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James Doyle Sell Mining Collection

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ASARCO

Mining Department
S. A. Anzalone
Chief Geologist

October 12, 1983

Mr. Jeffrey R. Ward
Lillian Penson Hall
Room 403
University of London
Talbot Square, London W21TT
ENGLAND

Re: J.R. Ward - Hardshell Technical Data

Dear Jeff:

Under separate cover we are this date transmitting the data on Asarco's Hardshell property that you requested during your visit to Tucson on September 2, 1983.

As soon as the final drill hole coordinates are calculated and plotted, copies of the computer-generated plan maps and cross sections will be sent to you at your London address.

When you are finished with this material we would appreciate your returning it to me or Mr. W.L. Kurtz at Asarco's Tucson office.

Best of luck in your studies.

Yours very truly,

S.A. Anzalone

S.A. Anzalone

SAA:llm

xc: TCOsborne
RLBrown, Jr.
WLKurtz

RJKupsch
DECrowell
ARRaihl

bxc: JDSell
FKoutz

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

Summary of Hardshell Material Sent to Jeff Ward

ARRaihl Report dated Nov. 11, 1981 - Hardshell Project, Estimated Capital & Operating Costs & Economic Evaluation.

SRDavis Report dated June 3, 1970 - Hardshell Geological Report.

FRKoutz Report dated July 10, 1978 - Hardshell Ore Types.

Harshaw, AZ NW/4 Lochiel 15' Quad.

Geology Map, Hardshell Project (SRD May 1970, Rev. 6/2/83 FRK) (with note to Ward that this is being updated & revised copy will be sent when completed).

Central Research Report Nos. 4825, 4891, 4930, 5041.

File Memo dated 6/23/81 by TDHenderson. Subject: Value of Byproduct Manganese Sulfate from Hardshell Ore. CEC letter dated 6/19/81 to DECrowell.

File Memo dated 5/15/80 by TDHenderson - Re: Meeting with ARMCO on Byproduct Manganese from Hardshell Ore.

Memo from BLDavis to TDHenderson dated 7/22/81 - Re: Manganese Sulfate.

M El Tawil & JEFay Memo to Kudryk dated 9/24/81 - Re: Preliminary Economic Comparison of Hardshell Project Process Alternatives.

FRKoutz Memo to JDSell dated 2/15/83 - Re: MS Thesis, S.A.Dean-Trench Tails Water Quality-Harshaw Creek Watershed.

Article on "Treatment of Manganese-Silver Ores", Bur. of Mines Bull. #226.

GWPickard Memo to WLKurtz dated 11/18/82 - Re: Hardshell Project, Preliminary Underground Ore Reserve (also 1/17/79 GWP Memo to FTG, same subject).

FTGraybeal Memo to WLKurtz dated 2/8/79 - Re: Underground Reserve Estimate, Hardshell Project.

FRKoutz Memo to JDSell dated 6/1/83 - Re: Drill Hole Depths to Alteration-Mineralization Horizons, Hardshell Project.

FRKoutz Memo to SAAnzalone dated 6/7/83 - Re: Geology-Exploration Aspects, Hardshell Project.

Histogram of Cation Content.

FRK Table on Production in the Greater Hardshell Area - Keith 1976 (FRK 8/8/78).

Article on Hardshell Mine (from what publication?).

FRKoutz Memo to JDSell dated 2/25/83 - Re: 1983 Assessment Work, Hardshell Project. Attached to this memo are the following:
- FRK Memo to WDPayne dated 8/28/81 - Monthly Progress Report.
- FRK Memo to WDPayne dated 9/29/81 - Monthly Progress Report.
- FRK Memo to FAMichel dated 10/13/81 - Lithology-Mineralization Summary.
- FRK Memo to TDHenderson dated 9/28/81 - Hermosa Metallurgical Sample.
- TDH Memo to FRK dated 10/30/81 - Metallurgical Testing of Hermosa Mine Samples.
- TDH File Memo dated 11/4/81 - Discrepancies in Calculated Heads & Silver Recoveries of Hermosa Mine Ore Leach Tests.

FRKoutz Memo to SAAnzalone dated 6/6/83 - Re: Technical Data-Summary on Hardshell Project.

ASARCO

Exploration Department

J D Sell

January 23, 1976

F. T. G.
JAN 22 1976

Memo for J.C. Balla
M.P. Barnes
R.E. Gale
F.T. Graybeal
L. Montoya
S. Von Fay

GOLD-SILVER PROSPECTING

Although it has been recognized for sometime that important sized deposits of gold and/or silver tend to occur in sedimentary or pyroclastic horizons associated with veins (such as Hardshell, Waterloo and Carlin) our search for new deposits has been largely oriented toward the study and sampling of exposed vein wallrock.

Mr. Kurtz reports that recent work at Rochester indicates that the Weaver formation (tuffs and fragmental volcanics) appears to contain the best silver values and that at Pueblo Viejo in the Dominican Republic open pit gold ore is apparently confined to a sedimentary sequence, ranging from shale to conglomerate. Freeport's recent discovery in the Creede District is another example.

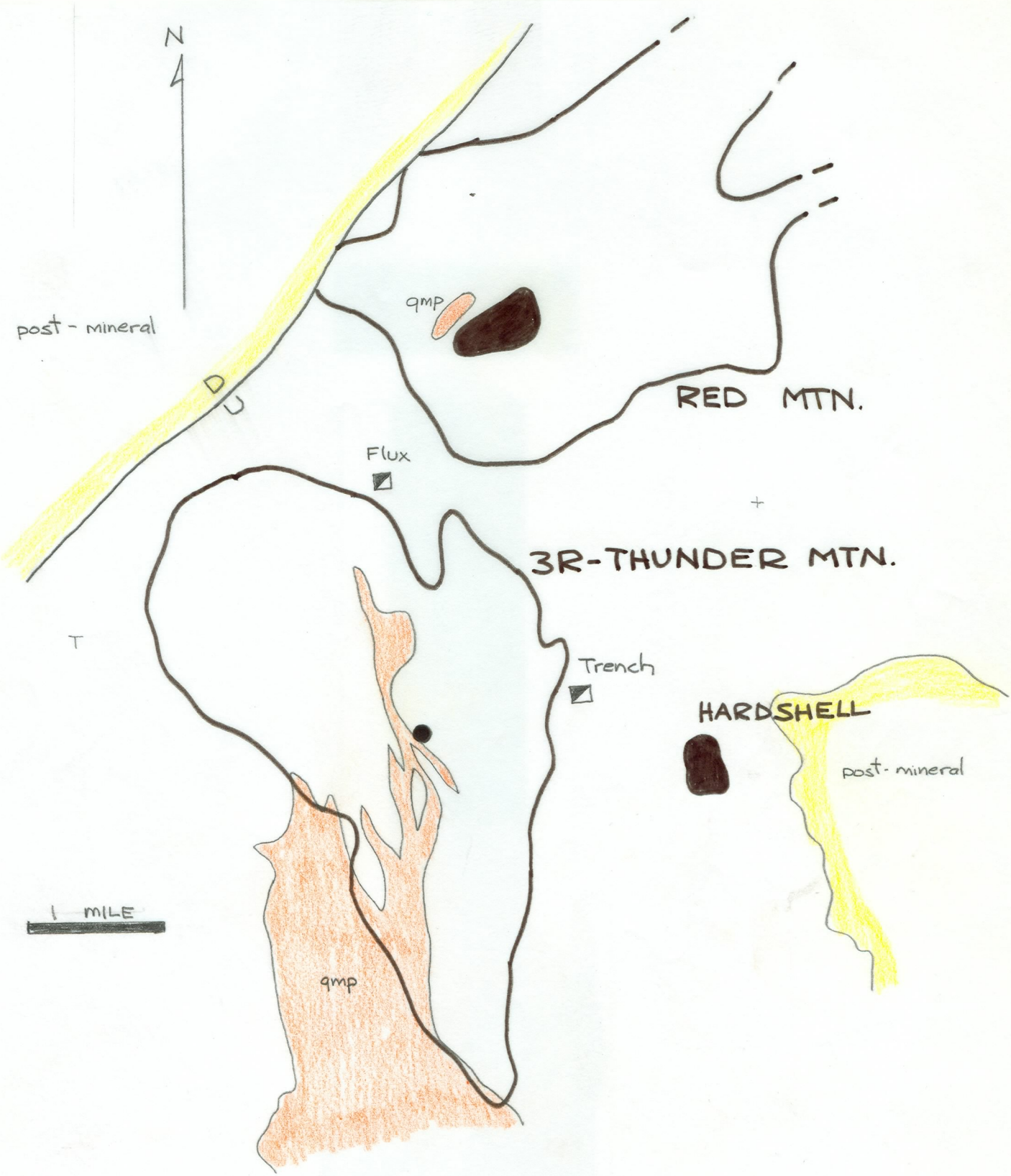
He has proposed, and I agree, that a more effective approach in prospecting should include a search for possibly favorable horizons in precious metal districts, rather than relying entirely on sample results from exposed vein wallrock.

J.H. Courtright

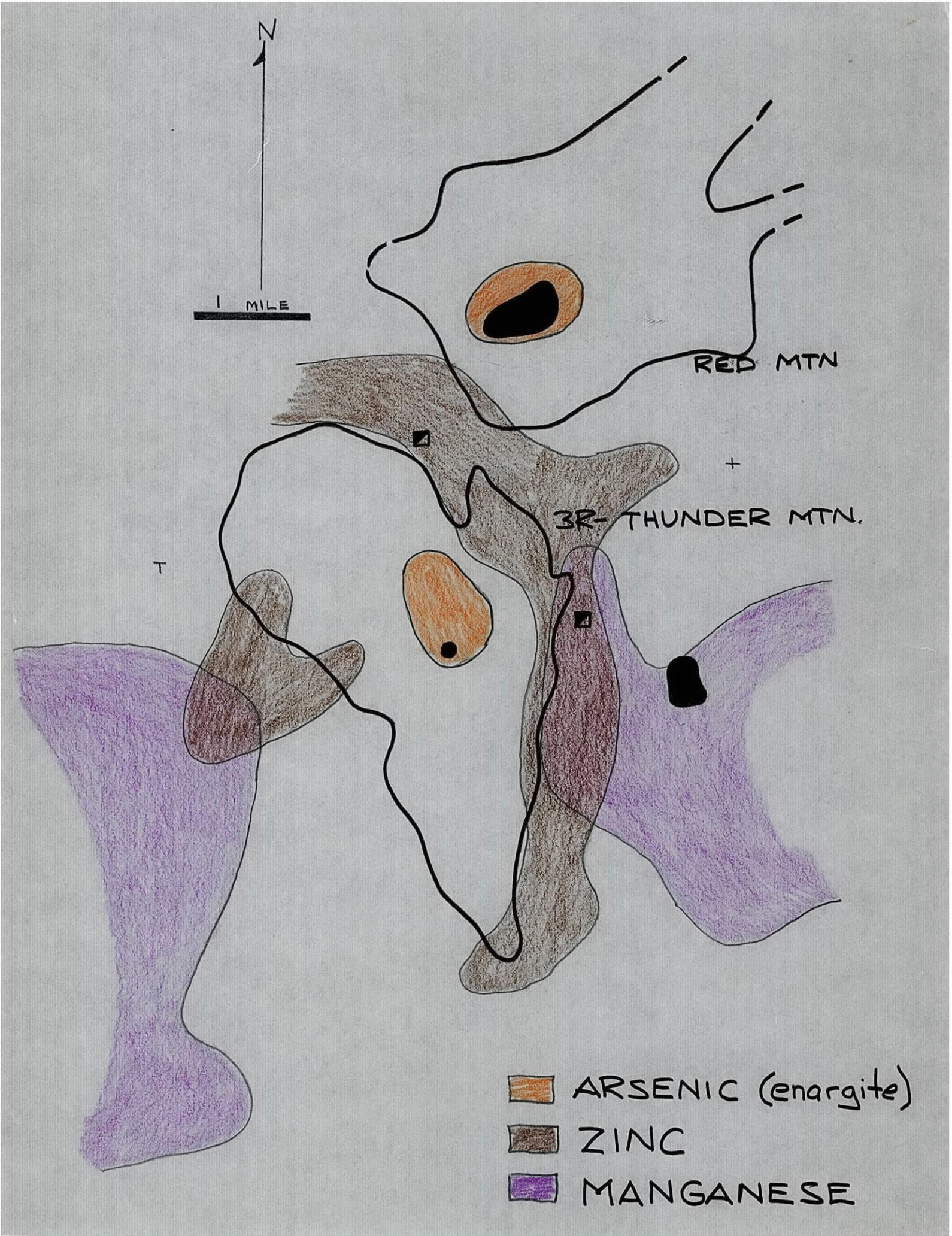
J.H. Courtright

JHC:vh

cc: TCOsborne
WLKurtz



3R ~~THUNDER MOUNTAIN~~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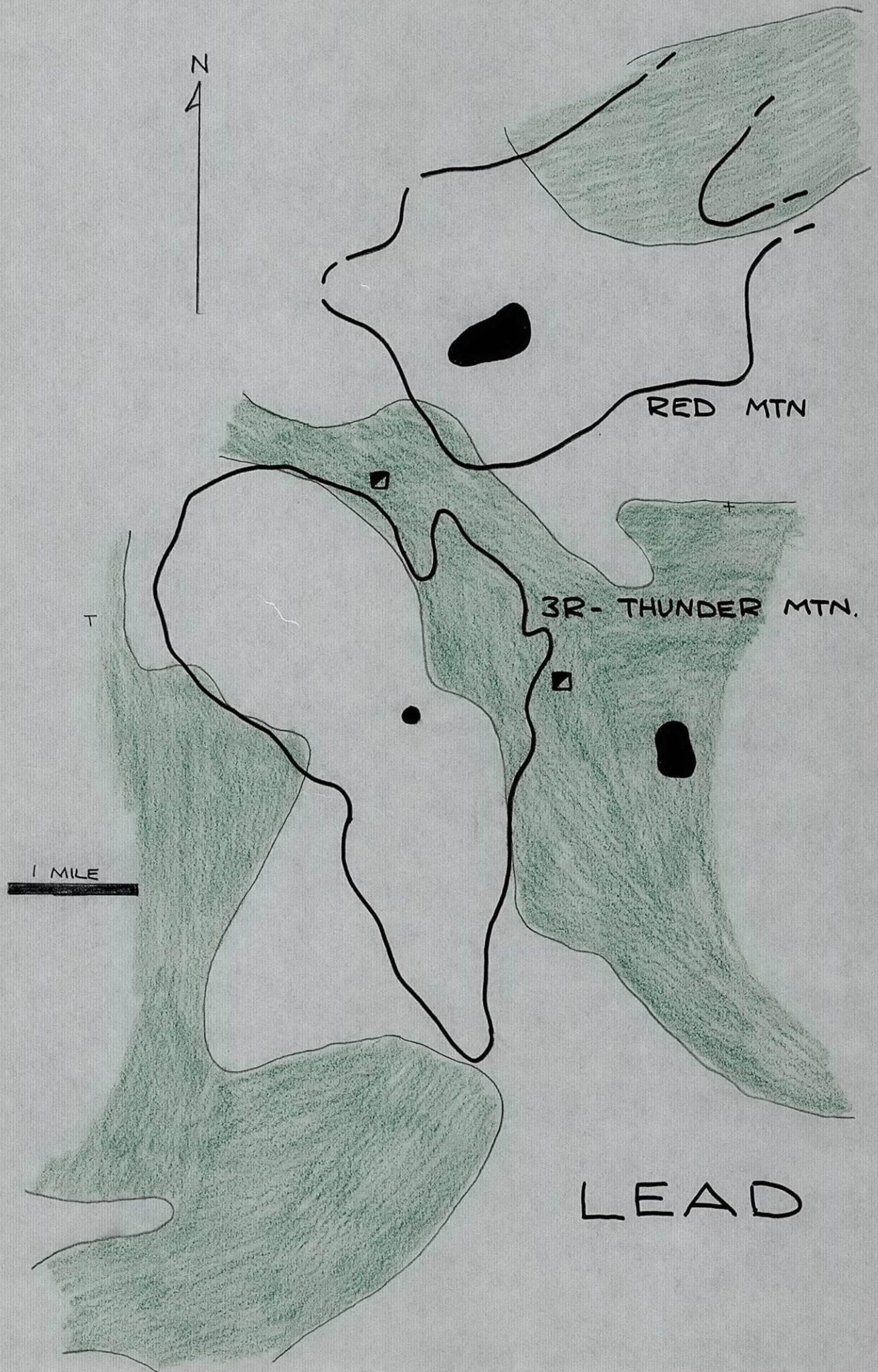
ARSENIC (enargite)
ZINC
MANGANESE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RED MTN
3R- THUNDER MTN.
1 MILE
LEAD

Marguerite Group
Santa Cruz Co.

Mr. Ted Walker, ph. 795-2980
Mr. Jim Sorrell (his nephew), ph. 884-8832
Also a geophysicist & prospector, has several other properties including a platinum dike 200' wide x 3500' long.
~~We~~ H has copy of report
Mr. W. Richard Hohnden, Sr. (Dick), ph. 298-5940. consultant.

					tabular zone of brecciated and sheared Jurassic volcanic tuff showing iron and manganese staining.	with a production of some 130 tons of ore averaging about 30 oz. Ag/T, 0.6 oz. Au/T and minor Cu.	
11. Gold Hill & Blue Ribbon mine group (Skyline, St. Christofer; Setka, Sheehy, Reyes, Delgado)	22S	10E	SE¼ 26	Au, Ag, Cu-, Pb-, Zn-	Irregular and lensing quartz-fissure veins, with partly oxidized and disseminated base metal sulfides, cutting Jurassic welded tuff.	Shaft operations. Prospected and worked intermittently from late 1800's but mainly from 1935 through 1941, producing some 120 tons of ore averaging about 0.6 oz. Au/T, 2 oz. Ag/T and minor Cu and Pb.	Knight, 1970 ABM file data
12. Grubstake mine (Scribner; Tully, Gzowski, Grasman, Cox)	23S	11E	SE¼ 19	Au, Ag, Cu-	Irregular, lensing fissure zone of brecciated Jurassic tuff cemented by finely crystalline quartz containing fine grained gold, silver, and copper mineralization. Argillitic alteration.	Shaft operations. Probably prospected in past but worked mainly from 1933 through 1940, producing some 250 tons of ore averaging about 0.8 oz. Au/T, 7 oz. Ag/T and minor Cu.	Knight, 1970 ABM file data
13. Idaho mine group (Arizona group; North Star Mg. & Development Co., Arivaca Mg. Co.)	22S	11E	S. Cen. 32 Protracted	Ag, Pb, Zn, Cu-, Au- (Sb, As)	Lensing quartz-fissure vein, containing disseminated galena, sphalerite, tetrahedrite, chalcopyrite, and pyrite, cutting Cretaceous conglomerate and sandy, limy, and silty sediments. Intrusive Laramide diorite porphyry.	Shaft and tunnel operations. Intermittent production from early 1910's through 1963, amounting to some 6,800 tons of ore averaging about 3 oz. Ag/T, 2% Pb, 1% Zn, 0.3% Cu and minor Au.	Warren & Loofbourow, 1932, p. 578-585 Wilson & Fowler, 1951, p. 44 Knight, 1970 ABM file data
14. Indian mine group (Indio; Lopez)	23S	10E	NE¼ 13	Au, Ag, Pb-, Cu-	Irregular, lensing quartz-fissure vein with spotty base metal sulfides, largely oxidized with supergene enrichment in gold and silver. Wall rock is Jurassic volcanic tuff and some Cretaceous sediments.	Shallow operations. In 1935-1936, produced some 110 tons of ore averaging about 0.7 oz. Au/T, 3 oz. Ag/T and minor Pb and Cu.	ABM file data
15. Loma de Manganese (Sheehy, Otero & Hunter)	23S	10E	SE¼ 1	Mn, Ag-, Cu-	Irregular, lenticular masses of psilomelane and pyrolusite with manganiferous calcite and iron oxides along a fissure in Jurassic rhyolite volcanics.	Open cut and shaft operation. Some 45 long tons of sorted 47% Mn ore produced in 1953-1954.	Farnham et alia, 1961, p. 191-192
16. Lucky Shot mine group (San Jose, Half & Half; Bejerano, Licano & Flores, Jime & Marker, Oro Verde Mg. Co., Big Four Mg. Co.)	23S	11E	N. Cen. 8	Zn, Pb, Ag, Cu-, Au-	Lensing quartz-fissure veins containing spotty sphalerite, galena, and chalcopyrite, partly oxidized. Wall rocks are Jurassic volcanic flows and tuff or Cretaceous sediments.	Shaft operations. Probably originally prospected in late 1800's but worked mainly during 1939-1940 and 1947-1948 when produced some 220 tons of ore averaging about 8% Zn, 4% Pb, 1 oz. Ag/T, and minor Au and Cu.	Wilson, 1951, p. 42 Knight, 1970 ABM file data
17. Margarita mine group (Golden Eagle, Rob Roy; Gold Zone Mg. Co., McDonald, Margarita Gold Mines Co., Daniels, Wechler)	23S	11E	NE¼ 7	Au, Ag, Pb-, Zn-, Cu-	Irregular, silicified blanket zone of numerous quartz veinlets and stringers containing abundant pyrite and very fine grained gold and silver mineralization associated mainly with oxidized sulfides. Country rock is a strongly silicified and sericitized Jurassic volcanic tuff.	Numerous open cut, shaft, and adit operations. Originally worked in 1890's but mostly in 1903 and from 1933 through 1941, producing some 4,400 tons of ore averaging about 0.3 oz. Au/T, 0.6 oz. Ag/T, and minor Pb and Cu.	Wilson, 1934 (Rev. 1967), p. 191-192 Knight, 1970 ABM file data

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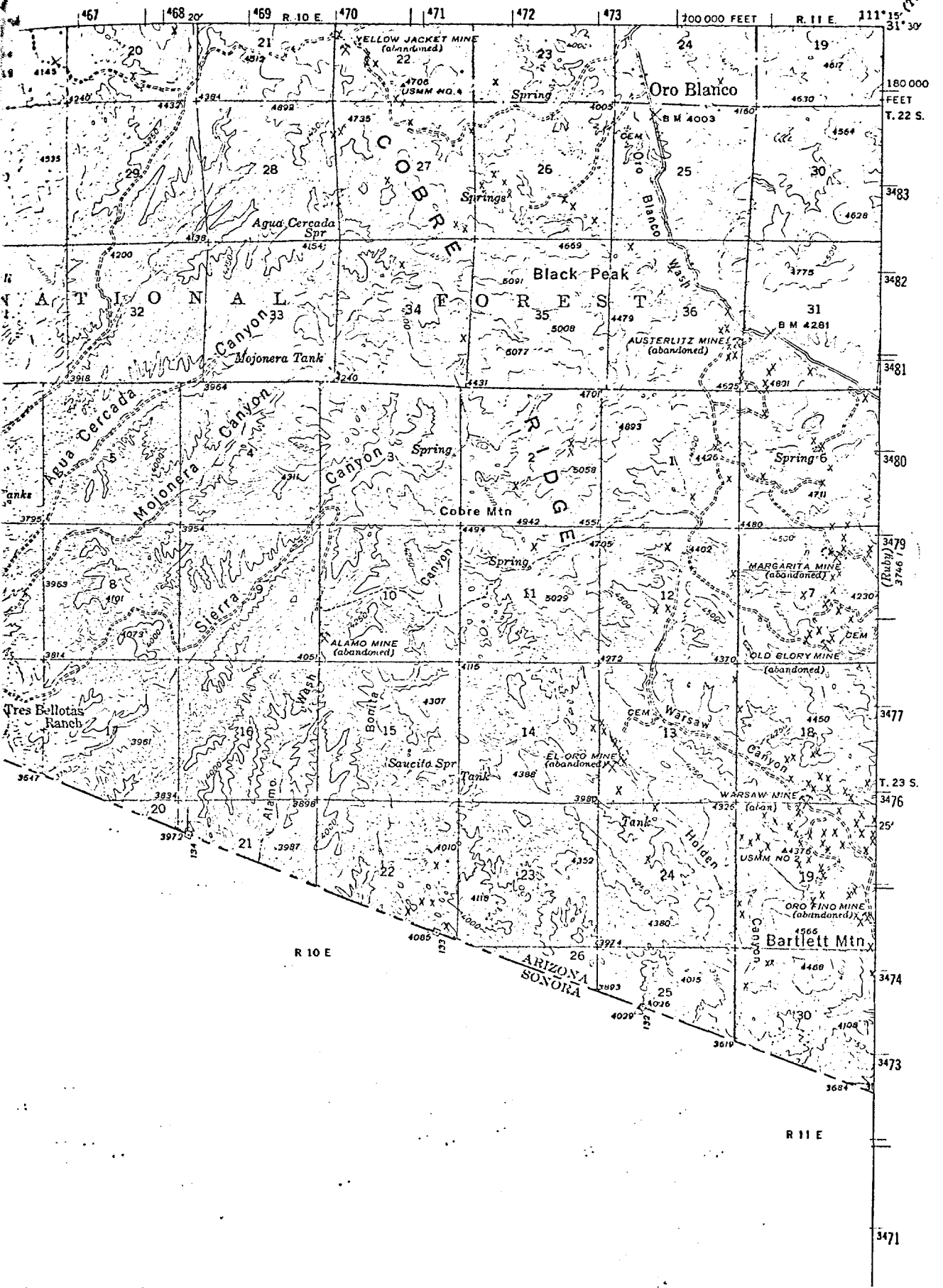
Index of Mining Properties in Santa Cruz Co., Az by S B Keith.

Table 4, Cont.

MINING DISTRICT AND MINES	LOCATION T.	R.	Sec.	MINERAL PRODUCTS	GEOLOGY	TYPE OF OPERATION AND PRODUCTION	REFERENCES
18. Montana mine group mines (Rough & Ready; Orion Co., Montana Co., Zeckendorf, Goldfield Consolidated Mines Exploration Co., Montana Mines Operations, Eagle-Picher Mg. & Smltg. Co., Miller, Maravilla Mineros Corp.)	23S	11E	N. 5	Pb, Zn, Ag, Cu (Cd, Sb, As)	Lensing, vuggy, quartz veins containing sphalerite, pyrite, galena, chalcopyrite and tetrahedrite as fracture fillings, in vugs, and as replacements of quartz and sheared and brecciated wall rock. En echelon veins are along a fault zone cutting blocks of Cretaceous conglomerate and Laramide diorite that are intruded and offset by later diorite porphyry dikes. Sulfides oxidized near the surface with enrichment of silver and gold.	Extensive operations from shafts. Located in the early 1870's and worked intermittently on a small scale until 1929 through 1940. Some sporadic work up to 1958. Total production would be some 870,000 tons of ore averaging about 3.5% Pb, 3.5% Zn, 5 oz. Ag/T, 0.5 oz. Au/T, and 0.3% Cu.	Andrus, 1931 Head, 1931 Warren & Loofbourow, 1932 Fowler, 1938 Wilson & Fowler, 1951 Knight, 1970 ABM file data
19. Old Glory mine group (Sargent, Esperanza, Blaine Ledge, Ophir; Arizona Gold Mg. & Milg. Co., Arizona Ophir Mg. Co., Foote, Pesano)	23S	11E	S. Cen. 7	Au, Ag, Pb-, Cu-, Zn-	Flat dipping, siliceous bed having a quartz core bordered by zones of quartz veinlets and abundant pyrite containing sparse base metal sulfides. Oxidation and supergene enrichment has produced high grade gold and silver values in iron oxide. Chalcanthite found.	Shallow adit and open cut workings. Prospected and worked sporadically since 1880's. Production would be some 700 tons of ore averaging about 0.4 oz. Au/T, 1 oz. Ag/T and minor Cu and Pb.	Wilson, 1934 (Rev. 1967, p. 189-190 Knight, 1970 ABM file data
20. Old Soldier mine (Progressive Mg. Co., Holt, Aubrey, Dale, Hack & Irwin)	23S	11E	N. Cen. 20	Ag, Au	Gold and silver mineralization in a shear zone of brecciated, pulverized and sericitized Jurassic volcanic tuff cemented by finely crystalline quartz.	Tunnel and shaft operations. Worked sporadically since late 1800's through 1942, producing some 1,250 tons of ore averaging about 12 oz. Ag/T and 0.4 oz. Au/T.	Knight, 1970 ABM file data
21. Oro (El Oro) mine (Williams, Foltz)	23S	10E	W. Cen. 13	Ag, Au, Cu-, Pb-, Zn-	Irregular and lensing quartz fissure veins containing spotty base metal sulfides, oxidized and supergene enriched in silver and gold. Wall rock is Jurassic volcanic tuff.	Shaft operations. Prospected and worked in 1890's and intermittently into 1900's. Produced some 100 tons of ore averaging about 16 oz. Ag/T, 0.5 oz. Au/T and minor Cu and Pb.	Knight, 1970 ABM file data
22. Oro Blanco area mines (Large group of claims and mines, often overlapping or restaked, owned and/or worked in whole or part by various companies, owners or lessors. Major mines are listed below.	23S	11E	SW¼ 17 SE¼ 18 NE¼ 19 NW¼ 20	Au, Ag, Cu-, Pb-	Lensing tabular zones of brecciated and sheared Cretaceous conglomerate or Tertiary volcanics with finely crystalline quartz cement, minor iron and manganese oxides, wall rock bleaching, and fine grained gold and silver values. Ratio of silver to gold about 10:1. Deposits appear limited in vertical and horizontal extent.	Shallow operations from adits, open cuts, and shafts. Worked sporadically since before the 1900's. Estimated and recorded production would be some 3,900 tons of ore averaging about 0.7 oz. Au/T and 7 oz. Ag/T with minor Cu and Pb. Some high grade stringers mined locally.	Blake, 1899 Wilson et alia, 1934 (Rev. 1967), p. 188-191 Knight, 1970 ABM file data
a. Don Amigos mine (Daniels, Legend Group Ltd, Arteala Investment Co., Oro Blanco Mines Co.)	23S	11E	NW¼ 20	Au, Ag	Irregular, lensing zone of brecciated to pulverized Cretaceous conglomerate cemented by finely crystalline quartz containing fine grained gold and silver mineralization, iron and manganese oxides. Mineralization all in oxidized zone.	Tunnel and shaft operations.	Wilson et alia, 1934 (Rev. 1967), p. 191 Knight, 1970 ABM file data

ARIZONA
ORO BLANCO QUADRANGLE
15-MINUTE SERIES



N

MARGARITA PROJECT

GEOLOGIC MAP

PPG INDUSTRIES

1 INCH = 450 FEET

INTENSE SILICIFICATION

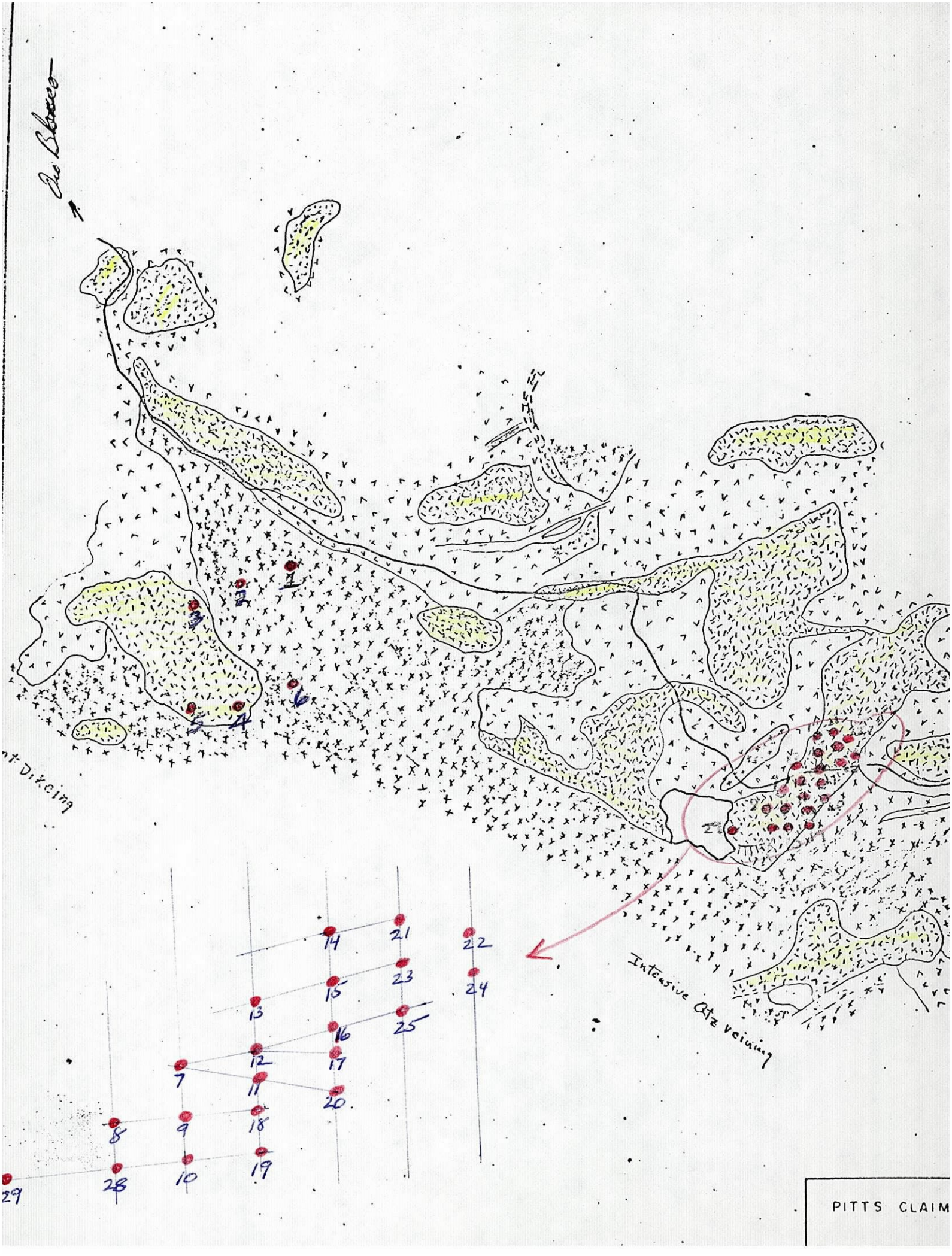
BASIC DIKES AND SHEAR ZONES

QTZ. VEINS AND DIKES

QTZ. LATITE

JURRASIC QTZ. MONZONITE

DRILL HOLES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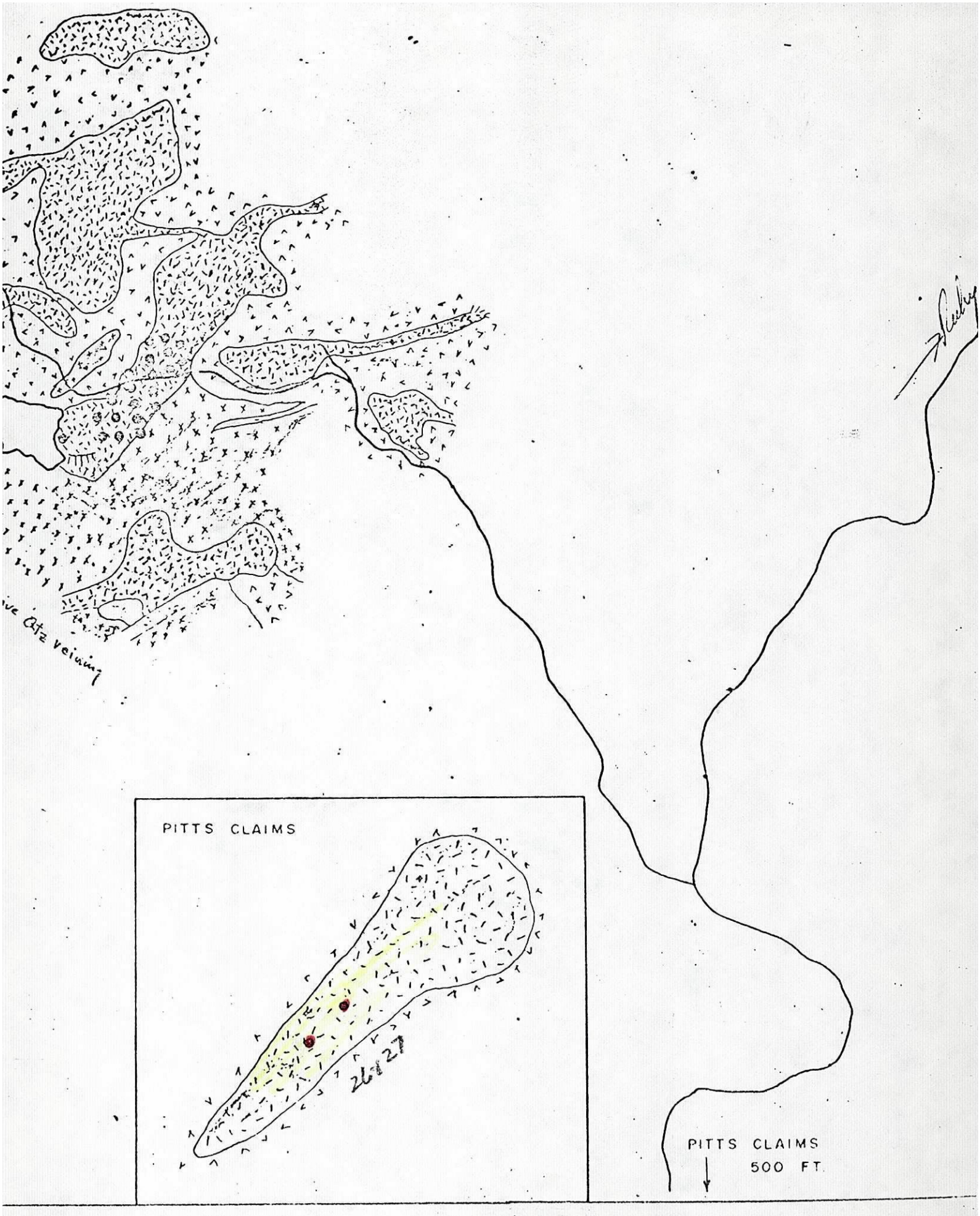
PITTS CLAIM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PITTS CLAIMS
26127
PITTS CLAIMS
500 FT.

ASARCO

Southwestern Exploration Division

July 15, 1977

TO: F. T. Graybeal

FROM: J. D. Sell

Margarita Group
Santa Cruz Co., Arizona

The Margarita property shows values which are apparently too low and spotty for immediate interest, but the data obtained may be useful in future investigations in the area.

Mr. Dick Hahman (ph. 298-5940, Tucson) has submitted the PPG and other data to us. Dick was a consulting geologist but is now with the new Geothermal Group attached to the U. of A.

The property is presently held by Mr. Ted Walker, ph. 795-2980, Tucson, and access to the pulps, etc., can be gained thru him or his nephew, Mr. Jim Sorrell, ph. 884-8832, Tucson.

As shown on the attached sheet (Attach. A) from ABM Bulletin 191, the Margarita group is credited with a production of 4,400 tons of ore averaging 0.3 oz. Au and 0.6 oz. Ag per ton. The present group contains 32 claims located mainly in the NE1/4 of Section 7, T23S, R11E, Santa Cruz County, as shown on the attached portion (Attach. B) of the 15-minute Oro Blanco quadrangle.

Ray Stauffer (Asarco report, March 21, 1966) sampled in the same general area and outlined several zones of +0.01 oz. Au/ton in an arkosic unit, with values as high as 0.07 oz. Au/ton. Ray suggested a possible 10 million tons within the area.

Pittsburgh Plate Glas (PPG) Industries drilled 29 holes, using a rotary air-trac with 3-1/2" bit, in three areas of the group. See attached map (file copy). Values found were generally in the 0.0X to 0.00X oz./ton gold range. As noted, no appreciable changes in value were found in the mapped quartz latite versus the intense silicification zones (probably also of a quartz latite parentage), although the eastern side was drilled on a rough 60-foot grid pattern. PPG became involved in the validity of fire assay versus a "special" wet assay method for precious metals. The fire assays regularly returned the 0.00X values whereas the wet method returned 0.0X values. With the overall low values, PPG has abandoned the option on the property.

PPG apparently did not sample or drill in the area of the upper workings which produced most of the known ore from the area.

Occidental also collected a few samples from the previous drilling and had them run by Union Assay, Southwest Assayers, and their own Candelaria Lab. Comparison of these shows some agreement in the 0.15 oz./ton range, but PM Labs and Skyline Labs were in the 0.01 oz./ton range for the same samples. Occidental did not option the property.

Various maps, sample assays, check assays, etc. are attached to the file copy only.

James D. Sell

James D. Sell

JDS:lb
Atts.

Attach. A.

					tabular zone of brecciated and sheared Jurassic volcanic tuff showing iron and manganese staining.	with a production of some 130 tons of ore averaging about 30 oz. Ag/T, 0.6 oz. Au/T and minor Cu.	
11. Gold Hill & Blue Ribbon mine group (Skyline, St. Christofer; Setka, Sheehy, Reyes, Delgado)	22S	10E	SE ¼ 26	Au, Ag, Cu-, Pb-, Zn-	Irregular and lensing quartz-fissure veins, with partly oxidized and disseminated base metal sulfides, cutting Jurassic welded tuff.	Shaft operations. Prospected and worked intermittently from late 1800's but mainly from 1935 through 1941, producing some 120 tons of ore averaging about 0.6 oz. Au/T, 2 oz. Ag/T and minor Cu and Pb.	Knight, 1970 ABM file data
12. Grubstake mine (Scribner; Tully, Gzowski, Grasman, Cox)	23S	11E	SE ¼ 19	Au, Ag, Cu-	Irregular, lensing fissure zone of brecciated Jurassic tuff cemented by finely crystalline quartz containing fine grained gold, silver, and copper mineralization. Argillitic alteration.	Shaft operations. Probably prospected in past but worked mainly from 1933 through 1940, producing some 250 tons of ore averaging about 0.8 oz. Au/T, 7 oz. Ag/T and minor Cu.	Knight, 1970 ABM file data
13. Idaho mine group (Arizona group; North Star Mg. & Development Co., Arivaca Mg. Co.)	22S	11E	S. Cen. 32 Protracted	Ag, Pb, Zn, Cu-, Au- (Sb, As)	Lensing quartz-fissure vein, containing disseminated galena, sphalerite, tetrahedrite, chalcopyrite, and pyrite, cutting Cretaceous conglomerate and sandy, limy, and silty sediments. Intrusive Laramide diorite porphyry.	Shaft and tunnel operations. Intermittent production from early 1910's through 1968, amounting to some 6,800 tons of ore averaging about 3 oz. Ag/T, 2% Pb, 1½ Zn, 0.3% Cu and minor Au.	Warren & Loofbourow, 1932, p. 578-585 Wilson & Fowler, 1951, p. 44 Knight, 1970 ABM file data
14. Indian mine group (Indio; Lopez)	23S	10E	NE ¼ 13	Au, Ag, Pb-, Cu-	Irregular, lensing quartz-fissure vein with spotty base metal sulfides, largely oxidized with supergene enrichment in gold and silver. Wall rock is Jurassic volcanic tuff and some Cretaceous sediments.	Shallow operations. In 1935-1936, produced some 110 tons of ore averaging about 0.7 oz. Au/T, 3 oz. Ag/T and minor Pb and Cu.	ABM file data
15. Loma de Manganese (Sheehy, Otero & Hunter)	23S	10E	SE ¼ 1	Mn, Ag-, Cu-	Irregular, lenticular masses of psilomelane and pyrolusite with manganiferous calcite and iron oxides along a fissure in Jurassic rhyolite volcanics.	Open cut and shaft operation. Some 45 long tons of sorted 47% Mn ore produced in 1953-1954.	Farnham et alia, 1961, p. 191-192
16. Lucky Shot mine group (San Jose, Half & Half; Bejerano, Licano & Flores, Jime & Marker, Oro Verde Mg. Co., Big Four Mg. Co.)	23S	11E	N. Cen. 8	Zn, Pb, Ag, Cu-, Au-	Lensing quartz-fissure veins containing spotty sphalerite, galena, and chalcopyrite, partly oxidized. Wall rocks are Jurassic volcanic flows and tuff or Cretaceous sediments.	Shaft operations. Probably originally prospected in late 1800's but worked mainly during 1939-1940 and 1947-1948 when produced some 220 tons of ore averaging about 8% Zn, 4% Pb, 1 oz. Ag/T, and minor Au and Cu.	Wilson, 1951, p. 42 Knight, 1970 ABM file data
17. Margarita mine group (Golden Eagle, Rob Roy; Gold Zone Mg. Co., McDonald, Margarita Gold Mines Co., Daniels, Wechler)	23S	11E	NE ¼ 7	Au, Ag, Pb-, Zn-, Cu-	Irregular, silicified blanket zone of numerous quartz veinlets and stringers containing abundant pyrite and very fine grained gold and silver mineralization associated mainly with oxidized sulfides. Country rock is a strongly silicified and sericitized Jurassic volcanic tuff.	Numerous open cut, shaft, and adit operations. Originally worked in 1890's but mostly in 1903 and from 1933 through 1941, producing some 4,400 tons of ore averaging about 0.3 oz. Au/T, 0.6 oz. Ag/T, and minor Pb and Cu.	Wilson, 1934 (Rev. 1967), p. 191-192 Knight, 1970 ABM file data

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Index of Mining Properties in Santa Cruz Co., AZ by S B Keith.

