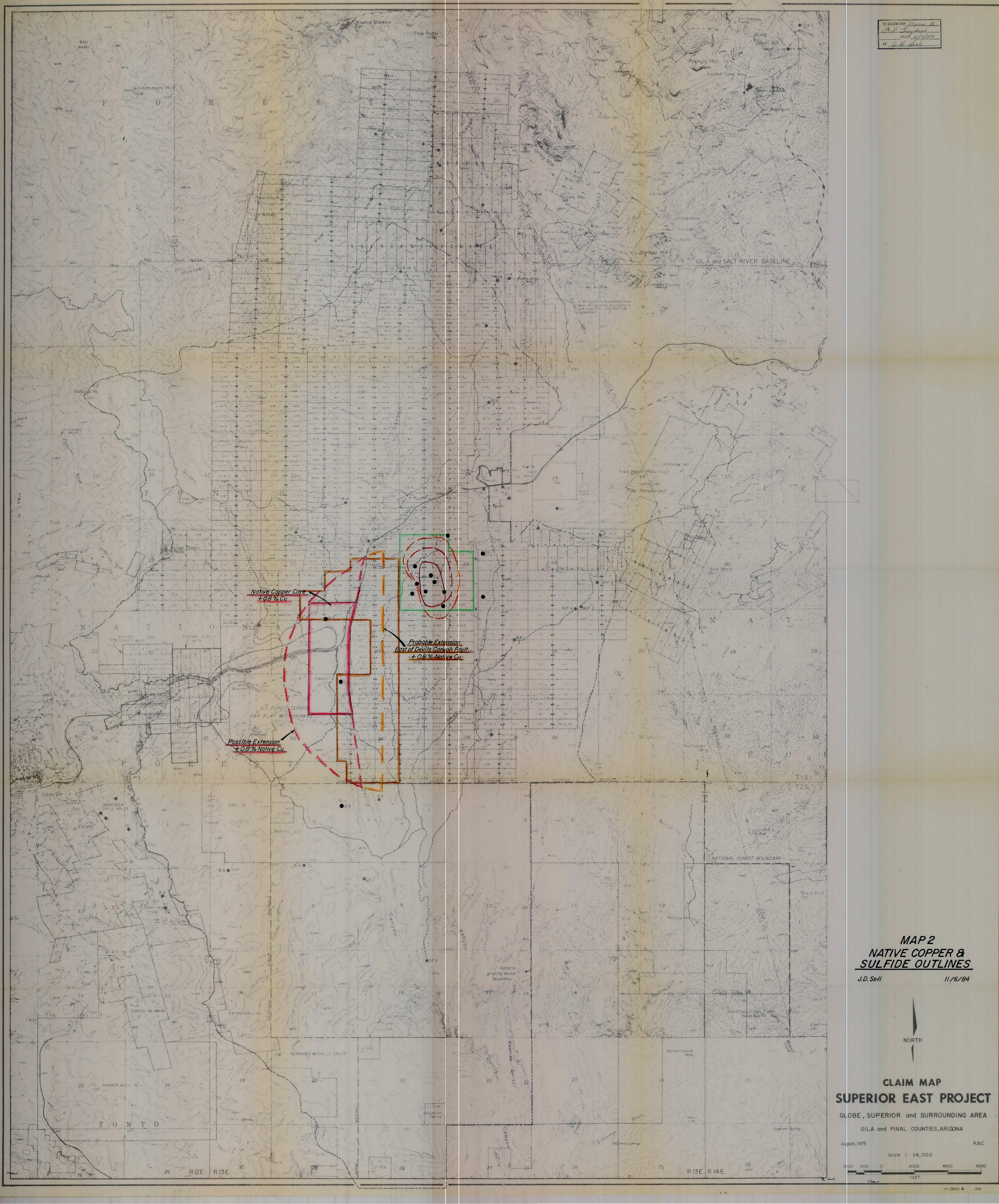
GLOBE, SUPERIOR and SURROUNDING AREA

GILA and PINAL COUNTIES, ARIZONA

August, 1975 R.B.C.