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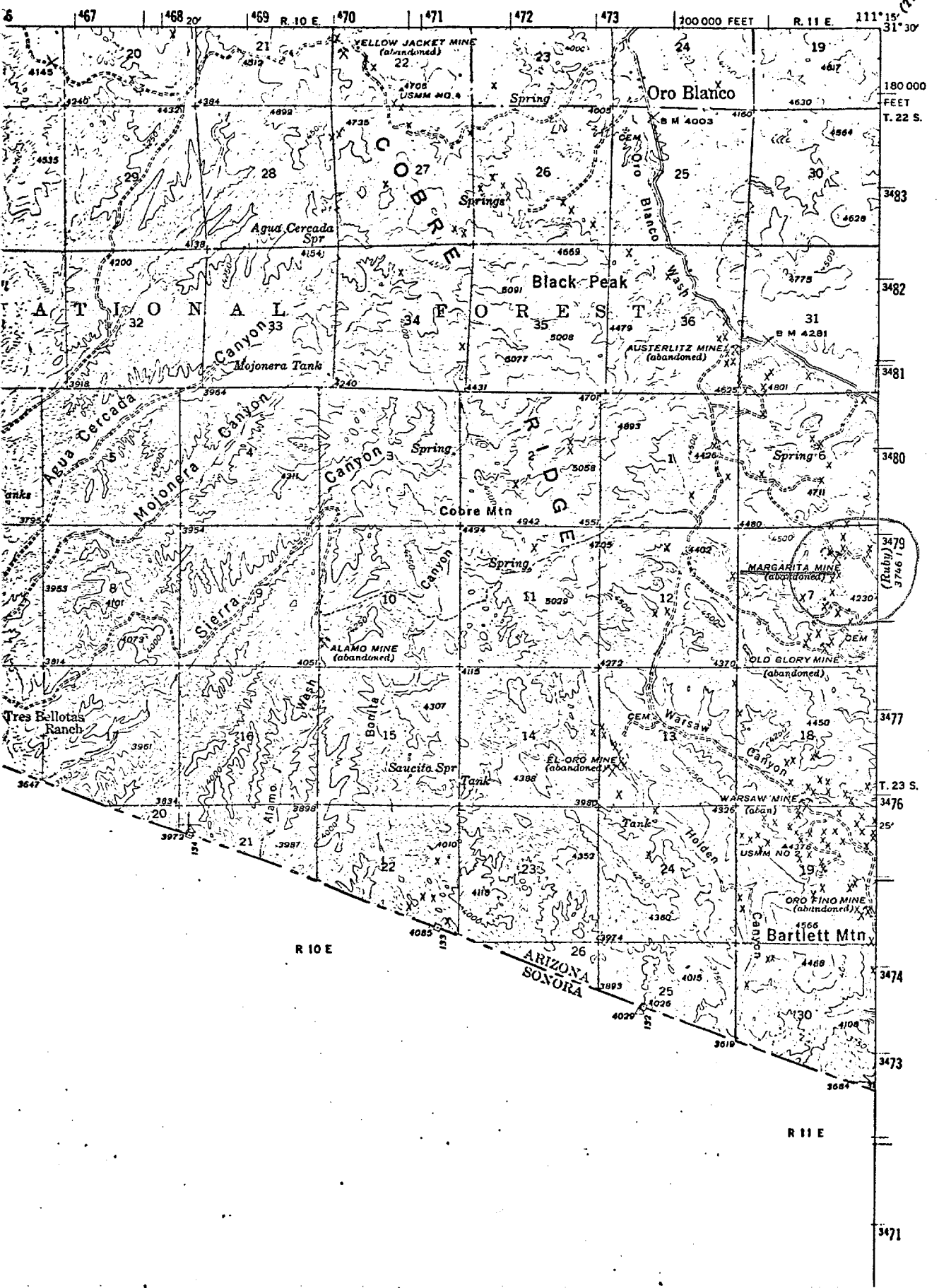
19. Old Glory mine group (Sargent, Esperanza, Blaine Ledge, Ophir; Arizona Gold Mg. & Mllg. Co., Arizona Ophir Mg. Co., Foote, Pesano)	23S	11E	S. Cen. 7	Au, Ag, Pb-, Cu-, Zn-	Flat dipping, siliceous bed having a quartz core bordered by zones of quartz veinlets and abundant pyrite containing sparse base metal sulfides. Oxidation and supergene enrichment has produced high grade gold and silver values in iron oxide. Chalcanthite found.	Shallow adit and open cut workings. Prospected and worked sporadically since 1880's. Production would be some 700 tons of ore averaging about 0.4 oz. Au/T, 1 oz. Ag/T and minor Cu and Pb.	Wilson, 1934 (Rev. 1967, p. 189-190) Knight, 1970 ABM file data
20. Old Soldier mine (Progressive Mg. Co., Holt, Aubrey, Dale, Hack & Irwin)	23S	11E	N. Cen. 20	Ag, Au	Gold and silver mineralization in a shear zone of brecciated, pulverized and sericitized Jurassic volcanic tuff cemented by finely crystalline quartz.	Tunnel and shaft operations. Worked sporadically since late 1800's through 1942, producing some 1,250 tons of ore averaging about 12 oz. Ag/T and 0.4 oz. Au/T.	Knight, 1970 ABM file data
21. Oro (El Oro) mine (Williams, Foltz)	23S	10E	W. Cen. 13	Ag, Au, Cu-, Pb-, Zn-	Irregular and lensing quartz fissure veins containing spotty base metal sulfides, oxidized and supergene enriched in silver and gold. Wall rock is Jurassic volcanic tuff.	Shaft operations. Prospected and worked in 1890's and intermittently into 1900's. Produced some 100 tons of ore averaging about 16 oz. Ag/T, 0.5 oz. Au/T and minor Cu and Pb.	Knight, 1970 ABM file data
22. Oro Blanco area mines (Large group of claims and mines, often overlapping or restaked, owned and/or worked in whole or part by various companies, owners or lessors. Major mines are listed below.	23S	11E	SW ¼ 17 SE ¼ 18 NE ¼ 19 NW ¼ 20	Au, Ag, Cu-, Pb-	Lensing tabular zones of brecciated and sheared Cretaceous conglomerate or Tertiary volcanics with finely crystalline quartz cement, minor iron and manganese oxides, wall rock bleaching, and fine grained gold and silver values. Ratio of silver to gold about 10:1. Deposits appear limited in vertical and horizontal extent.	Shallow operations from adits, open cuts, and shafts. Worked sporadically since before the 1900's. Estimated and recorded production would be some 3,900 tons of ore averaging about 0.7 oz. Au/T and 7 oz. Ag/T with minor Cu and Pb. Some high grade streaks mined locally.	Blake, 1899 Wilson et alia, 1934 (Rev. 1967), p. 188-191 Knight, 1970 ABM file data
a. Dos Amigos mine (Daniels, Legend Group Ltd, Artesia Investment Co., Oro Blanco Mines Co.)	23S	11E	NW ¼ 20	Au, Ag	Irregular, lensing zone of brecciated to pulverized Cretaceous conglomerate cemented by finely crystalline quartz containing fine grained gold and silver mineralization, iron and manganese oxides, [illegible]	Tunnel and shaft operations.	Wilson et alia, 1934 (Rev. 1967), p. 191 Knight, 1970 ABM file data

Attach. 13

ARIZONA

ORO BLANCO QUADRANGLE
15-MINUTE SERIES



Red Mtn

Collar Elevations

Top Mineral - Thickness @ Grade (below collar)

Total Depth.

144

5618'

To be drilled

139

5054'

L 4595 - 455 @ 0.76

5188 T.D.

133

5381'

1575½ - 274½ @ 0.30

2000 - 50 @ 0.44

U? 4920 - 50' @ 0.32

L? 5001 T.D.

142

5256'

U? 3700 - 50' @ 0.48

5229 T.D.

134

5702'

U 3410 - 505' @ 0.61

L 4750 - 444' @ 0.05

5194 T.D.

136

5494'

U 4410 - 360' @ 0.72

5046 T.D.

140

5749'

U 4505 - 195' @ 1.40

5145 T.D.

143

5836'

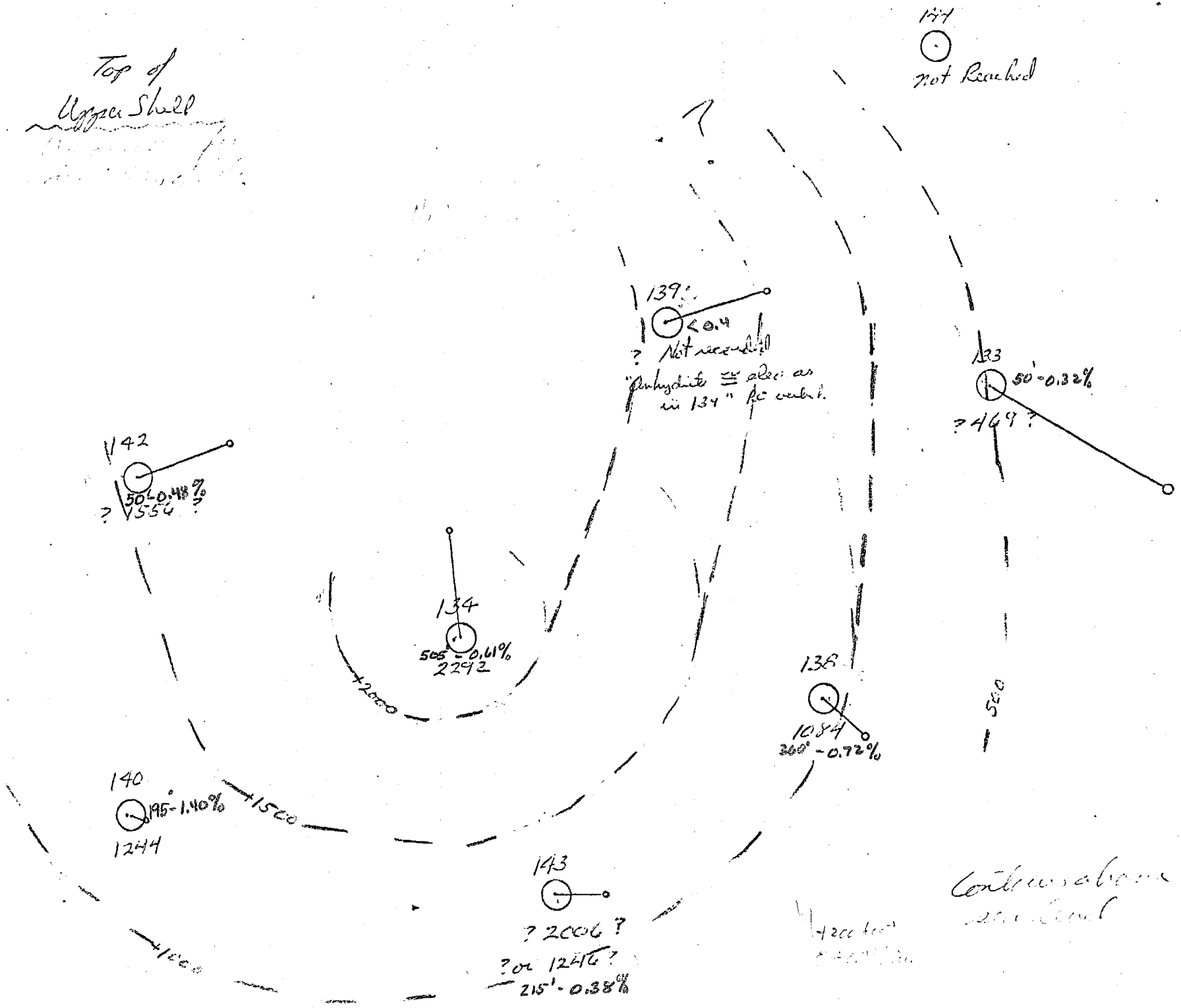
2200 - 275' @ 0.70% Cu Equiv. (0.37 Cu, 0.08 Mo

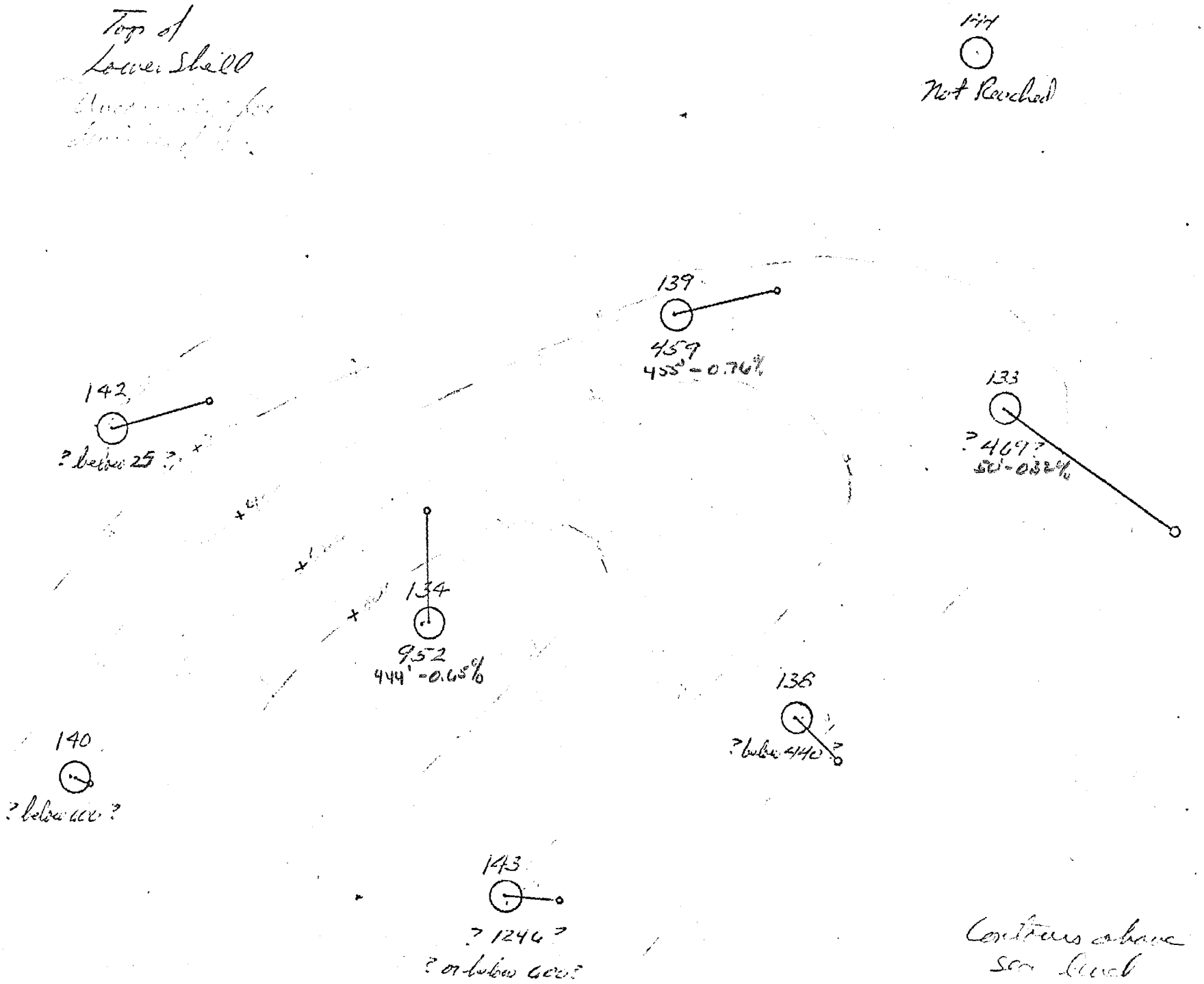
3330 - 80' @ 0.49

U? 4590 - 215' @ 0.38

5231 T.D.

1" = 400'


Top of
Upper Shell
147
not Reached
139
< 0.4
? Not recorded
"Anhydrite ≅ also as in 134" for comb.
133
50' - 0.32%
? 469 ?
142
50' - 0.48%
? 1556 ?
134
505' - 0.61%
2292
+2000
138
1084
360' - 0.72%
500
140
195' - 1.40%
1244
+1500
143
? 2006 ?
? or 1246 ?
215' - 0.38%
+1000
Continuation
1" = 400'


Top of
Lower Shell
141
Not Reached
139
459
455' - 0.76%
142
? below 25 ?
133
? 469 ?
50' - 0.82%
134
952
444' - 0.65%
136
? below 440 ?
140
? below 600 ?
143
? 1246 ?
? or below 600 ?
Contours above
sea level

1" = 400.0'

EEJ Map
April 1972

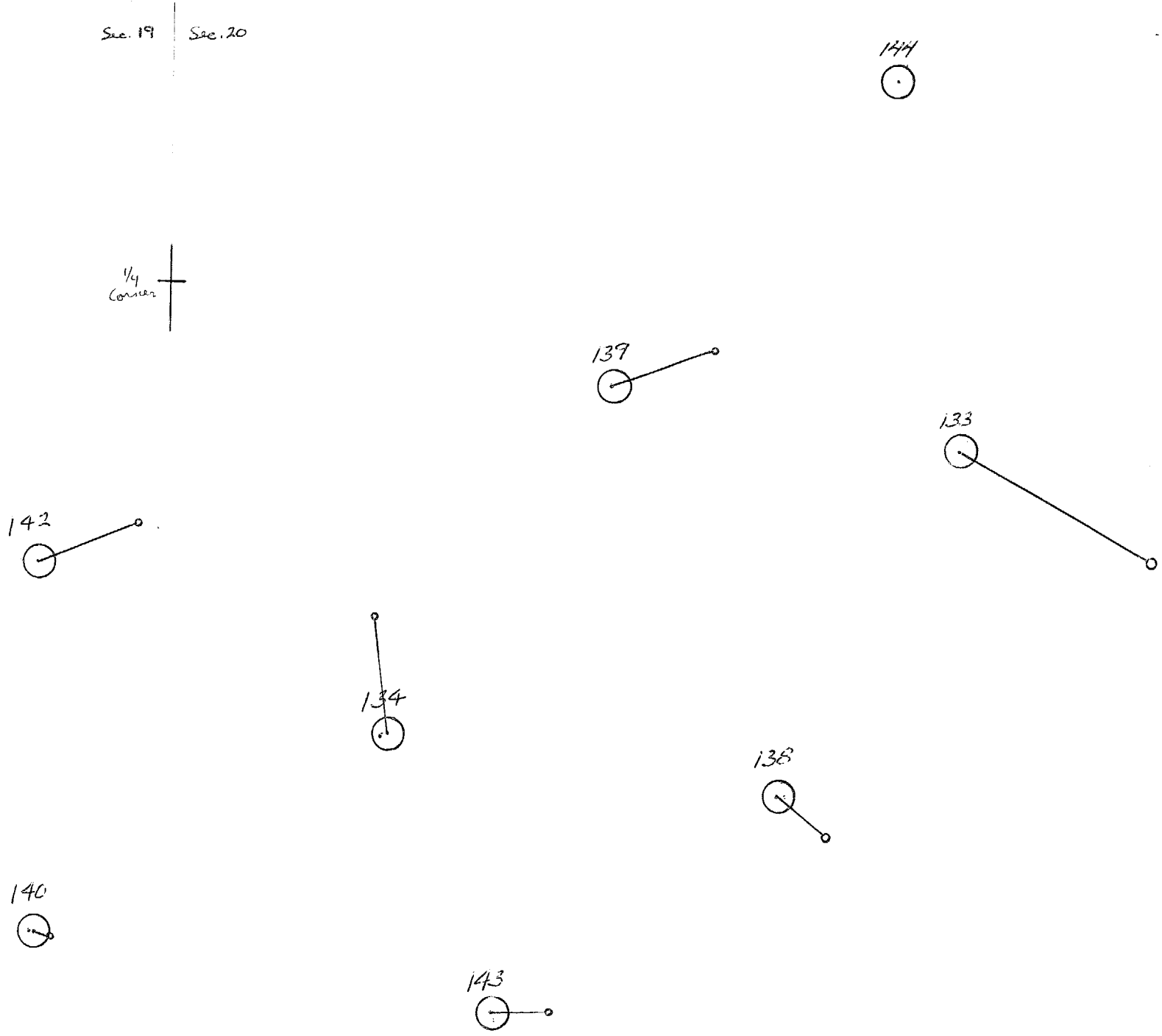
Hole	Collar Elev.	Intercepts: Thickness Grade	
#133	5389' collar	1575½ to - 274.5' thick @ 0.30	
		2060 " - 50 " @ 0.44	
		4920 " - 50 " @ 0.32	v+L?
		5001' TD.	
#134	5702' Collar.	3410' - 505 @ 0.61	v
		4750 - 444 @ 0.65	L
		5194' TD.	
#138.	5494' Collar	4410 - 360' @ 0.72	v
		5046' TD.	
#139	5054' Collar	4595' - 455' @ 0.76	L
		5188' TD.	
#140	5749' Collar	4505' - 195' @ 1.40%	v
		5145' TD.	
#142	5256' Collar	3700' - 50' @ 0.48%	v?
		5229' TD	
#143	5836' Collar	2200' - 275' @ 0.70 cu-z 0.37% Cu.	(Zinc Shell)
		3830 - 80' @ 0.49	?
		4590 - 215' @ 0.38	v
		5231 TD.	
#144	5618' Collar	present depth 1622' - to be deepened	

Hole	Depth to Primary Zone	Nomenclature	Sea Elevation
#133	4920-4970	Upper (?) & lower (?)	469-419 (?)
			T.D +388.
#134	3410-3915	Upper	2292 - 1787
	4750-5194	Lower	952 - 508
			T.D. +508'
#138	4410-4770	Upper.	1084-724
			T.D. +418'
#139	4595-5050	Lower	459 - 4
			T.D. (-) 134'
#140	4505-4700	Upper	1244-1049
			T.D. +604'
#142	3700-3750	Upper ?	1556-1506 (?)
			T.D. +27'
#143	3830 - 3910	(?)	2006- 1926 (?)
	4590-4805	Upper (?)	1246-1031 (?)
			T.D. +605'
#144	hole @ 1622' - to be deepened.		T.D.+3716 at present.

Report - JDL

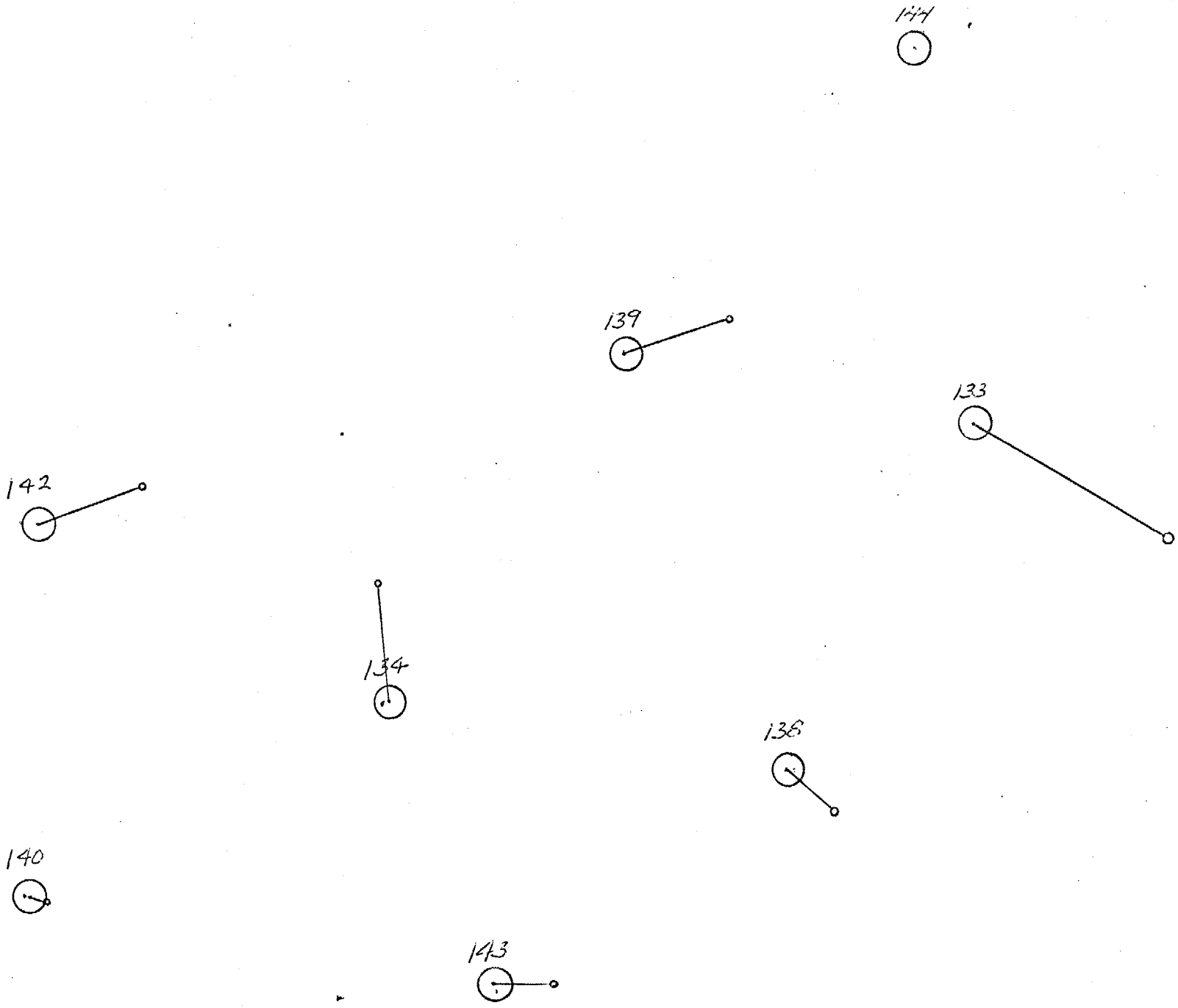
Hole	Elev. Collar	TD	Depth to Primary zone Ainsl	Surface
133	5389	5001	no intercept.	
134	5702	5194	3410-3915 Upper	2087-1792
		+513	4750-5194 Lower	797-513
138	5494	5046	4410-4770 Upper	1084-724
		+447		
139	5054	5188	4595-5050 Lower	549-4
		-134		
140	5749	5145	4505-4700 Upper	1244-1049
		+604		
142	5256	5229		
143	5836	5231	2200' south	
144	5418'	1622 to the Leopard		

nearby hole hit one good mineralization in upper or lower zone; but intercepted criteria for their existance but at a lower elevation than in 134 or 139.

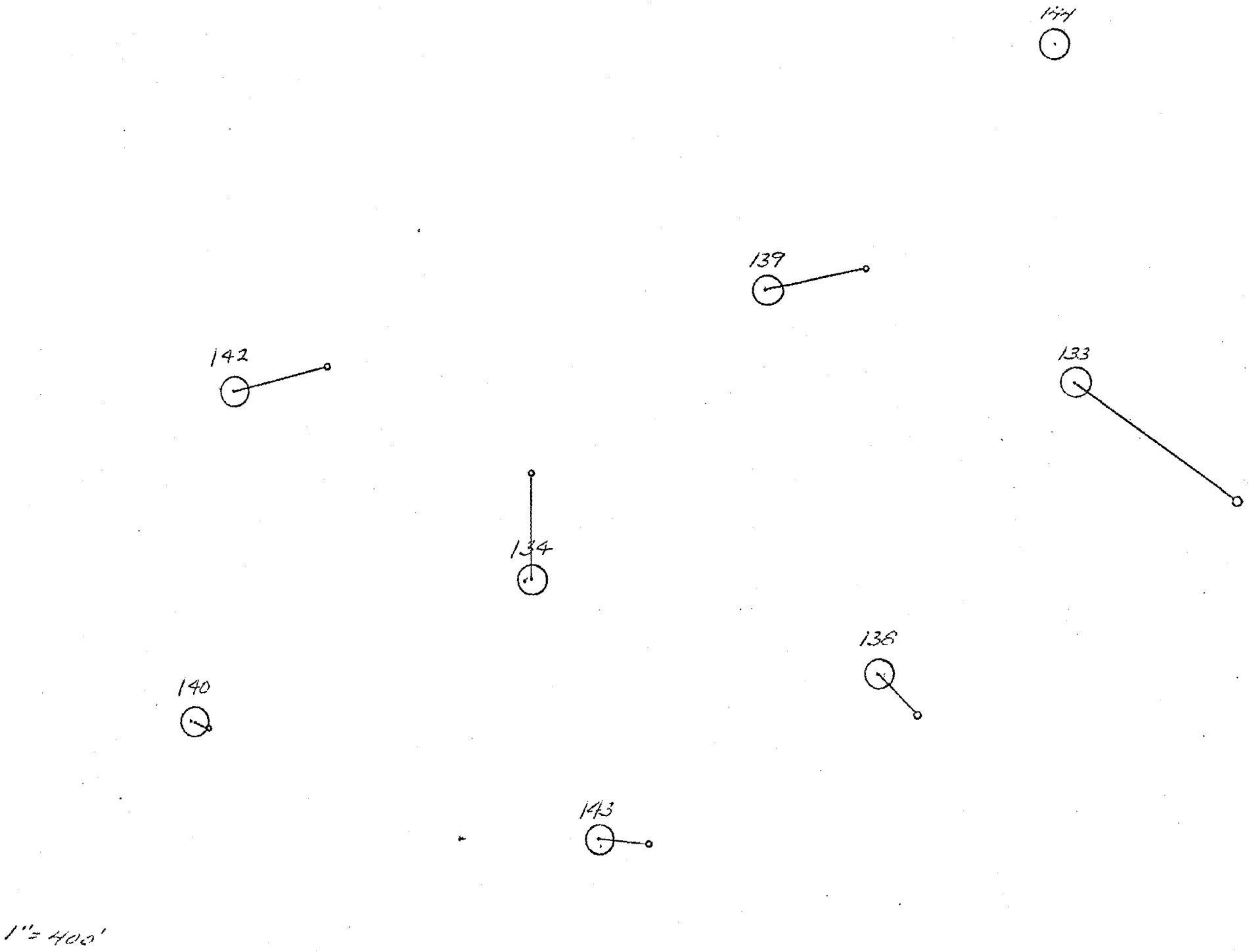


1" = 400'

EEJ April 1972



1" = 400'


144
139
142
133
134
136
140
143
1" = 400'

ASARCO

Southwestern Exploration Division

April 1, 1976

TO: F. T. Graybeal

FROM: J. D. Sell

Frontera Prospect
5 miles West of Nogales
Santa Cruz Co., Arizona

I submit the attached reconnaissance mapping of the Frontera Prospect. The work was undertaken during the Asarco Mexicana program, and apparently the report was not cross-filed in the Tucson Exploration Files.

The Frontera Prospect is best exposed and the best alteration-mineralization is mapped on the Sonora side of the International Boundary. However, it is a porphyry lead and the alteration extends north of the border. The dominant fracture pattern is N60°E with a subordinate N40°W.

Possibly ten or more holes have been drilled in the Arizona side, but only eight were found during the reconnaissance.

The Mexican files do not have any of the Cobre de Mexico's exploration data, nor was any of the data or core available during the mapping period.

James D. Sell

JDS:lb
Att: Sonora File SO-6-7

J D Self

Sept 16, 1976

FTG

JDS.

F. T. G.
SEP 19 1976

Ramon Shanin brought this report & area into us for consideration.

Apparently Shever is in on the partnership. Ramon did not say whether he was in.

Ramon verbally stated that Quintana drilled two holes outside the claim block east of Montana Peak. One in SW¼ Sec. 3, other in N½ of Section 10. He thought the hole(s) were around 2700 feet, had penetrated the volcanics, and bottomed in intrusive material.

Ramon will return &/or call for the material & any of our thoughts.

JDS

routed to GWP

No new information submitted, see attachments
Dec. 29, 1975 } memorandums G.W.P.
Jan 19, 1976

PS. Looks like we can tell Ramon that we've seen the data before & our interest has not changed JDS

Please do - thanks
FTG

ASARCO

Southwestern Exploration Division

December 29, 1975

TO: F. T. Graybeal

FROM: G. W. Pickard

Bear Valley Prospect
Oro Blanco District
Santa Cruz County, Arizona

Mr. R. B. Crist referred the attached "Addendum to Bear Valley Prospect" to me on December 23rd. The Bear Valley Prospect falls within the area mentioned by L. H. Knight, Jr. in his PhD thesis, 1970, on the Oro Blanco Mining District as possibly containing a buried Laramide pluton, and recommended IP work to search for possible associated sulfide mineralization.

The definite change in rock type at shallow depth noted by Mr. Sorrell in the two IP depth probes could be a change from the gravels and tuffs to the Oligocene rhyolite flows and tuffs of the Montana Peak formation.

The possible existence of 3% sulfides indicated by the polarization may lend some substance to the hypothesized Laramide pluton in this area.

It might be advantageous for Asarco to review the data compiled on the Bear Valley Prospect, offered by Messrs. Mosier and Schearer, thereby obtaining information on land ownership, exploration accomplished and planned, etc., if this can be done at no cost or obligation on the part of Asarco.

G. W. Pickard

G. W. Pickard

GWP:lb

cc: RBCrist

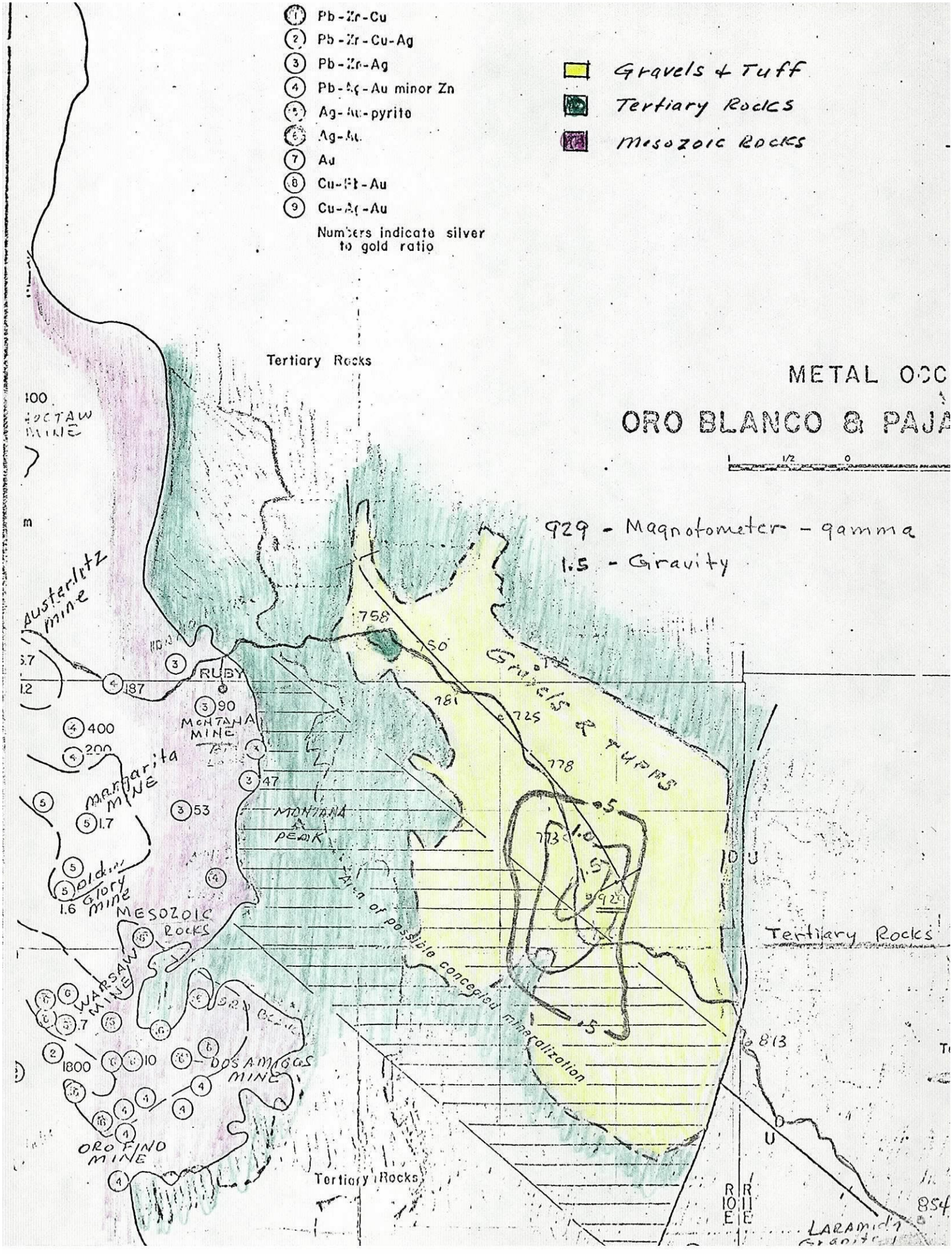
Addendum to Bear Valley Prospect
December 20, 1975

Mr. Jim Sorrell and I visited the Bear Valley Prospect on November 30, 1975, and while there ran a reconnaissance magnetometer survey with an Askanic torsion wire instrument.

Readings ranging from 86.86 to a maximum of 87.67 were taken along a ten mile section of the Ruby Road and along off roads in the area of the gravity high. These readings were converted to gammas minus 1000 by Mr. Sorrell. The gamma range was from 725 to 929 as indicated on the attached maps. The high reading of 929 was taken within the indicated high of the gravity anomaly. The second high reading of 854 was taken at the Summit Motorway turnoff, and the rock in the vicinity is indicated to be Laramide Granite on the Arizona Bureau of Mines Geologic Map.

During the first week of December Mr. Sorrell ran two IP Depth Probes in the vicinity of the high gravity and magnetometer anomalies. The two depth probe profiles are attached and are indicated by the arrows on the map. The depth probes were extended outward 2000' in a N 5° W direction, and in a N 75° E direction.

Mr. Sorrell commented that a definite rock change occurred at 30 feet on the north probe and at 50 feet on the east probe, and that the polarization indicated that the underlying rock may contain up to 3% sulfides.


1 Pb-Zn-Cu
2 Pb-Zn-Cu-Ag
3 Pb-Zn-Ag
4 Pb-Ag-Au minor Zn
5 Ag-Au-pyrite
6 Ag-Au
7 Au
8 Cu-Pb-Au
9 Cu-Ag-Au
Numbers indicate silver to gold ratio
Gravels & Tuff
Tertiary Rocks
Mesozoic Rocks
METAL OCC
ORO BLANCO & PAJA
929 - Magnotometer - gamma
1.5 - Gravity
Tertiary Rocks
Austerlitz mine
RUBY
MONTANA MINE
Margarita MINE
MONTANA PEAK
Area of possible concealed mineralization
Gravels & Tuffs
MESOZOIC ROCKS
WARSAW MINE
DOS AMIGOS MINE
ORO FINO MINE
Tertiary Rocks
Tertiary Rocks
LARAMIDE GRANITE

ASARCO

Southwestern Exploration Division

January 19, 1976

TO: F. T. Graybeal

FROM: G. W. Pickard

Bear Valley Prospect
Oro Blanco District
Santa Cruz County, Arizona

On January 15th I met with Mr. Joseph Shearer to discuss the Bear Valley Prospect. He supplied me with a copy of the claim locations denounced some two years ago in association with four other gentlemen. They became interested in the area after reading the thesis of L. H. Knight, Jr. and the claims were originally staked to cover the area recommended by Knight as containing possible concealed mineralization associated with a buried pluton. This ground was extended to the west to take in a small gravity anomaly that Mr. Shearer says was drilled by the Quintana Company about 1970, apparently with negative results. Recently, more ground has been added to cover the NE extension of the main gravity anomaly on the basis of their new magnetometer and I.P. work done in December 1975. This data has been presented to several other companies and one has expressed interest in the property, but to date no commitments have been made.

Mr. Shearer and associates are willing to negotiate a lease of their claims for exploration and exploitation, on the following terms:

First 6 months free.
First 6 months' extension would be $5000 with increments of $5000 each for successive extensions; i.e., 2nd six months' extension $10,000, 3rd $15,000, etc.; all payments to be applicable to the final purchase price of $4,500,000, which could be negotiated according to the exploration results.

If no company is interested at the present time, Mr. Shearer and associates plan additional I.P. work to define drilling targets for several shallow holes to test for rock alteration and the indicated sulfide mineralization.

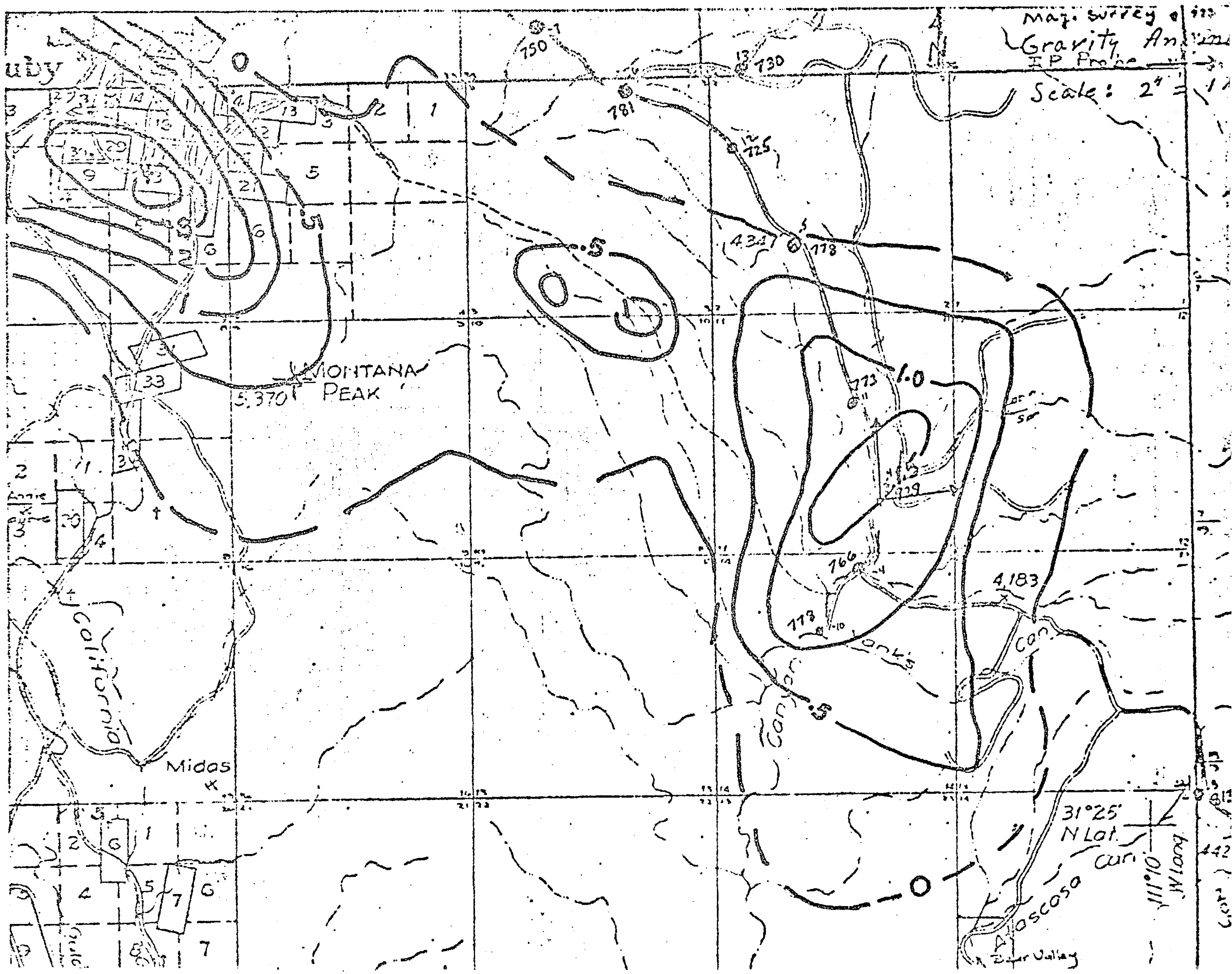
If Asarco considers the area to be of sufficient merit to take up the option on the property, this would require a program of geophysical exploration, followed by shallow to intermediate drilling to test any anomalies and determine the potential of the property.

Mr. Shearer mentioned another property in the Coyote Mts. held by his group, which is to be drilled in the near future by an unnamed mining company.

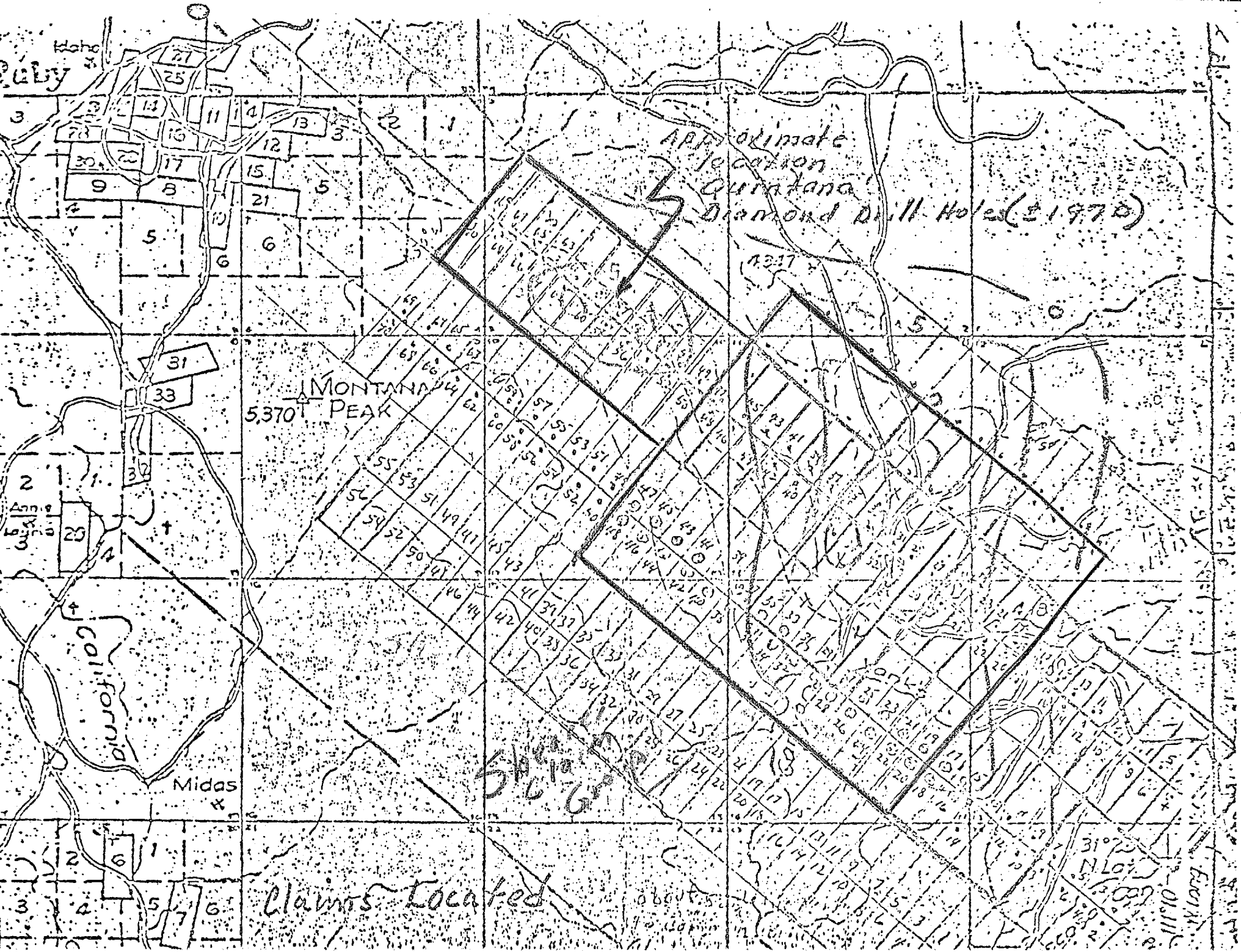
G. W. Pickard

G. W. Pickard

GWP:lb



Mag. survey
Gravity
IP Probe
Scale: 2"
MONTANA PEAK
5,370
California
Midas
31°25'
N Lat.
111°10'
W Long
Can.
Canyon
4,183


Idaho
Ruby
Approximate
location
Quintana
Diamond Drill Holes (±1970)
MONTANA
PEAK
5,370
California
Midas
Claims Located about
Anna
Lina

WILLIAM LUNDBY
GEOLOGIST
U. S. BUREAU OF MINES
INTERMOUNTAIN FIELD OPERATIONS CENTER

BUILDING 20
DENVER FEDERAL CENTER
DENVER, CO. 80225

(303) 234-4161

~~FRK~~
~~WLH~~
JDS

12/9/80

Bill chatted at the Az Conf AIME Monday about the 1' intercept of 21+ oz gold at ±850' in one of the perified holes in the fracture ring zone at Ventura.

Said FTG had known of it, but was wondering what, if anything, we were doing with it.

WHAT IS HIS INTEREST IN VENTURA INFORMATION V-36? - FTG KNOWS ALL ABOUT THIS. I'M NOT FAMILIAR WITH FX-RING ZN?

FOR JDS INFO:
V36: 820-830' | 2.35 oz Au, 56 oz Ag, 0.12 Cu, 0.004 Mo

Au °in 1/8" QTZ-SN VNLT @ 75° SLICKENS ON Au° @ 827'
Au° ~~[illegible]~~ DISSEM IN 3" ZONE AROUND VNLT.

LOG BY FTG 3/2/66

FRK 12 Dec 80

ITEM NO.	SAMPLE NO.
33	= ED-29
34	= ED-30A
35	= ED-30B
36	= ED-31

ITEM	34	35
ELEMENT		
Fe	20.%	1.%
Ca	2.%	15.%
Mg	.2%	2.%
Ag	500	10
As	7000	<500
B	100	<10
Ba	200	<10
Be	<2	<2
Bi	200	<10
Cd	<50	<50
Co	<5	<5
Cr	<10	<10
Cu	2000	100
Ga	50	<10
Ge	<20	<20
La	<20	<20
Mn	200	500
Mo	50	<2
Nb	20	<20
Ni	<5	<5
Pb	2000	1000
Sb	5000	<100
Sc	<10	<10
Sn	500	<10
Sr	<50	<50
Ti	<20	20
V	30	10
W	<50	<50
Y	<10	<10
Zn	>10000	<200
Zr	<20	<20

ASARCO

Mining Department

April 22, 1983

MEMORANDUM TO: R.J. Kupsch

Hardshell Project
Santa Cruz County, Arizona

An updated economic evaluation of the Hardshell Project is being considered by Asarco's Mining Department. This evaluation will aid in developing a possible metallurgical flowsheet and optimum mining method, which in turn will help to determine if additional development work at the Hardshell Project is warranted.

In conjunction with the above, a meeting was held on April 21, 1983, with members of the Asarco Exploration Department to ascertain what information was available and discuss what data would be required by the Mining Department to prepare the economic evaluation.

W.L. Kurtz, J.D. Sell and F.R. Koutz were present from the Exploration Department, along with A.R. Raihl and the writer from the Mining Department.

The following tabulation summarizes the technical data considered essential to the preparation of an economic evaluation of the Hardshell property. It was agreed that the Exploration Department would provide this information.

1. Surface topography with correct drill hole locations

2. Up-to-date claim map with notes on possible problem areas

3. Copy of all drill logs complete with rock types, ore type differentiation and assays. If available, Mn and acid soluble carbonate assays to be included.

4. Accurate drill hole coordinates, collar elevations and final depth of hole. Hole surveys, if any.

5. Up-to-date cross-sections and plan maps. G.W. Pickard's sections and plans will be acceptable. Additional sections can be computer generated incorporating new data provided in Item 3.

6. Estimate of tonnage and grade of various ore types. G.W. Pickard's will suffice until computer generates new figures based on data provided in Item 3 above.

7. Estimate of geological potential for additional ore and possible targets

8. Summary of potential problems: H_2O, environment, pollution, etc.

9. Identify all available drill hole samples, amounts on hand, where kept

10. Maps and assays of all underground sampling

11. All old reports:

J.H. Courtright	Feb. 1968
S. Von Fay	June 1965
etc.	

12. Drilling performance and problems; how problems were overcome

13. General summary of geology, what has been accomplished, exploration concepts

It is important that a geologist familiar with the varied ore types at Hardshell prepare certain portions of this summary data. This is particularly true with regard to Items 3, 7 and 13. Fleetwood Koutz has worked on the project for a number of years and is currently writing his PhD thesis on the property. He is considered the most qualified man available to handle this, and Bill Kurtz has agreed to keep him on the project until it is completed. Periodic meetings are planned to review the progress of this data compilation.

S.A. Anzalone
Chief Geologist

SAA:jm
cc: TEScartaccini
DFSkidmore
DECrowell
ARRaihl
RLBrownJr
WLKurtz
JDSell
FRKoutz

ASARCO

Exploration Department
Western USA

April 21, 1983

F. R. Koutz
Tucson Office

Hardshell Project
Santa Cruz County, AZ

You will provide Mr. Anzalone with the data we discussed today as per attached list.

You should plan to write a short memo which should include: general geology; geologic features that may influence open pit/underground mining; a simple description of the manner in which the silver occurs; continuity of silver values in the "manto" and in the rocks above the manto; drilling problems; additional mineral potential - laterally, vertically; and any environmental/pollution problems of which you may be aware.

W. L. Kurtz

W. L. Kurtz/cg

WLK/cg

cc: JDSell

RLBrown: FRKoutz will gather and provide SAA with the data listed below; also Koutz will prepare a concise memo summarizing the Hardshell project

Koutz April 21, 1983

DATA REQUIRED ON HARDSHELL PROJECT

SAA April 21, 1983

1. Surface topography with correct drill hole locations

2. Up-to-date claim map with notes on possible problem areas

3. Copy of all drill logs complete with rock types, ore type differentiation and assays. If available, Mn and acid soluble carbonate assays to be included. or separate list of assays.

4. Accurate drill hole coordinates, collar elevations and final depth of hole. Hole surveys, if any.

5. Up-to-date cross-sections and plan maps. G.W. Pickard's sections and plans will be acceptable. Additional sections can be computer generated incorporating new data provided in Item 3.

6. Estimate of tonnage and grade of various ore types. G.W. Pickard's will suffice until computer generates new figures based on data provided in Item 3 above.

7. Estimate of geological potential for additional ore and possible targets

8. Summary of potential problems: H_2O, environment, pollution, etc.
   Halpenny report on water farm.

9. Identify all available drill hole samples, amounts on hand, where kept

10. Maps and assays of all underground sampling

11. All old reports:

J.H. Courtright	Feb. 1968
S. Von Fay	June 1965
etc.	

12. Drilling performance and problems; how problems were overcome

13. General summary of geology, what has been accomplished, exploration concepts

cc SAA, ARR, JDS, FRK

ASARCO

Southwestern Exploration Division

April 22, 1983

To: T. D. Henderson

From: F. R. Koutz

Metallurgical Sample
Microbial Leaching
Hardshell Project
Santa Cruz County, AZ

I am sending you one 425 gm vial of Hardshell ore drill chips. Hole HDS-67: 375'-380' drilled in 1976. The interval contained 16.3 oz Ag/T. The interval 370-380 containing this sample ran 11.4 oz Ag/T and contained 0.18% Cu, 1.5% Pb, 0.48% Zn, 11.0% Mn, 2.9% Fe, 0.46% Al, 0.22% Na, 0.23% K, 75.5% SiO_2, 254 ppm As, 1040 ppm Sb, and <.005 oz Au/T.

As with previous Hardshell samples provided for test work outside the company, we ask that those doing the work provide us with a report on the results obtained.

F. R. Koutz

F. R. Koutz/cg

FRK/cg

cc: JDSell

T.E. Scantaccini
J.W. Sell

Jan. 31, 1983

The following Hardshell items are submitted for your review. Other variable notes and memos are also available on specific problems etc., as well as additional cross-sections in the drafting department.

1) 2 - 8½"x11" maps showing drill holes.
2) Letter to V. Kudryk from R.E. Crowell, December 9, 1982 (Metallurgy).
3) Reports – Metallurgical Tests by Central Engineering, Projects No 3103 & 5041, July 28, 1982 (Metallu
4) Hardshell Proj. Prelim. Underground Ore Reserve, by G.W. Pickard, (Update) Nov. 18, 1982 (General)
5) Hardshell Economic Evaluation, by A.R. Kuehl, Nov. 10, 1981 (Econ. Eval.).
6) AGS Field Trip No. 8, by F.R. Kouty, March 21, 19
7) Hardshell Proj. Prelim. Underground Ore Reserve, by G.W. Pickard, Jan 17, 1979 (w/ comm. by FTG)
8) Hardshell Ore Types, by F.R. Kouty, July 19, 1978.
9) Hardshell Geological Report, by S.R. Kiewis, June 3, 1970. (Contains the earlier drilling cross-sections — updates in drafting room but no report on updated sections)

James W. Sell

FRACTURE STUDY OF A VOLCANIC LITHOCAP, RED MOUNTAIN PORPHYRY COPPER DEPOSIT, SANTA CRUZ COUNTY, ARIZONA

M.S. Univ. AZ
Jun 1984

David J. Kistner

The Red Mountain lithocap is an extensively altered Laramide volcanic pile hosting a porphyry copper ore body that overlies the cupola of a deeply buried pluton. This investigation focuses on fracturing at the surface and its relationship to hydrothermal activity at depth.

X-ray diffraction analyses, leached capping characteristics, and fracture density measurements indicate that four distinct zones exist across the lithocap. Zone 1 includes rocks with quartz-sericite-pyrite-alunite-kaolinite veinlets, jarositic capping, and fracture densities of 0.20 to 0.40 per cm. Zone 2 hosts quartz-alunite-pyrophyllite-pyrite-enargite veinlets, hematitic capping, and fracture densities of 0.05 to 0.10 per cm. Zone 3 contains quartz-alunite-kaolinite-sericite veinlets, goethitic capping, and fracture densities of 0.05 to 0.20 per cm. Zone 4 hosts calcite-gypsum-epidote-chlorite veinlets and fracture densities of less than 0.05 per cm.

Each zone represents a particular structural level with respect to a potassic core assemblage of quartz-orthoclase-biotite-anhydrite-chalcopyrite which occurs 1 to 2 km. below the surface. Zone 1 represents a sulfide rich level of 10 to 20 weight % pyrite that overlies the low sulfide potassic core. Zone 2 is also centrally located above the core, but is shallower than zone 1. Zones 3 and 4 occur at increasing lateral distances from the center of the system.

Steeply dipping, randomly oriented tension cracks dominate the fracturing of the lithocap. The random orientation represents extensive hydrothermal fluid circulation above a hidden intrusion.

JDS cy

ASARCO

Exploration Department
Southwestern United States Division
James D. Sell
Manager

January 25, 1984

Mr. David J. Kistner
1232 N. Fremont Avenue
Tucson, AZ 85719

Dear Mr. Kistner:

This is to acknowledge receipt of your letter and resume expressing an interest in working for Asarco. At the present time there are no positions available and until a positive swing in metal prices occurs it is unlikely that we will add to our staff.

We will keep your resume in our active files for six months and will review your qualifications again in the event there is a change in our personnel needs. Thank you for contacting Asarco.

Sincerely,

James D. Sell

James D. Sell

JDS/cg

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

REVISED DUQUESNE REPORT

SANTA CRUZ COUNTY, ARIZONA

By

J. P. Wise
Rosario Exploration Company
June 1974

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Essential Data

1. Principals

Rosario Resources Corporation, a New York Corporation, in partnership with Simplot Industries Incorporated, of Boise, Idaho, holds leases on a group of mining claims in the State of Arizona, U.S.A.

2. Requirement

Production facilities for a mining and milling operation.

3. Management

The management of the present Rosario - Simplot partnership rests with Rosario.

4. Ore Reserves and Grade

1,114,451 short tons of an average grade of 2.61 oz/ton silver, 1.26% lead, 2.06% copper and 4.57% zinc have been considered as a probable tonnage and grade for the Feasibility Study. Over three-quarters of the potential ore bearing areas within the claims remain to be explored.

5. Capital Investment

Equity		
by Rosario - Simplot to date		$1,786,000
Required		
300 Ton per day operation		
Mine Plant and Development	461,000	
Mill and Surface	1,050,000	
Working Capital	633,000	2,144,000
500 Ton per day operation		
Mine Plant etc.	732,000	
Mill etc.	1,750,000	
Working Capital	1,055,000	3,537,000
750 Ton per day operation		
Mine Plant etc.	1,052,000	
Mill etc.	2,624,000	
Working Capital	1,653,000	5,329,000

1. SUMMARY

A review has been completed of the feasability of production on the grade indicated from extensive exploration on the Duquesne claims held by Rosario Resources Corporation in partnership with J.R. Simplot Company. Past production and geological considerations suggest that viable tonnages and grade exist in the area.

The properties are located in the Patagonia Mountains, in the extreme southerly part of Arizona, about 18 miles by graded road from the Southern Pacific Railroad at Nogales.

The area is one of faulted and folded volcanics and sediments cut by intrusives. Ore bodies are of the replacement type and occur both in the limestone and in skarn zones along contacts. Economic mineralization is copper - zinc - lead with accompanying silver and gold.

The claim holdings are substantial and include numerous mines which have been worked at various times since the 1870's. The larger part of the area remains to be explored and offers possibilities for future ore development.

Proven and probable reserves in the northwest end of the area total 188,736 tons at 2.61 ozs Ag, 1.26% Pb, 2.06% Cu and 4.57% Zn. Inferred ore indicated by incomplete surface drilling in the northwest of the area brings a total proven, probable and inferred reserve of 336,600 tons at 1.67 ozs Ag, 0.77% Pb, 1.36% Cu and 2.74% Zn. An additional 49,600 tons of probable ore have been delineated in the Empire Area to the South with an added potential of 728,200 tons of probably comparable grade along the Southern extension of the volcanic/limestone contact giving a combined total of approximately 1.1 million tons.

For the purposes of the Feasibility Study on the following page and as a long range expectation the grade of the northwest, proven and probable reserve 2.61 ozs Ag, 1.26% Pb, 2.06% Cu and 4.57% Zn is used.

FEASIBILITY STUDY

	$ (000 omitted)		
	300 T/Day	500 T/Day	750 T/Day
Plan	I	II	III
Exploration Expenses to Date	1,786	1,786	1,786
Mine Equipment and Preparation	461	732	1,052
Milling Equipment and Installation	1,050	1,750	2,624
Sub-Total	3,297	4,268	5,462
Working Capital, Inventory	633	1,055	1,653
Total Capital Required (includes exploration to date)	3,890	5,323	7,115

Operating costs have been estimated as follows for the three daily tonnage rates considered:

	$ per Ton of ore Milled		
	I	II	III
Mining	12.75	12.15	11.95
Milling	5.60	5.08	4.88
General Expense	5.10	3.93	3.29
Total Operating Costs	$23.45	$21.16	$20.12

The value of the ore after royalty and all other costs except depreciation, amortization and interest, is estimated below for the three operations, assuming metal prices at silver, $4.50/oz; lead, 19.5¢/lb; zinc, 33¢/lb; and copper 80¢/lb. Operating costs are then deducted to show Gross Operating Profit per Ton of Ore milled:

	$ per Ton of ore milled		
	I	II	III
Value of Ore after smelter charges, royalties, etc.	30.31	30.31	30.31
Operating Costs	23.45	21.16	20.12
Gross Operating Profit	6.86	9.15	10.19
Annual Tons	110,000	183,337	275,000
Annual Operating Profit	754,600	1,677,533	2,802,250

The indicated annual operating profit is encouraging and exploration chances are such that a mine life of 4 to 10 years is assured depending on the rate of extraction. A 500 tons per day operation appears to offer the best balanced return.

2. LOCATION AND ACCESS

The Duquesne District is located approximately 60 miles south of Tucson, Arizona, in Santa Cruz County, 5 miles north of the Mexico-United States international border, on the east flank of the Patagonia Mountains. (U. S. G. S.--Duquesne 15 min. quadrangle map).

Access to Duquesne is by 18 miles of dirt road from Nogales, situated to the west and 18 miles of dirt road from Patagonia, situated to the north.

3. OWNERSHIP AND HOLDINGS

The Duquesne mining property is under lease as described in Exhibit F. The holdings, totaling approximately 1712.5 acres, are made up of 77 patented claims and 35 unpatented claims. These claims form one contiguous group which essentially encompasses the entire Duquesne Mining District.

A complete list of claims, acreage, patent numbers, etc., plus a claim map, can be seen in Exhibit A. Claim Map is Exhibit G.

4. HISTORY AND PAST PRODUCTION

Prospecting and shallow mining activity developed at Duquesne by the late 1860's. The early activities centered on oxide lead-silver and copper ores which were treated locally at Lochiel, Santa Cruz, Sonora, and Mowry in open-hearth furnaces and crude smelters. Complex copper-zinc sulfide ores, when encountered, were disposed of as waste because of the lack of treatment facilities and operations were often terminated when the bulk of mineable material became sulfide in character.

The District first developed at the South Belmont and Silver Bell Mines and proceeded northward to the Bonanza and Holland Mines. The Bonanza Mine, eventually to become the deepest developed property in the Duquesne District, along with the Holland Mine, were the leading producers in the area. The following is a computation from Arizona State Mine Reports, U. S. G. S. publications and individual reports regarding past production from the District.

Years	Tons	Grade Ag. oz.	Pb%	Cu%	Zn%
1872 - 1899	25,000				
1899 - 1907	70,000				
1907 - 1925	100,000				
1925 - 1929	1,500				
1940 - 1944	116,050	3.77	2.39	1.44	7.79
1945 - 1950	37,386	4.25	3.48	1.70	9.05
1951 - 1957	41,681				
TOTAL	391,617 ✓				

5. GEOLOGY AND MINERALIZATION

Regional Geology:

The Patagonia Mountains lie within the central portion of the southwestern U. S. A. Basin and Range Province. South and east, the Patagonias give way to the Sierra De Pinitos and Sierra del Manzanal, respectively; to the north lie the Santa Rita mountains and beyond, to the west, the Sierrita Mountains, containing the open pit copper mines of Anaconda, ASARCO and The Duval Corporation. Rocks range in age from Precambrian to Tertiary with known deposits being in the Precambrian to upper Paleozoics on the most part, but with substantial mineralization being found in younger rocks.

Southern Arizona, southwestern New Mexico and northern Mexico have been sites for intense mining exploration and exploitation of porphyry copper type ore bodies. These large tonnage, low-grade, disseminated copper sulfide deposits occur with anomalous frequency within a south-southeast trending belt from Ithica Peak (Mineral Park) near Kingman, Arizona, to Cananea, Sonora, Mexico and beyond. They extend easterly to Chino, New Mexico and westerly to Ajo, Arizona. The deposits are generally related to intersecting southeasterly and northeasterly regional structures: Laramide intrusives are generally present: virtually all of the contact rock from Precambrian to Tertiary age is mineralized with copper sulfides although the intrusive itself may be barren.

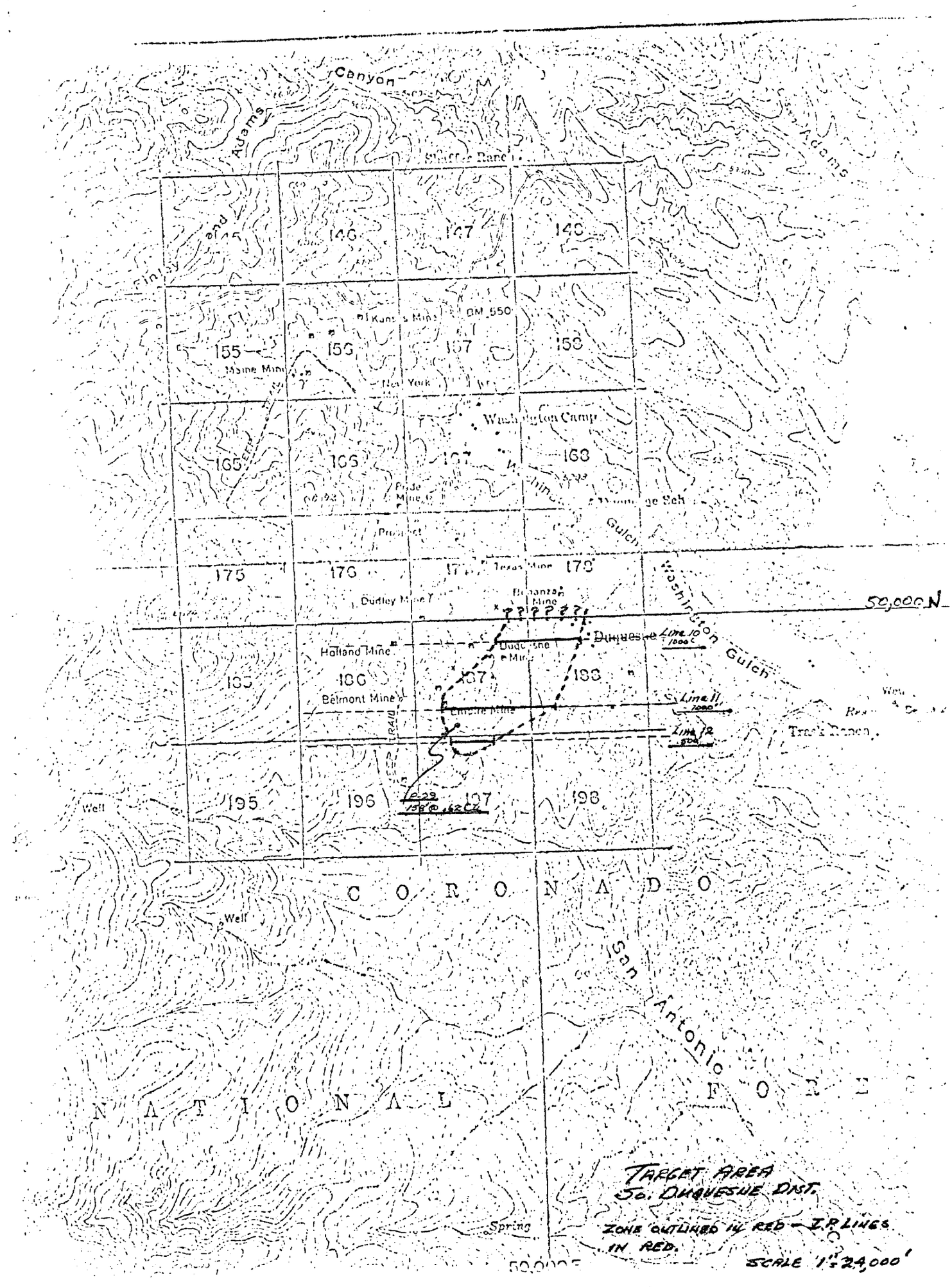
Daily copper ore production from the major mines of the area is in excess of 200,000 tons. Known undeveloped deposits occur at Helvetia in the Santa Rita range and at Red Mountain in the Patagonia Mountains. See general map.

Besides the recent discovery of the Red Mountain porphyry copper deposit, at least three other ore bodies have thus far been developed in the Patagonia Mountains within ten miles of the Duquesne District; however, owing to physical conditions, economics and metallurgical problems, they lie idle at this time. Norandex has drilled proven reserves at their Ventura and Four-Metals properties of approximately 15 million tons of 0.8% ^{e}Cu; ASARCO's Hardshell property contains reserves of 6.5 million tons of 5.02 oz. ton silver, 10-20% manganese and 2% combined lead-zinc. At Red Mountain, Kerr-McGee has thus far drilled out 316 million tons of an estimated 0.8% ^{e}copper.

Local Geology:

Rocks in the Duquesne District consist of Paleozoic (Penn-Permian) limestones and quartzites, Triassic-Jurassic volcanics (mostly rhyolitic in composition) and Cretaceous to Tertiary intrusive rocks. See geologic map.

The Paleozoic sediments and Triassic-Jurassic volcanics have been folded into a northerly plunging anticlinal structure. This structure is bordered on the west and south by intrusive rocks of the Patagonia Batholith. In the northeastern corner of the District, the smaller Washington Camp stock forms an egg-shaped out-crop. To the east, the volcanics terminate against a northerly trending basin and range fault with a probable vertical displacement of at least 2,000' down on the east. Superimposed on the anticlinal structure are a series of east-west normal faults with occasional northwest faults intersecting. Several regional faults can be traced into the District. North-south trending high angle pre-ore faults are, in many cases, off-set by east-west high angle post-ore faults and by nearly flat dipping post-ore faults.


Canyon
Adams
Shaffer Range
146
147
148
155
156
157
158
Kansas Mine
BM 550
Maine Mine
New York
Washington Camp
165
166
167
168
Pride Mine
Prospect
Gulch
175
176
Texas Mine
178
Dudley Mine
Bonanza Mine
Washington Gulch
50,000 N
Duquesne
Line 10
Holland Mine
185
186
187
188
Belmont Mine
Line 11
Line 12
Track Ranch
Well
195
196
197
198
C O R O N A D O
San Antonio
N A T I O N A L
F O R E S T
Spring
TARGET AREA
So. DUQUESNE DIST.
ZONE OUTLINED IN RED — I.P. LINES IN RED.
SCALE 1" = 24,000'

The alteration of Duquesne is pervasive, some limestones are altered to tremolite-wollastonite marble while others have been argillized; siltstones are altered to hornfels: the volcanic rocks have been thoroughly devitrified, locally silicified, sericitized and/or argillized. Intrusive rocks are generally fresh in appearance.

Recent mapping in the south half of the Duquesne District indicates that the sediments south of the Texas fault are underlain by intrusive rocks, probably related to the Patagonia Batholith. Depth to the intrusive in most locations should not exceed 500 feet and is probably shallower in some locations. Intrusive rocks outcrop in several locations and the character of these outcrops indicates stock instead of dike. Structures striking N. E. and originating in the stock southwest of Duquesne can be traced into the Duquesne sediments indicating that the sediments were under the same streeses that formed the structures in the stock. This particular evidence is not apparent in the north half of the district.

Vertical to flat dipping joints in the Duquesne Mine, Estella-Louise, Bonanza Fault area at times carry copper oxides and/or sericite. Skarnation within the area appears to be fault controlled, at least to the extent of the zones being bounded by faults (post-fault skarnation).

There is a possibility of mineralization at the sediment-intrusive interface in a N. E. trending area from the Empire or Silver Bell workings to the Estella-Louise area.

A review of the IP run by Mining Geophysics in relation to the geology and structure in this area indicates an anomalous zone approximately 1200' x 2500' in dimension, with target depth on the order of 400 - 500 feet. A rechecking of the drill hole data showed that four drill holes had been places in the south portion of the anomalous area. Hole P-29 encountered 158.5 feet of .62 Cu, no assays for Ag, Pb, Zn. The remainder of the holes have no data on assays, but the logs as such do mention scattered pyrite and chalcopyrite (see Figure I).

This zone is believed to be a valid exploration target which has not been tested by drilling. It is recommended that several drill holes be put down for test purposes.

Mineralization:

Quartz-garnet skarn occurs as scattered pods within the anticline, but is most abundant in the southern third of the District where the Patagonia Batholith borders the limestone on three sides. Elsewhere, the skarn development occurs on the contact between volcanics and limestone or within the formations at particular lithotogic variations, i.e. chert bands, silt bands and hornfels development.

Past production at Duquesne was derived from the numerous replacement bodies which occur at the base of quartz-garnet skarn within the Paleozoic sediments and along the north-south volcanic/limestone contact on the northwest and eastern sides of the District. Recent work in the Indiana area show limestones replaces by sulfides wich no apparent skarn development.

Substantial reserves have been calculated for the Duquesne District to date. These reserves are the result of exploration in but a small portion of the entire District and several areas remain which hold great potential for further increasing reserves.

The Washington Camp Stock in the vicinity of the Pochahontas Mine shows surface indications for possible porphyry type mineralization. Brecciation, silicification, quartz-sericite-tourmaline alteration is prevalent and leached outcrops are well-developed.

The Burnt Knob Area is another zone which indicates great potential. This area is quite similar to the Pocahontas zone mentioned above in that alteration is pervasive and leached outcrops are well-developed. One drill hole (RDH54) was placed in Burnt Knob and encountered ten feet of good value mineralization.

Further exploration targets are numerous at Duquesne, the above being mentioned as the most promising.

6. MINEWORKINGS AND DEVELOPMENT

Since Rosario Resources' involvement in the Duquesne District, a total of 38,540 feet of surface and underground drilling, approximately 1,400 feet of drifting and 150 feet of shaft sinking has been accomplished. The majority of this work was done in the vicinity of the Indiana Mine, the development of which consists of three levels, the 200 level being the most extensive.

Past development in the District is mainly confined to the Bonanza, Pride of the West, Holland and the Duquesne Mines, although some development work and production occurred at other mines in the area. (See Exhibit F.)

The Bonanza Mine has approximately 7,000 feet of underground workings distributed on six levels the shaft bottom being at 635 feet. The Pride of the West is developed by approximately 200 feet of shaft and 2,000 feet of drifting. The workings are now inaccessible due to caving and flooding.

At one time or another during Duquesne history, a total of 22 mines produced ore.

7. ORE RESERVES

Indiana - Happy Thought Area:

Proven, probable and inferred ore reserves total 336,651 tons averaging 1.67 oz/ton Ag, 0.77% Pb, 1.36% Cu, 2.74% Zn, with a possible 728,200 tons, of which the grade is not calculated, due to no drill hole data being available.

Empire Area:

Ore reserves in the Empire area are based on drill hole data, cross sections A-F, G-K and L-P, and surface geology.

Reserves in the Empire are:

49,600 tons 2.66 oz/ton Ag, 2.05% Pb, .38% Cu, 2.27% Zn. These reserves are figured to 5,400 feet elevation, the effective depth of drilling.

Method of Calculation:

Indiana Mine:	Calculated using cross sections based on drill data and underground workings.
Deerwater, West Indiana, South Indiana:	Calculated using drill hole influence.
Maine:	Calculated using drill hole data (This zone has not been completely drilled).
Maine Extension:	Calculated using geology, (i.e. surface expression of contact on surface), past geologic reports, production from Maine and Happy Thought Mines and drilling along the same contact to the north.
Empire Area:	Calculated using drill hole data and cross sections.

8. Metallurgy

Limited metallurgical testing has been conducted on ore samples from the mine area by 1) Denver Equipment Co. (1969). Reference: Order No. 03-11630; 2) American Smelting and Refining Co., Central Research, El Paso, Texas, Report No. 4402, (1970); Mountain States Research and Development, Tucson, Arizona, (1973) Project No. 2029. These tests have demonstrated that while the ores do not respond to conventional reagent combinations for the treatment of copper - lead - zinc ores, marketable products can be obtained by a combination of gravity concentration and differential flotation.

The two principal difficulties encountered to date are:
1) The high activation of sphalerite in the lead - copper rougher flotation step, in which the zinc mineral will not remain depressed and results in a high zinc content in the lead copper concentrate.
2) No satisfactory flotation method has been obtained for making a copper-lead separation.

Both of the above difficulties can probably be solved by additional testing. While this is being done, a two product process can be employed, resulting in a lead - copper concentrate and a zinc concentrate. Similar difficulties were encountered during the beginning operations of the Cia Minera La Negra y Anexas, S.A. in the state of Queretaro, Mexico. The ore from this mine shows many similarities to that of Duquesne. The mill began by making a copper - lead bulk concentrate and a zinc concentrate. Later, as a result of extensive testing, a satisfactory lead - copper separation was effected, and now three concentrates are being produced. Exhibit C, describes the process and the flow sheet.

The test used in this presentation is that of Mountain States Research and Development Report No. 4402, test GR-13, Exhibit D.

Product	% Wt.	Assay (%) Cu	Pb	Zn	Distribution (%) Cu	Pb	Zn
Cu Conc. (Gravity Tail)	8.11	16.35	9.00	24.45	65.5	28.7	19.1
Pb Conc. (Gravity Conc.)	3.02	11.05	53.80	7.20	16.5	63.9	2.1
Zn Conc.	15.24	0.88	0.25	50.75	6.6	1.5	74.4
Tailings	73.63	0.32	0.21	0.62	11.4	5.9	4.4
Calc. Head	100.00	2.03	2.54	10.39	100.0	100.0	100.0

The grade of the ore sample in the GR-13 test is practically the same as that of the ore reserves shown in this report. Taking the actual ore reserve figures, recalculating according to the distribution shown in the GR-13 test combined to make a lead - copper bulk concentrate plus a zinc concentrate, the following is obtained:

Lead - Copper bulk concentrate

Test GR-13

% Wt.	Copper	Lead	Zinc
	8.11x16.35 = 132.60	8.11x 9.00 = 72.99	8.11x24.45 = 198.29
	3.02x11.05 = 33.37	3.02x53.80 = 162.48	3.02x 7.20 = 21.64
11.13	165.97	235.47	220.03
Assays:	14.91%	21.16%	19.77%
Recoveries:	81.92%	92.53%	21.17%
Calculated Head:	2.03%	2.54%	10.39%

Ratio/ Concentration - K = 100/11.13 = 8.98: 1, say 9:1

9. Financial

Estimated Capital Investment	Plan I	II	III
	$ - (000 omitted)		
Exploration Expense			
To Date - Rosario - Simplot	1,786	1,786	1,786
Mine Equipment and preparation	461	732	1,052
Milling Equipment and installation	1.050	1,750	2,624
Sub - Total, depreciable investment	3,297	4,268	5,462
Working Capital, Contingencies	633	1,055	1,653
Total Capital, including That already spent	3,890	5,323	7,115

	I	II	III
Tons of ore milled per day	300T.p.d.	500T.p.d.	750T.p.d.

Estimated Operating Costs

	Plan I	II	III
Mining	$/Ton milled	$/Ton milled	$/Ton milled
Exploration	1.25	1.25	1.25
Drifts and X cuts	2.50	2.50	2.50
Raises and Winzes	2.25	2.25	2.25
Stoping	3.25	3.25	3.25
Ore Handling	.50	.50	.50
Operating Services	2.00	1.60	1.60
Mine Administration	1.00	.80	.60
Total Mine	$12.75	$12.15	$11.95
Milling			
Crushing	.55	.55	.55
Grinding	.95	.95	.95
Concentration	1.40	1.40	1.40
Power	.60	.60	.60
Haulage-Mines to Mill	.50	.50	.50
Sampling, Assaying & Metallurgy	.60	.48	.48
Mill Administration	1.00	.60	.40
Total Mill	$5.60	$5.08	$4.88
General Expense			
Accounting & Warehousing	.35	.28	.21
Geology, Engineering, Planning	.60	.48	.36
Travel Expense	.20	.16	.12
Supervision & Management	.70	.56	.42
Social Services	.40	.32	.32
Office	.60	.48	.36
Other	1.50	1.20	1.20
New York Office	.75	.45	.30
Total General Expense	$5.10	$3.93	$3.29
Total Operating Costs Before D. & D.	$23.45	$21.16	$20.12

FINANCIAL SUMMARY REVISED

E. T. Knight Data

Reserves - Estimated for projection purposes

Tons		oz/ton Au	oz/ton Ag	Grade %Pb	%Cu	%Zn
1,100,000	Assumed Grade	0.015	3.51	2.28	2.34	10.10

Gross Metal Value/Ton

Gold	@	$100.00/oz	X	0.015	oz.	=	$ 1.50
Silver	@	3.00/oz	X	3.510	oz.	=	10.53
Lead	@	0.18/lb	X	45.600	lbs.	=	8.21
Copper	@	0.68/lb	X	46.800	lbs.	=	31.82
Zinc	@	0.28/lb	X	202.000	lbs.	=	56.56
				Total			$108.62

Net Smelter Return Per Ton

Lead - Copper	Cons	$26.17
Zinc	Cons	17.39
	Total	$43.56

% NSR of Gross Metal Value = 40%

Using the above as an example of NSR, the following has been calculated for the present reserves

Revised Ore Reserves - June 1974

Tons	oz/ton Ag	Grade %Pb	%Cu	%Zn
188,736	2.61	1.26	2.06	4.57

Gross Metal Value/Ton

Silver	@	$ 4.50/oz	X	2.61	oz.	=	$11.75
Lead	@	0.195/lb	X	25.20	lbs.	=	4.91
Copper	@	0.80/lb	X	41.20	lbs.	=	32.96
Zinc	@	0.33/lb	X	91.40	lbs.	=	30.16
				Total			$79.79

% NSR of Gross Metal Value = 40%

Proportionate Gross Return/Ton = $79.79 X .4 = $31.91

Sandberg & Williams Lease @ 5% NSR/Ton = 1.60

Gross Return Less Royalty = $ [illegible]

Cash flow projections at three different plant capacities is given in the following tables assuming a reserve of 1.1 MT at the above described tenor and NSR.

FEASIBILITY SUMMARY REVISED – [illegible]

					I				II						III			
[illegible] Capital Investment	1	3,[illegible]				5,323,000				7,115,000								
[illegible] Investment	2	3,[illegible]				4,267,533				5,[illegible]								
[illegible] Royalty Income	3		3,[illegible]				5,556,044				8,[illegible]							
[illegible] Operating Cost	4	2,[illegible]				3,[illegible]				5,553,000								
[illegible] Profit (3-4)	5		754,100				1,677,533				2,[illegible]							
[illegible] Margin/Ton	6			6.83				9.15				10.19						
[illegible] (15% of 5)	7	113,[illegible]				251,630				420,337								
[illegible] (2 + I, II, III)	8	32,653				711,256				1,365,383								
[illegible] D & D (7+8)	9	142,843				962,886				1,785,720								
[illegible] Income (6-9)	10		311,757				714,647				1,0[illegible]							
[illegible] Tax (48% of 10)	11	149,693				343,031				487,931								
[illegible] Profit (10-11)	12		162,114				371,616				52[illegible],596							
[illegible] Profit / Ton	13			1.47				2.03				1.92						
[illegible] Flow (9 + 12)	14				604,957				1,334,502					2,3[illegible]4,316				
[illegible] Flow / Ton	15				5.50				7.28					8.4[illegible]				

EXHIBIT A
~~Appendix B~~

PATENTED CLAIMS LEASED FROM SANDBERG AND WILLIAMS

Claim Name	Mineral Survey No.	Acres	Dated Patented
Alaska	2210	11.491	11/29/09
Amsterdam	2211	3.439	11/29/07
Annie	2034	9.355	06/09/06
Arizona	1401	16.25	10/25/07
Belmont	Lot 38A	41.31	11/15/1875
Belmont Millsite	Lot 38B	5.00	11/15/1875
Big Cave	2021	19.473	03/02/08
Big Crop	2021	20.161	03/02/08
Big Crop No. 2	2021	20.210	03/02/08
Bisbee	2021	19.808	03/02/08
Bonanza	855	20.29	05/01/05
Bonanza Millsite	897	5.00	
Bronco	2021	19.612	03/02/08
California	1403	12.230	09/20/07
Center	2021	17.035	03/02/08
Chris Excers	2021	10.511	03/02/08
Comet	2032	8.310	06/09/06
Contact	2037	11.636	10/06/06
Copper Belt	2021	18.65	03/02/08
David Allen	2503	11.988	
Divide	2036	10.179	12/17/08
Dubley Standard	2036	20.244	06/30/06
Duquesne	2057	8.243	12/13/06
Elgin	2565	3.502	
Empire	Lot 40A	20.66	02/17/1877
Empire Millsite	Lot 40B	5.00	02/17/1877
Estelle-Louise	894	15.97	05/01/05
Golden Gate	2033	17.572	05/04/07
Grasshopper	2038	9.777	06/09/06
	Sub-Total	412.906	

Claim Name	Mineral Survey No.	Acres	Date Patented
Great Republic	899	11.27	11/29/07
Holland	2211	20.065	11/29/07
Illinois	856	5.06	10/31/06
Illinois Millsite	898	5.00	
Imperial	2217	4.474	12/17/08
Indiana	892	16.68	11/29/07
Indianapolis	2032	13.990	10/06/06
Iron Cow	2556	11.441	04/24/11
Joe Wheeler	2402	20.661	
Jumbo	2021	20.063	03/02/08
Kansas	1404	17.798	09/20/07
Keystone	2021	5.03	03/02/08
Klondike	2037	15.992	06/09/06
Last Chance	2021	10.683	03/02/08
Lauretta	2032	10.683	06/09/06
Lead King	2034	20.661	06/09/06
Little Emma	2032	7.127	10/06/06
Little Jober	2211	0.738	11/29/07
Maine	1405	17.465	09/20/07
Mansanita	2021	1.905	03/02/08
Mary Jane	2036	13.800	
Meyer	2214	17.701	08/20/08
Mohawk	2032	5.116	10/06/06
Montezuma	2037	19.866	06/09/06
New York	2216	7.957	
New York	1404	16.189	09/20/07
Ohio No. 2	1407	20.662	10/25/07
Pittsburgh	2021	19.584	
Pluto	2057	19.842	12/13/06
Pluto No. 2	2057	4.425	12/13/06
Pride of the West	2503	20.661	
Pride of the West No. 2	2503	1.325	
Rhino	2021	19.584	03/02/08
	Sub-Total	423.498	

Claim Name	Mineral Survey No.	Acres	Date Patented
San Antonio	Lot 39A	13.77	09/23/1876
San Antonio Millsite	Lot 39B	5.00	09/23/1876
Silver Bill	Lot 41	4.98	05/30/1881
Silver Jack	2021	19.126	03/02/08
Slim Jim	1407	15.990	03/19/08
Smuggler	2216	17.245	04/11/12
Stewart	2212	4.305	11/29/07
Success	2021	19.584	03/02/08
Texas	1402	18.875	09/20/07
Turnpike	2215	19.584	03/19/08
Virginia	2057	0.055	12/13/06
Wedge	2021	15.624	03/02/08
Wedge	2514	0.920	11/09/10
Yosemite	2216	0.384	
HAPPY THOUGHT	2558	20.660	FEB. 3, 1911
	Sub-Total	176.102	

77 Claims Total area = 1012.506 acres

UNPATENTED CLAIMS LEASED FROM SANDBERG AND WILLIAMS

Name of Claim	Recorded in the Records of Pima County, AZ in Book	Page
Col. or Doc Green	10	34-35
	Recorded in the Records or the Santa Cruz Co., AZ in Docket	Page
Tibbets	1	626
Lizzie	5	438
Alick Childs	3	20
Kokomo	26	250
Uvalde		
Sabinal		
Nueces		
Hondo		
Dolly	059	40
Dolly No. 1	059	41
Dolly No. 2	059	42
Dolly No. 3	059	43
Dolly No. 4	059	44
Dolly No. 5	059	45
Dolly No. 6	059	46
Dolly No. 7	059	47
Dolly No. 8	059	48
Dolly No. 9	059	49
Dolly No. 10	059	50
Dolly No. 11	059	51
Dolly No. 12	059	52
Dolly No. 13	059	53
Dolly No. 14	059	54
Dolly No. 15	059	55
Dolly No. 16	059	56
Dolly No. 17	059	435
Dolly No. 18	059	436
Dolly No. 19	059	437

Name of Claim	Recorded in the Records of Santa Cruz Co., AZ in Docket	Page
Dolly No. 20	059	438
Dolly No. 21	059	439
Dolly No. 22	059	440
Dolly No. 23	059	441

Rosa 1
Rosa 2

Approx. 20 acres per claim

35 claims Total area = 700.00 acres approximately

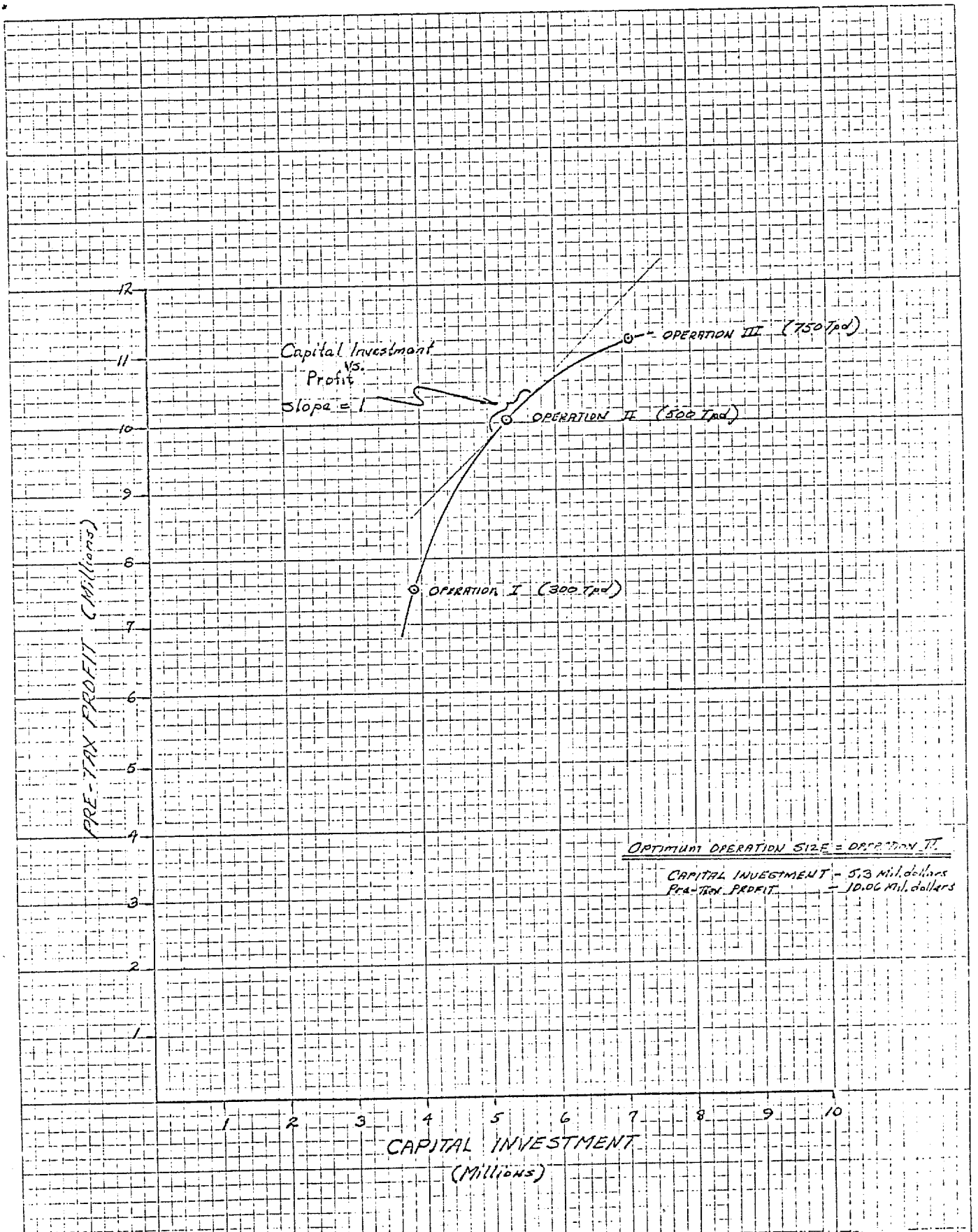


FIG. 1 - GRAPHIC EVALUATION OF OPTIMUM OPERATION SIZE FOR THE DUQUESNE MINING DISTRICT, INDIANA AREA.

EUGENE DIETZGEN CO. MADE IN U.S.A.
NO. 340-10 DIETZGEN GRAPH PAPER 10 X 10 PER INCH

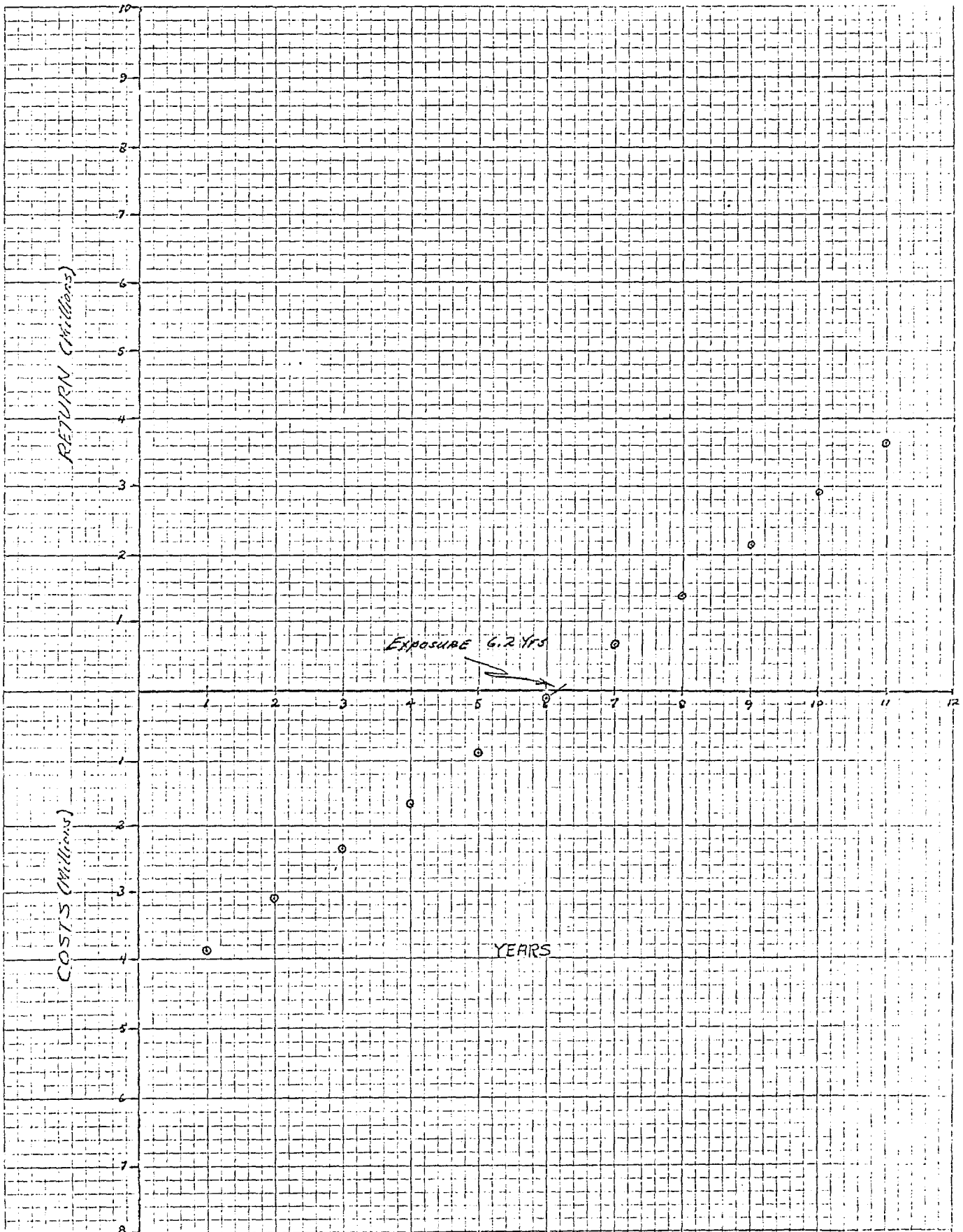


FIG. 2 - COSTS Vs. RETURN IN YEARS

Operation I.