Scale 1 : 24,000

2000 1000 0 2000 4000 6000
FEET


TO ACCOMPANY Memo to
G.D. Graybeal
DATED 11/7/84
BY J.D. Sell
Native Copper Core
+0.8 % Cu
Probable Extension
East of Devils Canyon Fault
+0.8 % Native Cu
Possible Extension
+0.8 % Native Cu.
U.S. FOREST SERVICE
OAK FLAT WITHDRAWAL
GILA and SALT RIVER BASELINE
15 Margaret claims (dotted) have been relinquished in accordance with ASARCO - INSPIRATION agreement.
Five Point Mountain
(The Watershed)
Superior
ANACONDA DRILL HOLES
BANNER ACE 1-76
DRAGGS-NEUMANN
ACE 88-107
EXTENTION 1-32
NORANDEX MICHELLE GROUP
SUN 1-51
I RANCH grazing lease boundary
NATIONAL FOREST BOUNDARY
Government Mtn
T1S
T2S
R.12E. R.13E.
R.13E. R.14E.
F O R E S T
N A T I O N A L
T O N T O
MAP 2
NATIVE COPPER &
SULFIDE OUTLINES
J.D. Sell
11/6/84
NORTH
CLAIM MAP
SUPERIOR EAST PROJECT
GLOBE, SUPERIOR and SURROUNDING AREA
GILA and PINAL COUNTIES, ARIZONA
August, 1975
R.B.C.
Scale 1 : 24,000
2000 1000 0 2000 4000 6000
FEET
mn 2886 A
dam

JDS

BHP Minerals International Inc.

5330 South 900 East
Suite 200
Salt Lake City, Utah 84117
Telephone (801) 261-1103
Facsimile (801) 261-7437

March 9, 1994

Dr. Gerald D. Van Voorhis
ASARCO Incorporated
180 Maiden Lane
New York, NY 10038

BHP Minerals

Dear Gerry:

Having now completed an initial review of both Helvetia-Rosemont and Superior East, I thought I might present you with a status report regarding initial impressions. As you may be aware, I gave Fred Graybeal a verbal report last week in your absence.

I am impressed with both projects and wish to proceed with a more thorough evaluation on each, for different reasons. I perceive Superior East to be an exploration project requiring significant delineation drilling, engineering studies, and metallurgical work to determine its viability. On the other hand, Helvetia is probably at a near feasibility stage and optimization studies and the long (never-ending?) permitting process would be on the horizon.

Jim Sell will be sending me more information on the underlying ownership and drill results at Superior East in the near term.

From Sal Anzalone I learned that an in-house reserve study is in progress for Helvetia. I have requested of Sal a copy of the necessary information on floppy disk in order to carry out a parallel study at BHP, hoping to expedite the due diligence aspects of the project.

I certainly appreciate your, and ASARCO's, willingness to work with BHP Minerals in the hope of moving both of these big projects to a positive production decision.

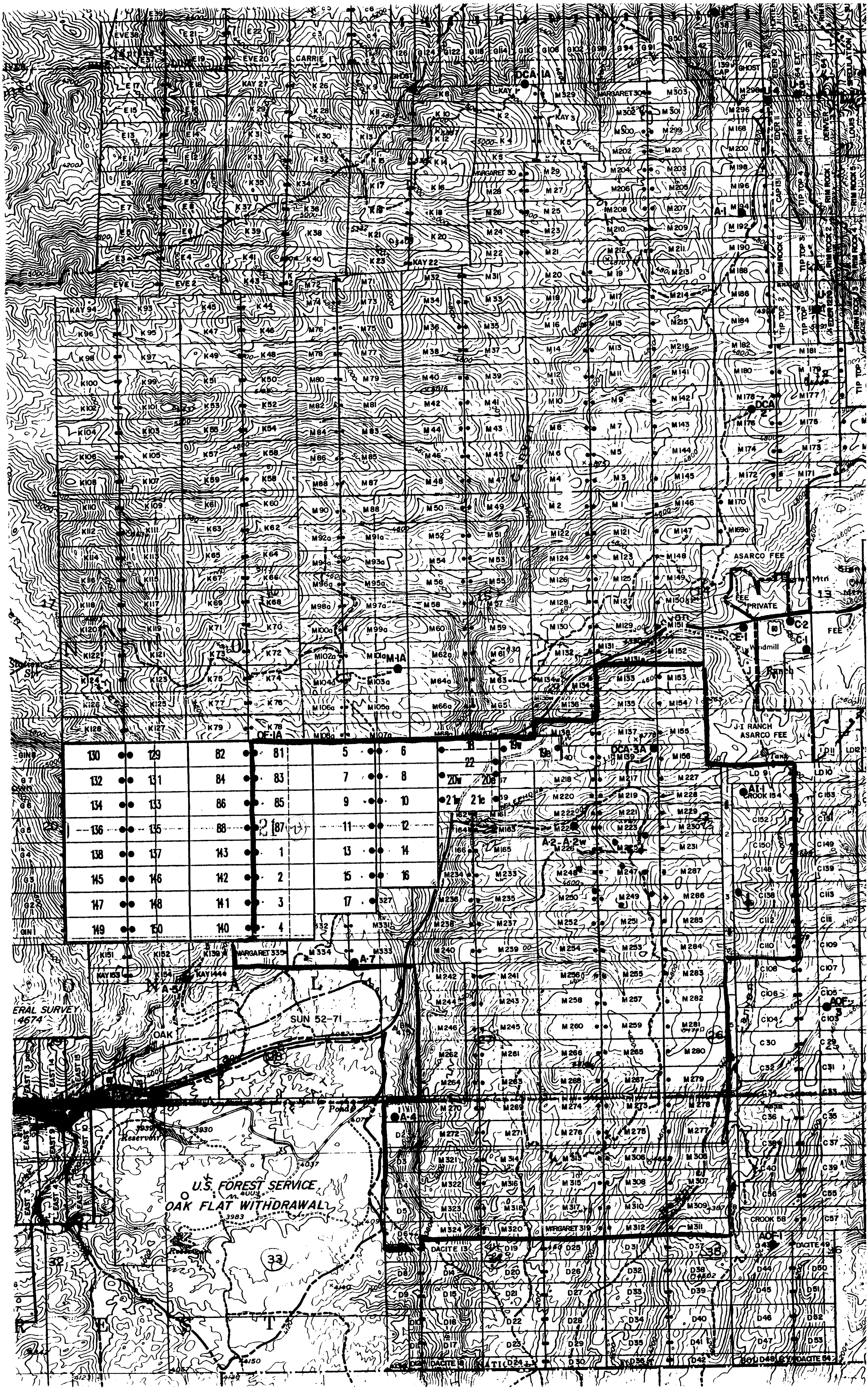
Sincerely yours,

Bob Schafer

Robert W. Schafer
Regional Manager
Western U.S. Exploration

RWS/ls

cc:	F. Graybeal	ASARCO, NY	H. Dummett	BHP Minerals
	S. Anzalone	ASARCO, AZ	M. Anglin	BHP Minerals
	J. Sell	ASARCO, AZ	W. Blenkhorn	BHP Minerals


U.S. FOREST SERVICE
OAK FLAT WITHDRAWAL
SUN 52-71
OAK
Reservoir
Pond
ERAL SURVEY
4674
ASARCO FEE
FEE
PRIVATE
J-I RANCH
ASARCO FEE
Windmill
Ranch
Tank
DCA-1A
DCA-2
DCA-3A
M-1A
OF-1A
A-1
A-2 A-2w
A-4
A-5
A-7
AI-1
AOF-1
AOF-3
CE-1
C-1
C-2
MARGARET 30
MARGARET 304
MARGARET 319
MARGARET 335
CROOK 154
CROOK 58
DACITE 13
DACITE 18
DACITE 49
DACITE 54
CARRIE 1
GHOST
CAP
EDER 10
EDER 11
EDER 12
RIM ROCK
TIP TOP
DENVER
LOUIS
SPECULATION
EVE 1
EVE 2
EVE 20
EVE 38
KAY 22
KAY 27
KAY 94
KAY 144
KAY 153