NO. 340-10 DIETZGEN SOFT FINISH PAPER
10 X 10 PER INCH
EUGENE DIETZGEN CO.
MADE IN U.S.A.

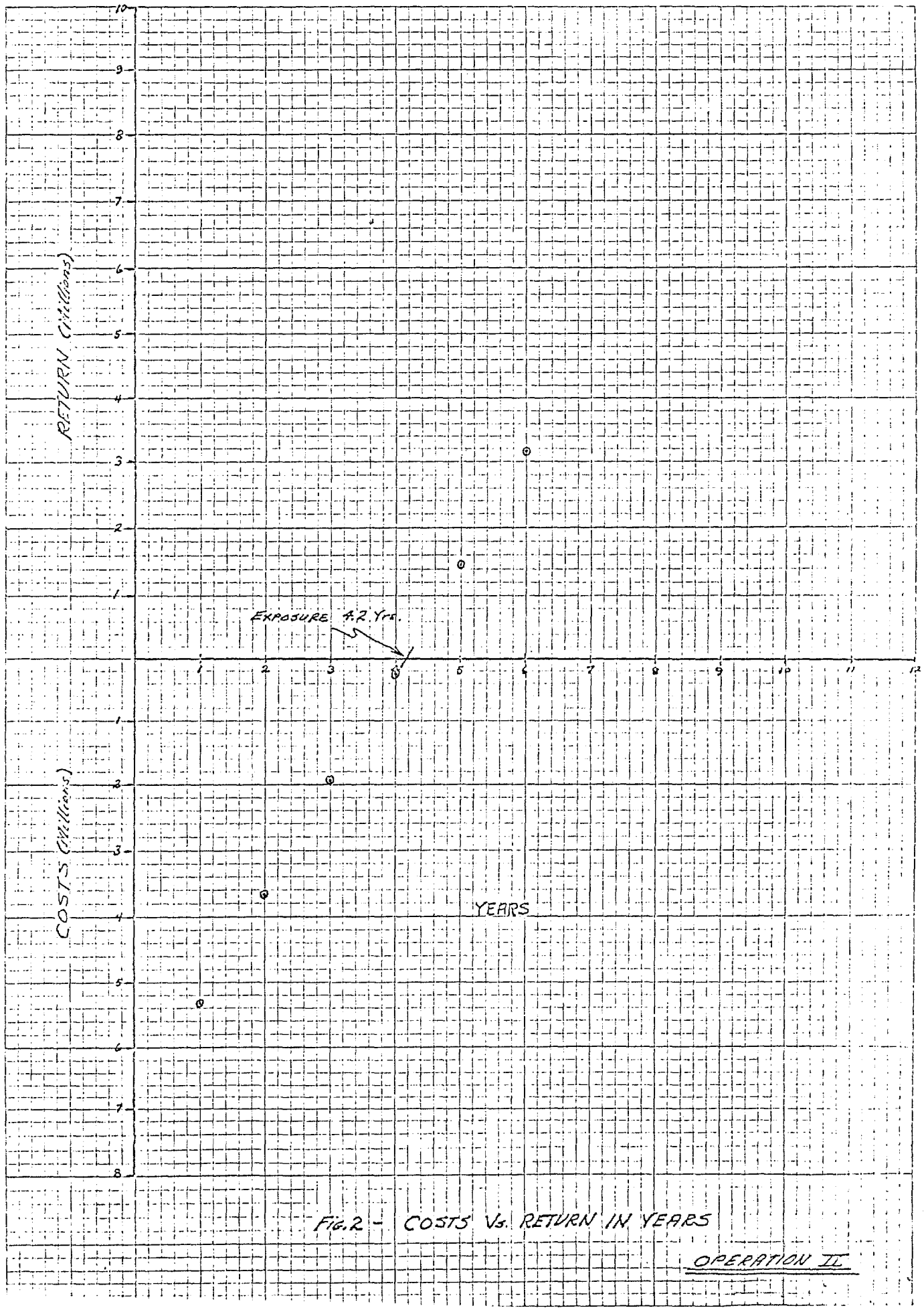


FIG. 2 - COSTS Vs. RETURN IN YEARS

OPERATION II

EUGENE DIETZGEN CO.
MADE IN U. S. A.
NO. 8-0-10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH

JDS

ASARCO

Exploration Department
Southwestern United States Division
James D. Sell
Manager

March 13, 1984

Mr. Dave Rhoades
Felmont Oil Corporation
8120 N. Sheridan
Building C, Suite 100
Arvada, CO 80003

Hardshell District
Santa Cruz County, AZ

Dear Mr. Rhoades:

ASARCO thanks you for the opportunity of evaluating your claim block east of our Hardshell area in the Patagonia Mountains. Based on the present interpretation, ASARCO will not pursue a completed agreement with Felmont at this time.

Under separate cover I am returning the materials which you have loaned to us for this evaluation. Thanks again; perhaps the next one will be a success.

Sincerely,

James D. Sell

JDS/cg

cc: FRKoutz
NFLewis (Felmont)

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

JDS-cc FK

ASARCO

Southwestern Exploration Division

June 26, 1984

To: J. D. Sell

From: F. R. Koutz

USBM Mn-Ag SO_2 Leach Test
Hardshell Project
Santa Cruz County, AZ

Attached is a letter, data and AIME Preprints on fairly successful SO_2 leaching tests completed in Mn oxide-Ag ores from Hardshell-Mowry, Tombstone and other areas. I believe they collected the sample themselves in the field and did not use any of our drill cuttings (unless they scooped up cuttings remaining at old drill sites). The sample is probably from the Salvador workings.

I don't think there is anything new in this information but I pass it on for the information of the metallurgists, miners and other geologists including those that I haven't listed below whom you feel should see a copy.

F. R. Koutz

FRK/cg

Attachments

cc: SAA
DEC/ARR
DFS
M El Tawil
RLBrown

United States Department of the Interior

BUREAU OF MINES

TWIN CITIES RESEARCH CENTER
5629 MINNEHAHA AVENUE SOUTH
MINNEAPOLIS, MINNESOTA 55417

June 12, 1984

Rec'd June 20, 1984 JaKoutz

Mr. Fleetwood R. Koutz
Geologist
Southwestern Exploration Division
ASARCO, Incorporated
P.O. Box 5747
Tucson, Arizona 85703

Dear Fleetwood:

Column leaching tests using aqueous SO_2 have been completed on manganese material collected at the Mowry and Hardshell mines 2 years ago. Enclosed are the chemical analyses of leachate from the column tests, recovery or extraction curves, solution-grade curves, and a summary of the test procedures used to leach manganese.

Material from both mines was also used to test a strategy for dual leaching of manganese and silver. First the manganese (and occasionally some of the silver) is leached with SO_2 to provide recoverable manganese and liberate the otherwise refractory silver. Following a caustic rinse to provide a pH of 9 or greater, the material is leached with cyanide to recover the silver. As you can see from the enclosed SME preprint 84-140, this dual leaching dramatically improved silver recovery over that obtained with cyanide leaching for the various silver-manganese materials tested. The Hardshell mine sample (coded AZ-2 in the SME preprint) was somewhat unusual in that most of the silver was recovered during the SO_2 leaching phase. The project funding level did not, however, permit us to conduct a microprobe analyses in sufficient detail to determine the exact silver mineralogy which would explain its high solubility in aqueous SO_2. The Mowry mine sample (AZ-3) leached in a more normal fashion with most of the silver extraction occurring in the cyanide leach after preleaching with SO_2. A graph curve for each sample comparing silver recovery with and without the SO_2 preleach is enclosed.

Ag is in cryptomelane $(K,Ag,Pb)Mn_4O_8$

Enclosed are three SME preprints which describe our manganese leaching research. We very much appreciate your help and interest in this work. If you would like to discuss the results of this research in more detail, please write or call me at (612)725-4547. Also could you forward a copy of this information to Al Raihl of your office ? Thanks again.

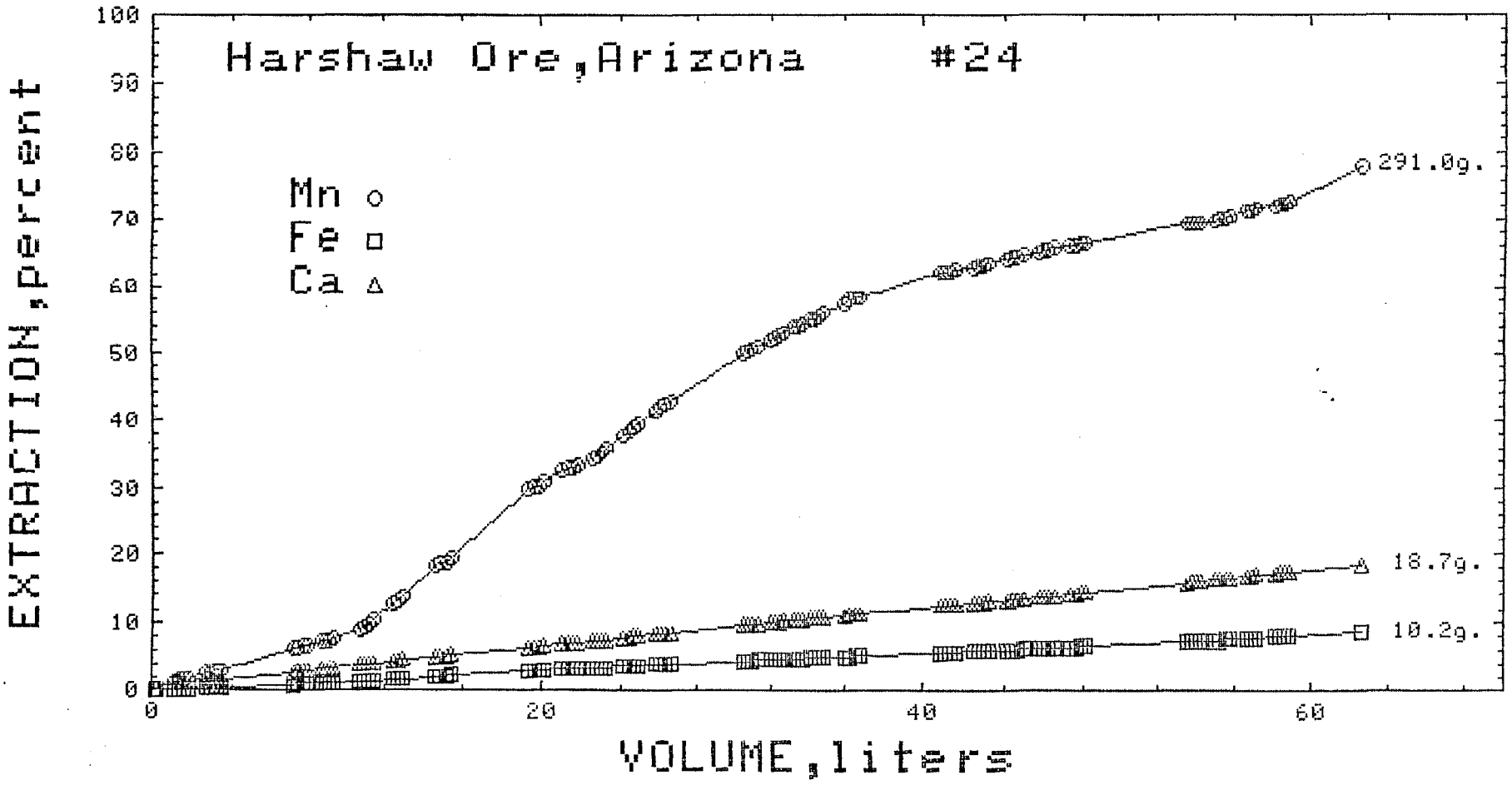
Sincerely,

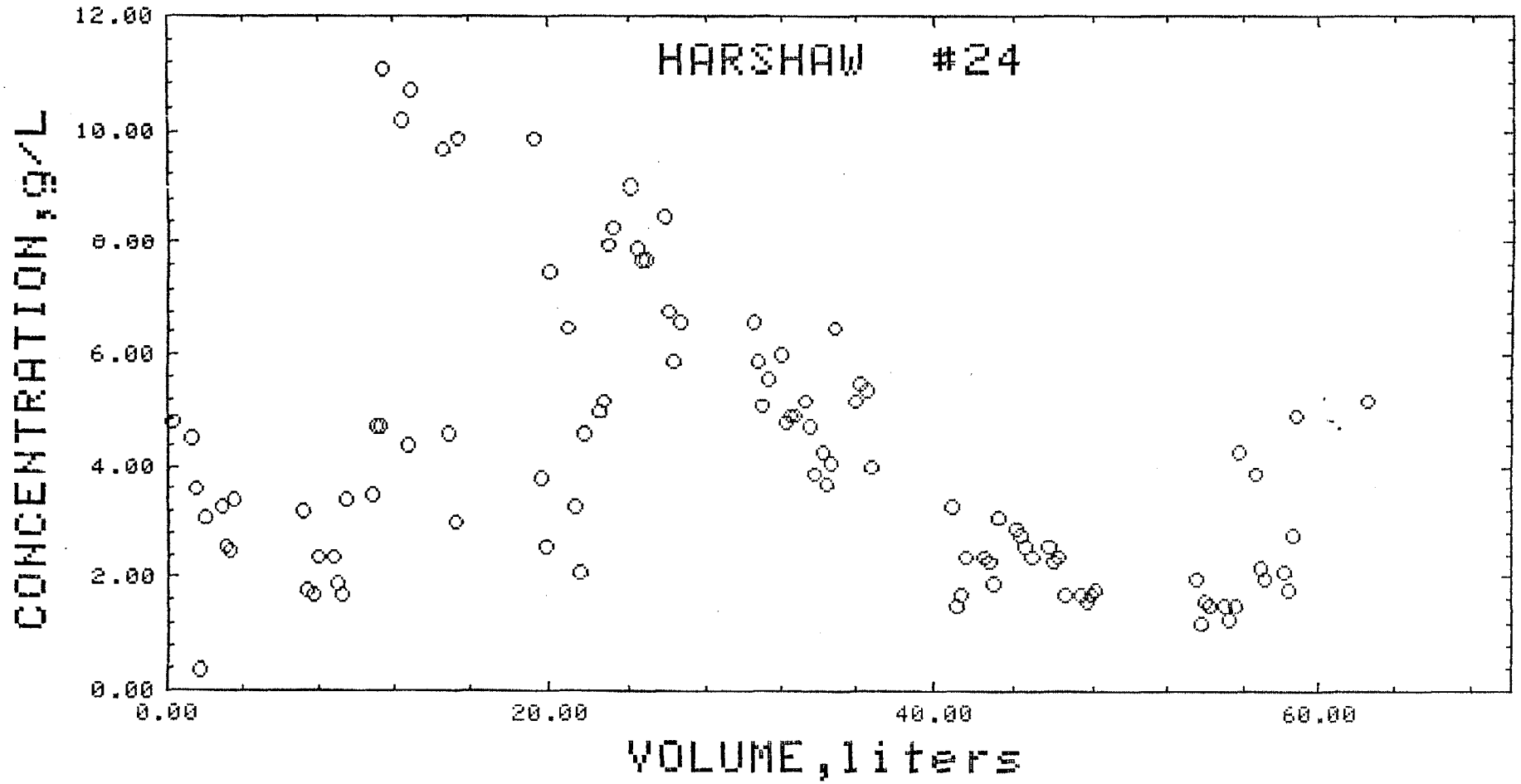
Pete Chamberlain

PETER G. CHAMBERLAIN
Group Supervisor
Mine Hydrology

Enclosures

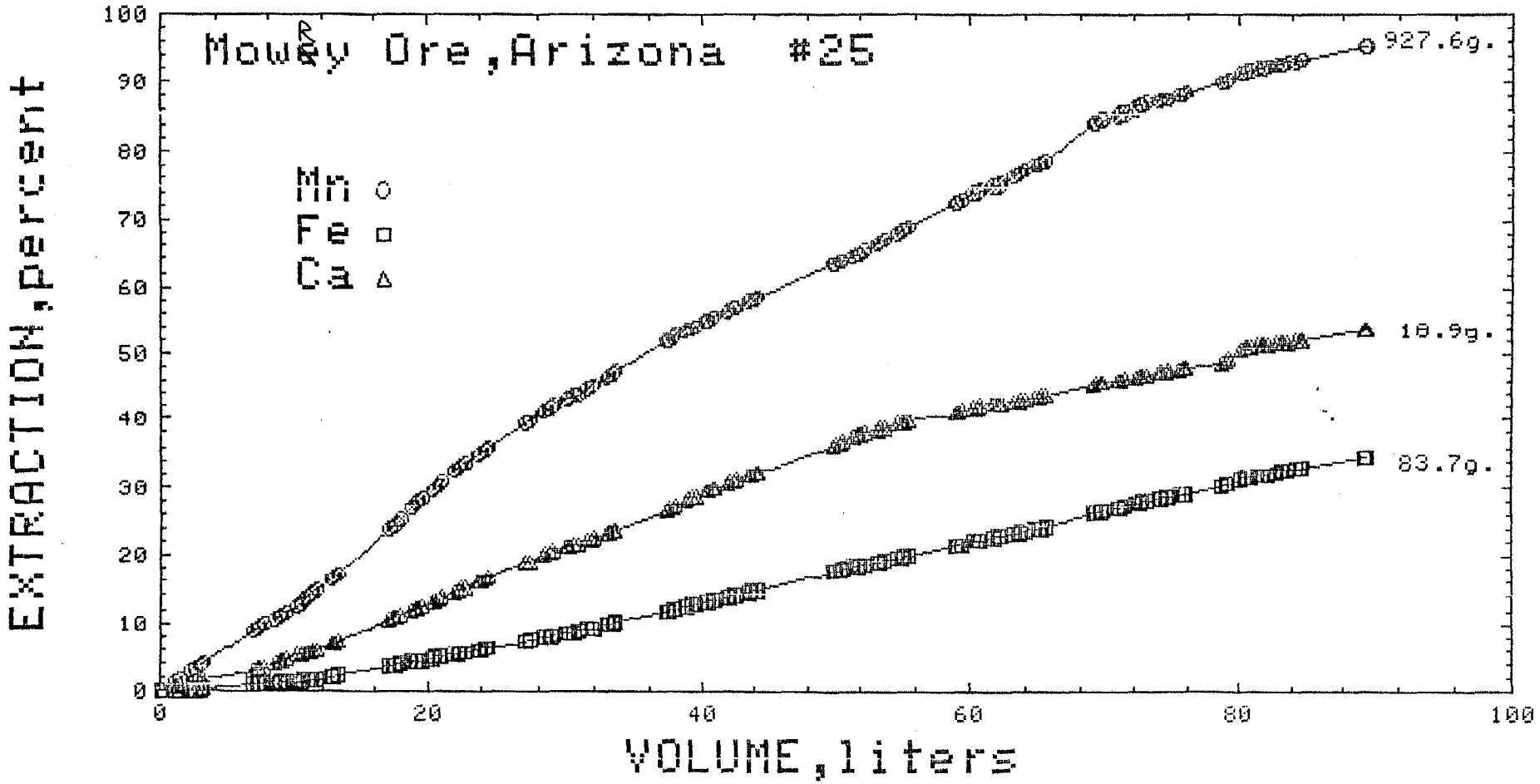
HARDSHELL MINE

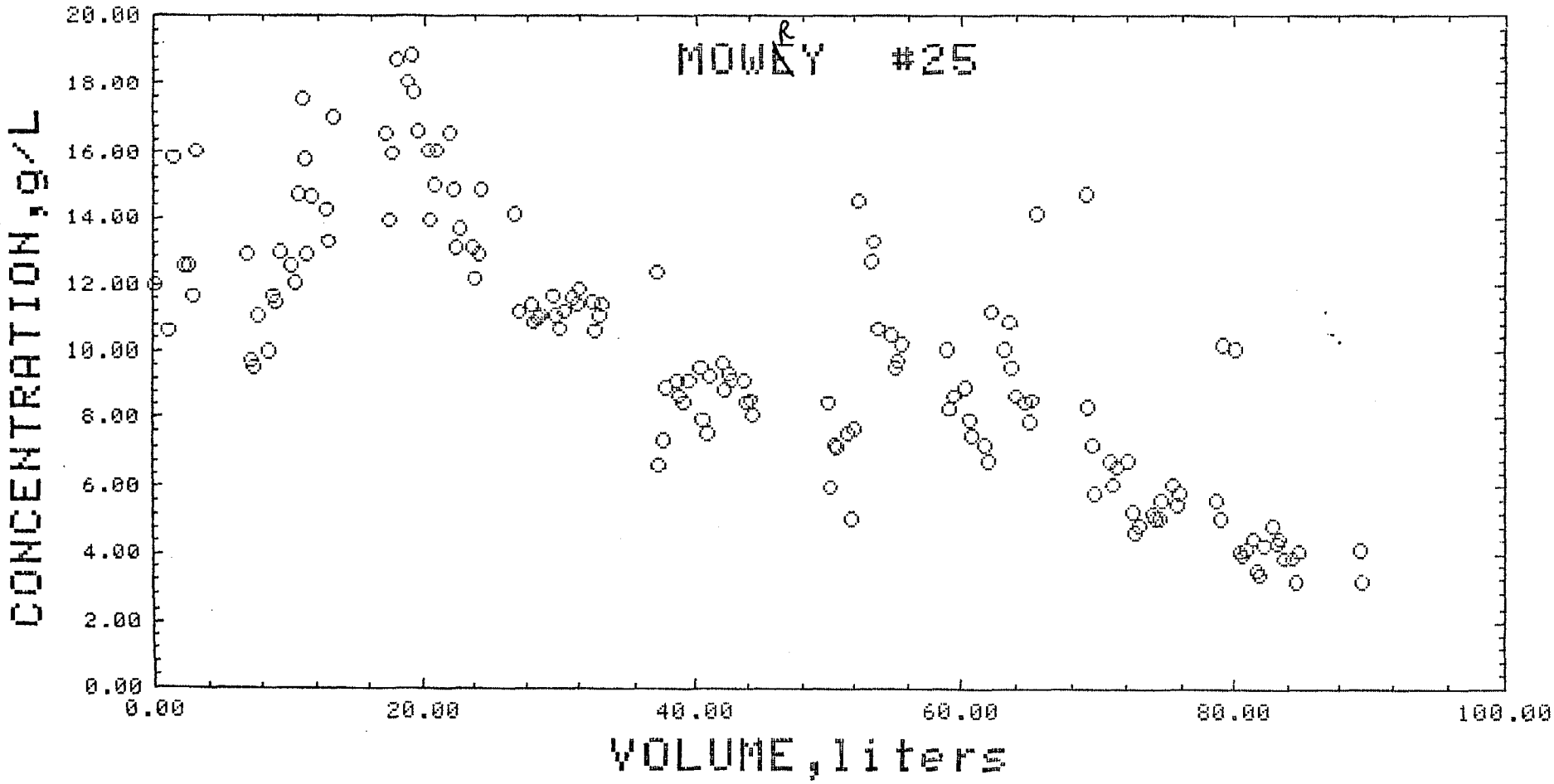



HARSHAW #24
CONCENTRATION,g/L
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
20.00
40.00
60.00
VOLUME,liters

SAMPLE NO	GRAMS FE	TOTAL FE	% FE	GRAMS CA	TOTAL CA	% CA	GRAMS MN	TOTAL MN	% MN	TOTAL VOL(L)
1	.040	.040	.03	.050	.050	.28	1.200	1.20	.32	.250
2	.149	.189	.16	.139	.190	1.07	4.185	5.38	1.45	1.180
3	.038	.226	.20	.017	.206	1.17	.900	6.28	1.69	1.430
4	.038	.264	.23	.021	.227	1.29	.090	6.37	1.71	1.680
5	.035	.299	.26	.012	.239	1.36	.775	7.15	1.92	1.930
6	.123	.422	.37	.055	.294	1.67	2.706	9.86	2.65	2.750
7	.035	.457	.40	.013	.307	1.74	.650	10.51	2.82	3.000
8	.035	.492	.43	.014	.321	1.82	.625	11.13	2.99	3.250
9	.040	.532	.46	.013	.334	1.89	.850	11.98	3.22	3.500
10	.582	1.114	.96	.182	.516	2.92	11.648	23.63	6.35	7.140
11	.035	1.149	.99	.012	.528	3.00	.450	24.08	6.47	7.390
12	.035	1.184	1.03	.013	.541	3.07	.425	24.50	6.59	7.640
13	.038	1.222	1.06	.012	.554	3.14	.600	25.10	6.75	7.890
14	.123	1.345	1.16	.041	.595	3.37	1.968	27.07	7.28	8.710
15	.035	1.380	1.19	.012	.607	3.44	.475	27.55	7.40	8.960
16	.035	1.415	1.22	.013	.620	3.52	.425	27.97	7.52	9.210
17	.040	1.455	1.26	.012	.633	3.59	.850	28.82	7.75	9.460
18	.206	1.661	1.44	.064	.697	3.95	4.515	33.34	8.96	10.750
19	.042	1.704	1.47	.012	.710	4.02	1.175	34.51	9.28	11.000
20	.045	1.749	1.51	.012	.722	4.09	1.175	35.69	9.59	11.250
21	.063	1.811	1.57	.015	.737	4.18	2.775	38.46	10.34	11.500
22	.235	2.046	1.77	.052	.789	4.47	9.996	48.46	13.02	12.480
23	.042	2.089	1.81	.012	.802	4.55	1.100	49.56	13.32	12.730
24	.060	2.149	1.86	.012	.814	4.62	2.675	52.23	14.04	12.980
25	.408	2.557	2.21	.085	.899	5.10	16.490	68.72	18.47	14.680
26	.042	2.599	2.25	.012	.912	5.17	1.150	69.87	18.78	14.930
27	.038	2.637	2.28	.013	.925	5.24	.750	70.62	18.98	15.180
28	.057	2.694	2.33	.012	.937	5.31	2.475	73.10	19.65	15.430
29	.906	3.601	3.12	.197	1.134	6.43	39.006	112.10	30.13	19.370
30	.042	3.643	3.15	.012	1.147	6.50	.950	113.05	30.39	19.620
31	.016	3.659	3.17	.012	1.159	6.57	.650	113.70	30.56	19.870
32	.040	3.699	3.20	.012	1.172	6.64	1.875	115.58	31.07	20.120
33	.136	3.835	3.32	.049	1.220	6.92	6.305	121.88	32.76	21.090
34	.023	3.857	3.34	.012	1.233	6.99	.825	122.71	32.98	21.340
35	.013	3.870	3.35	.012	1.245	7.06	.525	123.23	33.12	21.590
36	.030	3.900	3.38	.012	1.258	7.13	1.150	124.38	33.43	21.840
37	.094	3.994	3.46	.039	1.297	7.35	3.900	128.28	34.48	22.620
38	.032	4.026	3.49	.012	1.309	7.42	1.300	129.58	34.83	22.870
39	.038	4.064	3.52	.012	1.322	7.49	2.000	131.58	35.37	23.120
40	.042	4.106	3.56	.012	1.334	7.56	2.075	133.66	35.93	23.370
41	.164	4.270	3.70	.045	1.380	7.82	8.190	141.85	38.13	24.280
42	.042	4.312	3.73	.012	1.392	7.89	1.975	143.82	38.66	24.530
43	.040	4.352	3.77	.012	1.405	7.96	1.925	145.75	39.17	24.780
44	.042	4.395	3.81	.012	1.417	8.03	1.925	147.67	39.69	25.030
45	.164	4.559	3.95	.045	1.463	8.29	7.735	155.41	41.77	25.940
46	.040	4.599	3.98	.012	1.475	8.36	1.700	157.11	42.23	26.190
47	.035	4.634	4.01	.012	1.488	8.43	1.475	158.58	42.62	26.440
48	.038	4.671	4.04	.012	1.500	8.50	1.650	160.23	43.07	26.690
49	.549	5.220	4.52	.196	1.696	9.62	25.872	186.11	50.02	30.610
50	.035	5.255	4.55	.012	1.709	9.69	1.475	187.58	50.42	30.860
51	.030	5.285	4.58	.012	1.721	9.76	1.275	188.86	50.76	31.110
52	.038	5.323	4.61	.012	1.734	9.83	1.400	190.26	51.14	31.360
53	.105	5.428	4.70	.035	1.769	10.03	4.200	194.46	52.27	32.060
54	.035	5.463	4.73	.012	1.781	10.10	1.200	195.66	52.59	32.310
55	.035	5.498	4.76	.012	1.794	10.17	1.225	196.88	52.92	32.560
56	.040	5.538	4.79	.012	1.806	10.24	1.225	198.11	53.25	32.810
57	.080	5.618	4.86	.025	1.831	10.38	2.600	200.71	53.95	33.310
58	.040	5.658	4.90	.012	1.844	10.45	1.175	201.88	54.26	33.560
59	.037	5.694	4.93	.011	1.854	10.51	.839	202.72	54.49	33.775
60	.077	5.771	5.00	.021	1.876	10.63	1.849	204.57	54.98	34.205
61	.032	5.804	5.03	.012	1.888	10.71	.925	205.49	55.23	34.455
62	.027	5.831	5.05	.012	1.901	10.78	1.025	206.52	55.51	34.705
63	.038	5.869	5.08	.012	1.913	10.85	1.625	208.14	55.95	34.955
64	.150	6.018	5.21	.058	1.971	11.17	5.980	214.12	57.55	36.105
65	.035	6.053	5.24	.012	1.983	11.24	1.375	215.50	57.92	36.355
66	.040	6.093	5.28	.012	1.996	11.31	1.350	216.85	58.28	36.605
67	.032	6.126	5.30	.012	2.008	11.39	1.000	217.85	58.55	36.855
68	.618	6.744	5.84	.206	2.214	12.55	13.596	231.44	62.21	40.975
69	.021	6.765	5.86	.012	2.227	12.62	.375	231.82	62.31	41.225
70	.027	6.792	5.88	.012	2.239	12.69	.425	232.24	62.42	41.475
71	.030	6.822	5.91	.012	2.252	12.77	.600	232.84	62.58	41.725
72	.109	6.931	6.00	.042	2.294	13.00	2.016	234.86	63.13	42.565
73	.032	6.964	6.03	.012	2.306	13.07	.575	235.44	63.28	42.815
74	.030	6.994	6.06	.012	2.319	13.15	.475	235.91	63.41	43.065
75	.032	7.026	6.08	.012	2.331	13.22	.775	236.69	63.62	43.315
76	.120	7.147	6.19	.043	2.374	13.46	2.494	239.18	64.29	44.175
77	.030	7.177	6.21	.012	2.387	13.53	.700	239.88	64.48	44.425
78	.032	7.209	6.24	.012	2.399	13.60	.650	240.53	64.65	44.675
79	.030	7.239	6.27	.012	2.412	13.67	.600	241.13	64.81	44.925

0064	57	.080	5.618	4.86	.025	1.831	10.38	2.600	200.71	53.75	33.510
0065	58	.040	5.658	4.90	.012	1.844	10.45	1.175	201.88	54.26	33.560
0066	59	.037	5.694	4.93	.011	1.854	10.51	.839	202.72	54.49	33.775
0067	60	.077	5.771	5.00	.021	1.876	10.63	1.849	204.57	54.98	34.205
0068	61	.032	5.804	5.03	.012	1.888	10.71	.925	205.49	55.23	34.455
0069	62	.027	5.831	5.05	.012	1.901	10.78	1.025	206.52	55.51	34.705
0070	63	.038	5.869	5.08	.012	1.913	10.85	1.625	208.14	55.95	34.955
0071	64	.150	6.018	5.21	.058	1.971	11.17	5.980	214.12	57.55	36.105
0072	65	.035	6.053	5.24	.012	1.983	11.24	1.375	215.50	57.92	36.355
0073	66	.040	6.093	5.28	.012	1.996	11.31	1.350	216.85	58.28	36.605
0074	67	.032	6.126	5.30	.012	2.008	11.39	1.000	217.85	58.55	36.855
0075	68	.618	6.744	5.84	.206	2.214	12.55	13.596	231.44	62.21	40.975
0076	69	.021	6.765	5.86	.012	2.227	12.62	.375	231.82	62.31	41.225
0077	70	.027	6.792	5.88	.012	2.239	12.69	.425	232.24	62.42	41.475
0078	71	.030	6.822	5.91	.012	2.252	12.77	.600	232.84	62.58	41.725
0079	72	.109	6.931	6.00	.042	2.294	13.00	2.016	234.86	63.13	42.565
0080	73	.032	6.964	6.03	.012	2.306	13.07	.575	235.44	63.28	42.815
0081	74	.030	6.994	6.06	.012	2.319	13.15	.475	235.91	63.41	43.065
0082	75	.032	7.026	6.08	.012	2.331	13.22	.775	236.69	63.62	43.315
0083	76	.120	7.147	6.19	.043	2.374	13.46	2.494	239.18	64.29	44.175
0084	77	.030	7.177	6.21	.012	2.387	13.53	.700	239.88	64.48	44.425
0085	78	.032	7.209	6.24	.012	2.399	13.60	.650	240.53	64.65	44.675
0086	79	.030	7.239	6.27	.012	2.412	13.67	.600	241.13	64.81	44.925
0087	80	.110	7.350	6.36	.042	2.454	13.91	2.210	243.34	65.41	45.775
0088	81	.030	7.380	6.39	.012	2.467	13.98	.575	243.91	65.56	46.025
0089	82	.032	7.412	6.42	.012	2.479	14.06	.600	244.51	65.72	46.275
0090	83	.027	7.440	6.44	.012	2.492	14.13	.425	244.94	65.84	46.525
0091	84	.106	7.545	6.53	.044	2.536	14.38	1.496	246.44	66.24	47.405
0092	85	.027	7.573	6.56	.012	2.548	14.45	.400	246.84	66.34	47.655
0093	86	.027	7.600	6.58	.012	2.561	14.52	.425	247.26	66.46	47.905
0094	87	.035	7.635	6.61	.012	2.573	14.59	.450	247.71	66.58	48.155
0095	88	.799	8.435	7.30	.266	2.840	16.10	10.660	258.37	69.45	53.485
0096	89	.032	8.467	7.33	.012	2.852	16.17	.300	258.67	69.53	53.735
0097	90	.035	8.502	7.36	.012	2.865	16.24	.400	259.07	69.63	53.985
0098	91	.040	8.542	7.40	.012	2.877	16.31	.375	259.45	69.73	54.235
0099	92	.136	8.678	7.51	.040	2.917	16.54	1.200	260.65	70.06	55.035
0100	93	.035	8.713	7.54	.012	2.930	16.61	.325	260.97	70.14	55.285
0101	94	.038	8.751	7.58	.012	2.942	16.68	.375	261.35	70.24	55.535
0102	95	.050	8.801	7.62	.012	2.955	16.75	1.075	262.42	70.53	55.785
0103	96	.176	8.977	7.77	.044	2.999	17.00	3.432	265.85	71.46	56.665
0104	97	.035	9.012	7.80	.012	3.011	17.07	.550	266.40	71.60	56.915
0105	98	.040	9.052	7.84	.012	3.024	17.14	.500	266.90	71.74	57.165
0106	99	.160	9.212	7.98	.050	3.074	17.43	2.100	269.00	72.30	58.165
0107	100	.038	9.249	8.01	.012	3.086	17.50	.450	269.45	72.42	58.415
0108	101	.040	9.289	8.04	.012	3.099	17.57	.700	270.15	72.61	58.665
0109	102	.055	9.344	8.09	.012	3.111	17.64	1.225	271.38	72.94	58.915
0110	103	.829	10.174	8.81	.188	3.300	18.71	19.604	290.98	78.21	62.685


Mowry Ore,Arizona #25
Mn ○
Fe □
Ca △
927.6g.
18.9g.
83.7g.
EXTRACTION,percent
VOLUME,liters
0
10
20
30
40
50
60
70
80
90
100
0
20
40
60
80
100

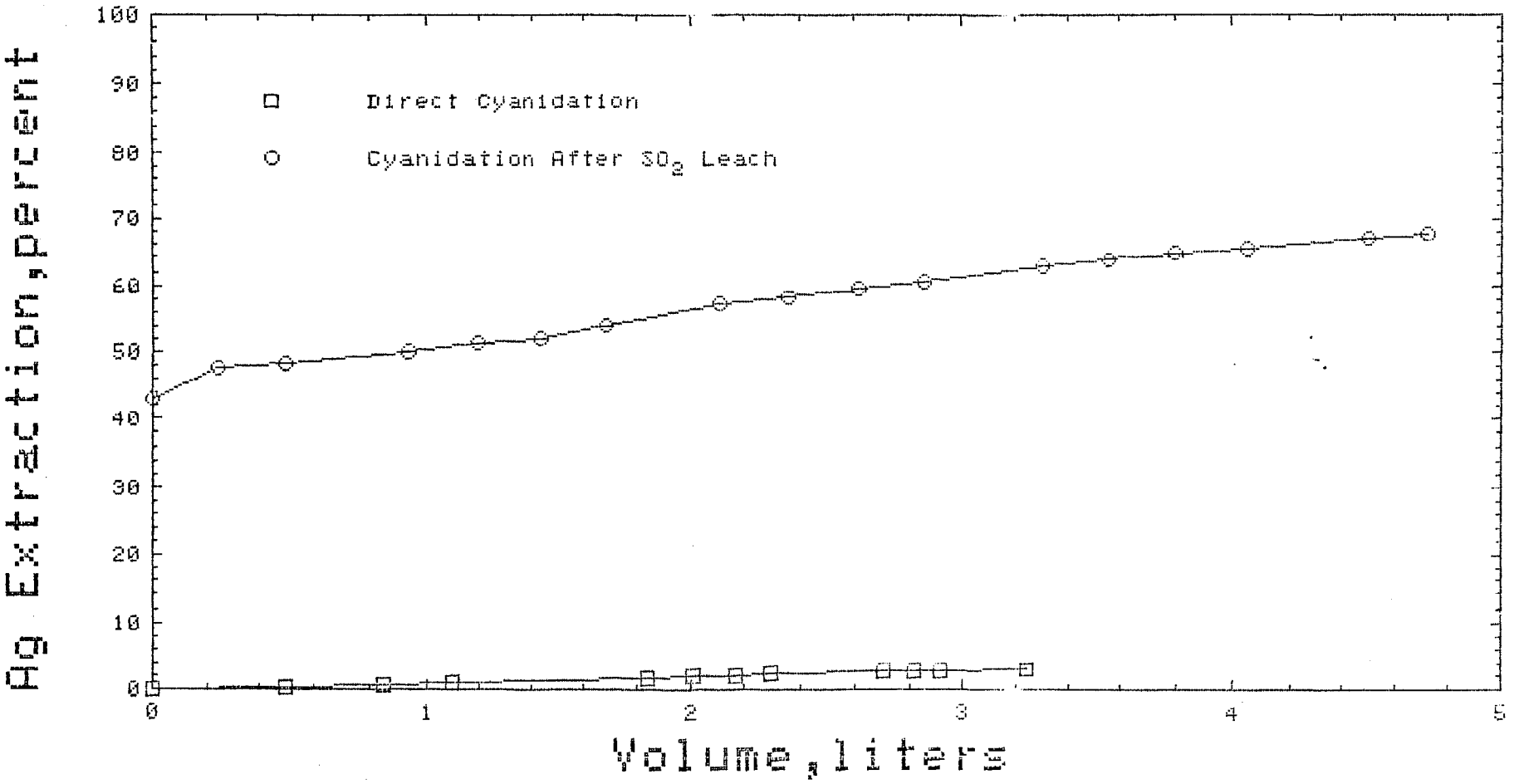

MOWRY #25
CONCENTRATION,g/L
VOLUME,liters
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
20.00
40.00
60.00
80.00
100.00

$A T=00004 IS ON CR00034 USING 00054 BLKS R=0000 MOWRY #25

SAMPLE NO	GRAMS FE	TOTAL FE	% FE	GRAMS CA	TOTAL CA	% CA	GRAMS MN	TOTAL MN	% MN	TOTAL VOL(L)
1	.057	.057	.02	.053	.053	.15	3.000	3.00	.31	.250
2	.165	.222	.09	.223	.276	.79	10.282	13.28	1.37	1.220
3	.088	.310	.13	.038	.313	.89	3.975	17.26	1.78	1.470
4	.281	.591	.24	.155	.468	1.34	12.222	29.48	3.04	2.440
5	.073	.664	.27	.038	.506	1.45	3.150	32.63	3.37	2.690
6	.065	.729	.30	.032	.538	1.54	2.925	35.55	3.67	2.940
7	.132	.861	.36	.045	.583	1.67	4.025	39.58	4.08	3.190
8	1.542	2.403	.99	.526	1.110	3.17	48.504	88.08	9.09	6.950
9	.082	2.485	1.03	.045	1.155	3.30	2.450	90.53	9.34	7.200
10	.082	2.568	1.06	.045	1.200	3.43	2.400	92.93	9.59	7.450
11	.105	2.673	1.11	.057	1.257	3.59	2.775	95.71	9.87	7.700
12	.310	2.982	1.23	.189	1.446	4.13	8.600	104.31	10.76	8.560
13	.110	3.092	1.28	.078	1.524	4.35	2.925	107.23	11.06	8.810
14	.097	3.190	1.32	.078	1.601	4.58	2.875	110.11	11.36	9.060
15	.127	3.317	1.37	.053	1.654	4.73	3.250	113.36	11.69	9.310
16	.409	3.726	1.54	.209	1.863	5.32	10.962	124.32	12.82	10.180
17	.120	3.846	1.59	.053	1.915	5.47	3.025	127.35	13.14	10.430
18	.153	3.999	1.66	.057	1.973	5.64	3.700	131.05	13.52	10.680
19	.197	4.196	1.74	.057	2.030	5.80	4.400	135.45	13.97	10.930
20	.105	4.301	1.78	.033	2.063	5.89	2.370	137.82	14.22	11.080
21	.137	4.439	1.84	.055	2.118	6.05	3.225	141.04	14.55	11.330
22	.165	4.604	1.91	.060	2.178	6.22	3.675	144.71	14.93	11.580
23	.736	5.340	2.21	.276	2.454	7.01	16.445	161.16	16.62	12.730
24	.143	5.482	2.27	.045	2.499	7.14	3.325	164.49	16.97	12.980
25	.222	5.705	2.36	.067	2.567	7.33	4.275	168.76	17.41	13.230
26	3.358	9.062	3.75	1.224	3.791	10.83	65.570	234.33	24.17	17.180
27	.175	9.237	3.82	.057	3.849	11.00	3.500	237.83	24.53	17.430
28	.208	9.445	3.91	.063	3.911	11.17	4.000	241.83	24.94	17.680
29	.222	9.667	4.00	.057	3.969	11.34	4.700	246.53	25.43	17.930
30	.808	10.476	4.34	.235	4.204	12.01	17.014	263.54	27.18	18.870
31	.222	10.698	4.43	.065	4.269	12.20	4.725	268.27	27.67	19.120
32	.205	10.903	4.51	.070	4.339	12.40	4.450	272.72	28.13	19.370
33	.210	11.113	4.60	.070	4.409	12.60	4.175	276.89	28.56	19.620
34	.647	11.760	4.87	.216	4.624	13.21	12.397	289.29	29.84	20.390
35	.220	11.980	4.96	.082	4.707	13.45	3.500	292.79	30.20	20.640
36	.218	12.197	5.05	.078	4.784	13.67	3.750	296.54	30.59	20.890
37	.225	12.422	5.14	.078	4.862	13.89	4.025	300.57	31.00	21.140
38	.865	13.287	5.50	.291	5.153	14.72	15.604	316.17	32.61	22.080
39	.218	13.505	5.59	.080	5.233	14.95	3.725	319.89	33.00	22.330
40	.202	13.707	5.68	.070	5.303	15.15	3.275	323.17	33.33	22.580
41	.222	13.930	5.77	.073	5.376	15.36	3.425	326.59	33.69	22.830
42	.874	14.804	6.13	.285	5.661	16.17	12.445	339.04	34.97	23.780
43	.232	15.036	6.23	.082	5.743	16.41	3.050	342.09	35.29	24.030
44	.238	15.274	6.32	.078	5.821	16.63	3.225	345.31	35.62	24.280
45	.275	15.549	6.44	.070	5.891	16.83	3.725	349.04	36.00	24.530
46	2.590	18.139	7.51	.803	6.694	19.12	36.778	385.82	39.80	27.120
47	.250	18.389	7.61	.073	6.766	19.33	2.800	388.62	40.08	27.370
48	1.020	19.409	8.04	.306	7.072	20.21	11.628	400.25	41.28	28.390
49	.222	19.631	8.13	.073	7.145	20.41	2.725	402.97	41.56	28.640
50	.205	19.836	8.21	.070	7.215	20.61	2.750	405.72	41.85	28.890
51	.213	20.049	8.30	.067	7.282	20.81	2.775	408.50	42.13	29.140
52	.819	20.868	8.64	.243	7.525	21.50	10.530	419.03	43.22	30.040
53	.215	21.083	8.73	.065	7.590	21.69	2.775	421.80	43.51	30.290
54	.202	21.285	8.81	.060	7.650	21.86	2.675	424.48	43.78	30.540
55	.250	21.535	8.92	.057	7.708	22.02	2.800	427.28	44.07	30.790
56	.847	22.382	9.27	.177	7.885	22.53	8.932	436.21	44.99	31.560
57	.300	22.682	9.39	.055	7.940	22.68	2.850	439.06	45.29	31.810
58	.300	22.982	9.52	.053	7.992	22.83	2.975	442.03	45.59	32.060
59	1.068	24.050	9.96	.214	8.206	23.45	10.235	452.27	46.65	32.950
60	.275	24.325	10.07	.047	8.253	23.58	2.650	454.92	46.92	33.200
61	.275	24.600	10.19	.055	8.308	23.74	2.775	457.69	47.21	33.450
62	.275	24.875	10.30	.067	8.376	23.93	2.850	460.54	47.50	33.700
63	4.332	29.207	12.09	1.011	9.387	26.82	44.764	505.31	52.12	37.310
64	.188	29.395	12.17	.060	9.447	26.99	1.675	506.98	52.29	37.560
65	.220	29.615	12.26	.073	9.519	27.20	1.850	508.83	52.48	37.810
66	.250	29.865	12.37	.105	9.624	27.50	2.250	511.08	52.72	38.060
67	.770	30.635	12.69	.239	9.863	28.18	7.084	518.17	53.45	38.830
68	.250	30.885	12.79	.073	9.935	28.39	2.175	520.34	53.67	39.080
69	.225	31.110	12.88	.090	10.025	28.64	2.125	522.47	53.89	39.330
70	.250	31.360	12.99	.101	10.125	28.93	2.300	524.77	54.13	39.580
71	.870	32.230	13.35	.261	10.386	29.68	8.352	533.12	54.99	40.450
72	.218	32.447	13.44	.060	10.446	29.85	2.000	535.12	55.20	40.700
73	.208	32.655	13.52	.055	10.501	30.00	1.900	537.02	55.39	40.950
74	.250	32.905	13.63	.070	10.571	30.20	2.325	539.34	55.63	41.200
75	.935	33.840	14.01	.238	10.809	30.88	8.245	547.59	56.48	42.050
76	.250	34.090	14.12	.063	10.872	31.06	2.225	549.81	56.71	42.300
77	.250	34.340	14.22	.060	10.932	31.23	2.350	552.16	56.95	42.550
78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