JDS

ASARCO

Exploration Department

April 13, 1994

Mr. Robert Schafer
Regional Manager
Western US Exploration
BHP Minerals International Inc.
5330 South 900 East, Suite 200
Salt Lake City, Utah 84117

Land Status
Superior East Project
Pinal County, AZ

Dear Bob:

At last the claim map surfaced. The heavy black line north and east of Oak Flat should encompass the present holdings of ASARCO Incorporated.

Keep after it and me for information leading to a continued exploration-development plan.

Sincerely,

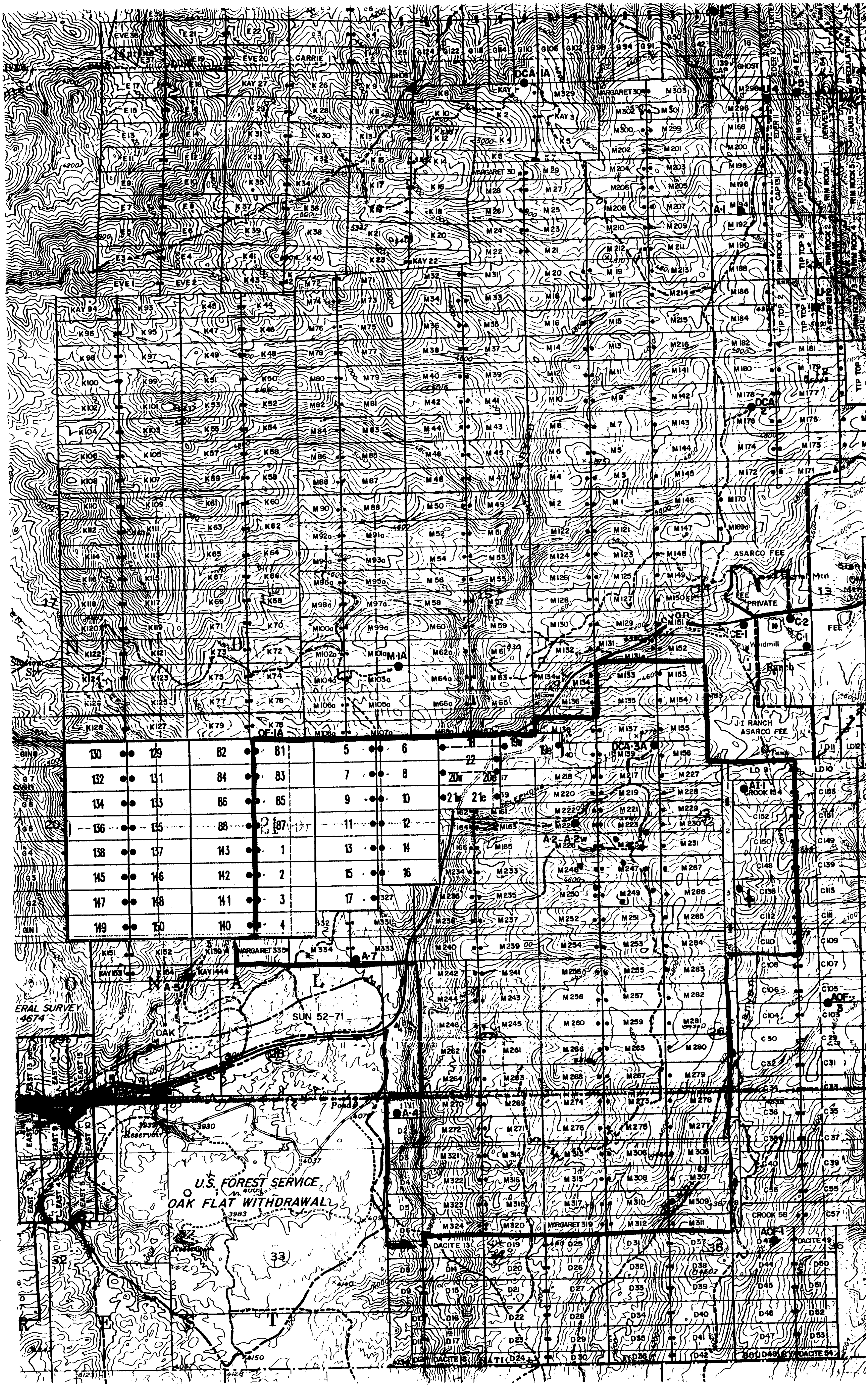
James D. Sell/mek

James D. Sell

JDS:mek
Att.

cc: G.D. Van Voorhis
D.A. Melhado
File

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703
1150 North 7th Avenue (602) 792-3010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OAK FLAT WITHDRAWAL
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J-I RANCH
ASARCO FEE
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FEE
Windmill
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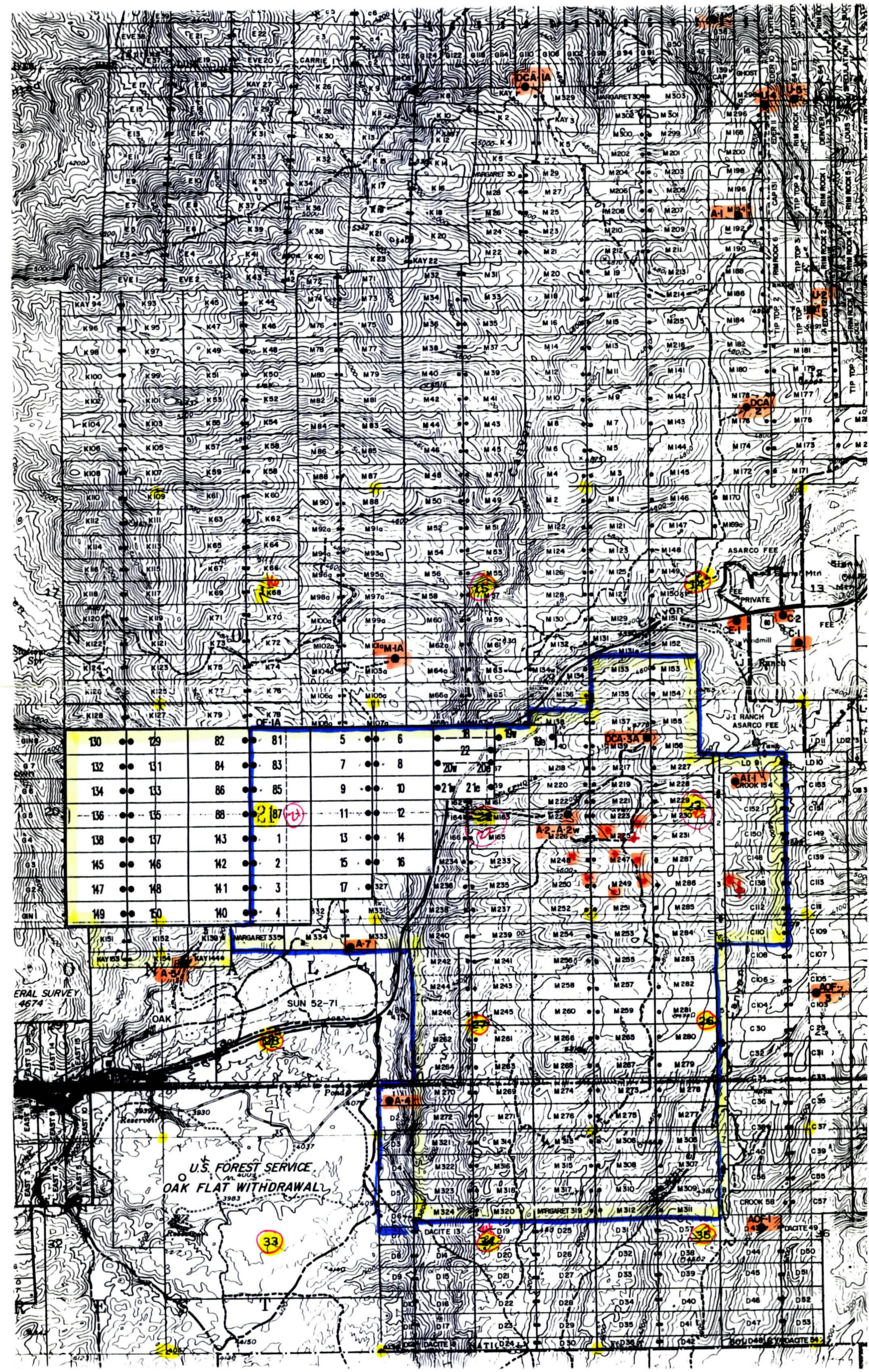
DCA 2
DCA-3A
A-1
A-2 A-2w
A-4
A-5
A-7
AI-1
CROOK 154
AOF-1
AOF-3
C-1
C-2
CE-1
M-1A
OF-1A
MARGARET 335
MARGARET 319
DACITE 13
DACITE 49
DACITE 54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RIM ROCK
EDER
DENVER
LOUIS
SPECULATION
GHOST
CARRIE 1
KAY 22
EVE 1
EVE 2