0082	75	.935	33.840	14.01	.238	10.809	30.58	8.245	547.59	56.48	42.050
0083	76	.250	34.090	14.12	.063	10.872	31.06	2.225	549.81	56.71	42.300
0084	77	.250	34.340	14.22	.060	10.932	31.23	2.350	552.16	56.95	42.550
0085	78	.250	34.590	14.32	.067	10.999	31.43	2.300	554.46	57.19	42.800
0086	79	.946	35.536	14.71	.198	11.197	31.99	7.912	562.38	58.01	43.660
0087	80	.250	35.786	14.82	.053	11.250	32.14	2.125	564.50	58.23	43.910
0088	81	.250	36.036	14.92	.057	11.307	32.31	2.150	566.65	58.45	44.160
0089	82	.275	36.311	15.04	.055	11.362	32.46	2.025	568.68	58.66	44.410
0090	83	6.720	43.031	17.82	1.400	12.762	36.46	47.600	616.28	63.57	50.010
0091	84	.300	43.331	17.94	.067	12.830	36.66	1.500	617.78	63.72	50.260
0092	85	.325	43.656	18.08	.063	12.892	36.83	1.825	619.60	63.91	50.510
0093	86	.275	43.931	18.19	.065	12.957	37.02	1.800	621.40	64.09	50.760
0094	87	.935	44.866	18.58	.247	13.204	37.72	6.460	627.86	64.76	51.610
0095	88	.210	45.076	18.66	.057	13.261	37.89	1.275	629.14	64.89	51.860
0096	89	.250	45.326	18.77	.075	13.336	38.10	1.925	631.06	65.09	52.110
0097	90	.250	45.576	18.87	.045	13.381	38.23	3.650	634.71	65.47	52.360
0098	91	.900	46.476	19.24	.198	13.579	38.80	11.430	646.14	66.65	53.260
0099	92	.232	46.708	19.34	.035	13.614	38.90	3.325	649.47	66.99	53.510
0100	93	.250	46.958	19.44	.047	13.662	39.03	2.675	652.14	67.27	53.760
0101	94	1.155	48.113	19.92	.178	13.840	39.54	11.025	663.17	68.40	54.810
0102	95	.275	48.388	20.04	.032	13.873	39.64	2.400	665.57	68.65	55.060
0103	96	.250	48.638	20.14	.038	13.910	39.74	2.450	668.02	68.90	55.310
0104	97	.250	48.888	20.24	.045	13.955	39.87	2.550	670.57	69.17	55.560
0105	98	3.795	52.683	21.82	.483	14.438	41.25	34.845	705.41	72.76	59.010
0106	99	.235	52.918	21.91	.042	14.481	41.37	2.075	707.49	72.97	59.260
0107	100	.235	53.153	22.01	.038	14.518	41.48	2.175	709.66	73.20	59.510
0108	101	.890	54.043	22.38	.160	14.678	41.94	8.010	717.67	74.02	60.400
0109	102	.235	54.278	22.48	.035	14.713	42.04	2.000	719.67	74.23	60.650
0110	103	.227	54.506	22.57	.027	14.741	42.12	1.875	721.55	74.42	60.900
0111	104	.902	55.408	22.94	.125	14.866	42.47	7.008	728.55	75.15	61.860
0112	105	.232	55.641	23.04	.030	14.896	42.56	1.700	730.25	75.32	62.110
0113	106	.230	55.871	23.13	.027	14.923	42.64	2.800	733.05	75.61	62.360
0114	107	.970	56.841	23.54	.126	15.049	43.00	9.797	742.85	76.62	63.340
0115	108	.230	57.071	23.63	.030	15.079	43.08	2.725	745.58	76.90	63.580
0116	109	.218	57.288	23.72	.027	15.107	43.16	2.400	747.98	77.15	63.830
0117	110	.210	57.498	23.81	.035	15.142	43.26	2.175	750.15	77.37	64.080
0118	111	.619	58.117	24.07	.102	15.244	43.55	5.780	755.93	77.97	64.760
0119	112	.225	58.342	24.16	.042	15.286	43.67	1.975	757.91	78.17	65.010
0120	113	.227	58.569	24.25	.047	15.334	43.81	2.150	760.06	78.40	65.260
0121	114	.325	58.894	24.39	.038	15.371	43.92	3.550	763.61	78.76	65.510
0122	115	4.667	63.561	26.32	.610	15.982	45.66	53.132	816.74	84.24	69.100
0123	116	.275	63.836	26.43	.032	16.014	45.75	2.100	818.84	84.46	69.350
0124	117	.275	64.111	26.55	.030	16.044	45.84	1.825	820.66	84.65	69.600
0125	118	.250	64.361	26.65	.027	16.072	45.92	1.450	822.11	84.80	69.850
0126	119	1.200	65.561	27.15	.110	16.182	46.23	6.800	828.91	85.50	70.850
0127	120	.250	65.811	27.25	.030	16.212	46.32	1.525	830.44	85.66	71.100
0128	121	.275	66.086	27.37	.025	16.237	46.39	1.650	832.09	85.83	71.350
0129	122	1.023	67.109	27.79	.093	16.330	46.66	6.324	838.41	86.48	72.280
0130	123	.250	67.359	27.89	.032	16.362	46.75	1.325	839.74	86.62	72.530
0131	124	.218	67.577	27.98	.035	16.397	46.85	1.175	840.91	86.74	72.780
0132	125	.222	67.799	28.07	.038	16.435	46.96	1.225	842.14	86.86	73.030
0133	126	.893	68.692	28.44	.171	16.606	47.44	4.940	847.08	87.37	73.980
0134	127	.222	68.915	28.54	.038	16.643	47.55	1.275	848.35	87.50	74.230
0135	128	.213	69.127	28.62	.027	16.671	47.63	1.275	849.63	87.64	74.480
0136	129	.230	69.357	28.72	.025	16.696	47.70	1.400	851.03	87.78	74.730
0137	130	.770	70.127	29.04	.100	16.796	47.99	4.697	855.72	88.26	75.500
0138	131	.232	70.360	29.13	.025	16.821	48.06	1.375	857.10	88.41	75.750
0139	132	.275	70.635	29.25	.027	16.848	48.14	1.450	858.55	88.56	76.000
0140	133	3.069	73.704	30.52	.279	17.127	48.93	15.624	874.17	90.17	78.790
0141	134	.400	74.104	30.68	.038	17.165	49.04	1.275	875.45	90.30	79.040
0142	135	.450	74.554	30.87	.148	17.312	49.46	2.550	878.00	90.56	79.290
0143	136	1.649	76.203	31.55	.514	17.826	50.93	9.797	887.79	91.57	80.260
0144	137	.210	76.413	31.64	.032	17.859	51.02	1.025	888.82	91.68	80.510
0145	138	.192	76.605	31.72	.025	17.884	51.10	1.000	889.82	91.78	80.760
0146	139	.195	76.800	31.80	.027	17.911	51.17	1.050	890.87	91.89	81.010
0147	140	.459	77.260	31.99	.073	17.984	51.38	2.520	893.39	92.15	81.570
0148	141	.190	77.450	32.07	.025	18.009	51.45	.875	894.26	92.24	81.820
0149	142	.175	77.625	32.14	.023	18.032	51.52	.850	895.11	92.33	82.070
0150	143	.197	77.822	32.22	.021	18.053	51.58	1.075	896.19	92.44	82.320
0151	144	.632	78.454	32.49	.067	18.121	51.77	3.479	899.67	92.80	83.030
0152	145	.192	78.647	32.57	.024	18.144	51.84	1.100	900.77	92.91	83.280
0153	146	.192	78.839	32.65	.019	18.164	51.90	1.125	901.89	93.03	83.530
0154	147	.180	79.019	32.72	.021	18.185	51.96	.975	902.87	93.13	83.780
0155	148	.540	79.559	32.94	.060	18.246	52.13	2.808	905.68	93.42	84.500
0156	149	.165	79.724	33.01	.021	18.266	52.19	.800	906.48	93.50	84.750
0157	150	.200	79.924	33.09	.024	18.290	52.26	1.025	907.50	93.61	85.000
0158	151	3.580	83.504	34.58	.551	18.841	53.83	19.278	926.78	95.59	89.590
0159	152	.167	83.672	34.65	.020	18.861	53.89	.800	927.58	95.68	89.840

HARDSHELL


Ag Extraction,percent
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50
40
30
20
10
0
Direct Cyanidation
Cyanidation After SO_2 Leach
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1
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3
4
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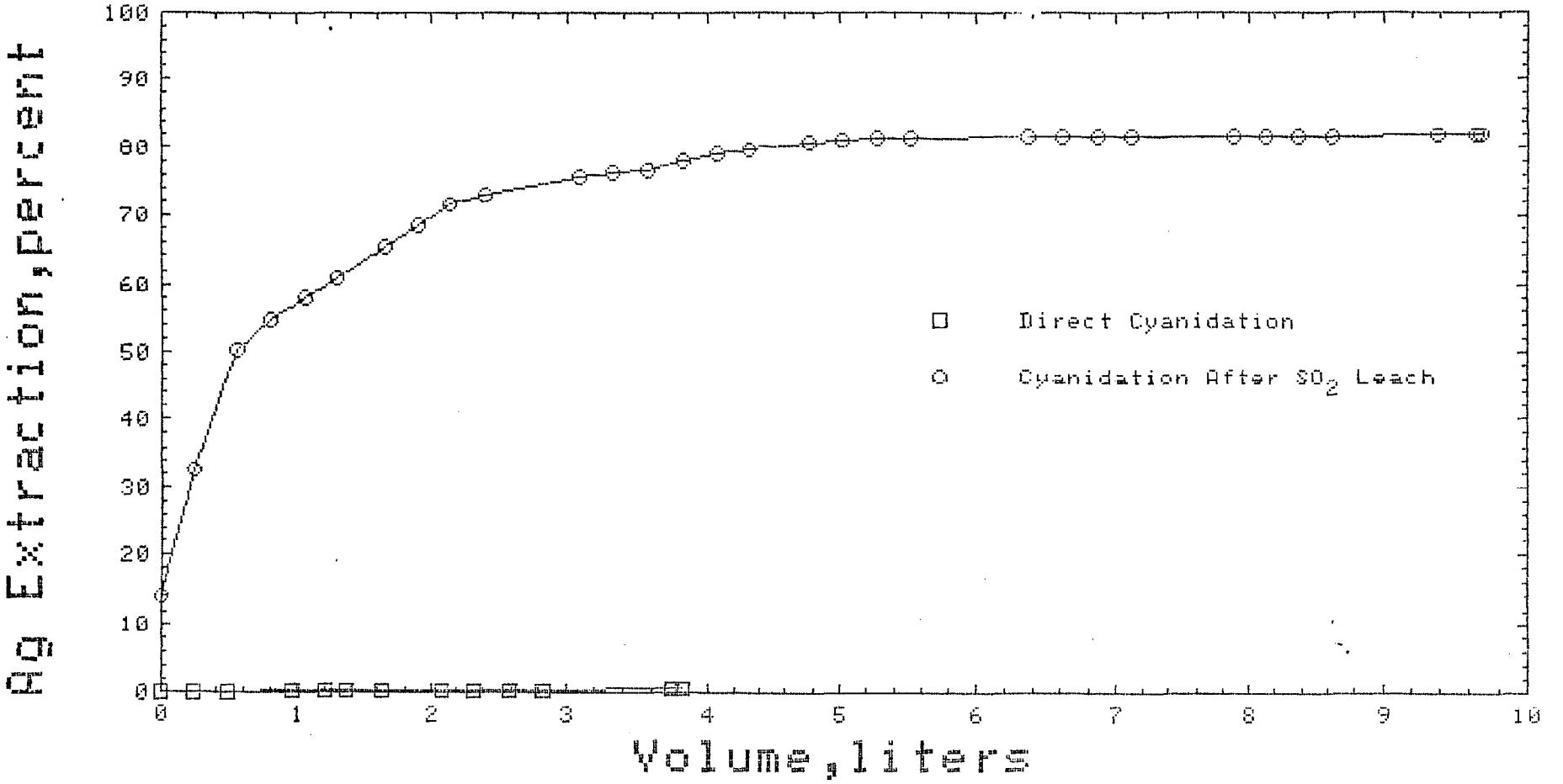
Volume,liters

MOWRY


Ag Extraction,percent
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9
10
Volume,liters
Direct Cyanidation
Cyanidation After SO_2 Leach

TEST PROCEDURES

1. Column leaching tests were conducted in 4 in. (10 cm) diameter columns that were 3 ft. (1 m) long and contained 3.5 kg of -1 in + 1/2 in sized sample pieces.

2. The leach solutions were prepared by bubbling SO_2 into distilled water, analyzing for SO_2 content by idometric titration and then diluting to the final desired SO_2 concentration (5 pct).

3. A 5 pct SO_2 solution was applied at a rate of 1 ml per minute. This rate approximates the application rates in gold/silver and copper heap leaching operations and resulted in an unsaturated column. The tests were usually run until the manganese in the effluent from the column dropped to about 1 g/L. At least 50 L of solution were applied to each column during any one test.

4. After completion of the leaching tests, the residues were washed with distilled water. The pregnant solution and dried residues were analyzed for manganese, iron and calcium by atomic absorption spectroscopy. Metal extractions were calculated using both the filtrate and residue analyses.

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RECENT RESEARCH ON LEACHING MANGANESE

Peter G. Chamberlain

John E. Pahlman

Charles A. Rhoades

U.S. Department of the Interior
Bureau of Mines
Minneapolis, Minnesota

For presentation at the SME-AIME Fall Meeting and Exhibit
Salt Lake City, Utah - October 19-21, 1983

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RECENT RESEARCH ON LEACHING MANGANESE

Peter G. Chamberlain, John E. Pahlman, and Charles A. Rhoades

U.S. Department of the Interior
Bureau of Mines
Minneapolis, Minnesota

Abstract. Domestic mining will not produce a significant portion of the manganese consumed in the United States unless new mining and processing techniques are implemented that will enable domestic lean ores to economically compete with rich foreign ores. One mining-processing technique that appears promising for certain deposits is in situ and/or heap leaching with aqueous SO_2. Since leaching offers economic advantages of low capital costs, low operating costs, and short start-up times as well as environmental and safety improvements over conventional mining-processing, the Bureau of Mines studied the leachability of manganese deposits from several districts. Manganese oxides, hydroxides, and carbonates were leached to 80 to 90 pct recovery in 7 to 40 days of leaching with a solution containing 5 pct SO_2 in column leaching tests. Preliminary cost analyses of surface mining-heap leaching, block caving-in situ leaching, and shrinkage stoping-in situ leaching indicate that the products of manganese leaching may be economically produced for the chemical and electrolytic manganese industries. The easiest marketable product to obtain would be a manganese sulfate commonly used as a fertilizer amendment. Manganese carbonates and hydroxides could also be precipitated from the pregnant leach solutions.

Introduction

Domestic mines account for a mere 2 pct of the manganese consumption in the United States. Although plentiful supplies of manganese are readily available from several foreign countries, the Nation's vulnerability to sudden cessation of foreign shipments plus the current trade imbalance has stimulated a renewed search for economic methods of producing manganese from domestic deposits. The Bureau's Minerals Availability Field Office recently published a study (Kilgore and Thomas, 1982) that manganese could not be produced competitively from 8 domestic deposits using various conventional mining and milling schemes. The long-run total costs for production from these domestic operations ranged from $8 to $35/long ton unit or 22.4 lbs ($.16 to $.71/kg) contained manganese as compared to 1982 prices averaging between $1.60 and $1.70/long ton unit ($.03/kg) for 48 pct minimum grade manganese ore imported f.o.b. Chicago or Pittsburgh.

Clearly, significant new technology is necessary to enab le domestic producers to produce manganese at competitive prices. From strategic material and market size standpoints, such new technology would have the greatest impact if it provided manganese in the form that could be used directly by the steel industry. The chemical, battery, and superalloy industries, however, annually consume about 100,000 tons (10×10^6 kg) of manganese and it is these markets that seem attractive targets for the technology recently researched by the Bureau—in situ and/or heap leaching manganese with aqueous SO_2. Although the products of leaching cannot be charged directly into steelmaking furnaces without expensive reprocessing, they can be readily incorporated into other industries as manganese sulfates, oxides, and carbonates.

In situ leaching has been very successful for uranium and, to a lesser degree, for copper. Heap leaching has become a very important source of gold, silver and copper. Leaching offers advantages of low capital cost, low operating cost, and short start-up times as well as environmental and safety improvements over conventional mining. The primary disadvantage—low recovery—favors consideration of the method for small and/or low grade deposits that would not otherwise be mined. Most domestic manganese deposits fall in that category.

Leaching manganese with SO_2 was explored by the Bureau during the 1940's (Wyman and Ravitz, 1947). Experiments demonstrated that a variety of manganese deposits could be leached with SO_2 to produce manganese sulfate solutions. Laboratory leaching tests led to pilot plant experiments and eventually to commercial production of manganese from a vat leaching operation during World War II. Although heap leaching experiments were conducted in the 1950's, (Bender and Rampacek, 1957), in situ leaching was not seriously considered until Mr. James Lake presented several ideas on leaching the Artillery Peak deposits to the Bureau. A contract subsequently awarded to a private firm to evaluate

TABLE 1. - Manganese sample characteristics

State	District	Manganese form	Primary manganese minerals	Grade[1] (pct)	Origin
Arizona	Artillery Peak	Oxide	Wad[1]	4	Sedimentary
Do	Tombstone	Do	Psilomelane Manganite Pyrolusite[2]	2	Hydrothermal vein
Do	Do	Do	Manganite Psilomelane Pyrolusite	10	Do
Do	Harshaw	Do	Cryptomelane Psilomelane Pyrolusite	28	Do
Do	Do	Do	Pyrolusite	11	Do
Arkansas	Batesville	Do	Hausmannite Psilomelane Braunite	7	Do
California	Paymaster	Do	Pyrolusite Psilomelane Manganite	20	Do
Colorado	San Juan Mtn.	Silicate	Rhodonite[2]	30	Do
Do	Leadville	Oxide	Psilomelane Pyrolusite	11	Do
Maine	North Aroostook	Oxide/Silicate	Braunite Rhodochrosite	23	Submarine volcanogenic-sedimentary
Minnesota	Cuyuna	Oxide/Hydroxide	Manganite	3	Sedimentary
Do	Do	Carbonate	Rhodochrosite	8	Do
Do	Do	Oxide	Pyrolusite Stilpnomelane Manganite	6	Do
Do	Do	Do	Pyrolusite	11	Do
Do	Do	Do	Pyrolusite	4	Do
Nevada	Virgin River	Do	Wad	27	Do
Do	Boulder City	Do	Wad	9	Do
Do	Three Kids	Do	Wad	16	Do
South Dakota	Chamberlain	Carbonate	Manganocalcite Pyrolusite Manganite	[3]1	Fossil sea nodules

NA = Not available.
[1]Amorphous collection of oxides.
[2]May be the pyroxmanganite variety.
[3]Grade of manganese in shale. Nodules average 18 to 20 pct manganese.

TABLE 2. - Manganese recovery from SO_2 leaching

District	Manganese form	Grade, pct Mn	Manganese recovery pct[1]
Artillery Peak	Oxide	4	95
Tombstone	Do	2	82
Tombstone	Do	10	92
Harshaw	Do	28	95
Harshaw	Do	11	78
Batesville	Do	7	59
Paymaster	Do	20	67
San Juan Mtn.	Silicate	30	30
Leadville	Oxide	11	83
North Aroostook	Oxide/Silicate	23	93
Cuyuna	Oxide/Hydroxide	3	82
Cuyuna	Carbonate	8	94
Cuyuna	Oxide	6	61
Cuyuna	Do	11	62
Cuyuna	Do	4	92
Virgin River	Do	27	73
Boulder City	Do	9	82
Three Kids	Do	16	94
Chamberlain	Carbonate	18	89

[1]Generally based on results of 1-3 tests each.

TABLE 3. - Cost analysis (1982 dollars) of leaching systems

System	$MnSO_4$ capacity, tons/day	Costs		Operating costs per ton $MnSO_4$
		Capital, millions	Daily operating	
Surface mine, heap leach	9,300	14.1	$66,500	[1]$219
Sublevel stoping	9,300	NA	89,700	[1] 321
Block caving	9,300	16.2	80,700	[1] 274
Shrinkage stoping	800	4.9	26,800	[2] 335

NA = Not analyzed.
[1]Massive deposit containing 3.5 pct manganese.
[2]Vein deposit contains 10 pct manganese.

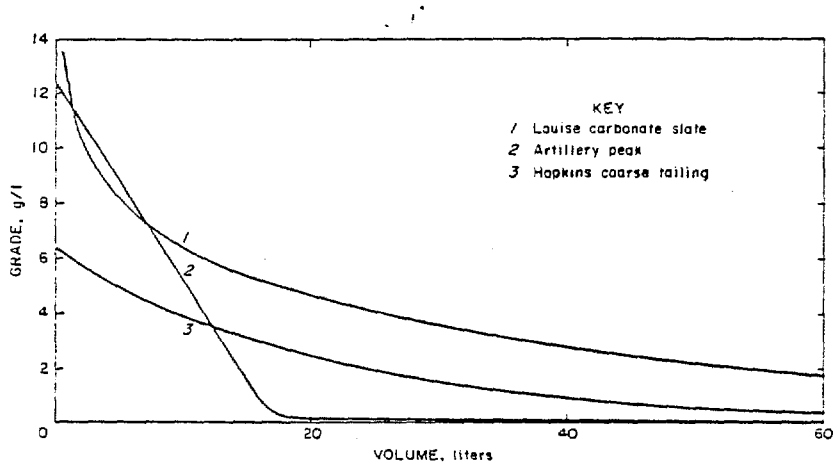

Figure 1. - Concentration of manganese in effluent leaching solution

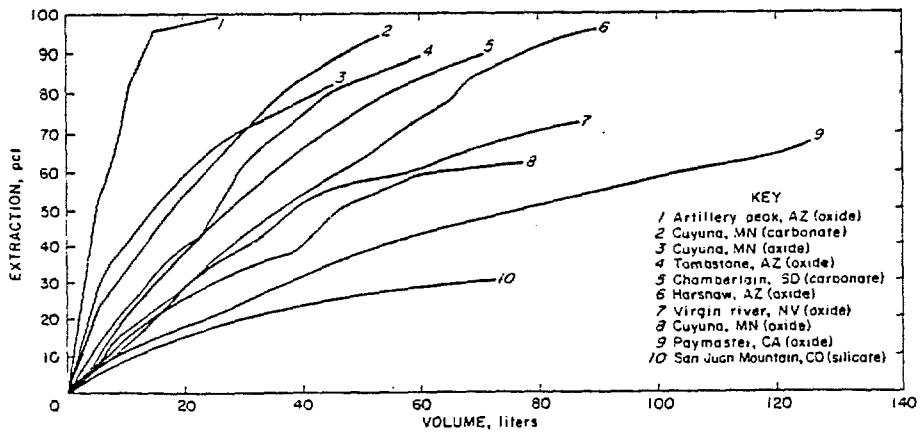

Figure 2. - Selected leaching recovery curves for samples from several manganese sources

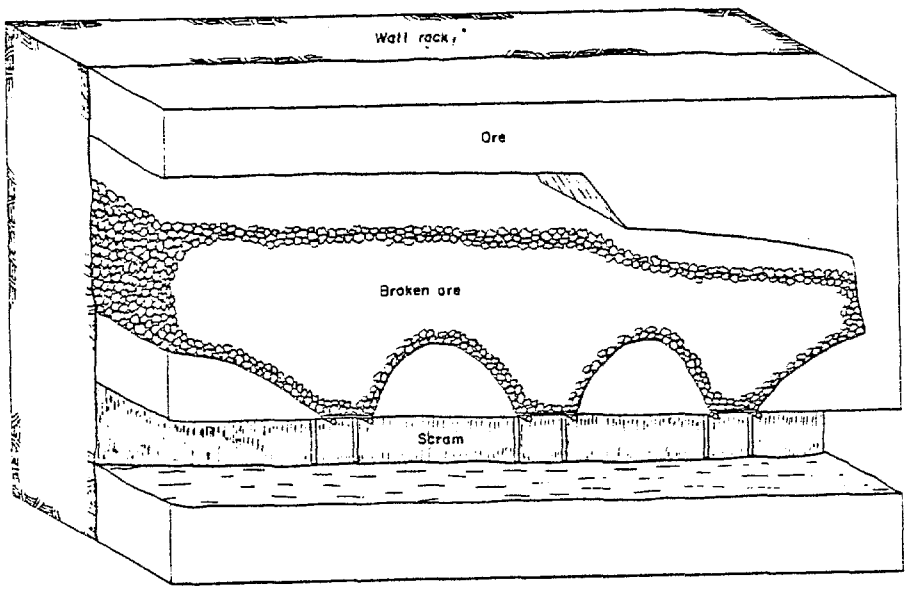

Figure 3a. - Ore preparation phase, shrinkage-stope mining/in situ leaching

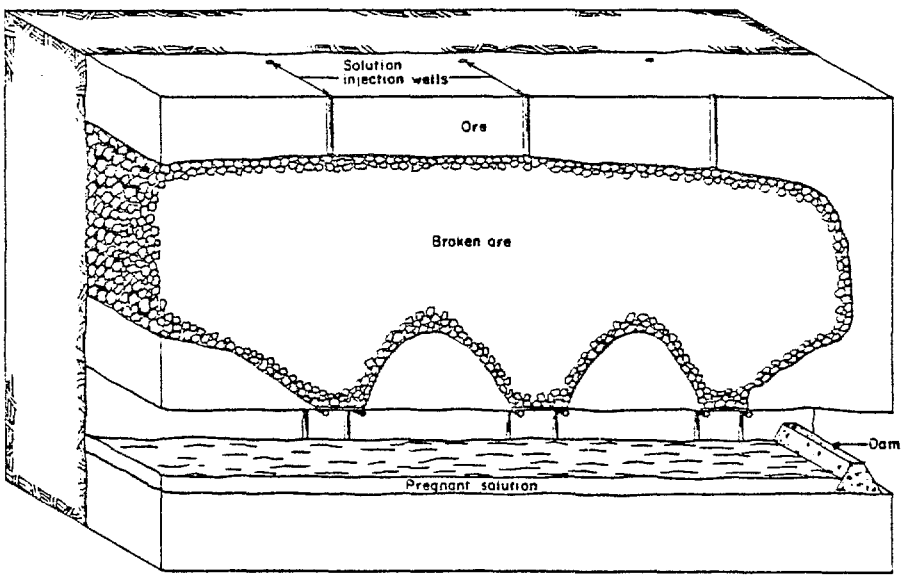

Figure 3b. - Leaching phase, shrinkage-stope mining/in situ leaching

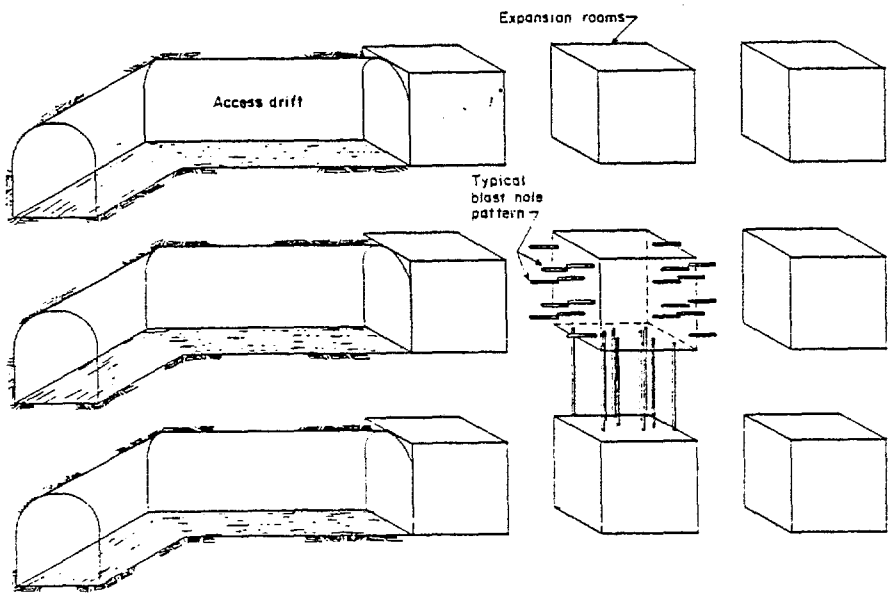

Figure 4a. - Blasting scheme (cross-section), underground leaching concept patterned after modified in situ retort for oil shale

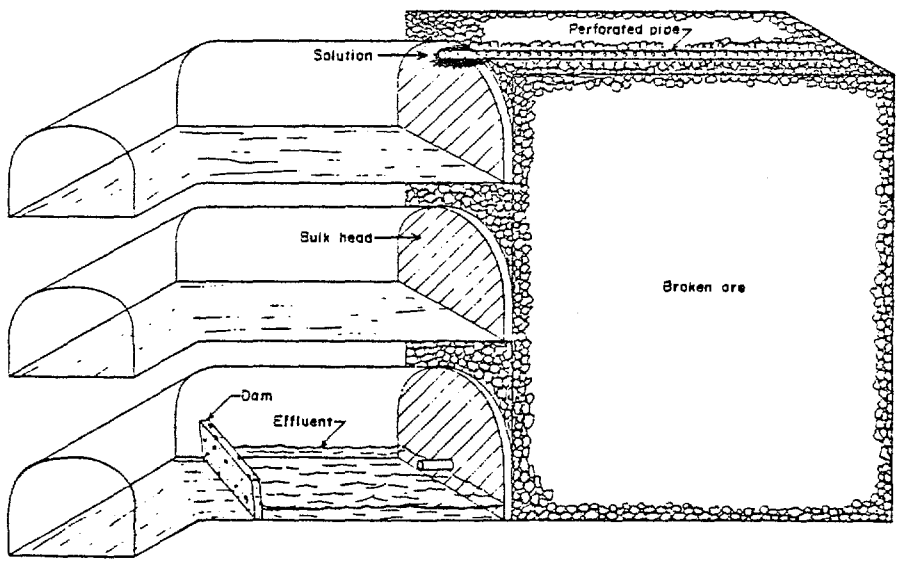

Figure 4b. - Leaching phase (cross-section), underground leaching concept patterned after modified in situ retort for oil shale

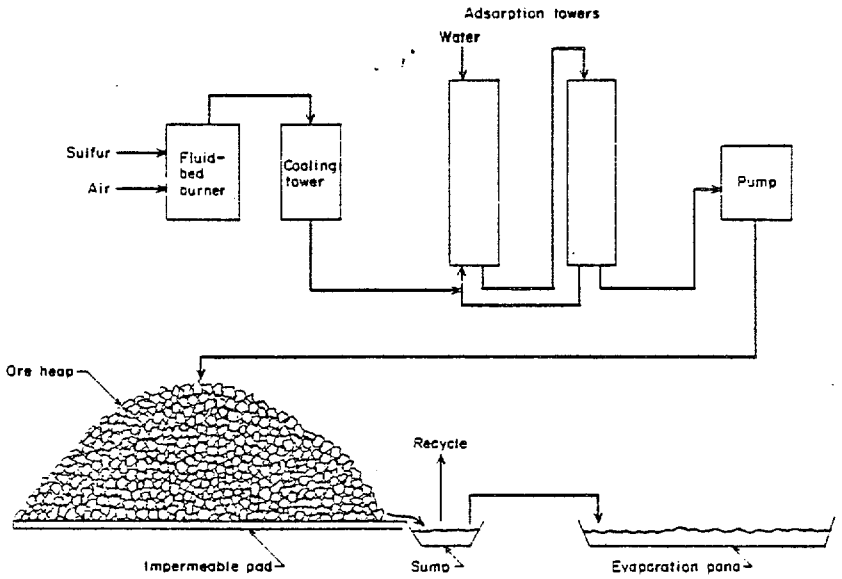

Figure 5. - Leaching system for manganese (schematic)

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RECOVERY OF SILVER FROM MANGANESE ORES

Charles A. Rhoades

John E. Pahlman

Peter G. Chamberlain

Bureau of Mines
Twin Cities Research Center
Minneapolis, Minnesota

For presentation at the SME-AIME Annual Meeting
Los Angeles, California - February 26-March 1, 1984

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Abstract. The Bureau of Mines is conducting research on a dual leaching method that offers the potential for the economic recovery of the silver as well as the manganese contained in some of the domestic manganiferous silver deposits. The method is an initial leach of the manganese with aqueous SO_2 followed by a neutralization rinse, and then by a second leach for the extraction of silver with cyanide solution. Refractory silver in these ores is either bound by the high-valence manganese, chemically resistant to cyanide leaching, or is rendered inaccessible to cyanide leach solution by the surrounding manganese mineralization. Less than 10 pct of the silver was extracted when -1 in +1/2 in (-2.5 cm + 1.3 cm) ore pieces were leached directly with cyanide. However, extractions of 25 to 82 pct for silver and 65 to 96 pct for manganese were attained in laboratory column leach tests using the dual method on the same size ore pieces from six domestic deposits.

TABLE 1. - Manganese ore sample characteristics

Sample No.	State	County	District	Manganese form	Manganese minerals	Principle gangue minerals	Origin
AZ-2...	Arizona	Santa Cruz	Hanshaw	Oxide	Psilomelane, pyrolusite, braunite	Anglesite, quartzite, felsite, rhyolite, galena	Hydrothermal vein
AZ-3...	do	do	do	do	Psilomelane, pyrolusite	Quartzite, anglesite, felsite, rhyolite, galena	do
AZ-4...	do	Cochise	Tombstone	do	Psilomelane, todorokite	Calcite, quartz, dolomite	do
AZ-5...	do	do	do	do	Psilomelane, pyrolusite	Quartz, calcite, colomite	do
CO 1...	Colorado	Lake	Leadville	do	Pyrolusite, psilomelane	Quartz, calcite, hematite, goethite	do
NV 4...	Nevada	Lincoln	Pioche	do	Psilomelane (coronadite), pyrolusite	Hematite, quartz, calcite	Hydrothermal vein

TABLE 2. - Partial chemical analysis of ore samples

Sample No.	Chemical analysis			
	percent			oz/ton
	Fe	Ca	Mn	Ag
AZ-2...	3.3	0.5	11.	2.9
AZ-3...	6.9	1.0	28.	2.4
AZ-4...	2.5	25.	2.0	2.4
AZ-5...	1.9	<.50	9.8	7.0
CO-1...	6.0	9.9	10.	4.0
NV-4...	23.	3.2	11.	3.3

TABLE 3. - Silver extraction test results

Sample	Cyanide silver extraction direct, pct	SO_2 silver extraction, pct	Cyanide silver extraction after SO_2 leach, pct	Total silver extraction, pct
AZ-2	3.3	43.	23.	66.
	-	43.	25.	68.
AZ-3	.7	14.	64.	78.
	-	14.	66.	80.
	-	14.	68.	82.
AZ-4	1.0	1.9	22.	24.
	-	1.9	23.	25.
AZ-5	1.3	13.0	46.	59.
	-	13.0	59.	72.
	-	13.0	63.	76.
	-	13.0	65.	78.
	-	13.0	67.	80.
CO-1	8.5	2.2	65.	67.
	-	2.2	76.	78.
	-	2.2	80.	82.
NV-4	4.5	40.	12.	51.
	-	40.	14.	53.

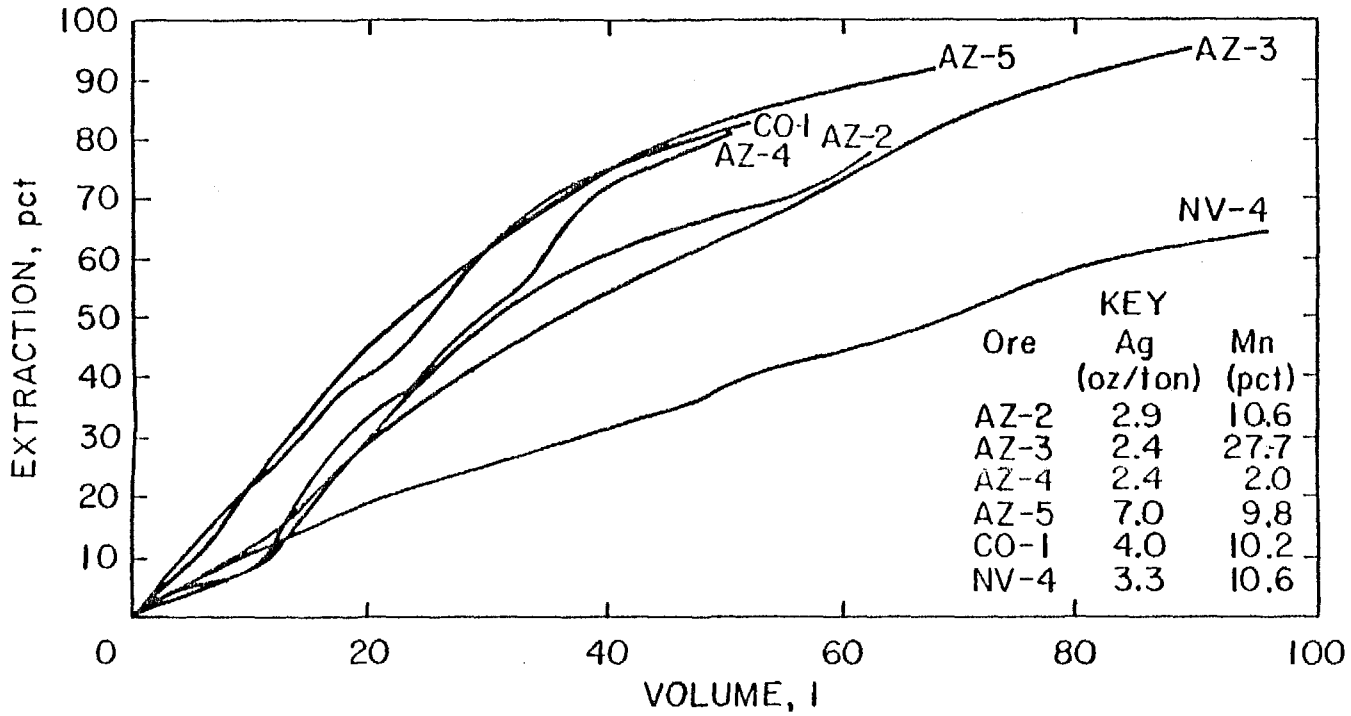

FIGURE 1. - Manganese extraction curves for six silver containing ore samples.

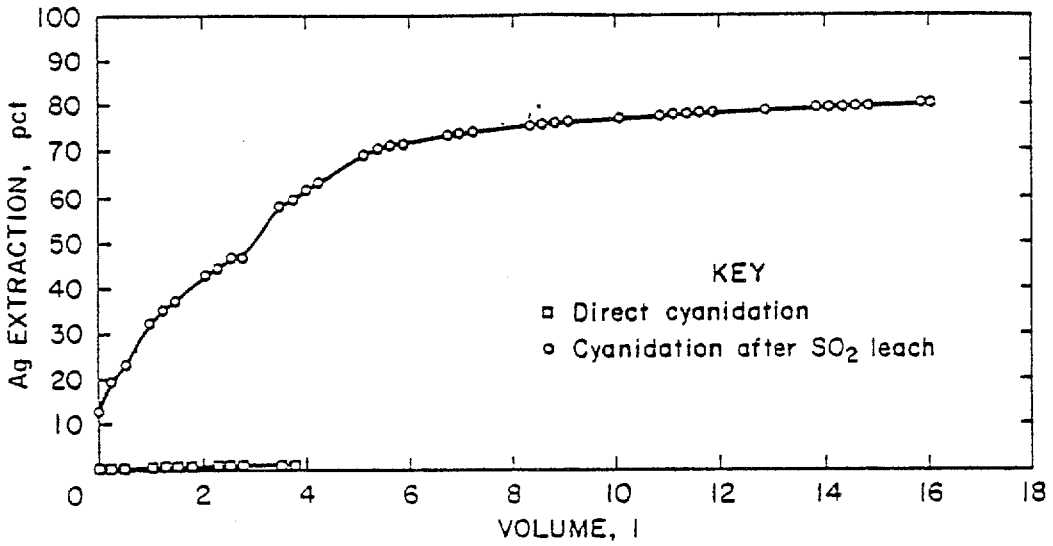

FIGURE 2. - Silver extraction curves for sample AZ-5

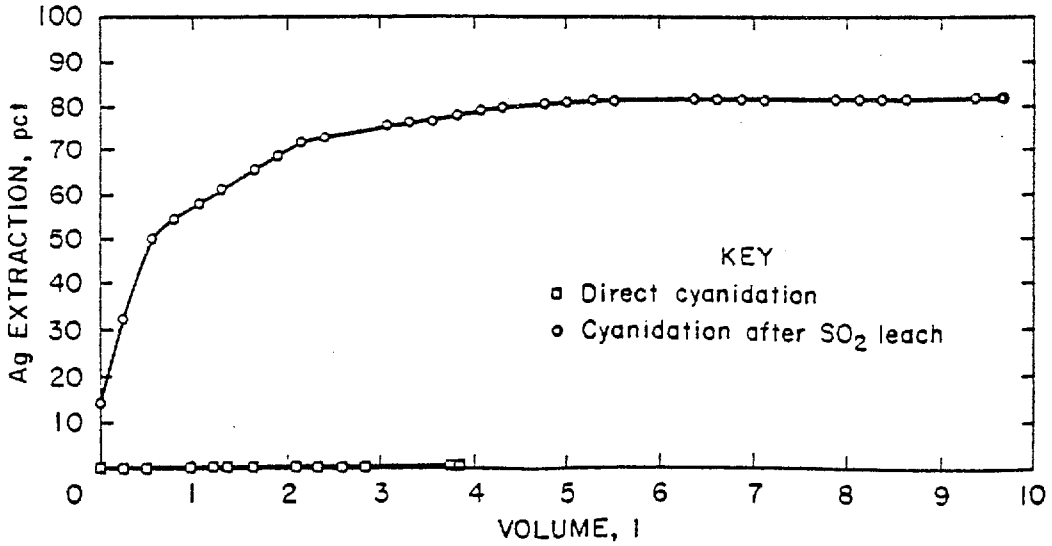

FIGURE 3. - Silver extraction curves for sample AZ-3

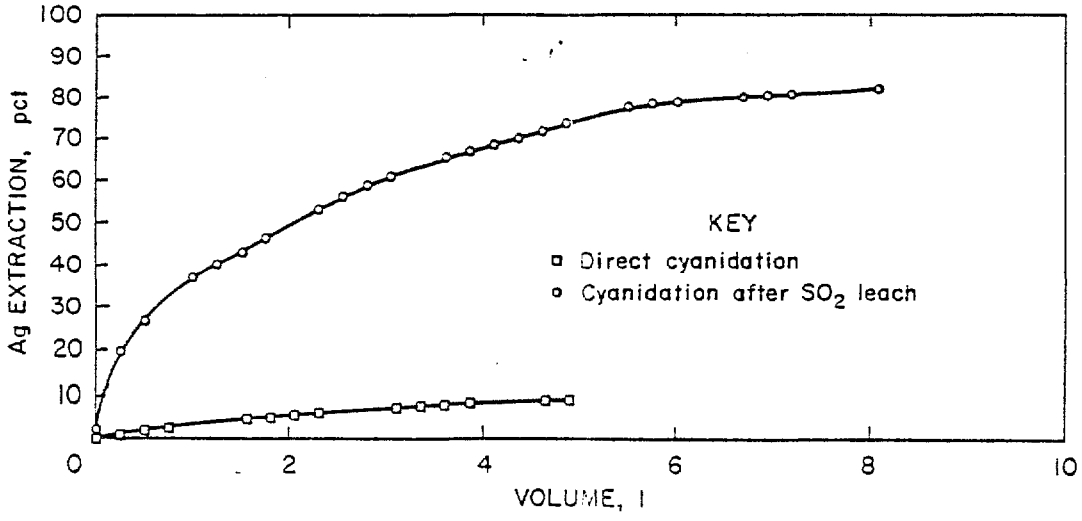

FIGURE 4. – Silver extraction curves for sample CO-1

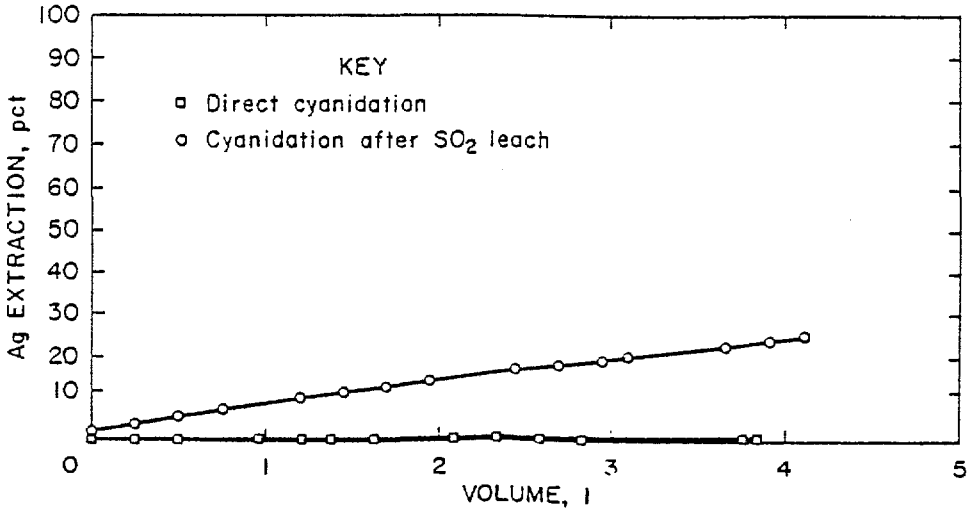

FIGURE 5. – Silver extraction curves for sample AZ-4

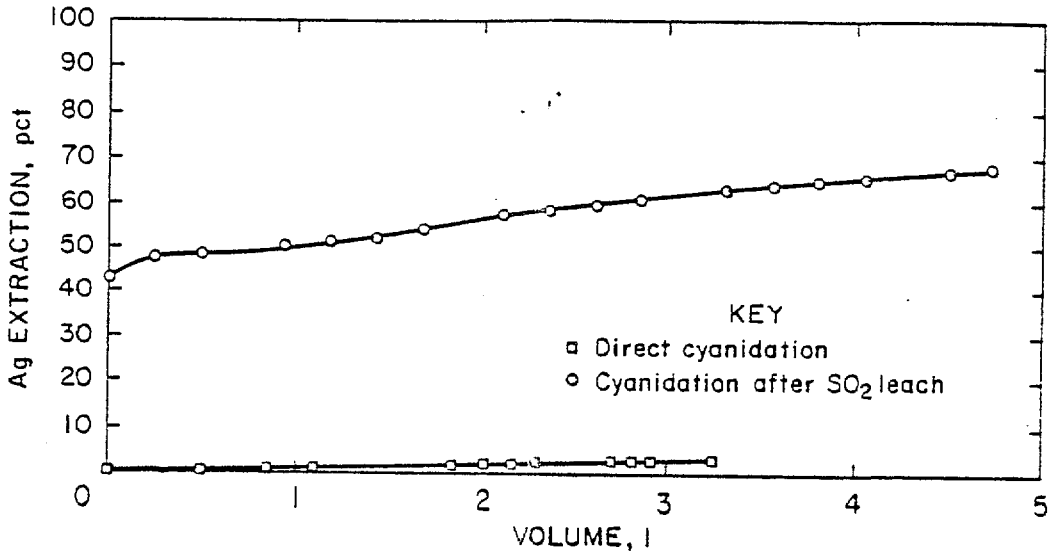

FIGURE 6. - Silver extraction curves for sample AZ-2

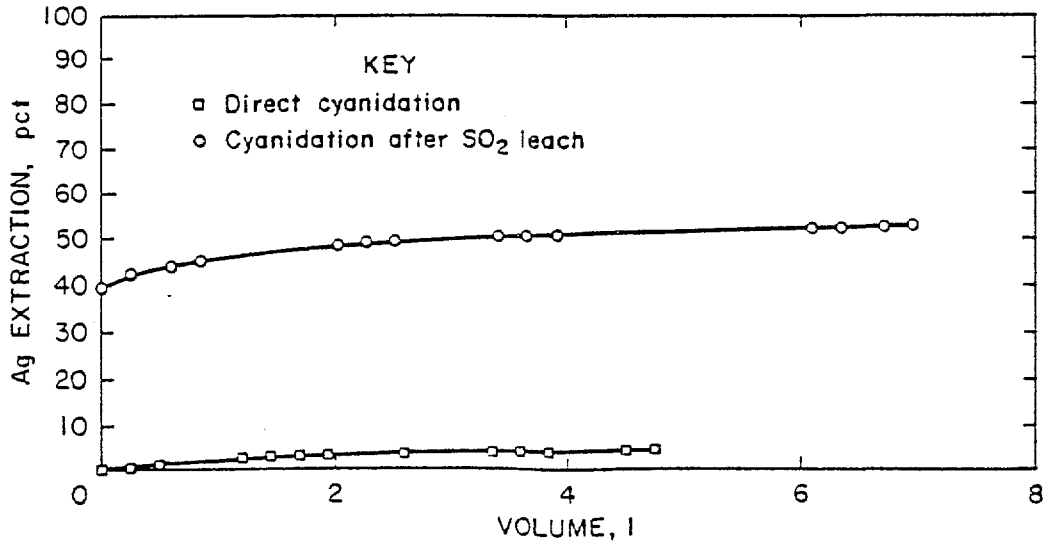

FIGURE 7. - Silver extraction curves for sample NV-4

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ARIZONA'S ARTILLERY PEAK MANGANESE DEPOSITS AND THEIR POTENTIAL FOR IN SITU LEACHING

Peter G. Chamberlain

U.S. Department of the Interior
Bureau of Mines
Minneapolis, Minnesota

For presentation at the SME-AIME Fall Meeting and Exhibit
Denver, Colorado - November 18-20, 1981

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Arizona's Artillery Peak Manganese Deposits and Their Potential for Leaching

Abstract. The Bureau of Mines is conducting research to boost domestic production of manganese. Virtually no mining exists in the low grade and/or small deposits that occur in this Country. One large, low-grade manganese deposit located in westcentral Arizona--The Artillery Peak district--was extensively studied and sporadically mined during the 1940's and 1950's. Although manganese mining in the district has been long dormant, recent studies indicate that the deposits may be amenable to economical production by heap and/or in situ leaching methods. A conceptual design for an in situ leaching system features undercutting and blasting a block of ore, leaching with SO_2, and extracting the manganese as a sulfate or oxide. Possible applications to other manganese deposits depend upon formation permeability and specific manganese mineralogy.

originally dissolved out of crystalline rocks

Table 1. Principal Manganese Deposits (After Manganese Recovery Technology Panel, 1976)

Resource	Amount of ore, million short tons	Manganese, percent	Iron, percent	Principal manganese minerals
Aroostook, Maine	377	9	20	Braunite (silicate)
Artillery Peak, Arizona	175	4	3	Wad (oxide) Psilomelane (oxide)
Batesville, Arkansas	196	4	1-3	Hausmannite (oxide) Braunite (silicate)
Chamberlain, South Dakota	>2,200	0.6	1	(Carbonates)
Cuyuna Range, Minnesota	272	8	32	Manganite (hydroxide) Psilomelane (oxide)
San Juan Mtns., Colorado	48	8	low	Rhodonite (silicate) Rhodochrosite (carbonate)

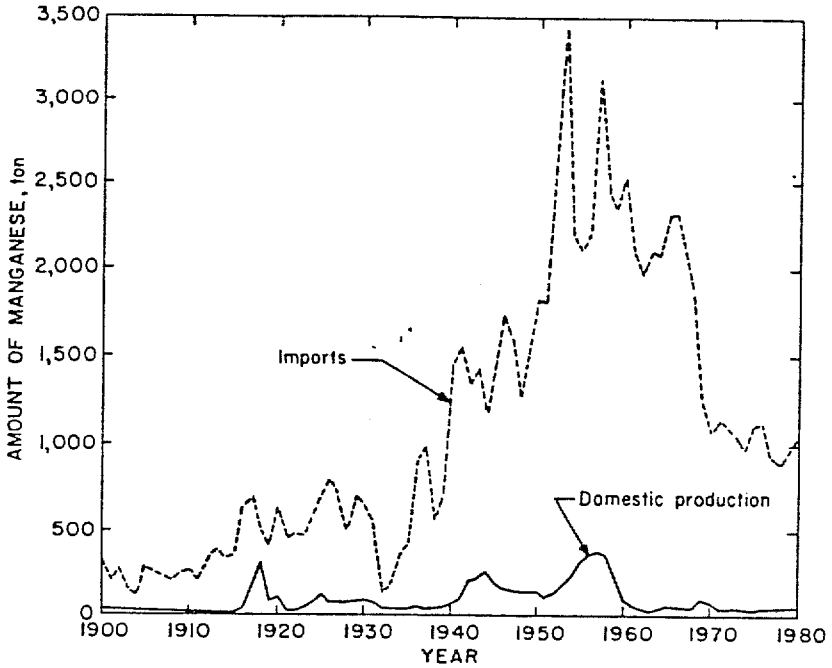

Figure 1. Manganese production trends.

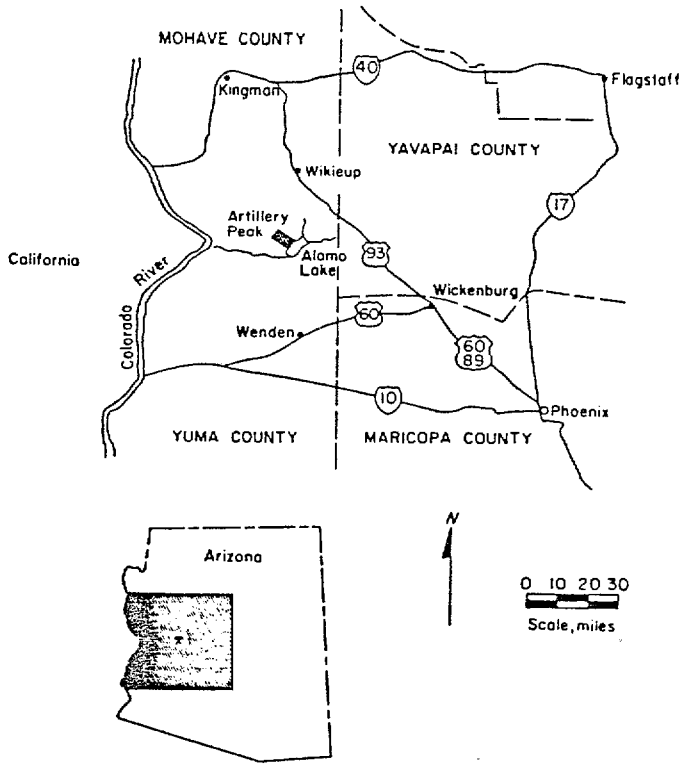

Figure 2. Artillery Peak District location.

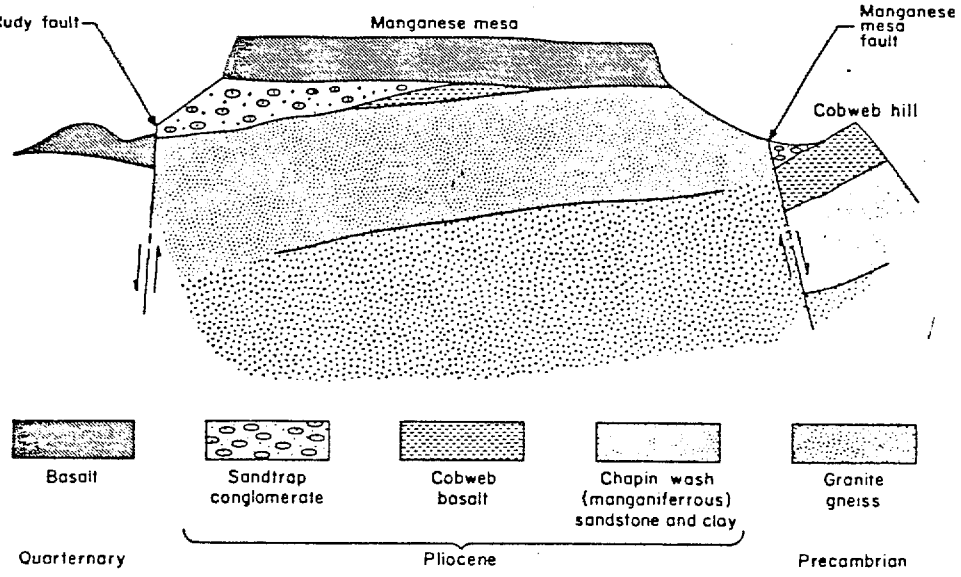

Figure 3. Geologic section (east-west) of Artillery Peak District.

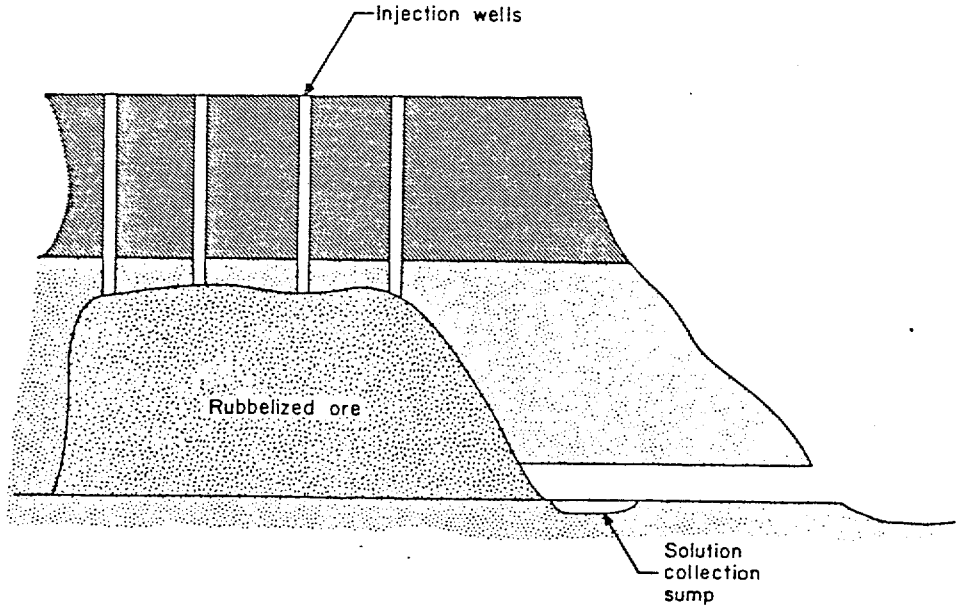

Figure 5. Ore preparation for leaching.

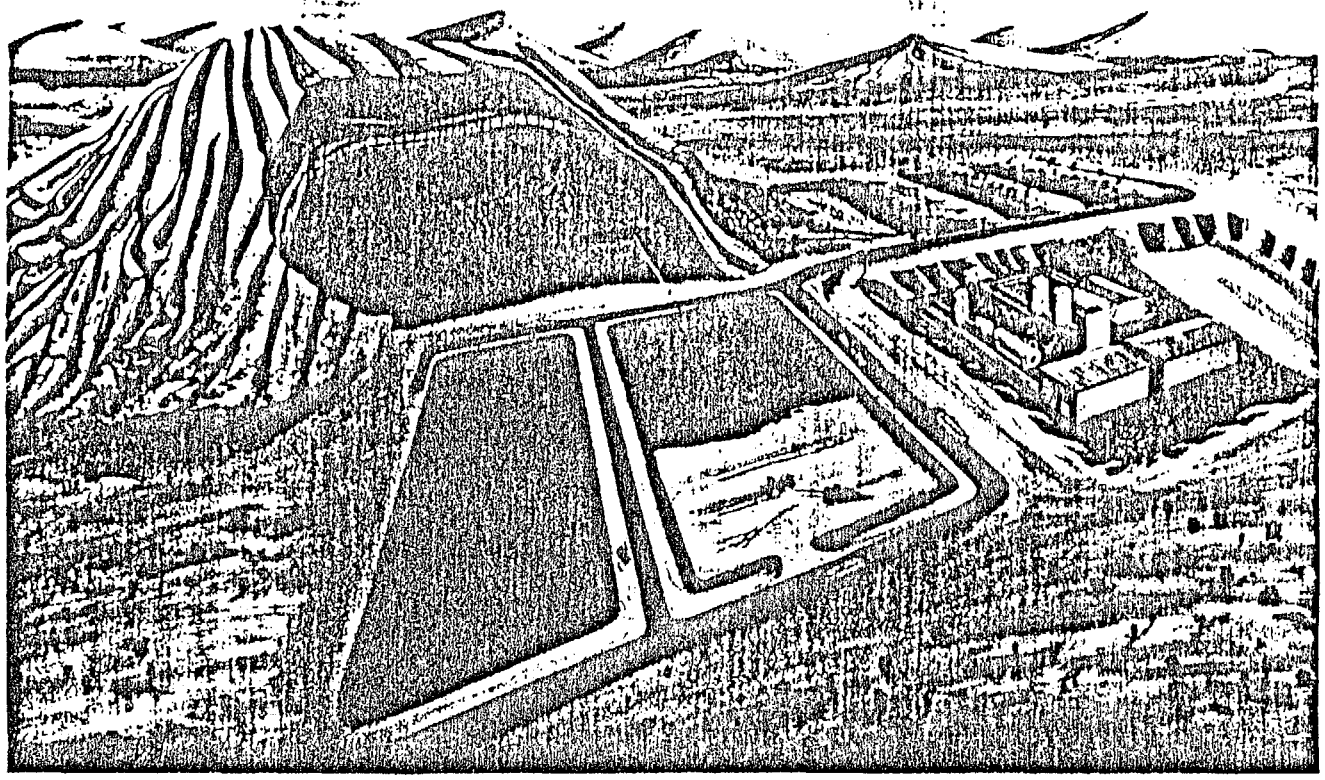

Figure 4. Conceptual design for in situ leaching.

ASARCO

Exploration Department
Southwestern United States Division

June 21, 1984

Ms. Joyce A. Hall
Landman
Noranda Exploration, Inc.
P.O. Box 7176
Reno, Nevada 89510

Affidavit of Labor
Ventura Project
Santa Cruz County, AZ

Dear Ms. Hall:

Enclosed is a copy of an invoice from Joy Manufacturing Company, 707 Boyd Blvd., LaPorte, Indiana 46350, amounting to $9,222.75 for drilling hole V-74-1 with a diamond drill rig. This work should fulfill the requirement for 1984 assessment work on the West and VS claims in Santa Cruz County, Arizona.

Please send me a copy of the recorded Affidavit of Labor on these claims when it has been stamped as received by the BLM.

Sincerely yours,

J. R. Stringham
Assistant to the
Manager, SWED

JRS:mek
enc.

cc: J. D. Sell
A. Lamarre - Noranda, Tucson

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

ASARCO

Exploration Department
Southwestern United States Division

CERTIFIED MAIL
RETURN RECEIPT

August 28, 1984

Ms. Mary Lou Sainz
Santa Cruz County Recorder
P.O. Box 1150
Nogales, Arizona 85621

Amended Notices of Location
Harshaw Mining District
Santa Cruz County, AZ

Dear Ms. Sainz:

Enclosed is Asarco's check of $35.00 as the recording fee for the enclosed Amended Notices of Location with maps for the following 7 lode claims:

Name of Claim	Owner	Date of Amended Notice of Location
Calvin Coolidge	Kerr-McGee	8/14/84
Good Luck	ASARCO Incorporated	8/3/84
Orb 7	Kerr-McGee	8/20/84
Orb 8	" "	8/1/84
Orb 9	" "	8/1/84
Orb 10	" "	8/16/84
Boot 107	ASARCO Incorporated	8/2/84

Please return in the enclosed stamped envelope.

Very truly yours,

J. R. Stringham
Assistant to the
Manager, SWED

JRS:mek
encs.

cc: J. D. Sell
A. J. Robles

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

Thunder Mt/Trench

ASARCO

Exploration Department
Southwestern United States Division

September 11, 1984

Mr. E. E. Jones
Kerr-McGee Corporation
Minerals Exploration Division
P.O. Box 25861
Oklahoma City, Oklahoma 73125

Amended Notices of Location
Harshaw Mining District
Santa Cruz County, Arizona

Dear Mr. Jones:

Enclosed for your records are copies of amended notices of location for claims in the Harshaw Mining District, Santa Cruz County, Arizona which were quit claimed to Kerr-McGee. These amended notices have been recorded in the official records of Santa Cruz County and filed with the BLM which has acknowledged receiving them.

Sincerely yours,

J. R. Stringham
Assistant to the
Manager, SWED

JRS:mek
encs.

cc: J. D. Sell

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

AFFIDAVIT OF LABOR PERFORMED
AND IMPROVEMENTS MADE

STATE OF ARIZONA)
) ss
County of Pima)

J. R. Stringham, being first duly sworn, deposes and says that he is a citizen of the United States and more than twenty-one (21) years of age, and resides in Tucson, County of Pima, State of Arizona, and is personally acquainted with the mining claims situated in the Palmetto and Harshaw Mining Districts, Santa Cruz County, Arizona, the names and books and pages of record in the office of the County Recorder of Santa Cruz County, Arizona, and the Bureau of Land Management serial number of the Notices of Location whereof are set forth as follows on Exhibit A.

This keeps appearing on all the affidavits. I think it is incorrect to say "each of the described claims" Shouldn't it be for the "group of claims"? JOS

That all of said mining claims are owned by ASARCO Incorporated and Anaconda Minerals Company, the mailing address for which is P.O. Box 5747, Tucson, Arizona 85703; that between September 1, 1983 and May 31, 1984, in excess of $10,000 worth of work and improvements were done and performed for the benefit ~~of each of~~ the described claims. Work and improvements consisted of drilling with diamond drill rig by Joy Manufacturing Co., 707 Boyd Blvd., La Porte, Indiana 46350.

Said labor was performed and improvements made at the expense of ASARCO Incorporated for the benefit of each and all of said mining claims (97) comprising said contiguous groups as part of the general plan of exploration, improvements and development, and they tend to explore, improve and develop each and all of said mining claims. The amount expended for and the value of said labor and improvements is more than One Hundred Dollars ($100.00) ← This OK for each of the mining claims and at least said amount was allocated to each of the mining claims. Said expenditure was made in good faith for the purpose of exploring, improving and developing said contiguous groups of mining claims, and was intended as annual labor and improvements for each and all of the described unpatented lode mining claims for the assessment year ending at 12:00 o'clock Meridian, September 1, 1984.

Now that you got the County Recorders signature & validation, you'll be sending confirmations to Anaconda etal? or do you wait until the BLM comes back? JOS

ASARCO Incorporated

By _____
Agent

STATE OF ARIZONA)
) ss
County of Pima)

The foregoing instrument was acknowledged before me this 27th day of June, 1984, by J. R. Stringham.

My Commission Expires:
My Commission Expires March 4, 1985

Notary Public

7/12

Anaconda
is held until
acknowledgment
is received from
BLM

Mary

Ack rec.
Mailed copy to Anaconda
7/18/84
M.

Sierra Vista F.S.
Patagonia etal AZ

FROM: W. L. KURTZ Aug 27, 1984

TO: JD Sell

Scott Burrill reports that Sierra Vista Forest Range needs 30 day head start on any physical work you may want to do in their Forests — precipitated by a suit filed on Forest over archeological.

xc: to JDS in Eureka
8/27/84

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 388
September 12, 1984
SHIPMENT NO. V74-1
JAMES D. SELL
V74-1 1944-1950

ASARCO INCORPORATED
Attn: Mr. Fleetwood Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 62 Split Core Samples

ITEM	SAMPLE NUMBER	Cu (%)	Mo (%)
1	V74-1 1944-1950	.31	.005
2	V74-1 1950-1960	.20	.013
3	V74-1 1960-1970	.12	.003
4	V74-1 1970-1980	.09	.003
5	V74-1 1980-1990	.18	.002
6	V74-1 1990-2000	.27	.020
7	V74-1 2000-2010	.17	.004
8	V74-1 2010-2020	.15	.007
9	V74-1 2020-2030	.11	.020
10	V74-1 2030-2040	.12	.022
11	V74-1 2040-2050	.16	.003
12	V74-1 2050-2060	.06	.001
13	V74-1 2060-2070	.17	.002
14	V74-1 2070-2080	.22	.003
15	V74-1 2080-2090	.12	.002
16	V74-1 2090-2100	.12	.003
17	V74-1 2100-2110	.12	.004
18	V74-1 2110-2120	.08	.001
19	V74-1 2120-2130	.06	.002
20	V74-1 2130-2140	.11	.001
21	V74-1 2140-2150	.16	.006
22	V74-1 2150-2160	.13	.005
23	V74-1 2160-2170	.11	.004
24	V74-1 2170-2180	.15	.003
25	V74-1 2180-2190	.13	.002

RECEIVED
SEP 14 1984
EXPLORATION DEPARTMENT

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	Cu (%)	Mo (%)
26	V74-1 2190-2200	.11	.007
27	V74-1 2200-2210	.12	.003
28	V74-1 2210-2220	.07	.007
29	V74-1 2220-2230	.08	.003
30	V74-1 2230-2240	.09	.001
31	V74-1 2240-2250	.08	.009
32	V74-1 2250-2260	.05	.001
33	V74-1 2260-2270	.03	.004
34	V74-1 2270-2280	.03	.001
35	V74-1 2280-2290	.04	.001
36	V74-1 2290-2300	.03	.001
37	V74-1 2300-2310	.05	.012
38	V74-1 2310-2320	.15	.001
39	V74-1 2320-2330	.09	.004
40	V74-1 2330-2340	.03	.001
41	V74-1 2340-2350	.07	.004
42	V74-1 2350-2360	.04	.003
43	V74-1 2360-2370	.08	.004
44	V74-1 2370-2380	.02	.003
45	V74-1 2380-2390	.08	.004
46	V74-1 2390-2400	.01	.002
47	V74-1 2400-2410	.05	.003
48	V74-1 2410-2420	.07	.006
49	V74-1 2420-2430	.13	.007
50	V74-1 2430-2440	.22	.011

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 388
September 12, 1984

ITEM	SAMPLE NUMBER	Cu (%)	Mo (%)
51	V74-1 2440-2450	.16	.003
52	V74-1 2450-2460	.21	.002
53	V74-1 2460-2470	.21	.002
54	V74-1 2470-2480	.23	.001
55	V74-1 2480-2490	.10	.011
56	V74-1 2490-2500	.33	.002
57	V74-1 2500-2510	.22	.001
58	V74-1 2510-2520	.12	.001
59	V74-1 2520-2530	.13	.012
60	V74-1 2530-2540	.07	.006
61	V74-1 2540-2550	.16	.007
62	V74-1 2550-2560	.05	.001

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 388
September 12, 1984

ITEM	SAMPLE NUMBER	Pb (ppm)	Zn (ppm)	Au (ppm)	Ag (ppm)
6	V74-1 1990-2000	5.	30.	<.02	1.0
11	V74-1 2040-2050			<.02	.8
16	V74-1 2090-2100	5.	30.	<.02	.6
21	V74-1 2140-2150			<.02	.6
26	V74-1 2190-2200	<5.	20.	<.02	.2
31	V74-1 2240-2250			<.02	.2
36	V74-1 2290-2300	5.	20.	<.02	<.2
41	V74-1 2340-2350			<.02	<.2
46	V74-1 2390-2400	5.	45.	<.02	<.2
51	V74-1 2440-2450			<.02	.6
56	V74-1 2490-2500	<5.	60.	<.02	.4
61	V74-1 2540-2550			<.02	<.2

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

REGISTERED ASSAYER
CERTIFICATE NO.
9425
WILLIAM L.
LEHMBECK
DATE SIGNED
Arizona U.S.A.

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 383
August 23, 1984
PROJECT: HDS-MET
JAMES D. SELL
HDS-SURF-40

ASARCO INCORPORATED
Attn: Mr. Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 14 Rock Chips and Drill Cutting Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Pb (%)	Zn (%)
1	HDS-SURF-40	.015	5.15	2.53	2.70
2	HDS-SURF-72	<.005	14.40	1.67	5.30
3	HDS-SURF-73	<.005	14.04	2.64	2.38
4	HDS-SURF-74	.025	2.42	1.09	2.02
5	HDS-SURF-80	.020	1.68	.17	.49
6	HDS-SURF-81	.025	6.22	1.00	1.72
7	HDS-SAL 1	<.005	14.84	1.06	2.74
8	HDS-SAL 2	.010	10.36	.15	1.05
9	HDS-SAL 3	<.005	6.92	.09	1.99
10	HDS-SAL 4	<.005	3.28	.44	.92
11	HDS-SAL 5	.005	3.40	.52	1.20
12	HDS-SAL 6	<.005	1.12	.13	1.48
13	HDS-MN-FINE	.015	6.52	2.05	2.46
14	HDS-INCL. TAIL	.010	6.75	2.92	.32

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 383
August 23, 1984

ITEM	SAMPLE NUMBER	Mn (%)	SiO2 (%)	CO2 (%)
1	HDS-SURF-40	19.7	52.8	16.3
2	HDS-SURF-72	20.2	42.0	17.9
3	HDS-SURF-73	14.4	60.3	11.0
4	HDS-SURF-74	11.5	68.6	8.2
5	HDS-SURF-80	3.5	82.6	1.9
6	HDS-SURF-81	5.0	70.5	7.1
7	HDS-SAL 1	23.3	50.4	16.8
8	HDS-SAL 2	25.0	48.5	18.3
9	HDS-SAL 3	25.5	45.8	18.7
10	HDS-SAL 4	14.4	66.9	10.9
11	HDS-SAL 5	14.6	64.9	10.8
12	HDS-SAL 6	34.6	30.1	26.5
13	HDS-MN-FINE	14.9	51.2	11.5
14	HDS-INCL. TAIL	2.7	67.0	1.9

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

REGISTERED ASSAYER
CERTIFICATE NO.
9425
WILLIAM L.
LEHMBECK
DATE SIGNED
Arizona U.S.A.

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF SPECTROGRAPHIC ANALYSIS

JOB NO. TAJ 383
August 23, 1984
PROJECT: HDS-MET
JAMES D. SELL
HDS-SURF-40

ASARCO INCORPORATED
Attn: Mr. Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 6 Samples

The attached pages comprise this report of analysis. Values are reported in parts per million (ppm), except where otherwise noted, to the nearest number in the series 1, 1.5, 2, 3, 5, 7, 10, etc. within each order of magnitude. These numbers represent the approximate boundaries and midpoints of arbitrary ranges of concentration differing by the reciprocal of the cube root of ten. The 'accepted' value is considered to be within + or − 1 step of the range reported at the 68 % confidence level and within + or − 2 steps at the 95 % confidence level.

REGISTERED ASSAYER CERTIFICATE NO. 9425 WILLIAM L. LEHMBECK DATE SIGNED Arizona U.S.A.

William L. Lehmbeck
Manager

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 383
PAGE 2

ITEM NO.	SAMPLE NO.
7	HDS-SAL 1
9	HDS-SAL 3
11	HDS-SAL 5
12	HDS-SAL 6
13	HDS-MN-FINE
14	HDS-INCL. TAIL

ITEM	7	9	11	12	13	14
ELEMENT						
Fe	.1%	1%	1.5%	1.5%	5%	5%
Ca	.02%	.03%	.02%	.03%	<.02%	.03%
Mg	.02%	.02%	.02%	.03%	.15%	.15%
Ag	700	300	100	50	300	200
As	<500	700	2000	<500	1000	1500
B	<10	10	10	<10	15	10
Ba	1500	5000	1000	3000	200	1500
Be	<2	2	2	3	<2	3
Bi	<10	<10	<10	<10	<10	<10
Cd	<50	500	300	200	50	500
Co	<5	<5	<5	30	<5	30
Cr	30	300	300	<10	300	100
Cu	1000	1000	700	150	1500	3000
Ga	<10	10	<10	10	15	15
Ge	<20	<20	<20	<20	<20	<20
La	<20	<20	<20	<20	<20	<20
Mn	>10000	>10000	>10000	>10000	>10000	>10000
Mo	20	50	20	50	15	20
Nb	<20	<20	20	<20	20	30
Ni	10	30	15	150	5	50
Pb	3000	700	5000	1000	>10000	>10000
Sb	500	1500	2000	3000	5000	1500
Sc	<10	<10	<10	<10	<10	10
Sn	<10	<10	<10	<10	<10	<10
Sr	200	700	300	700	100	150
Ti	<20	200	150	500	1500	1000
V	30	70	50	70	150	100
W	<50	150	70	<50	<50	50
Y	<10	20	10	50	<10	50
Zn	>10000	>10000	10000	7000	3000	>10000
Zr	<20	50	<20	70	150	100

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

CORRECTED COPY
JOB NO. TAJ 383
September 18, 1984
PROJECT: HDS-MET
JAMES D. SELL
HDS-SURF-40

ASARCO INCORPORATED
Attn: Mr. Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 14 Rock Chips and Drill Cutting Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Pb (%)	Zn (%)
1	HDS-SURF-40	.015	5.15	2.53	2.70
2	HDS-SURF-72	<.005	14.40	1.67	5.30
3	HDS-SURF-73	<.005	14.04	2.64	2.38
4	HDS-SURF-74	.025	2.42	1.09	2.02
5	HDS-SURF-80	.020	1.68	.17	.49
6	HDS-SURF-81	.025	6.22	1.00	1.72
7	HDS-SAL 1	<.005	14.84	1.06	2.74
8	HDS-SAL 2	.010	10.36	.15	1.05
9	HDS-SAL 3	<.005	6.92	.09	1.99
10	HDS-SAL 4	<.005	3.28	.44	.92
11	HDS-SAL 5	.005	3.40	.52	1.20
12	HDS-SAL 6	<.005	1.12	.13	1.48
13	HDS-MN-FINE	.015	6.52	2.05	2.46
14	HDS-INCL. TAIL	.010	6.75	2.92	.32

RECEIVED
SEP 20 1984
EXPLORATION DEPARTMENT

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	Mn (%)	SiO2 (%)	CO2* (%)
1	HDS-SURF-40	19.7	52.8	.20
2	HDS-SURF-72	20.2	42.0	.50
3	HDS-SURF-73	14.4	60.3	.20
4	HDS-SURF-74	11.5	68.6	.20
5	HDS-SURF-80	3.5	82.6	.30
6	HDS-SURF-81	5.0	70.5	3.90
7	HDS-SAL 1	23.3	50.4	.10
8	HDS-SAL 2	25.0	48.5	.10
9	HDS-SAL 3	25.5	45.8	.10
10	HDS-SAL 4	14.4	66.9	<.05
11	HDS-SAL 5	14.6	64.9	<.05
12	HDS-SAL 6	34.6	30.1	<.05
13	HDS-MN-FINE	14.9	51.2	.10
14	HDS-INCL. TAIL	2.7	67.0	<.05

*NOTE: Corrected carbon dioxide values.

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

REGISTERED ASSAYER
CERTIFICATE NO.
9425
WILLIAM L.
LEHMBECK
DATE SIGNED
Arizona U.S.A.

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

PRELIMINARY
JOB NO. TAJ 383
August 14, 1984
PROJECT: HDS-MET
JAMES D. SELL
HDS-SURF-40

ASARCO INCORPORATED
Attn: Mr. Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 14 Rock Chip Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Pb (%)	Zn (%)
1	HDS-SURF-40	.015	5.15	2.53	2.70
2	HDS-SURF-72	<.005	14.40	1.67	5.30
3	HDS-SURF-73	<.005	14.04	2.64	2.38
4	HDS-SURF-74	.025	2.42	1.09	2.02
5	HDS-SURF-80	.020	1.68	.17	.49
6	HDS-SURF-81	.025	6.22	1.00	1.72
7	HDS-SAL 1	<.005	14.84	1.06	2.74
8	HDS-SAL 2	.010	10.36	.15	1.05
9	HDS-SAL 3	<.005	6.92	.09	1.99
10	HDS-SAL 4	<.005	3.28	.44	.92
11	HDS-SAL 5	.005	3.40	.52	1.20
12	HDS-SAL 6	<.005	1.12	.13	1.48
13	HDS-MN-FINE	.015	6.52	2.05	2.46
14	HDS-INCL. TAIL	.010	6.75	2.92	.32

RECEIVED
AUG 16 1984
EXPLORATION DEPARTMENT

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 383
August 14, 1984

ITEM	SAMPLE NUMBER	Mn (%)	SiO2 (%)	CO2 (%)
1	HDS-SURF-40	19.7	52.8	16.3
2	HDS-SURF-72	20.2	42.0	17.9
3	HDS-SURF-73	14.4	60.3	11.0
4	HDS-SURF-74	11.5	68.6	8.2
5	HDS-SURF-80	3.5	82.6	1.9
6	HDS-SURF-81	5.0	70.5	7.1
7	HDS-SAL 1	23.3	50.4	16.8
8	HDS-SAL 2	25.0	48.5	18.3
9	HDS-SAL 3	25.5	45.8	18.7
10	HDS-SAL 4	14.4	66.9	10.9
11	HDS-SAL 5	14.6	64.9	10.8
12	HDS-SAL 6	34.6	30.1	26.5
13	HDS-MN-FINE	14.9	51.2	11.5
14	HDS-INCL. TAIL	2.7	67.0	1.9

NOTE: Spectrographic analysis pending.

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

REGISTERED ASSAYER
CERTIFICATE NO.
9425
WILLIAM L.
LEHMBECK
DATE SIGNED
Arizona U.S.A.

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF SPECTROGRAPHIC ANALYSIS

JOB NO. TAJ 383
August 28, 1984
PROJECT: HDS-MET
JAMES D. SELL
HDS-SURF-40

ASARCO INCORPORATED
Attn: Mr. Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 6 Samples

The attached pages comprise this report of analysis. Values are reported in parts per million (ppm), except where otherwise noted, to the nearest number in the series 1, 1.5, 2, 3, 5, 7, 10, etc. within each order of magnitude. These numbers represent the approximate boundaries and midpoints of arbitrary ranges of concentration differing by the reciprocal of the cube root of ten. The 'accepted' value is considered to be within + or - 1 step of the range reported at the 68 % confidence level and within + or - 2 steps at the 95 % confidence level.

REGISTERED ASSAYER
CERTIFICATE NO. 9425
WILLIAM L. LEHMBECK
Arizona

William L. Lehmbeck
Manager

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

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EXPLORATION DEPARTMENT

*NOTE: Corrected values.

SKYLINE LABS, INC.
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JOB NO. TAJ 383
PAGE 2

ITEM NO.	SAMPLE NO.
7	= HDS-SAL 1
9	= HDS-SAL 3
11	= HDS-SAL 5
12	= HDS-SAL 6
13	= HDS-MN-FINE
14	= HDS-INCL. TAIL

ITEM	7	9	11	12	13*	14*
ELEMENT						
Fe	.1%	1%	1.5%	1.5%	5%	5%
Ca	.02%	.03%	.02%	.03%	.03%	<.02%
Mg	.02%	.02%	.02%	.03%	.15%	.15%
Ag	700	300	100	50	200	300
As	<500	700	2000	<500	1500	1000
B	<10	10	10	<10	10	15
Ba	1500	5000	1000	3000	1500	200
Be	<2	2	2	3	3	<2
Bi	<10	<10	<10	<10	<10	<10
Cd	<50	500	300	200	500	50
Co	<5	<5	<5	30	30	<5
Cr	30	300	300	<10	100	300
Cu	1000	1000	700	150	3000	1500
Ga	<10	10	<10	10	15	15
Ge	<20	<20	<20	<20	<20	<20
La	<20	<20	<20	<20	<20	<20
Mn	>10000	>10000	>10000	>10000	>10000	>10000
Mo	20	50	20	50	20	15
Nb	<20	<20	20	<20	30	20
Ni	10	30	15	150	50	5
Pb	3000	700	5000	1000	>10000	>10000
Sb	500	1500	2000	3000	1500	5000
Sc	<10	<10	<10	<10	10	<10
Sn	<10	<10	<10	<10	<10	<10
Sr	200	700	300	700	150	100
Ti	<20	200	150	500	1000	1500
V	30	70	50	70	100	150
W	<50	150	70	<50	50	<50
Y	<10	20	10	50	50	<10
Zn	>10000	>10000	10000	7000	>10000	3000
Zr	<20	50	<20	70	100	150

SKYLINE LABS, INC.
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Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 356
April 18, 1984
PROJECT NO.: HDS
SHIPMENT NO. 2
HDS-93-10

ASARCO INCORPORATED
Attn: Mr. Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Hardshell

Analysis of 68 Drill Chip Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Ag (oz/t)	FIRE ASSAY Au (oz/t)
1	HDS-93 0-10	2.57	.010
2	HDS-93 10-15	1.40	.005
3	HDS-93 15-20	1.40	<.005
4	HDS-93 20-25	1.22	<.005
5	HDS-93 25-30	1.24	<.005
6	HDS-93 30-35	.46	
7	HDS-93 35-40	.40	
8	HDS-93 40-45	.44	
9	HDS-93 45-50	.52	
10	HDS-93 50-55	.48	
11	HDS-93 55-60	.78	
12	HDS-93 60-65	.50	
13	HDS-93 65-70	.50	
14	HDS-93 70-75	.54	
15	HDS-93 75-80	.56	
16	HDS-93 80-85	.50	
17	HDS-93 85-90	1.10	.005
18	HDS-93 90-95	.90	
19	HDS-93 95-100	.74	
20	HDS-93 100-105	1.00	<.005
21	HDS-93 105-110	.48	
22	HDS-93 110-115	.38	
23	HDS-93 115-120	.38	
24	HDS-93 120-125	.30	
25	HDS-93 125-130	.24	

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Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	FIRE ASSAY Ag (oz/t)	FIRE ASSAY Au (oz/t)
26	HDS-93 130-135	.28	
27	HDS-93 135-140	.34	
28	HDS-93 140-145	.32	
29	HDS-93 145-150	.34	
30	HDS-93 150-155	.26	
31	HDS-93 155-160	.32	
32	HDS-93 160-165	.24	
33	HDS-93 165-170	.14	
34	HDS-93 170-175	.36	
35	HDS-93 175-180	.38	
36	HDS-93 180-185	.22	
37	HDS-93 185-190	.20	
38	HDS-93 190-195	.14	
39	HDS-93 195-200	.28	
40	HDS-93 200-205	.80	
41	HDS-93 205-210	2.26	<.005
42	HDS-93 210-215	2.42	<.005
43	HDS-93 215-220	2.68	<.005
44	HDS-93 220-225	2.04	<.005
45	HDS-93 225-230	1.32	<.005
46	HDS-93 230-235	1.04	<.005
47	HDS-93 235-240	.70	
48	HDS-93 240-245	.40	
49	HDS-93 245-250	.34	
50	HDS-93 250-255	.28	

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REPORT OF ANALYSIS

JOB NO. TAJ 356A
April 27, 1984
PROJECT NO.: HDS
SHIPMENT NO. 2
HDS-93-10
PAGE 1 OF 1

ASARCO INCORPORATED
Attn: Mr. Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 13 Pulp Samples

ITEM	SAMPLE NUMBER	Pb (%)
1	HDS-93 0-10	<.01
2	HDS-93 10-15	<.01
3	HDS-93 15-20	<.01
4	HDS-93 20-25	<.01
5	HDS-93 25-30	<.01
17	HDS-93 85-90	.13
20	HDS-93 100-105	.10
41	HDS-93 205-210	1.04
42	HDS-93 210-215	.63
43	HDS-93 215-220	.18
44	HDS-93 220-225	.22
45	HDS-93 225-230	.11
46	HDS-93 230-235	.06

1 ppm = .0001 %
1000 " = .1%

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

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REGISTERED ASSAYER ARIZONA 9425 WILLIAM L. LEHMBECK DATE SIGNED Arizona 4/27/84

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 357A
April 30, 1984
PROJECT NO. HDS-94
SHIPMENT NO. 3
JAMES D. SELL

ASARCO INCORPORATED
Attn: Mr. Fleetwood Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 15 Pulp Samples

ITEM	SAMPLE NUMBER	Pb (%)
20	HDS-94 100'-105'	.27
21	HDS-94 105'-110'	.41
22	HDS-94 110'-115'	.10
23	HDS-94 115'-120'	.04
24	HDS-94 120'-125'	.08
28	HDS-94 140'-145'	.01
29	HDS-94 145'-150'	.02
30	HDS-94 150'-155'	<.01
31	HDS-94 155'-160'	<.01
34	HDS-94 170'-175'	.02
40	HDS-94 200'-205'	.08
41	HDS-94 205'-210'	.06
63	HDS-94 315'-320'	.14
64	HDS-94 320'-325'	.29
65	HDS-94 325'-330'	.33

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

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REGISTERED ASSAYER
9425
WILLIAM L. LEHMBECK
DATE SIGNED
Arizona U. S. A.

JDS

SKYLINE LABS, INC.

1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 362
April 30, 1984
SHIPMENT NO. HDS-97(A)
JAMES D. SELL
HDS-97 0-10
PAGE 1 OF 1

ASARCO INCORPORATED
Attn: F.R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 11 Drill Cutting Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Ag (oz/t)	FIRE ASSAY Au (oz/t)
1	HDS-97 0-10	.28	
2	HDS-97 10-15	1.06	<.005
3	HDS-97 15-20	.90	
4	HDS-97 20-25	1.16	<.005
5	HDS-97 25-30	.48	
6	HDS-97 30-35	.16	
7	HDS-97 35-40	.14	
8	HDS-97 40-45	.08	
9	HDS-97 45-50	<.01	
10	HDS-97 50-55	<.01	
11	HDS-97 55-60	<.01	

NOTE: Additional Silver results to follow as TAJ 362-A.

NOTE: Lead results to follow as TAJ 362-B.

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

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REGISTERED ASSAYER CERTIFICATE NO. 9425 WILLIAM L. LEHMBECK DATE SIGNED Arizona U.S.A.

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 361
April 30, 1984
PROJECT: HARDSHELL
JAMES D. SELL
HDS-96 0-10

ASARCO INCORPORATED
Attn: Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 79 Drill Cutting Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Ag (oz/t)	FIRE ASSAY Au (oz/t)
1	HDS-96 0-10	2.50	.005
2	HDS-96 10-15	1.62	<.005
3	HDS-96 15-20	1.82	<.005
4	HDS-96 20-25	2.18	<.005
5	HDS-96 25-30	3.60	<.005
6	HDS-96 30-35	2.86	<.005
7	HDS-96 35-40	7.16	<.005
8	HDS-96 40-45	2.10	<.005
9	HDS-96 45-50	1.52	<.005
10	HDS-96 50-55	2.98	<.005
11	HDS-96 55-60	3.26	<.005
12	HDS-96 60-65	2.58	<.005
13	HDS-96 65-70	2.76	<.005
14	HDS-96 70-75	.98	
15	HDS-96 75-80	1.26	<.005
16	HDS-96 80-85	10.22	.005
17	HDS-96 85-90	1.80	<.005
18	HDS-96 90-95	6.00	.005
19	HDS-96 95-100	2.00	<.005
20	HDS-96 100-105	1.50	<.005
21	HDS-96 105-110	.94	
22	HDS-96 110-115	.90	
23	HDS-96 115-120	.80	
24	HDS-96 120-125	.66	
25	HDS-96 125-130	1.00	<.005

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Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	FIRE ASSAY Ag (oz/t)	Au (oz/t)
26	HDS-96 130-135	.96	
27	HDS-96 135-140	1.10	<.005
28	HDS-96 140-145	1.22	<.005
29	HDS-96 145-150	1.00	<.005
30	HDS-96 150-155	.94	
31	HDS-96 155-160	20.09	.015
32	HDS-96 160-165	7.69	.015
33	HDS-96 165-170	1.50	<.005
34	HDS-96 170-175	1.58	<.005
35	HDS-96 175-180	.90	
36	HDS-96 180-185	.98	
37	HDS-96 185-190	1.14	<.005
38	HDS-96 190-195	1.10	<.005
39	HDS-96 195-200	.82	
40	HDS-96 200-205	.90	
41	HDS-96 205-210	.50	
42	HDS-96 210-215	1.10	<.005
43	HDS-96 215-220	3.72	.005
44	HDS-96 220-225	34.17	.010
45	HDS-96 225-230	2.58	.005
46	HDS-96 230-235	1.84	<.005
47	HDS-96 235-240	1.38	<.005
48	HDS-96 240-245	1.40	<.005
49	HDS-96 245-250	1.30	<.005
50	HDS-96 250-255	1.12	<.005

SKYLINE LABS, INC.
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Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	FIRE ASSAY Ag (oz/t)	Au (oz/t)
51	HDS-96 255-260	1.06	<.005
52	HDS-96 260-265	1.08	<.005
53	HDS-96 265-270	1.60	.005
54	HDS-96 270-275	1.54	.005
55	HDS-96 275-280	1.06	.005
56	HDS-96 280-285	.86	
57	HDS-96 285-290	1.18	<.005
58	HDS-96 290-295	1.26	<.005
59	HDS-96 295-300	1.90	<.005
60	HDS-96 300-305	1.88	<.005
61	HDS-96 305-310	2.04	<.005
62	HDS-96 310-315	1.84	<.005
63	HDS-96 315-320	1.52	<.005
64	HDS-96 320-325	1.28	<.005
65	HDS-96 325-330	1.12	<.005
66	HDS-96 330-335	1.12	<.005
67	HDS-96 335-340	1.08	<.005
68	HDS-96 340-345	.76	
69	HDS-96 345-350	.60	
70	HDS-96 350-355	1.68	<.005
71	HDS-96 355-360	.88	
72	HDS-96 360-365	.90	
73	HDS-96 365-370	.90	
74	HDS-96 370-375	.58	
75	HDS-96 375-380	.58	

SKYLINE LABS, INC.
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Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	FIRE ASSAY Ag (oz/t)	FIRE ASSAY Au (oz/t)
76	HDS-96 380-385	.52	
77	HDS-96 385-390	.48	
78	HDS-96 390-395	.54	
79	HDS-96 395-400	.46	

NOTE: Lead results to follow as TAJ 361-A.