CONFIDENTIALITY AGREEMENT

(Disclosure of Confidential Information)

THIS CONFIDENTIALITY AGREEMENT, dated this 12th day of January, 19 94, is made and entered into by and between BHP Minerals whose business address is 5330 South 900 East, Suite 200, Salt Lake City, Utah 84117, (hereinafter referred to as "COMPANY") and ASARCO Incorporated, with offices at 180 Maiden Lane, New York, New York 10038, together with its subsidiaries and affiliates (hereinafter referred to as "ASARCO");

W I T N E S S E T H

WHEREAS, ASARCO is willing to disclose certain confidential information to COMPANY in connection with COMPANY's interest in acquiring the Project, as described below, and solely for the purposes herein described and on the terms and conditions set forth below.

NOW THEREFORE, in consideration of the above premises, the information to be provided hereunder, and other good and valuable consideration the adequacy of which is hereby acknowledged, ASARCO and COMPANY hereby agree as follows:

I. Project

Project shall consist of all data and information relating to the Superior East Project of ASARCO located in Pinal County, Arizona.

II. Confidential Information

A. COMPANY agrees to hold in confidence and not to use or disclose to any person without the prior written consent of ASARCO: (1) any and all information disclosed to COMPANY by ASARCO relating directly or indirectly to the Project, and (2) any and all confidential information whether or not specifically identified by ASARCO as confidential which is disclosed to COMPANY directly or indirectly by ASARCO, including, without limitation, the following: information relating to planning, mining, exploration, land, mineral rights, water rights, permits, financial aspects or projections, geologic data, and any and all analyses, reports, studies, costs, mining methods, strategies, results, processes, formulas, patterns, devices, and trade secrets. All of the above shall hereinafter be collectively referred to as "Confidential Information"; provided, however, such term shall not include the following:

(1) Confidential Information that at the time of disclosure is in the public domain;

(2) Confidential Information that after disclosure is published or otherwise becomes part of the public domain through no fault of COMPANY (but only after, and only to the extent that, it is published or otherwise becomes part of the public domain);

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ASARCO Incorporated

By_____

Its_____

BHP Minerals

By Peter Schafer

Its Western U.S. Exploration Manager

JDS
3/10/94

Bob Schaefer:

Sorry about the delay. My ex draftsman who has all the maps etc is not at work this week so the graphics labs are late. Here the are the:

1. Continental Copper Agreement with the CAN-US underlying agreement.
2. Drill Logs of Holes:
   A-8 thru A-17 ; AI-1, AI-2, DCA-3A.
   in the main block.