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

REGISTERED ASSAYER
CERTIFICATE NO. 9425
WILLIAM L. LEHMBECK
SIGNED
Arizona U.S.A.
4-30-84

JDS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 360
April 30, 1984
PROJECT: HARDSHELL
JAMES D. SELL
HDS-95 0-10

ASARCO INCORPORATED
Attn: Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 53 Drill Cutting Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Ag (oz/t)	FIRE ASSAY Au (oz/t)
1	HDS-95 0-10	.20	
2	HDS-95 10-15	.02	
3	HDS-95 15-20	.24	
4	HDS-95 20-25	.02	
5	HDS-95 25-30	<.01	
6	HDS-95 30-35	<.01	
7	HDS-95 35-40	<.01	
8	HDS-95 40-45	.20	
9	HDS-95 45-50	.26	
10	HDS-95 50-55	.24	
11	HDS-95 55-60	.34	
12	HDS-95 60-65	.48	
13	HDS-95 65-70	.72	
14	HDS-95 70-75	.86	
15	HDS-95 75-80	1.02	<.005
16	HDS-95 80-85	.76	
17	HDS-95 85-90	1.64	<.005
18	HDS-95 90-95	3.60	.020
19	HDS-95 95-100	4.54	.005
20	HDS-95 100-105	5.62	.050
21	HDS-95 105-110	3.58	.005
22	HDS-95 110-115	2.26	.005
23	HDS-95 115-120	3.40	<.005
24	HDS-95 120-125	1.44	<.005
25	HDS-95 125-130	1.78	<.005

SKYLINE LABS, INC.
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Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	FIRE ASSAY Ag (oz/t)	Au (oz/t)
26	HDS-95 130-135	1.18	<.005
27	HDS-95 135-140	1.98	<.005
28	HDS-95 140-145	2.16	<.005
29	HDS-95 145-150	1.70	<.005
30	HDS-95 150-155	1.20	<.005
31	HDS-95 155-160	1.24	<.005
32	HDS-95 160-165	1.40	<.005
33	HDS-95 165-170	1.08	<.005
34	HDS-95 170-175	1.41	<.005
35	HDS-95 175-180	1.26	<.005
36	HDS-95 180-185	.82	
37	HDS-95 185-190	.72	
38	HDS-95 190-195	.66	
39	HDS-95 195-200	.60	
40	HDS-95 200-205	.70	
41	HDS-95 205-210	.82	
42	HDS-95 210-215	1.10	<.005
43	HDS-95 215-220	.92	
44	HDS-95 220-225	.82	
45	HDS-95 225-230	1.10	<.005
46	HDS-95 230-235	.74	
47	HDS-95 235-240	.70	
48	HDS-95 240-245	.70	
49	HDS-95 245-250	.70	
50	HDS-95 250-255	1.06	<.005

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	FIRE ASSAY Ag (oz/t)	FIRE ASSAY Au (oz/t)
51	HDS-95 255-260	.80	
52	HDS-95 260-265	.78	
53	HDS-95 265-270	.98	

NOTE: Lead results to follow as TAJ 360-A.

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

REGISTERED ASSAYER
ARIZONA
9425
WILLIAM L. LEHMBECK
SIGNED
ARIZONA
4-30-84

JOS

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 355
April 30, 1984
ERM-NV-1 THRU ERM-NV-15
PAGE 1 OF 1

ASARCO INCORPORATED
Attn: Mr. Fleetwood Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Hermosa - N. Kern
Hardshell Proj.

Analysis of 15 Rock Chip Samples

ITEM	SAMPLE NUMBER	FIRE ASSAY Au (oz/t)	Ag (oz/t)	Pb (%)
1	ERM-NV-1	.020	13.22	1.47
2	ERM-NV-2	.010	10.63	5.30
3	ERM-NV-3	.005	2.20	1.09
4	ERM-NV-4	.020	3.30	1.39
5	ERM-NV-5	.005	3.72	2.01
6	ERM-NV-6	.005	3.30	.25
7	ERM-NV-7	.005	2.04	.35
8	ERM-NV-8	.005	3.60	1.11
9	ERM-NV-9	<.005	9.12	6.40
10	ERM-NV-10	.005	5.66	1.28
11	ERM-NV-11	.010	4.05	1.09
12	ERM-NV-12	.010	2.69	1.58
13	ERM-NV-13	.015	3.51	2.65
14	ERM-NV-14	.015	5.75	2.17
15	ERM-NV-15	.010	3.75	.77

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

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

REGISTERED ASSAYER CERTIFICATE NO. 9425 WILLIAM L. LEHMBECK DATE SIGNED 4/30/84 Arizona U.S.A.

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 362C
June 20, 1984
SHIPMENT NO. HDS-97(A)
JAMES D. SELL
HDS-97 0-10
PAGE 1 OF 1

ASARCO INCORPORATED
Attn: F.R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 10 Pulp Samples

ITEM	SAMPLE NUMBER	Pb (%)
31	HDS-97 155-160	.04
32	HDS-97 160-165	.68
33	HDS-97 165-170	.52
34	HDS-97 170-175	.12
35	HDS-97 175-180	.14
39	HDS-97 195-200	.30
41	HDS-97 205-210	.34
42	HDS-97 210-215	.34
43	HDS-97 215-220	.34
45	HDS-97 225-230	.43

cc: Asarco Incorporated
Attn.: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

RECEIVED
JUN 25 1984
EXPLORATION DEPARTMENT

REGISTERED ASSAYER
CERTIFICATE NO. 9425
WILLIAM L. LEHMBECK
Arizona

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

ASARCO

Exploration Department
Southwestern United States Division

CERTIFIED MAIL
RETURN RECEIPT

October 16, 1984

Ms. Mary Lou G. Sainz
Santa Cruz County Recorder
P.O. Box 1150
Nogales, AZ 85621

Notice of Intention to Hold
Mining Claims
Trench Project
Harshaw Mining District
Santa Cruz Co., AZ

Dear Ms. Sainz:

Enclosed for recording in the official records of Santa Cruz County is the Notice of Intention To Hold Mining Claims Shell 188 thru Shell 237 located in the Harshaw Mining District, Santa Cruz County, Arizona.

Asarco's check for $5.00 as the filing fee for this Notice is enclosed, along with a return, self-addressed, stamped envelope.

Very truly yours,

J. R. Stringham
Assistant to the
Manager, SWED

JRS:mek
encs.

cc: J. D. Sell
A. J. Robles

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

ASARCO

Exploration Department
Southwestern United States Division

CERTIFIED MAIL
RETURN RECEIPT

October 16, 1984

Mr. Dean Bibles
State Director, State Office
Bureau of Land Management
Dept. of the Interior
P.O. Box 16563
Phoenix, AZ 85011

Trench Project
Harshaw Mining District
Santa Cruz County, AZ
Notice of Intention to
Hold Mining Claims

Dear Sir:

This Notice of Intention to Hold Mining Claims is made pursuant to 43 C.F.R. Subpart 3833 by J. R. Stringham as Agent in behalf of ASARCO Incorporated, the mailing address for which corporation is P.O. Box 5747, Tucson, Arizona 85703. The Certificates of Location for the following named claims are recorded in Santa Cruz County, Arizona, and have been assigned the following Bureau of Land Management Serial Numbers:

Name of Claim	Recorded in the Official Records of Santa Cruz County, Arizona		BLM Serial Number
	Book	Pages	
Shell 188 thru Shell 237	373	434 thru 533	A MC 219829 thru A MC 219878

The above claims are held and claimed by ASARCO Incorporated for the valuable mineral contained therein. Asarco intends to continue development of the claims. An affidavit of assessment work has not been filed for these claims as this is not required in the assessment year in which the claims

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

are located. This notice is for the period ending December 30, 1984.

ASARCO Incorporated

By: _____
J. R. Stringham

JRS:mek

cc: J. D. Sell
A. J. Robles

STATE OF ARIZONA)
) ss
County of Pima)

The foregoing instrument was acknowledged before me this 16th day of October, 1984, by J. R. Stringham.

Laura P. Gallegos McCrary
Notary Public

My Commission Expires:

My Commission Expires March 4, 1985

Nov. 26, 1984

F.D.S. / ~~F.R.S.~~ week before 15-22 of Dec.

Called Corry to give permission 11-29-84
He referred me to (A) below.

Dr. Charles Corry wants permission to run geophysical surveys (self potential & polarization experiments) from Paul Conley's land (Brownie Group) up 3-R Canyon up to and about the 3R Mine -- Sec 25, 35, and 36 T22S, R15E. They want to find the limits of S.P. response and measure the maximum I.P. response.

Dr. Corry is part of a cooperative composed of:

(1) Dr. Charles Corry (formerly Mgr. of Geophys Res. at Anaconda)
Dept. Geol. - Geophy.
Missouri Sch. of Mines (Rolla)
314-341-4852 his office
" " -4616 his sec. with Student

(2) Dr. Wayne Peeples
U. of Texas (El Paso) with Student

(3) Zong Geophysics (Tucson)
Contact: Dudley Emer
327-5501 Kan may go

(A) They did some work on Mt. Emmons (American Geophys. Union, EOS Vol. 65, No 45 ; 1983 or 1984) P 1080

I told Dr. Corry someone from ASARCO will be back to him by the end of the week.

H.G.K.

JDS

ASARCO

Southwestern Exploration Division

August 2, 1985

To: J. D. Sell

From: F. R. Koutz

Gold Geochemical Zoning
Red Mountain Deposit
Patagonia Mountains
Santa Cruz Co., AZ

W.L. Kurtz asked that I have the pulps from G.J. Stathis' 1973 surface geochemical study at Red Mountain run for Au. The strong advanced argillic alteration environment present on the surface at Red Mountain often has gold values of ore grade in other similar localities. Stathis had collected 65 samples in the Fall of 1972 to detail geochemical anomalies over a known deep porphyry copper system that might be useful in the search for buried deposits elsewhere. 59 Elements were analyzed by mostly semi-quantitative methods. The first 24 samples were analyzed for Au by Rocky Mountain Geochemical-Tucson, but all samples were less than the 0.1 ppm detection limit at the time.

A diligent search of the Ventura Warehouse failed to turn up the pulps. However, the crusher rejects for the first 54 samples were found and sent to Skyline for repulping and AA analysis (.002 ppm Au detection limit). The lost pulps may not have been returned from our former S.L.C. Geochemical Lab where they were sent for additional work, or they may actually be in the warehouse, but in a mislabelled box. The pulps may also have been mistakenly sent to the Florence Warehouse, and eventually ended up in the Santa Cruz Warehouse fire.

The attached results (TAJ 429) show Au ranging from <.002 to 0.82 ppm for the 54 samples with a mean of .031 ppm. Only 2 samples were >.1 ppm (.82, .15 ppm) and if these are excluded the mean of the remaining 52 is only .014. Note that Rocky Mountain Geochemical did not detect these two >0.1 ppm values. Of significantly anomalous values only 15 were >.02 ppm or weakly anomalous and 6 >.05 ppm (moderately anomalous for most geochemical systems). Some 14 values were <.005 ppm -- probably less than average geochemical abundance for rhyolite tuffs. The results confirm that there are no large near surface gold deposits on the upper slopes of Red Mountain.

I have plotted the results on Stathis' sample map (1973, Figure 4) 1"=2000' which shows that most of the >.02 ppm (20 ppb) Au values fall inside the area showing 'surface "live" limonite distribution'--also defined as >5 Vol.% original pyrite (now leached). The "possible" outline of deep primary Cu mineralization from a 1970 Kerr-McGee press release and the outcrop of the rhyolite tuff on top of Red Mountain is shown for comparison with other of Stathis' figures. It is now known (see Quinlan's 1981 AGS Field Trip Guide) that this "outline" only roughly corresponds to the west (NW) limb of the NE elongated Red Mountain deposit. The deep breccia high Cu-Mo grade pipe in the S.central low-grade core of the deposit is approximately beneath

Stathis' sample 3. The east (SE) limb is approximately beneath the SW/4 Sec. 21. The east limb does not correspond to Stathis' eastern "Secondary possible deep target," Figure 11.

The higher Au values (>.02 ppm--weakly anomalous) show a fairly good correlation with high values of As, Fe and V, and a fairly weak correlation with high Mo, Pb and Sr. The higher Au values show a poor correlation with higher values of Cu, Zn, F, Mn, Zn and Ag (high 1 ppm detection limit).

What exactly these correlations of Au values mean is uncertain. Stathis noted over the west limb of primary copper a good correlation of As, Mo and especially Pb. B, Cu and Ga formed halos beyond and La, Mn and Zn formed outer fringe halos. The higher Au values span all Stathis' zones of the presently known NW limb, but are low over the central core and the SW periphery of the deposit. Not enough samples were taken (or have been lost) to fully define the east limb, but the values are not as high as the west limb values. The west limb, however, is more strongly dissected and there is considerable vein-controlled mineralization on the NW limb around the Aztec Mine.

Kerr-McGee did not assay for Au on their surface geochemical survey for Cu, Mo, and As (enargite was early considered a key to copper mineralization), but Russ Corn noted that Au was usually below detection in surface geochem grab samples. These pulps were apparently thrown out when Kerr-McGee closed their Tucson Exploration office.

During later drilling Kerr-McGee consistently assayed for Au and Ag--especially in higher-grade Cu-Mo zones. Except for a few "high grade" local values of >.01 opt gold was generally .001-.005 opt where copper was >0.1-0.2%. With a 0.3% Cu cutoff the 385 m.t. in the total deposit averages 0.58% Cu, .009% Mo, .12 opt Ag and .003 opt (.10 ppm) Au. The 36 m.t. in the breccia pipe averaged 1.2% Cu, .028% Mo, 0.15 opt Ag and .004 opt Au. The Au values although by American Analytical were from before the bad high values were turned out by AARL in 1979-80. There is an outcropping breccia pipe on the SE flank of the deposit where Kerr-McGee did their 1980-83 assessment drilling that did contain a few spotty Au values up to several tenths opt Au. Kerr-McGee's drill hole core and data including assays (but not reports or reserves) are now available to the Continental Scientific Drilling Committee Group at their Nogales Airport warehouse.

Four distinct stages of alteration-mineralization complicate any interpretation metallic zoning from the surface or even in core. An early hypogene porphyry copper stage is pervasive and is dominated by high pyrite with minimal Cu. The surficial advanced argillic alteration is part of this system. A main stage more-Cu rich porphyry copper system more sharply domed and elongated NE-SW is superimposed on the early stage. The west and east limbs are part of this system. The main stage mineralization only reaches the present surface along restricted fracture zone. The breccia pipe system is the third stage forming its own internal porphyry copper zoning system which does not reach the surface. The fourth stage--supergene enrichment/alteration is

superimposed on the early hypogene system near the surface. These alteration mineralization stages were worked out by Kerr-McGee as summarized by J. Quinlan (1981 Guidebook article). The results have been confirmed by fluid inclusion studies (Bodman and Beane, 1980).

M.A. Chaffee, U.S.G.S., has been studying metallic geochemical zoning in a line of E-W drill holes--the same section A-A' DDH RM-157 to 158 shown in Quinlan's guidebook article. This work was reported at the Feb. '85 N.Y. AIME meeting. The sampling is somewhat suspect since Chaffee sub-sampled a "representative" 10' interval each 50 feet in the line of drill holes. The "representative" section was sampled to avoid "secondary" veins, etc. Au values above .04 ppm are considered anomalous. A few spotty values above this are scattered in many of the holes--a few more near the upper parts of the outside holes.

The main Au anomaly breaches to the central portion of the main stage system as an upward widening core cutting the late potassic-late phyllic shell directly above the breccia pipe and ponds "spreading" out laterally and becoming ragged about the position of the base of the present chalcocite blanket. It is not exactly clear whether the Au anomaly is related to the main stage mineralization or later. The anomaly as sampled in drill holes does not reach the surface. Stream sediment Au values (>.04 ppm) shown in Chaffee and others (1981) around Red Mountain are confined to the area to the SW near the Flux mine and to the NE of the mountain near Harshaw Creek.

The +0.04 ppm Au stream sediment anomaly (Background @ 0.02 ppm) follows the main crest of the Patagonia Mountain south to the 4 Metals Mine (breccia pipe). The anomaly has some distinct NE elongation west of Mowry and through the 4 Metals Mine. What the stream sediment anomaly means in terms of bedrock anomaly is uncertain, but much of the anomaly conforms to the alunite-pyrophyllite alteration zone which with slightly increased silicification somewhat holds up the crest of the Patagonias.

As part of F.T. Graybeal's 1972-73 "Sunnyside" study of the Patagonia Mountains over 300 geochemical samples were collected along E-W traverses across the range. The samples were not analyzed for Au because it was felt that the values would not be high enough to be significant at the sloppy lower detection limits available then.

The Patagonias are not known for their Au high values. There are only a few spotty Au placers in the range with insignificant production. Ores and concentrates produced from the Patagonias seldom contain enough Au - .02 opt - to be paid for its value by the smelter according to Trench Unit and Ore Purchasing records. Of course, .02 opt Au is heapleach ore in many cases today.

The Laramide of Arizona is not noted for its high Au values compared to the Jurassic (e.g. Bisbee) or the mid-late Tertiary. The reasons for this are probably related to the types of magmas being generated at the time.

I have located all the Sunnyside pulps in the warehouse and plan to select out those in the advanced argillic-argillic core (70-100 samples) of the range for Au analysis. There is no reason to run the complete set at this time. However, Chaffee's stream sediment anomalies for a number of elements are not as complete as Graybeal's 2 studies from surface samples and production records. The significance and associated possible bed rock Au anomalies should be checked out for a number of stream sediment anomalies not in the central portion of the Patagonias--particularly NE of Red Mountain. The source of the anomalous stream segments just south of the Hardshell deposit and east of American Peak is not known. Exxon was rumored to have collected a number of very anomalous Au samples in the jasperoids on American Peak and to the south. Sampling by F. Michel and myself around American Peak failed to confirm a bed rock anomaly in the jasperoids here.

F. R. Koutz /mek

F. R. Koutz

FRK:mek
Att: Assays (TAJ 429)
Sample Map and Results

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 429
June 13, 1985
W.L. KURTZ
SHIPMENT NO. GJS-73-RM
RM:1-54

ASARCO INCORPORATED
Attn: Mr. Fleetwood R. Koutz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

ASARCO Incorporated
JUN 14 1985
SW Exploration

Analysis of 54 Crusher Samples

ITEM	SAMPLE NO.	Au (ppm)
1	RM-1	.007
2	RM-2	.006
3	RM-3	.003
4	RM-4	.004
5	RM-5	.020
6	RM-6	.050
7	RM-7	.024
8	RM-8	.006
9	RM-9	.003
10	RM-10	.004
11	RM-11	.820
12	RM-12	.024
13	RM-13	.150
14	RM-14	.070
15	RM-15	.019
16	RM-16	.050
17	RM-17	.022
18	RM-18	.070
19	RM-19	.009
20	RM-20	.009
21	RM-21	.032
22	RM-22	.018
23	RM-23	.009
24	RM-24	.009
25	RM-25	<.002

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 429
June 13, 1985

ITEM	SAMPLE NO.	Au (ppm)
26	RM-26	.009
27	RM-27	.013
28	RM-28	.003
29	RM-29	.003
30	RM-30	.005
31	RM-31	.008
32	RM-32	.003
33	RM-33	.006
34	RM-34	<.002
35	RM-35	.007
36	RM-36	.007
37	RM-37	.015
38	RM-38	.008
39	RM-39	.003
40	RM-40	.005
41	RM-41	.004
42	RM-42	.005
43	RM-43	.004
44	RM-44	.006
45	RM-45	.024
46	RM-46	.026
47	RM-47	.017
48	RM-48	.010
49	RM-49	.008
50	RM-50	.011

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

JOB NO. TAJ 429
June 13, 1985

ITEM	SAMPLE NO.	Au (ppm)
51	RM-51	.008
52	RM-52	.003
53	RM-53	.002
54	RM-54	.014

cc: Asarco Incorporated
Attn: Mr. W.L. Kurtz
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

cc: Asarco Incorporated
Attn: Mr. James D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

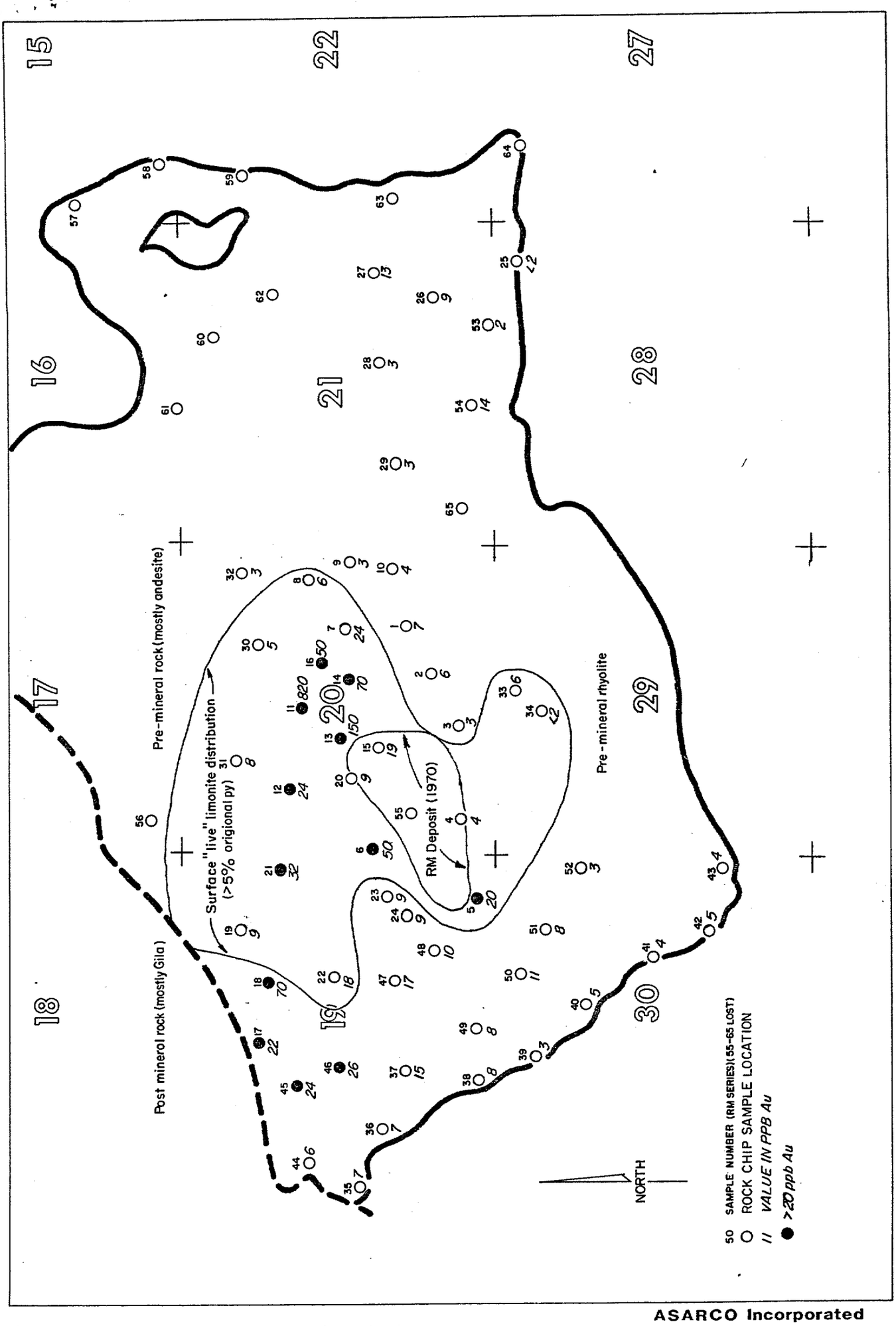
cc: Asarco Incorporated
Attn: Ms. Mary Kavanagh
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

REGISTERED ASSAYER
CERTIFICATE NO. 9425
WILLIAM L. LEHMBECK
DATE SIGNED
Arizona U.S.A.
6/13/85

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122



RED MOUTAIN GOLD ASSAYS (TAJ-429)

ASARCO Incorporated

1985 GOLD PROGRAM

AMS Sheet: Nogales, Az.

USGS Quad.: Elgin & Lochiel,Az. 15'

Twsp.: 22S **Rng.:** 16E **Sec.:** 15-22,27-30

Prospect Name: Red Mountain

Owner: Kerr-McGee

Examined by: F.R.Koutz(after GJS mn2589)

Follow-up Recommended: Yes ☐ **No** ☒

State: Arizona

SCALE: 1"=2000'

County: Santa Cruz

District: Harshaw

MILS and/orTerradata no. _____ / _____

map no. 6291 **date** 9/85

JDS

ASARCO

Southwestern Exploration Division

October 2, 1985

F. T. Graybeal
New York Office

Low Grade-Heap Leach Gold Potential
Oro Blanco Mining District
Santa Cruz County, AZ

Attached are two memos by F.R. Koutz with the aid of T. Dalla Vista.

As with the Steeple Rock District, N.M., the Oro Blanco District has held a long history of one-day visits by Asarco personnel and with lots of smoke but little else with a general tangled land problem. The past 10-15 year problem of the Border and Hippies has also contributed to a lack of an overall investigation.

Fleet is spending several more days reviewing in the field and will propose a study program for the district which we may then do later this year.

James D. Sell

James D. Sell

JDS:mek
Atts.

cc: W. L. Kurtz
F. R. Koutz
T. Dalla Vista

ASARCO

Southwestern Exploration Division

JDS

September 30, 1985

To: J. D. Sell

From: F. R. Koutz

Low Grade-Heap Leach Gold Potential
Oro Blanco Mining District
Santa Cruz Co., AZ

I attach two memos--the outgrowth of T. Dalla Vista and my Sept. 13 visit to the Oro Blanco District with some file and BLM microfiche work and phone calls by me. In summary, the Oro Blanco District contains a number (4-5+) of incompletely to over-drilled areas of shallow gold mineralization purported to be in the ½-1 million ton + range at grades of .05-.10 opt with up to several opt Ag. There are also a number of known undrilled +.01 opt Au surface anomalies with areas suggesting up to several million tons to less than 200 feet depth. Most of these areas will, of course, have fewer tons and lower grades when all drilling data has been brought to light, but at present I do not have the data to dismiss them. There is also the potential for deeper (below Air-Trak range) targets in permeable low-angle volcanics and fracture zones. Almost all the areas have or have had considerable property problems. There is a possibility that although individually too small, several of the properties could be combined to make a viable leach operation. In short the district deserves a thorough review of past drilling data and geology-mineralization in the field.

At present, besides W. Ewing I have contacted Jay Santos of NCA Minerals, Yerington, NV, who now reports some 90 holes ("600,000T @ .06 opt Au and 1 opt Ag") plus a new surface anomaly (1½-2 m.T. potential) @ .023-.046 opt Au. Mr. Santos also mentioned that John Mohon did considerable work in the district two years ago for St. Joe Minerals. Mr. Santos will send his new data and stop by on his way to the district in late October.

I have also contacted promotor Robert Johnson, who lives on the Arivaca road and will visit him October 2. Mr. Johnson has (optioned?) some 170 acres including the Old Glory and claims he had 300-500,000T @ .08-.10 opt Au plus other good areas. Mr. Johnson apparently used to have a lease on the Margarita also and has collected considerable geochem. and drilling data in the district. John Mohon confirmed the potential of the district and mentioned several other contacts for information and areas of interest. I will keep you posted on progress.

F. R. Koutz

FRK:mek
Att.

*J.H. Montgomery's Pirates Gold summary just arrived for files

JDS

ASARCO

Southwestern Exploration Division

September 13, 1985

To: J. D. Sell

From: F. R. Koutz

Margarita-Old Glory Mine Area
Pirates Gold Corp. (VSE)
Oro Blanco District
Santa Cruz Co., AZ

On September 13, T. Dalla Vista and I visited the above mines to check out, as requested by you, an announcement in the August 27 George Cross News Letter on Pirates Gold purported to have 500,000 T @ .06 opt Au, shallow, flat-lying with a 1:1 waste/ore ratio, from extensive sampling including 300 drill holes with additional sampling and 22,000' of RDH and DDH starting this month.

On the way into the Margarita, some 1-2 miles SSW of Ruby we met W.R. Ewing, President of Arizona Western Mines with whom we detoured for the morning for a visit to his heap-leaching and planned mining operations at his Oro Blanco Mine residence several miles to the south of the Margarita. Mr. Ewing provided a review of recent history of the district including that at the Margarita since the July 15, 1977 review of the Pittsburgh Plate Glass (PPG) Industries drilling report by you.

Besides the Margarita section and tidbits scattered through our Oro Blanco District files, I consulted some of my 10 year old notes on Louis Knight's 1970 (UofA) dissertation on the district (we do not have a library copy). Under "Ruby property" in our files, a June 1983 report by John G. Payne for a Goldsil Resources Prospectus provides drilling data on 1981 Energy Reserves Group (ERG) drilling at the Margarita. We also met a geological crew (3-5 men) from Montgomery Consultants (for Pirates Gold, 203-2786 W. 16th Ave., Vancouver) locating old drill holes, doing mapping and geophysics (EM) using the equipment of James D. Sorrel, one of the property owners also with the Canadian crews.

According to Mr. Ewing and confirmed by the Montgomery geologist, the Margarita area has been drilled 4 times since PPG, although complete drilling data/assays are missing from 2 of the drilling projects. The Old Glory property has also been drilled 3 or 4 times, most lately by Chester Millar of Red Dog Mining;part of Glamis Gold and/or part of a Teck-Highland Crow (Gordon Kieval) sub-company. (Mr. Millar is on the Teck board of directors?) Millar spent two weeks this May drilling some 25 holes to about 100' max. depth by an old Air Trak--still at the Old Glory Mine-- but the results were apparently not encouraging. There are a number of rotting/ vandalized sacks of cuttings exposed on the Margarita property from 1983 (?-number: M83N-83 etc.).

Both the Old Glory and Margarita properties have been under litigation over the last few years, apparently cleared up now. Recent posts on the Margarita have June 1985 amendment notices to 1969 claims by Marion C. Wallace and James D. Sorrel. The Goldsil Report (1983) says that Charles (Chuck, Chick?) Hagerty was the property owner. Mr. Ewing says that a Bob Johnson, living on the Amado-Arivaca Road, sold or optioned the claims to two parties at the same time several years ago. Mr. Ewing says that a number of Tucson, Reno and Vancouver exploration companies have extensively sampled and mapped the property over the last 7 years--many claiming to have an option from various, often competing claimants to the property.

A quick review of the 1981 ERG data shows some 47 drill holes, less than 100' deep each drilled on a 70' diagonal grid of which 24 showed intercepts of ≥5' of + .02 opt Au (480' total). The mineralized zone is about 500' N-S and 400' E-W in the central part and 200' E-W on the N&S ends. With an average intercept of 20' >.02 opt (the intercepts are often discontinuous) and 13 cu.ft./T with average width of 300' this would give some 230,000T (500 x 300 x 20 ÷ 13). The weighted mean of intercept grades is .065 opt Au. The average depth of the bottom of the "ore" is 39 feet. A rough ore/waste ratio is .93/1. Presumably more carefully done reserves by Payne and ERG are 250,000T @ .062 opt or 230,000T @ .060 opt Au.

Mr. Sorrel claims reserves of 600,000T @ .08 opt Au from all drilling projects from which he has data including PPG. Mr. Sorrel claims that the PPG assays are good. The PPG data from 29 Air-Trak holes shows values of .0X opt by a special "wet" method by "PM" Labs (a notorious "high" lab from the late 1970's) while fire and AA values from reliable labs consistently give .00X on less Au. Details of the ERG drilling (apparently new holes) and assaying are not known, but it is in the same area as the PPG drilling so an unresolved sampling-assay problem exists. There are hundreds of drill hole collars from the various drilling compaigns on the property--many around the old workings on 10-40 foot centers so Pirates "300 previous drill holes" may even be under estimated.

The Montgomery geologist provided no information but they will drill in any case and have plenty of financing and are talking to the Old Glory "owners." As is usual, according to the Montgomery geologist most of the unfavorable data is missing. Mr. Sorrel said PPG could have had a permanent interest in the property if they had made their last $5000 payment. Apparently payments (or work commitment-stock) now are $100,000 (per year?).

Mr. Sorrel said he will put Asarco "on the waiting list" after I asked him if he would bring his complete set of data to us if Pirates gives up the property.

The Margarita occurs in welded and non-welded tuffs with minor breccias and epiclastic sediments which appear to dip shallowly to the north. In the area of the old workings, however, bleaching-sericitization with silicification-silica veinlet stockworks with several percent goethite and hematite are so pervasive that the host-rock texture is difficult to discern. Trace malachite and alunite (?) were noted. The alteration-volcanic textures appear quite similar to that over the Hardshell-Hermosa deposits in the Patagonias--although the silicification is not nearly as pervasive--to massive jasperoid as to Hardshell. Knight mapped this area as part of the shallow NNE-dipping Jurassic Cobre Ridge Tuff. To the east of and south in the valley--between the Margarita and Old Glory are porphyritic quartz monzonite to granodiorite irregular sills and dikes. The white feldspars to 1 cm. are well sericitized and the rock as a whole weathers in low relief while the silicified tuffs form ridges. These are part of Knight's Sidewinder Quartz Monzonite--shallow northward (20-30°) dipping irregular dike swarms. Knight* claimed that these dikes are Early Tertiary and post-mineral. I was not convinced of this in the few hours I spent in the area. The dikes certainly have a close spatial if not genetic association with mineralization, but the contacts I observed were poor. Outcrop over the area is fairly good, however, through the scrub oak and heavy grasses.

The mineralized (Fe-Ox afer pyrite) and altered zones at Margarita appear to be somewhat discontinuous and stacked: some 300-800' E-W to NNW and a few 100 feet N-S for individual zones. The 2-3 glory holes some 150 x 100 feet in very irregular area and 50-60 feet deep suggest maximum production of several ten-thousand tons (AZ Bur. Mines Bull. 191, 1975, p.64 lists only 4400T @ 0.3 opt Au and 0.6 opt Ag). Knight says there are 1200 feet of workings. The old workings appear to have followed the more fractured shears with more hematite. High angle WNW to E-W fracturs, dipping N&S are more common than low angle fractures.

The Old Glory mine area some 2-3000 feet S is similar to the Margarita, but with more extensive mineralization and workings. There are more thick quartz veins and more QMP dikes (poorly altered) at Old Glory. Knight suggests 17,000T removed and a fairly extensive mill foundation is present in the Canyon to the east. The Payne report says that 75,000T @ 0.6 opt were produced in the area which would appear to be more accurate. Reserves (apparently greatly exaggerated) as of 1915 in our files were 220,000T @ $\frac{1}{4}$ opt Au. There are easily $\frac{1}{2}$-1 million tons of material at Old Glory that deserve to be drill-tested (and probably were).

Overall both T. Dalla Vista and I were impressed with the strength and pervasiveness of iron oxide and sericitization with local silicification at both Margarita and Old Glory. Knight suggests that these flat-lying silicified zones in the Cobre Ridte Tuff have little potential for deposits of any size. This may be so for deposits in the +10 million ton range, but

I suggest that smaller deposits, especially at depth below present drilling in stratiform permeable zones has not been disproved with our present knowledge. I suggest that previous and recent drilling data be obtained from the owners and the district be examined in more detail.

F. R. Koutz

FRK:mek
Att: ER

cc: T. Dalla Vista

* L. Knight now says after dissertation was completed Anaconda dated the Sidewinder QM at 24 m.y.--equivalent to base of Montana Peak Tuffs, the Ruby Diorite at 90 m.y. and the Cobre Ridge Tuff is Jurassic, but the K-feldspar K-Ar date is rough. He will send copies of his plates and figures--missing or irreproducible in the UofA Library PhD copy.

ASARCO EXPLORATION RECORD

G. Cross News Letter
27 August 1985

[X] FIELD EXAMINATION [ ] LITERATURE SEARCH [X] ASARCO FILE [X] Pirates Gold Corp. Vancouver

Section I General Indexing

① Name(s) of Property or Area: Pirates Gold Corp. Margarita & Old Glory Ruby Property-Goldsil						② Country: USA-Santa Cruz Co.	③ State or Province: Arizona
						④ USGS Quad. 7½' Bartlett Mt.	⑤ File or Gore No.
⑥ Latitude: 31°17'N	⑦ Longitude: 111°15'N	⑧ AMS Sheet: Nogales	Township: 23S	Range: 11E	Section: 7	⑨ Examined by: F.R.Koutz-T.DallaVista	⑩ Date: 9/13/85
						⑪ Office: Tucson	⑫ Field Days: ½

Section II Sources of Information

Date Typed 9/30/85

⑬ References

Author	Date	Title	Publications	Vol. No.
Knight, L.H.	1970	Struct.&Mineraliz.-Oro Blanco Min.Dist.	UofA PhD	171p.
Sell, J.D.	1977	Margarita Group (PPG Data)	Asarco Files	
Asarco Files		Oro Blanco Dist.(esp. Ruby Prop., J.G.Payne-Goldsil/ERG rept.)		

Section III Appraisal

⑭ Recommendations
- [X] Action Now
- [?] Too Low Grade
- [?] Too Small
- [X] Ownership Problem
- [ ] Access Problem
- [X] Rev.District

⑮
- [X] Post Producer
- [ ] Producer
- [X] Mineral Deposit
- [X] Prospect
- [X] Bad Assays ?
- [?] deeper targets
- [X] Geologic Concept
- [X] Geochem Anomaly
- [?] Geophy Anomaly
- [ ]

⑯ Production

Commodity	Tons	Grade
Au(Margarita)	4,440(min)	0.3 Au+0.6Ag
Au(Old Glory)	75,000	0.6 opt

⑰ Reserves
- [ ] Measured
- [X] Estimated

Commodity	Tons	Grade
Au	500,000 ??	.06 opt
	Stripping Ratio	1:1

⑱ Num. Drill Holes 300+
Approx Total Footage 25,000'

⑲ Excavations Several 1000' workings-Several Old Glory holes. see files

⑳ [ ] Spectro. Analysis Attached ㉑ [ ] Assays Attached ㉒ [ ] Geochem Results Attached

Section IV Geologic Data

㉓ Commodity or Contained Metals: Au-Ag

㉔ Ore Minerals-Major: Electrum (.700 fine) pyrite Minor: malachite (T Pb-Zn oxide)

㉕ Host Rocks-Major: Tuffs-welded & non-welded Loc.seds Minor: Qtz Monz.Porph. Dikes-Sills

㉖ Age of Host Rocks: Jurassic + Bx 24 m.y.

㉗ Nature of Exposures: Fair to good, 300' of relief. Scrub oak & grass. Silicified volcanics weather to highs, QMP to lows in valleys. Alt. destroys texture

㉘ Alteration: Silicified WNW veinlets--fractures, pervasive sericite-clay, local jasperoid Trace alunite (?)

㉙ Total Extent: 3000x1500'(N-S) each but spotty

㉚ Structure: N to NNE shallow-dipping volcanics. W to NNW fractures (high sangle): some low angle fractures. Glory holes are stockwork zones. QMP intrudes ore zones (post min?)

㉛ Ore Occurrence: Shallow, gently north dipping silicified-stockwork veinlets with several percent pyrite now oxidized. Best areas 500'x300'x40' deep.

㉜ Age of Mineralization: Laramide?

㉝ Conclusions & Recommendations: Similar to alteration over Hardshell-Hermosa--but more spotty. This high potential area has apparently been thoroughly tested to 100 feet for shallow OP heap-leach Au and what has been found several 100,000T of .05 opt is spotty & may not be able to be mined with present Au price. All available data should be assembled & the district reviewed for missed areas. Deeper targets in flat permeable zones in volcanics may exist. District should be reviewed and examined in detail in spite of promotors, drug and other border problems.

(For additional space use extra sheets)

JDS

ASARCO

Southwestern Exploration Division

September 18, 1985

To: J. D. Sell

From: F. R. Koutz

Oro Blanco Mine Area
SW/4 Sec. 17, T23S, R11E
Oro Blanco District
Santa Cruz Co., AZ

On our way into the Margarita Mine on Sept. 13, some 1-2 miles south of Ruby, T. Dalla Vista and I met W. R. Ewing, President of Arizona Western (ex-Legend) Mines. We detoured for a morning around his mining and heap leach operations at his Oro Blanco Mine residence and reviewed recent developments in the District. Mr. Ewing, his partner Maria V. Voyles and several others associated with these ventures are among the more legitimate mine developers/prospectors/promotors in the area. There are also several dozen "hippies" of various ages living in tents, shacks, old buses and trailers scattered over the district--mostly squatting but some living on their own or on others (with and without permission) patented claims. A number of marijuana growers at Ruby Townsite and vicinity were arrested earlier in the week and a number of others under surveillance were in the process of moving according to Ewing. Everyone has been quite friendly according to Ewing and no booby-traps (except possibly leaving with the Ruby crew) are present. Ewing says other border problems are greatly exaggerated in the Nogales and Tucson papers.

I attach a 1984 private placement prospectus of Arizona Western Mines which includes a summary report by Vic Livingston and John Vuich which review the Oro Blanco Mine (36 claims) including 1983-84 work by Rayrock Mines. Rayrock apparently spent some $150,000 in the area and drilled 6000 feet. Mr. Ewing was busy getting Middle Fork Mines (Vancouver) who had a lease after Rayrock to remove the last of their equipment, etc. Middle Fork drilled 50-60 holes but the best they came up with was 30-40' of .03 opt Au but had some long intervals of 1 opt Ag (in MnOx). Sampling underground in the Oro Blanco Mine by others, mostly Rayrock, suggests some 165,000T @ .28 opt Au (+ prob 1-2 opt Ag). Maps by Rayrock show 95' of 0.287 opt Au perpendicular to the vein trend across a shatter zone between the "middle" and "SW" or "parallel" vein on the 125 level of the Oro Blanco Mine. There are also averages of 73' @ .094 and 45' of .130 across other veins.

E.A. Swanson (under L.K. Wilson) examined this mine for Asarco in 1950 (see Smuggler Gulch in Oro Blanco files and maps 886 and 887), and suggested "developed-proven" and "probable" vein ores at 40,000 + 43,000T over an average 4.6' width with 1906 assays suggesting a grade (probably high) of 0.32 opt Au. Swanson suggests reserves for this mine, and the nearby Smuggler Gulch and Tres Amigos Mine of 70,000T @ .25 opt Au and 1.0 opt Ag developed and 93,000T @ 0.15 opt Au and 0.5 opt Ag probable--all above 125 to 280 feet depth and strike lengths of 800-1000'. Ewing apparently holds all this ground.

Rayrock although they did plenty of sampling and mapping with some drilling did not find the bulk tonnage-open pit target they were after. Just west of the divide between Old Glory Canyon and Warsaw Canyon (extreme SW corner Sec. 7) Chester Miller, one of the directors of Highland Crow-Teck (+Red Dog Mining - Glamis Gold), drilled 21 Air Trak holes this May to 90' maximum. Of 92 ten-foot assays (Skyline UVK 008) 8 were 1-3.3 ppm, and 29 were ≥0.3 ppm (mostly .3-.6 ppm) but there were no large continuous intervals >0.3 ppm Au. Mr. Ewing will have the samples run for Ag as there are spotty manganese oxides in the area.

The WNW striking 50-80° NE dipping fissure-breccia veins in the Oro Blanco Mine area are developed in apparently parallel-dipping Jurassic ash flow tuffs, conglomerates, grits and breccias intruded by irregular Laramide (?) diorite dikes (probably Louis Knight's (PhD 1970 UofA) Sidewinder Quartz Monzonite). The veins are not well silicified and often don't outcrop well, but show silica and limonite halos for at least several tens of feet away from the veins. The countryside is more or less weakly to moderately sericitized, which increases toward the veins. There are a number of brecciated zones at least several tens of feet wide which show strong MnOx and Fe oxide flooding which look quite good. Overall the alteration and iron oxides are impressive and suggest that the area needs to be gone over and sampled quite closely. A number of companies have done this and wide zones with .0X opt Au and .X opt Ag are common, but the grades usually decrease with depth and/or are spotty in what drilling has been done according to Mr. Ewing.

Mr. Ewing has a 500T cyanide leach pad (lined) set up complete with crusher, ore bin, cement-agglomeration unit, carbon columns, stripping unit, retort, etc. which all looks quite workman like with all state permits, and produced one Doré bar. The grade on the pad is .12-.15 opt Au and 2 opt Ag. They plan to go back into operation within a month cycling the leach pad and starting to produce from the 125 level of the Oro Blanco Mine, now fairly well equipped with hoist, jacklegs, etc. and a Mexican mine crew of up to 12. Mr. Ewing has apparently bought considerable equipment from Kerley Chemical who he uses with Skyline for his assays. He is also thinking of picking up the pilot plant (?) that Kerley used to "recover" silver from manganese oxides.

The directors of Arizona Western might be willing to part with 50% of their property for a $500,000 work commitment--85% in the ground, but are not actively looking for partners. They are mainly interested in vein mining +.15 opt Au. Mr. Ewing offered to let us go over all the data and reports he had collected from those who have worked on the property for the last 4-6 years and suggested we come back and visit next month when he is operating. I said I would be in touch with him in late October.

Mr. Ewing said that the ground around him to the south was held by NCA Minerals out of Yerington who have drilled some 70-100 holes--some last year to 200' by a big Air-Trak rig. Our files (White Gold property) show that H.G. Kreis reviewed data from this property in June 1983. Although

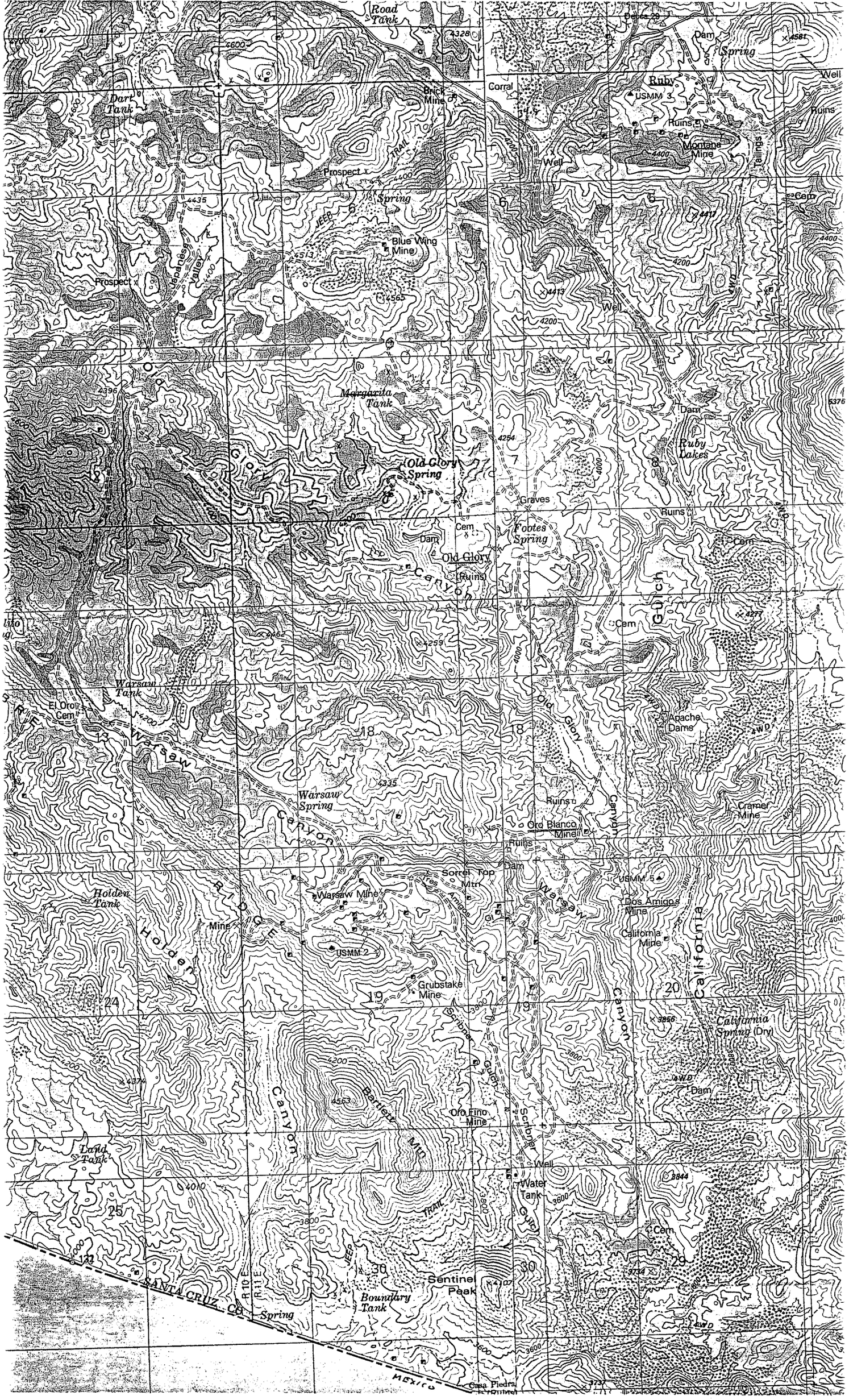
the owners claimed 500,000T @ .07 opt Au, Hank suggested that there was only 100,000T @ 0.04-0.08 opt Au. The 1" = 40' map with the data shows of a 1200' x 1200' area with 320 grid surface samples over a 1000' N-S by 400' E-W area showing 60% >.015 opt Au which might average 0.04 opt. Unfortunately, drilling in this area did not confirm the surface grades. NCA should be contacted to determine what additional data they have developed and the area examined in the field.