You should be able to get what you want from these.

Sincerely

James D Sell

cc: FILE

USE THIS AIRBILL FOR SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL
PACKAGE TRACKING NUMBER **8444899923**

2M 8444899923

8 4 4 4 8 9 9 9 2 3

RAL EXPRESS ACCOUNT NUMBER: 7-0143-6

Date: 3/10/94

Name) Please Print	Your Phone Number (Very Important)	To (Recipient's Name) Please Print	Recipient's Phone Number (Very Important)
JAMES D Sell	(602)798-7500	Robert W. Schafer	(801) 261-1103
Department/Floor No.		Company	Department/Floor No.
RCO INC		BHP Minerals International	Suite 200
ess		Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.)	
0 N 7TH AVE		5330 South 900 East	
State / ZIP Required		City / State / ZIP Required	
SON AZ	85705	Salt Lake City, UT	84117

AL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here
Street Address
City / State / ZIP Required

1 [X] Bill Sender Acct. No. Req'd. 2 [ ] Bill Recipient's FedEx Acct. No. Fill in Account Number below 3 [ ] Bill 3rd Party FedEx Acct. No. Fill in Account Number below (req'd.) 4 [ ] Bill Credit Card Fill in Credit Card No. below (req'd.)

Acct./Credit Card No. _____ Exp. Date _____

SERVICES (Check only one box)

night (ss morning†)	Standard Overnight (Delivery by next business afternoon. No Saturday delivery†)	
AGING	51 [ ] OTHER PACKAGING	
LETTER*	56 [ ] FEDEX LETTER*	
PAK*	52 [ ] FEDEX PAK*	
BOX	53 [X] FEDEX BOX	
TUBE	54 [ ] FEDEX TUBE	
-Day siness day †)	Government Overnight (Restricted for authorized users only)	
OMY* not available.	46 [ ] GOVT LETTER	
my rate.	41 [ ] GOVT PACKAGE	
Freight Service (for packages over 150 lbs.)		
NIGHT HT** vation required) ent may reas.	80 [ ] TWO-DAY FREIGHT**	

*Declared Value Limit $500. **Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service
1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H)
2 [ ] DELIVER WEEKDAY

Saturday Service
31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H)
3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations)
9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling
4 [ ] DANGEROUS GOODS (Extra charge)
6 [ ] DRY ICE Dangerous Goods Shipper's Declaration not required
Dry Ice, 9, UN 1845, _____ X _____ kg, 904 III
[ ] DESCRIPTION
12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

6

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
Total	Total	Total

DIM SHIPMENT (Chargeable Weight)
[ ] _____ lbs.
L x W x H

Received At
1 [ ] Regular Stop 3 [ ] Drop Box
2 [ ] On-Call Stop 4 [ ] B.S.C. 5 [ ] Station

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this airbill constitutes your agreement to the service conditions in our current Service Guide, available upon request. See back of sender's copy of this airbill for information. Service conditions may vary for Government Overnight Service. See U.S. Government Service Guide for details.

We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, and document your actual loss for a timely claim. Limitations found in the current Federal Express Service Guide apply. Your right to recover from Federal Express for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the declared value specified to the left. Recovery cannot exceed actual documented loss. The maximum Declared Value for FedEx Letter and FedEx Pak packages is $500.

In the event of untimely delivery, Federal Express will at your request and with some limitations refund all transportation charges paid. See Service Guide for further information.

7 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature: _____

Federal Express Use

Base Charges	
Declared Value Charge	
Other 1	
Other 2	
Total Charges	

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