Although the Oro Blanco district apparently has been well picked over, I believe the area deserves a thorough review including at least several weeks of examination in the field and contacting property owners/promoters for data. G.W. Pickard reviewed the files and Knight's PhD thesis in 1975 and there was some interest in a possible buried porphyry copper in the Bear Valley area at that time. The last field work was in 1966 by M.R. Stauffer who visited and sampled a number of the properties including the Margarita and Old Glory. The area is one of the few base metal districts in southern Arizona that contains significant gold. Why this is so is uncertain, but it may have to do with host-source rocks: the Jurassic volcanics and intrusives rather than the notoriously Au-poor Laramide in the state. The mineralization may also be related to the Montana Peak ash flow tuffs (2 miles NE) with accompanying rhyolite dikes which may be Middle Tertiary--a epoch of relatively high gold mineralization.

F. R. Koutz

FRK:mek
Att: 7½ min. map

cc: T.Dalla Vista


Road Tank
Dam
Spring
Well
Ruby
USMM 3
Ruins
Montana Mine
Tailings
Corral
Brick Mine
Dark Tank
Prospect
Spring
Blue Wing Mine
Japanese Valley
Cem
Margarita Tank
Old Glory Spring
Ruby Lakes
Graves
Footes Spring
Old Glory (Ruins)
Old Glory Canyon
Old Glory Gulch
Warsaw Tank
El Oro Cem
Warsaw Canyon
Warsaw Spring
Apache Dams
Cramer Mine
Oro Blanco Mine
Sorrel Top Mtn
Tres Amigos
Warsaw Mine
USMM 5
Dos Amigos Mine
California Mine
California Canyon
California Spring (Dry)
Holden Tank
Holden Canyon
USMM 2
Grubstake Mine
Scribner Gulch
Barlow Mtn
Oro Fino Mine
Land Tank
Water Tank
Sentinel Peak
Boundary Tank
SANTA CRUZ CO
MEXICO
Casa Piedra Ruins

JDS

ASARCO

Southwestern Exploration Division

October 4, 1985

FILE MEMORANDUM

Margarita Property
Santa Cruz County, AZ

AMAX Exploration made an ore reserve estimate on the Margarita Property according to conversations brought back by F. R. Koutz and in some of the reports from the property owners.

I called C.P. Miller, Manager, AMAX Exploration, Tucson, and inquired about the study. He was kind enough to allow me to read the report and take notes before it and all the files were sent to Denver upon the final closing of the Tucson Office.

The reserve was prepared by B.C. Koskiniemi, formerly with Anamax. No verification of the assays, no further drilling, no testing of any kind was done by AMAX, i.e., they assumed all data was correct. Using previous data, however obtained from the owners, a series of cross-sections were prepared and the preliminary reserves calculated from these.

Four pits were outlined in the study and the geological preliminary reserves are:

1.	Margarita	264,900	tons	@	0.052	opt	Au
2.	N. Margarita	51,600	"	"	0.035	"	"
3.	N. Hill	175,400	"	"	0.059	"	"
4.	Cascabel	24,000	"	"	0.070	"	"
	Geologic Total	515,900	tons	@	0.054	opt	Au

Mineable reserves are less than that depending upon the cut-off used and the percent metallurgical recovery used.

Using a "no-frills" approach, AMAX estimated capital costs at $1.4 million, operating costs at $16,000 per week on a production mine rate of 500 TPD, or 2,500 tons per week, with leach-precipitate at a 7 day week, and, other costs at $½million. Other included capitalization of investment by present limited partners, further drilling, metallurgical testing and feasibility studies. The total cost per ton of ore, without stripping, was estimated at $10.14 per ton. The cost of $1.10 was assigned per ton of waste mining. $400 Per ounce gold was used.

Verbally, Mr. Miller said that geologically they believed that the sill of intrusive in the area was along a flat lying fault. As one pit area was under the fault intrusive and the other on top, then further exploration targets were available. Of course, the depth increases, and hence the stripping ratio, so a trade off at the gold content is soon reached.

The addendum contains the Summary, Geological Reserve method, the estimated ore reserves and ore cut-off analysis.

James D. Sell

JDS:mek
atts.

cc: W. L. Kurtz
F. R. Koutz

Addendum

SUMMARY

The reserves developed in this study are considered to be of a very preliminary nature and refinements must be made if preliminary feasibility is established favorably. The results are summarized in Table 1.

Geologic reserves are estimated at 516,000 tons at 0.054 ounces Au per ton using a 0.020 ounce grade cutoff.

Mineable ore reserves were estimated from open pit designs taking into account economic stripping limits. Two pits were designed on the basis of different metallurgical gold recoveries, (1) 60% recovery, and (2) 100% recovery. Mineable reserves within the pit outlines at a 0.020 ounce cutoff are as follows:

No studies yet done on % met. recovery therefore assume for the preliminary study.

Pit Design	Ore		Stripping Ratio
	Tons	Oz Au/Ton	W:O
60%	361,000	0.064	1.21:1.00
100%	442,000	0.058	1.35:1.00

The entire study was done in AMAX's Tucson Office during the period of April 26 1984 to May 4, 1984, where all cross-sections, maps, pit designs, reports, and back-up data used and/or developed in this study are on file.

TABLE 1

MARGARITA PROPERTY
SUMMARY OF ESTIMATED ORE RESERVES

Area	Sec.	Geological Tons	Geological Oz. Au/Ton	Mineable (Cutoff w/60% Recovery) Tons	Mineable (Cutoff w/60% Recovery) Oz. Au/Ton	Mineable (Cutoff w/100% Recovery) Tons	Mineable (Cutoff w/100% Recovery) Oz. Au/Ton
Cascabel	2	7,173	.084	4,782	.102	7,173	.084
	3	16,825	.064	16,825	.064	16,825	.064
Subtotal		23,998	.070	21,607	.072	23,998	.070
North Hill	6	3,754	.032	-	-	-	-
	7	12,404	.032	3,998	.041	10,486	.033
	8	12,749	.072	4,817	.149	7,020	.110
	9	3,072	.089	1,536	.152	3,072	.089
	10	24,898	.053	22,630	.056	22,630	.056
	11	4,586	.060	3,182	.074	3,182	.074
	12	13,888	.051	3,456	.118	9,280	.066
	13	13,490	.050	10,902	.056	10,902	.056
	14	26,037	.043	21,216	.046	26,037	.043
	15	18,480	.060	18,480	.060	18,480	.060
	16	17,875	.055	8,781	.084	8,781	.084
	17	4,266	.060	1,466	.141	3,868	.073
	18	8,015	.058	6,054	.069	8,015	.058
	19	10,160	.172	10,160	.172	10,160	.172
	20	1,696	.032	-	-	1,696	.032
Subtotal		175,370	.059	116,778	.076	143,609	.067
North Margarita	23	10,150	.042	2,342	.099	5,660	.058
	24	41,459	.033	12,135	.045	26,797	.038
Subtotal		51,609	.035	14,477	.054	32,457	.041
Margarita	27	17,617	.038	9,240	.045	9,240	.045
	28	10,521	.066	10,521	.066	10,521	.066
	29	36,600	.042	36,600	.042	36,600	.042
	30	29,744	.046	19,844	.052	27,581	.047
	31	51,304	.052	33,496	.061	48,887	.053
	32	41,472	.051	35,208	.055	41,472	.051
	33	37,296	.063	30,528	.071	33,408	.066
	34	36,036	.057	30,852	.063	32,472	.061
	35	1,504	.025	-	-	-	-
	36	1,440	.085	1,440	.085	1,440	.085
	37	1,408	.038	-	-	-	-
Subtotal		264,942	.052	207,729	.057	241,621	.054
TOTAL		515,919	.054	360,591	.064	441,685	.058
Strip ratio				1.21		1.35	

GEOLOGICAL RESERVES

The geological reserves were estimated from east-west cross-sections. The sections were AMAX generated computer printouts at a scale of 1" = 50'. Information on the sections included surface topography and drill holes. Generally, assays were shown for five foot assay intervals where the grade exceeded 0.010 ounces of gold per ton. Cross-sections were generally about 50 feet apart which follows the drill spacing of ± 50 feet between holes.

Cross-section locations are shown on area topography maps at a scale of 1" = 100'. A total of 37 cross-sections were generated. Sections 1 to 26 are located on Topography Map-1, and sections 27 to 37 are on Map-2, both of which are on file in the AMAX office. Cross-section coordinates and distance of influence are shown in Appendix I.

The sections did not include any geology and no geological interpretations were added to the sections. AMAX geologists are in the process of analyzing and/or developing geological data and maps.

The ore block model was developed on the cross-sections using a block height of ten feet with an average assay of 0.020 oz. Au, or greater. Generally, the horizontal block dimensions extended midway between drill holes on sections and midway to the adjoining sections. Blocks were not located by levels but only by assay intervals. However, a ten foot bench height was also assumed for pit design in determining mineable reserves. (As per Brost, September 1981).

Tonnages were based on a factor of 12.5 cubic feet per ton Brost and others).

For end holes it was assumed that the mineralization extends 20 feet beyond the hole. Also, in areas where a section does not have any drilling, the mineralization was assumed to be continuous if both adjoining sections contained ore blocks in the area concerned.

Total geological ore reserves are estimated at 516,000 tons, averaging 0.054 ounces of Au per ton at a 0.020 ounce cutoff (See Table I).

Appendix II includes a listing of ore blocks by cross-section and drill hole. Also included are block dimensions, tonnages and grades.

TABLE 2

Ore Cutoff Analysis
(w/o Stripping)

	$/Ton Ore
Operating Cost $16,000 - 2,500 tons	$ 6.40
Capital $1,372,000 - 500,000 tons	2.74
Other Expenses $500,000 - 500,000 tons	1.00
TOTAL COST	$10.14

Grade Cutoffs

@ 60% Recovery
$10.14/ton ÷ ($400/oz Au x 0.6) = 0.042 oz Au/ton

@ 100% Recovery
$10.14/ton ÷ ($400/oz Au x 1.0) = 0.025 oz Au/ton

Margarita Mine
Santa Cruz Co. AZ

NORTHLAND BANK(NLD-V,T,Alberta)

ONTHS ENDED 31 JULY	1985	1984
otal Interest Revenue	$102,650,000	$72,483,000
let Income	2,140,000	2,346,000
Per Share	33¢	44¢
Total Assets	$1,364,300,000	$972,400,000

In presenting l results of Northland Bank in t months ended 31July85 management s ses including new-branch start-up expenses and some modest interest reversals impacted third quarter performance by about 10¢ per share. Also, there was a drop in fee income dropped, mainly due to the timing of receipt rather than a real interruption in fee generation. Net earnings were $291,000 vs $1,043,000 in third quarter 1984, being 4¢ vs 16¢ per share. Management expect fourth quarter results to rebound.

ARGYLL ENERGY CORPORATION(AYE-T)

SIX MONTHS ENDED JUNE 30,	1985	1984
Oil and Gas Sales, Net	$3,097,406	$1,832,204
Cash Flow	1,509,131	1,074,569
Per Share	26¢	28¢
Earnings	675,163	568,996
Per Share	12¢	15¢
Average Shares Outstanding	5,865,369	3,895,529
Daily Oil Production-bbls.	484	240
Daily Gas Production-mcf.	846	599

Argyll Energy Corporation participated in a total of 22 wells in the first months. Fourteen were development wells and eight exploratory wells were farmed out at no cost. Seventeen were oil wells; one was a gas well; three were dry holes and one is suspended. All of this drilling took place in Alberta. The most active continued to be in Nisku oil pools at Heath, Alberta. The company also announced results of a third Nisku oil pool at Ribstone, ALberta on the Heath Nisku trend. Two exploratory wells have been drilled. One is capable of producing at a rate far in excess of its allowable limit and the second, near the southern edge of the pool, is now being evaluated. The corporation is now planning a major development drilling program at the Ribstone area for the next year or two.

MUSTANG RESOURCES INC.(MUR-V)

CONTROL SHIFTS - David G.Mark, a director of Mustang Resources Inc., announces that Barrett Sleeman and W.G. Hainsworth have resigned as directors and that Zubair Hashmi and L.R. Khan have been appointed president and secretary, respectively. Approvals are being sought for the transfer of 750,000 escrow shares to Mr.Hashmi, being 375,000 from each of Mr.Mark and Alice Usher.

PIRATES GOLD CORPORATION(PIT-V)

BULK LEACHABLE GOLD PROSPECT ACQUIRED IN SOUTHERN ARIZONA - Eberhard Mueller, president, announces that Pirates Gold Corporation has acquired the Margarita mine in Santa Cruz county, 75 miles south of Tucson, Arizona. Previous operators conducted much work on the property including geological mapping, surface sampling, trenching, underground work and about 300 drill holes of various types. Some of these operators calculated reserves which indicate an excellent probability that a viable bulk leachable gold deposit is present.

The Margarita mine has indicated reserves of some 500,000 tons grading about 0.06 oz.gold per ton. The probability of increasing the reserve with additional work is good. The indicated reserve occurs in flat-lying, shallow bodies which may be removed, for the most part, with a waste/ore ratio of one to one. Preliminary metallurgical testing indicates a recovery of 92% of gold by a cyanide leaching process.

Pirates Gold has started a 2-stage program. A multi element rock geochemical study is now in progress to locate any feeder zones. A 22,000 - foot percussion and diamond drill program is to start in early September.

The company is negotiating to acquire an adjoining group of claims.

Fleet should check this out 9/5/85

COLFAX ENERGY LTD.(CFX-V)

NEW DIRECTOR APPOINTED - John N.Woods, president of Cofax Energy Ltd., announces the appointment as a director of Charles Franklin Agar who has had over 30 years of oil and mining experience. In the past, he has been president of Mineral Resources International Limited (MRI) and Nanisivik Mines Ltd. and was responsible for the exploration and development of MIR's Baffin Island zinc-lead-silver mine, an $85,000,000 investment.

Mr.Agar is still chairman of Nanisivik Mines Ltd. and is a consultant to and member of the executive committees of the boards of directors of COHO Resources Limited, Imperial Metals Corporation and MRI. Mr.Agar will become directly involved in development of Colfax's Bohol Island gold project in the Philippines, far which, see GCNL 164(85) page 2.

BLACKDOME EXPLORATION LTD.(BEE-V,T)

PROGRESS TOWARD GOLD PRODUCTION REPORTED - By the end of the second quarter, Blackdome Exploration Ltd. had completed a review of the capital costs and a new estimate of the cost of bringing their gold mine into production on Black Dome Mountain west of Clinton, B.C., was $10,650,000 plus working capital. Some additional financing was arranged through the sale of shares. Working capital at 30June stood at $6,482,767.

R.Carl Ashenhurst, president, reports that clearing of the plant site wa completed in June and logging, clearing and stripping of the tailings disposal area continued throughout the month. The camp site was cleared and levelled and two 42-man bunkhouses with kitchen-dinner-recreation hall had arrived on site by the end of the quarter. The pilot plant run at Lakefield Research was nearing completion with gratifying recoveries. A final flow sheet should be determined early in the third quarter permitting decisions on equipment purchases. A 10-inch diameter production water well drilled in June intersected a water source which pump tests indicate will pump at the rate of 110 U.S. gallons per minute. In conjunction with reclaim water and waterflow from the 1920-meter portal there should be no problem maintaining an adequate supply of process water. Applications are being completed for the many permits required to bring the property into production.

FOR THE RECORD

ADAMS SILVER RESOURCES INC. (ADM-V) began diamond drilling on the Adams Plateau NE of Kamloops, B.C., on 20Aug85. The first two drill holes will be on the AXL claims which are equally owned by Adams Silver Resources Inc., C.T.EXPLORATION LTD., CLIFTON RESOURCES LTD. and the vendor, Farrah Resources Ltd. Adams Silver is operator. This project is under the direction of Bruce Spencer, P.Eng.

MUSTO EXPLORATION LIMITED (MUX-V) has Vancouver Stock Exhange concent for the issue of $5,000,000 of convertible debentures to 8 purchasers. The debentures have a term of 4 years and are convertible in whole or part at the holder's option at $5.00 per share during the first two years ending 30Jun87 and $5.50 per share during the last two years ending 30Jun89. The debentures will accrue interest at 8% per annum starting 15Jan86.

TO WXK/JDS

JDS

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ASARCO

Southwestern Exploration Division

JDS

January 7, 1985

F. T. Graybeal
New York Office

F. R. Koutz's
Old Glory - Margarita Area
Oro Blanco Mining District
Santa Cruz County, AZ

I submit the above memo and compilation. A very large "bag of worms" is expressed in the various true or pseudo land owner - optionees.

Recent Pirates Gold promotional releases suggest they have confirmed the numbers stated by others, i.e., ½ million at 0.08 opt gold, but can't seem to expand the number.

Nevertheless, since most of the past drilling has been promotional and have literally mined the main zone with drill holes, I believe a restudy of the district with plotting all the quartz-iron oxide zones, their relation to structure and stratigraphy, is in order to gain the insight into the potential of the district. If an aggregate of several million tons could be suggested as open-pit leach, then the area is of interest to untangle the nest of ownerships.

James D. Sell

James D. Sell

JDS:mek

cc: F. R. Koutz
T. Dalla Vista

JDS

ASARCO

Southwestern Exploration Division

December 20, 1985

To: J. D. Sell

From: F. R. Koutz

OLD GLORY - MARGARITA AREA
Oro Blanco Mining District
Santa Cruz County, Arizona

Attached is my October 10, 1985, report on the Old Glory - Margarita Area with Addendum of November 7, 1985, and claim map, for your review and distribution.

F. R. Koutz

FRK:mek
Atts.

cc: J. Mohon (GBED)

OBSERVATIONS: OLD GLORY - MARGARITA AREA
ORO BLANCO MINING DISTRICT
SANTA CRUZ COUNTY, ARIZONA

October 10, 1985

SUMMARY AND CONCLUSIONS

Follow up work indicates that Pirates Gold may well have 0.5-0.6 m.t.@ .05-.08 opt Au on the Margarita property with potential for more. Shallow and intermediate depth Au-Ag potential on the adjoining Old Glory property has been fairly well tested by recent drilling and found to be minimal limited to a few ten-thousand tons @ .05 opt Au. Deeper potential (below 200') below Old Glory and probably Margarita is only fair at best, has partially tested negatively and is below the strong supergene enriched Au-Ag zone. A number of surrounding goethitic, bleached color anomalies and extentions of the Margarita zone to the NW, the Margarita-Old Glory trend to the south (Warsaw Canyon), the Austerlitz and the breccia vein-shatter zones in the Warsaw-Oro Blanco mine area should be checked out in more detail examining recently generated data (see attached map).

Several weeks of field work in the district is proposed to examine known potential target zones for shallow Au-Ag mineralization and to develop others while gaining a detailed feel for the style of mineralization, alteration and lithology in the District--the most productive in Santa Cruz County.

BACKGROUND

The following briefly reviews follow-up work on the Oro Blanco Au-Ag District since my memos and notes of Sept. 13, 18 and 30. Since then the Pirates Gold summary on the Margarita property and L.H. Knight's thesis maps have arrived. I have reviewed R.A. Johnson's data on the Old Glory and Margarita history and spent a day with T. Dalla Vista reviewing the Old Glory property and vicinity in the field with data in hand. We did not revisit the Margarita as the crew from Montgomery Consultants was still at work. You have reviewed (Oct. 4) Amax's Margarita ore reserves/ thoughts with C.P. Miller. I have reviewed NCA Minerals new data and will meet with Jay Santos in the field in early November. I have also discussed the district with John Mohon. Several weeks of field work is proposed to examine potential target areas in the district and surrounding area. A partial claim map with some of the gold anomalies and geologic features is attached.

On October 2, I met with Robert A. Johnson, Managing Partner of Sonora Exploring and Mining Co. (an Arizona limited partnership) dba Apache International Mining (Sasabe Star Rt Box 45-C,

85736, phone 398-2106; 11.8 miles west of Amado on Arivaca Road; 1.1 miles south on Moyza Ranch Road). Mr. Johnson is a semi-retired, highly leveraged, ex-international Citibanker who got into the "mining" business (promotion) as a precious metals buyer/trader.

Mr. Johnson's group holds some 8 unpatented lode claims (New Margarita 33-40) plus 2 patented (Old Glory No. 1--leased from T. Culbertson of FICO and Old Glory No. 4 leased from Anamax) claims covering the Old Glory property (map attached). They also held the adjoining Margarita property to the north, leased from Wilson-Sorrel, the underlying owners, from 1980-1985, but failing to make several balloon $50,000\quarter payments, were evicted by the owners, now under appeal (J.C.Lacy is Apache's solicitor). All recent drilling on the Margarita was done under lease from Apache (much with Apache's air trak and crews) and Johnson holds a "complete" data package (which Sorrel doesn't have) with assays, chip samples, some core, reports, as well as several crates of old mining records/maps on the Old Glory-Margarita. Pirates Gold who now has the Margarita lease from J.D. Sorrel is negotiating with Johnson for the Old Glory plus or minus all old data. Mr. Sorrel, the nephew of Marion Wilson, is an ex-geophysical crew member for Heinricks and has been part of a number of mining promotions in the region dating back to the early 1970's. A summary, although incomplete, of work on the Margarita is given in Montgomery Consultants Ltd. report for Pirates Gold of May 27, 1985, now in our files.

Basically Pirates' calculations for the Margarita claim some 560,000T @ .081 opt Au (.025 c/o) in 4 open-pittable zones at the Margarita (Amax gets 516,000 T @ .054 opt Au (.02 c/o) from slightly more complete data) with 4 smaller zones and deep targets remaining to be tested. Johnson says there are over 400 holes at Margarita and from skimming a few of the reports and assay sheets (often with checks) that Johnson let me look at and discussions with Johnson much of the drilling, sampling, assaying and reporting (bad holes get lost, good holes are repeatedly twinned) must be considered suspect until checked. Amax and Montgomery in their studies assumed all data was correct. Montgomery Consultants apparently will do the checking/drilling necessary (to $600,000) for Pirates to verify past work and test additional zones this fall/winter. Johnson says that he has the 1984 Amax report claiming that Old Glory potential is 1/3 of Margarita or 150,000-200,000 T @ .05 opt Au. However, this is before the latest round of Old Glory drilling and such information was not noted by J.D. Sell in reviewing Amax's calculations.

The Old Glory property has been drilled 4 or 5 times, the last 3 times by Johnson's leasees: Studsvik Analytica AB (1982), Golden Concord Mines (Crossland Industries) (1983-84), and

(Angus) MacDonald International (1985) (C.F. Millar-Red Dog Mining/Highland Crow-Teck). It has been more or less extensively surface and underground sampled by those that have held the Margarita and including the above plus Energy Reserves Group, Phelps Dodge (Jerry Wegley), Nicor (K. Emanuel), Amax, Homestake, Ranchers, St. Joe, Mt. States (N. Dausinger), and Goldfields (unasked). Mr. Johnson let me make copies of what Old Glory data he made available, but nothing from Margarita proper.

Mr. Johnson would like to lease his claims for $5,500/month until production--afterwards sharing 50% of net profits to 150' depth or a 6% NSR below 150' depth. There is an underlying 7.5% NSR on each of the two patented claims ($200,000 each buy-out according to the leases but Johnson says they would probably be obtained for less than $50,000 each) which cover the best ground. For the $5,500 one gets the ground, the $250 each/month lease payments on the patented claims paid, the right to use Apaches air-trak (650 cfm, 120' depth limit) paying all expenses--employing relatives and friends, use of 2 bedrooms and kitchen of Johnson's house, use of storage space: trailers, garage etc. $10,000 Payment is due on signing (to cover Johnson's <u>numerous</u> back debts including to his lawyers). This would be a horrible deal unless one got in and out quickly. As detailed below the quickly-testable shallow potential is minimal and has been tested and limited deeper potential may have been tested also. Potential below 200-500 feet depth is nebulous, lacking supergene Au-Ag enrichment and would take considerable lithologic and structure work to develop a target.

GEOLOGY

The Old Glory Mine is exposed on a NW-trending "sugar-loaf" ridge with 400 feet of relief some 2 miles SW of Ruby. It is exposed over a 1400 WNW strike length and 200-300' width. The strike of low angle mineralized, silicified fractures ranges from N60W in the SE portion to N20W in the NW portion (most of the zone is N60-40W). The silicified zone essentially forms a 5-40° NNE-dipping crescent-cap rock to the hill which is truncated to the north by erosion and/or normal faulting. There are a number of NNE to ENE as well as WNW high angle fractures exposed which appear to control mineralization.

The Old Glory is hosted in Knight's welded tuff member of the Cobre Ridge Tuff which consists of welded and non-welded tuffs, tuff breccia and arkosic epiclastic sandstones. The tuff is so strongly bleached (sericite plus clay)and silicified in the mine area that the exact rock type is often uncertain but it appears to be a lithic lapilli and crystal tuff. There are a number of Sidewinder Quartz Latite Porphyry dikes/sills on the property which generally run E-W, dipping shallowly to the north. Here as elsewhere in the district the Sidewinder igneous bodies are quite irregular and can probably best be described as cactoliths.

From what I've seen in the district, I disagree with Knight--to me (and T. Dalla Vista) the Sidewinder appears to be pre or syn-mineral instead of post but usually has very low Au-Ag grades. The Sidewinder may be genetically related to mineralization. To the south in Section 18 alteration (clay-sericite ± quartz ± adularia (?) veinlets) extend at least several tens of feet from these dikes-sills with a weak goethitic halo and anomalous Au.

On the west end of the Old Glory claims a 100-200 foot thick sandstone-arkose-quartzite bed dips steeply to the north. Portions of this unit appear identical to the fine-grained clastic ore-host unit at Hardshell. This unit strikes ESE some 500-800' south of the crest of Old Glory hill and might make good ore if the NE fractures controlling Old Glory mineralization intersect it below Old Glory Hill. Unfortunately this unit has an almost vertical dip on the ridge south of Old Glory Hill and Knight shows it dipping SW on strike to the SE. Although the volcanic host rock dips around Old Glory appear to be moderately N to NE, apparently they are actually to the SSW according to Knights 1"=1000' map of the district. The NE plane of torsion through Old Glory (and Margarita?) may have contributed to fracturing and thus mineralization.

There are several high-angled WNW faults present that appear to have dropped the mineralized zone down--possibly to the south and certainly to the north--at least several times betweem Old Glory Hill and Old Glory Spring. These zones to the north as at the new Old Glory mill ruins are off the Old Glory property being part of the Margarita. The zones at least south of the spring have apparently not yet been tested by drilling but appear more spotty than the Margarita or Old Glory zones. In addition when viewed from a distance there appears to be a 600-800 foot wide NNE-trending anomalous iron oxide color zone extending through Old Glory through Margarita. The silica bodies on the southside of Margarita Hill north of Old Glory Spring appear to terminate at the margin of these color zones. A number of mineralized fractures and workings at Margarita strike NNE. Thus there appears to be good structural as well as pseudostratigraphic (shallow NE-dipping minor shears) control of mineralization.

T. Dalla Vista and I received a tour of the hill by watchman Robert Fricchione who lives in an old bus on the hill with his wife, kids, goats, solar cells, TV satellite dish etc. "Robert" had just moved several months before from the Margarita one-half mile to the north where he had lived for the last 5-6 years. He had participated in most area drilling campaigns as a helper/sampler and is quite familiar with local geology..

It was quite clear with assays in hand that the better Au values

only occur where there are significant iron oxides (ex-pyrite). Heavy white, flat silica pods, veinlets and flooding plus bleached zones although they are quite impressive generally had less than .01 opt Au unless vuggy and/or containing +1% goethite and hematite. The workings inclined to the north were generally below a stacked series of 1-10 foot flat quartz veins/pods. The host rock was strongly bleached and laced with stockwork quartz + iron oxide veinlets. Jarosite and some pyrite were noted with minor copper carbonate. There was also locally several percent late brown to black and white carbonate usually in veinlets. Much of the outcrop on the NW end of the silicified zone and outcrop below the silica cap on the north side of the hill is a greenish gritty-arkosic + bleached tuff with 5-10% white quartz veinlets and little iron oxide or gold.

The best looking mineralization on the hilltop had 30-80% white to grey, vuggy quartz veinlets with 3-5% hematite, 1-3% goethite and 1% jarosite after pyrite--generally with +0.1 opt Au. The headwall of the glory hole in such material showed 84' (horizontal) of 0.2 opt Au and 1.6 opt Ag from Ranchers Exploration assays. Some 33 5-foot cut assays over a 350' WNW x 50' wide zone (Homestake) on the crest of Old Glory Hill averaged .056 opt Au and 0.9 opt Ag. Similar grade but patchy, smaller zones are present some 300' SE on the SE end of Old Glory Hill, in the new mill area off the claim area to the north and along the stream north of the old mill in the NE corner of claim No. 33.

We did not enter the 200' NNE adit some 90' below the hill crest on the south side nor the 200' SW tunnel 150' below the crest of the hill from the NE side of the hill. Johnson will clean these adits up and sample for 1986 assessment work. Old reports refer to these tunnels as dead work although zones of 5-10' of .2 opt were encountered in 5-10% added quartz near their ends. Old maps show a number of 30-55 NE dipping quartz veins and shears and quartz monzonite dikes-sills. It is clear, however, from drilling and sampling that the width and grades of surface mineralization do not extend to this depth.

In 1982 Studsvik Analytica AB drilled 6, 6" reverse-circulation rotary holes (Ventures Drilling) from 200-400 feet depth, 2 @ 90° and 4 @ 60-70° for a total of 1500 feet at Old Glory. Assays (1/2 a.t. Hazen, Denver) on 5 to 10 foot intervals showed only 100 feet).01 opt Au with a maximum of .068 opt and mean of .018 opt. Johnson claims that assaying and/or sampling were bad because low results were also obtained at Margarita where others previously and subsequently drilled good values. The assays are somewhat suspect also because Hazen's lower detection limit was .01 opt and many of the holes showed long intervals of 0.2-1 opt Ag especially near the surface where others get locally spotty +.01 opt Au values also with .2-1 opt Ag.. The lower parts of these holes were wet. The remaining deeper cuttings at the collars show partially silicified (mostly white quartz) arkose-

-grit (often with K-feldspar overgrowths) but only traces of pyrite. Several of the holes cut thick unmapped sections of Sidewinder Quartz Monzonite.

In 1984 Golden Concord Mines drilled 15 air-track holes (using the Apache Rig) from 25-120 feet depth (1275 feet total on holes OG 2-14 with assay information). Most of these holes were vertical. Of 248 5-foot assays (Jacobs-Tucson: 2A.T.) 44 values (18%) were).01 opt Au to a maximum .21 opt (.033 opt mean), 56 values: .003-.01 opt, 102 values: .001-.003 opt and 46 values: trace-nil. There were no consistent +10' intervals of +.05 opt Au . 19 of 44 of the +.01 opt values were in the first 30 feet. 120 of 248 Ag assays) .05 opt Ag average 0.25 opt Ag.

These holes were not randomly distributed and often drilled projections of mineralized surface zones--with little luck--even when intersecting old workings.

In May 1985 Angus MacDonald-Chester Millar drilled 26 air-track (Apache Rig) holes (1655 feet total) from 50-90' depth (65' average) mostly vertical with a few angle holes. 166 AA assays by Skyline (UWG 001-003) were checked fairly well by 2 a.t. Fire Jacobs repeats of most plups--although some nugget effect is present. 17 Values (10 foot) (10%) were 1-10 ppm (3.2 ppm Au mean) with 15 of these values within the first 30 feet of drilling. 25 Values were .3-1 ppm (.50 ppm mean); 44 .1-.3 ppm; 59: .02-.1 ppm and 21 (.02 ppm. Six holes had) 10 feet of +.05 opt Au-often around old workings. 155 of 166 Ag values were).02 ppm averaging 4.6 ppm .

These drilling results suggest that there are probably only a few ten-thousand tons of .05-.08 opt Au above 100 feet depth at Old Glory and mostly at or near the surface in the best 700' WNW by 100' area well tested by drilling to 50-120' depth. Several holes 50-200' SW of the crest had some of the better values but no extensive zone of open-pit heap leachable mineralization is suggested by the spotty alteration here although exposures are not good. Deeper drilling showed a few 5-10' .01-.03 opt Au zones to 390 feet--probably narrow feeders. Old Glory/Margarita and most other mines in the district are classic cases of supergene Ag and Au enrichment.

We noted the anchor cables and BX collars of several old angle diamond drill holes at the Old Glory workings. On questioning Mr. Johnson said that he had heard that ND Resources (Nuclear Dyanamics-Bob Ford-Phoenix) had drilled 5 DDH in 1970-71 but that he had no data on the holes. ND Resources (Phoenix phone 267-0581) is in bankruptcy, but their ex-geologist F.X. Canady (966-1204) says all the DDH at Old Glory were shallow (120' max.) for assessment work and showed only a few spotty values. ND also held the Margarita, but mineralization appeared too spotty by DDH for them.

Mr. Johnson also said that in 1955-56 Anaconda had drilled a 500 foot-70°W inclined DDH from what is now the NE corner of New Margarita No. 33 (to hit NE projection of mineralization) and had intersected 60' of 0.35 opt Au from 350-410'. This data comes from R. Lunden via Mt. States (N. Dausinger). Other holes were also apparently drilled but Mr. Johnson was unsuccessful in obtaining any data from Anaconda-Denver (John Wilson) who wanted a $5,000 "search fee." This hole in the Canyon north of the Old Mill would have an intercept 700 feet in elevation below the crest of mineralization on Old Glory Hill and suggests that mineralization covers a significant vertical range in the area and that high grade Au values may continue below the supergene zone.

Standing on the top of Old Glory Hill, essentially a horst of mineralization, the view to the east below in Old Glory and California Gulch shows numerous goethitic color anomalies. Many of these were traversed on the road into Old Glory from the east and show fractured and bleached volcanics with goethite and hematite on fractures and quartz veinlets often associated with rotten bodies of Sidewinder Quartz Monzonite. I would surmise that the Old Glory-Margarita mineralization represents high-level silicification spreading out along subtle low-angle, north-dipping shears--also a locus of Sidewinder sills--from higher-angle deep feeders. The ground to the east of Old Glory-Margarita and to the SSW of Old Glory ought to be prospected.

To the south of Old Glory are the Willie claims of the Goldspar (Warsaw Canyon) Project of NCA Minerals (Jay Santos) north of Warsaw Canyon. Mr. Santos has come up with a number (10 mesh soil geochemical anomalies (50 foot grid)).01 opt Au over areas up to 400' x 200'. Mr. Santos has invalidly extrapolated these enhanced values to depth to calculate potential tonnages.

A brief overview in the field shows a number of goethitic color anomalies in Cobre Ridge Tuff associated with NW fractures and/or dikes--but much less silica compared to Old Glory-Margarita. Nevertheless the areas, poorly located, will be examined in detail in field with Mr. Santos in early November.

The "White Gold" area from which H.G.Kreis examined the data from 48 Copperfields (Teck) percussion holes in 1983 (see 9/18/85 F.R.Koutz memo Oro Blanco Area) is still held by NCA. In 1983-84 Ormont Exploration (Vancouver) financed 42 additional percussion holes on the property apparently in the same central zones previously drilled. Santos sent several reports claiming 1/2 m.t. @ .059 but with no additional assay data or maps of the new drilling--which he will provide when I visit the property. The very "encouraging" surface anomaly in the 1983 data is also a (10 mesh <u>soil</u> anomaly although not directly stated. Santos sent poorly located soil anomaly maps for a smaller western zone

which should also be looked into. The reports sent also included results of 1985 St. Joe American metallurgical tests showing 85-95% Au recovery and 22-23% Ag recovery from .05 opt Au and 1.6 opt Ag oxide and sulfide drill cuttings. St. Joe is active in the district and has recently contacted a number of the underlying property owners in the district to determine if their properties were still leased out. Mr. Johnson implied that Joe Rankin of St. Joe has made an offer for the deep Old Glory area, but less than Apache wants.

One should note that NCA is not a fly-by-night outfit and reportedly (N.Miner, Aug 29+ J. Santos) has in production a 1600 TPD heap leach (1.5 m.t. @ .07 opt Au, 78% rec.) at Clear Creek "Goldstripe," Plumas County, CA (see Nov. 6 memo and report).

RECOMMENDATIONS

The Margarita Property will be tied up for at least the next 9 months by Pirates Gold. Nevertheless, the data ought to be assembled and examined in some detail although I strongly suspect that the underlying owners have placed such a high price on it that no one could operate at a profit with present Au prices. The shallow and intermediate depth potential at Old Glory has been fairly well tested by drilling. The relatively high Ag as well as Au values at depth are encouraging and the surrounding area to the east and south ought to be gone over in some detail for favorable host rock. The Old Glory property as presently known and presented is unattractive except for wildcat drilling to below 200' depths. The ground just north of Old Glory on the Margarita claims is apparently one of Pirates' targets. NCA's ground will be reviewed in the field soon and Bill Ewing's (Arizona Western Minerals) data and ground will be gone over then to determine if favorable targets remain.

L.H. Knight as part of his 1970 dissertation has mapped some 60 square miles at 1"=1000' but the map lacks the requisite detailed lithologic breakdown--with alteration mapping to develop drill targets. Several weeks ought to be spent going over the district with the map as a base, learning the lithology and alteration/ mineralization styles at the various prospects. Any detailed mapping (1"=200-500') and extensive geochemical sampling ought to wait until potential targets are identfied.

The best areas (about 5 square miles total) are the district as defined by Knight: the flat-lying silica bodies around Margarita-Old Glory and the Austerlitz Mine and the breccia veins-silicified shatter zones in the Oro Blanco - Warsaw Mine areas may be the only areas with widespread supergene enrichment (preserved?) to make viable open-pit heap leach operations of any size if several of the better areas are combined. Vein targets are more nebulous and almost all small. Only one mine,

the Montana (at Ruby) with 770,000 T production of 8% Pb + Zn, .3% Cu, 5.4 opt Ag and .06 opt Au would be large enough (?) to be operated on a reasonable scale today. Vein targets would be of secondary importance, but might be located on strike or under shallow cover. Hardshell "type" disseminated manto Ag-MnOx + Au in epiclastic sediments beneath deeper stratiform but structurally controlled silica zones may be present although Paleozoic carbonates are not.

The above outlined work will be done later this fall/winter and will include an up-to-date property map of the district from BLM/microfiche records. Many of the scattered patented claims are being bought (at up to $1000/acre!) by resident hippies who are quick to contact visiting geologists for help with their mortgage payments. Other notorious blanket "courthouse" over-stakers, such as Chuck Haggerty can probably be disregarded, judging from Haggerty's latest promotional data forwarded by John Balla this month.

Other outlying areas around Arivaca might also be examined. Recent Air-trak drilling has been reportedly going on in the Cerro Colorado District, on the south side of the Las Guijas Mountains, the San Luis (Oceanic property - University of Arizona ?) (Sec. 27, T21S, R9E) and Ajax-Edwards/Fraquita wash (Sec. 5 & 8, T21S, R10E) areas.

F. R. Koutz

FRK:mek
Att: claim map
Nov. 7 Addendum

cc: T. Dalla Vista
J. Mohon (GBED) - Your comments and ideas welcomed.

NOVEMBER 7, 1985
ADDENDUM TO OLD GLORY AREA REPORT
WHITE GOLD-WARSAW CANYON PROPERTIES
NCA MINERALS
ORO BLANCO MINING DISTRICT
SANTA CRUZ COUNTY, ARIZONA

On November 5 I met with Jay Santo of NCA Minerals at his trailer parked at Warsaw Spring and spent several hours going over his maps and data and also received a tour/orientation of several hours each of his White Gold and Warsaw Canyon (ex-Gold Star) properties. We also spent an hour examining Pirates Gold recent air-rotary drilling area south of Old Glory Spring on the Margarita Property.

Mr. Santos is spending a month on his properties in careful reconnaissance panning, soil geochemical sampling, surveying, optioning claims and staking fractions and extentions. He will also spend January-February on the properties. On November 6 he copied numerous maps, drill logs and information for me and will send additional maps/assays as they are received. Mr. Santos has under claim/option some 44 lode claims on the White Gold project and 63 claims at his recent Warsaw Canyon project south of the Old Glory and is negotiating with the owners of the Grubstake group (plus or minue 10 claims) which connect his two projects and with other land owners in the area.

Mr. Santos' Au anomalies are (10 mesh solid anomalies and may well be enriched up to an order of magnitude in the sieving and by natural surface lag processes. He usually pans soil for Au to locate areas to start 50' grid geochem sampling (Au plus or minus Ag only).

The White Gold area shows an area about 1000'N-S and 400'E-W with a <u>soil</u> Au anomaly averaging .04 opt in NW striking, steeply dipping Oro Blanco conglomerate and siltstone--some limey. There are also numerous WNW to NW and N to NNE faults. Alteration consists of weak to moderate silicification and argillization with disseminated goethite after several percent pyrite. Au mineralization usually, but not always, coincides with the iron oxide color anomalies. Drilling of 48 holes to 122' depth in 1982 and 42 holes to 230' in 1984 has defined a 360' NW striking zone about 120' wide and up to or greater than 100' deep which might roughly contain from a quick inspection of the assay cross sections, some 350,000 T at .02-.03 opt. Santos claims 500,000 T @ .06 opt Au + 1.4 opt Ag. There are 3 to 5 smaller surface soil Au anomalies poorly tested or untested by drilling which deserve further study. The area needs to be carefully gone over in the field with Santos' geologic and soil anomaly (1" = 40') maps, outcrops chip sampled (which Santos doesn't believe in)

and evaluated for additional drill targets. Six holes show significant length +.05 opt intervals and the geologic and assay logs of all drilling (which I now have) need to be compiled into more reliable mineral inventory.

The Warsaw Canyon property (formerly Goldstar) was acquired and staked this year by Mr. Santos and extends from the Old Glory property for 1-1 1/2 miles south. The area is underlain by steeply SW dipping welded tuffs and lesser interbedded unwelded tuffs, grits and arkosic sandstones--volcanically derived--all part of Knight's Jurassic Cobre Ridge Tuff. There are several WNW striking Sidewinder Quartz monzonite porphyry dikes and sills, often discontinuous, in the area which are generally well argillized and weathered. Silicification, argillization (plus or minus sericite) and up to several percent disseminated goethite after pyrite is associated with the margins of these intrusives--usually at least several tens of feet from the contacts. The host volcanics around the intrusives also contain cream-colored veinlets and flooding with local rhombic feldspar druse in vugs--which is most probably adularia--similar to the Hermosa Mine and the area around Hardshell.

About 1/3 of Mr. Santos' several hundred soil samples to date show +.01 opt Au and within a 700 x 2500 foot zone sampled there are six anomalous zones up to 600 feet long and several 100 feet wide with +.01. The anomalous zones usually have a good correlation with iron oxide and silicification--the margins of the quartz monzonite intrusives. Alteration/silicification is <u>not</u> as impressive as Old Glory although is similar to a number of less well mineralized or untested Margarita zones. My initial impression that the minor shearing and fracturing with associated iron oxides represents feeders to higher level manto mineralization such as at Old Glory-Margarita, but the higher-level mantos have been eroded. The possibility remains that silica-Au manto zones poorly outcrop and may be found at depth. The Warsaw Canyon property needs and deserves to be closely gone over, geochem chip sampled and mapped for a full evaluation. I intend to start this work in the near future .

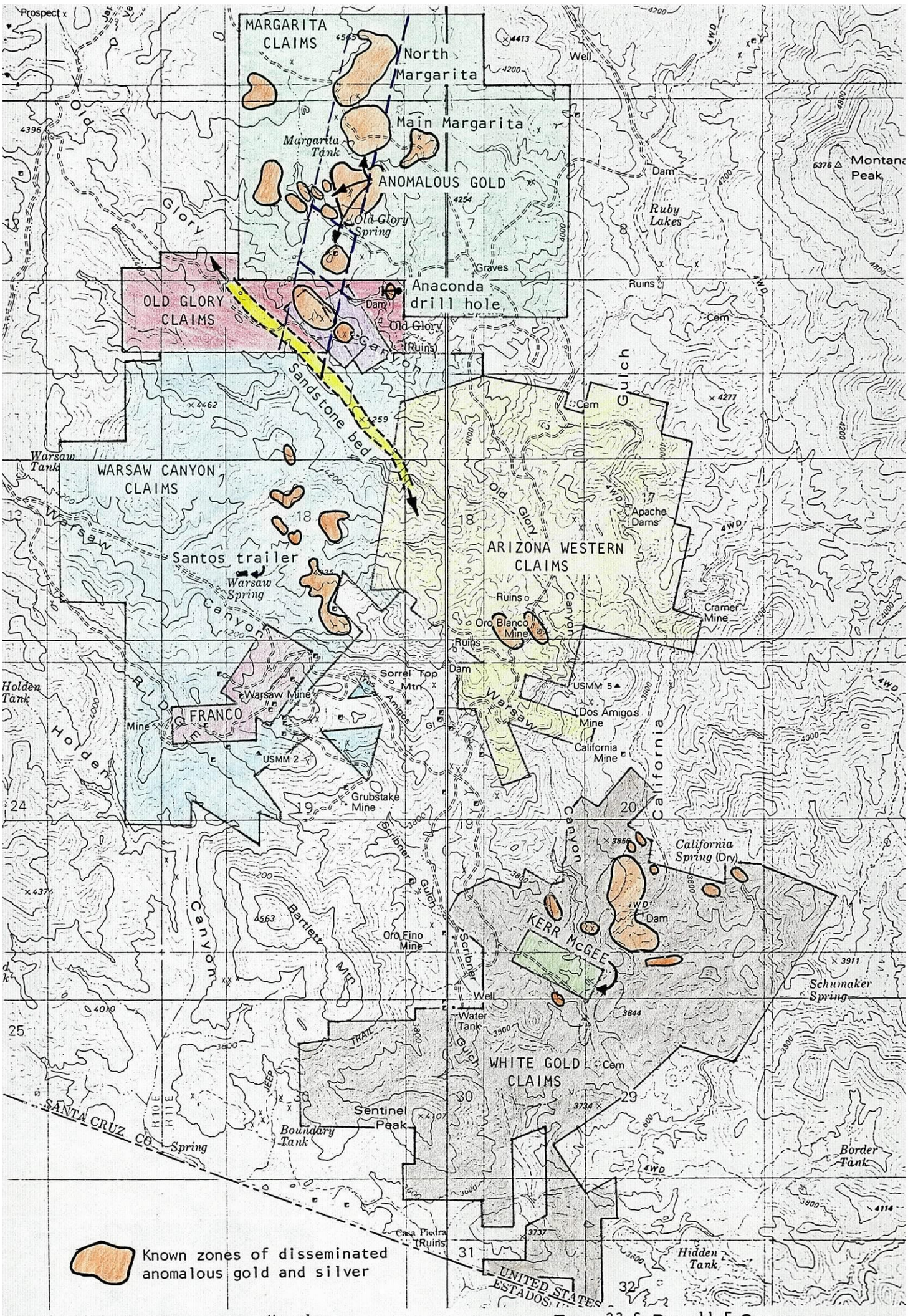
NCA Minerals would like to cut a deal on this property with say a $50,000-$75,000 required annual expenditure up to say $300,000 for a 50% share after which expenditures would be shared 50/50 and directed by a management committee. Underlying monthly payments are $3,500/month on the White Gold and $500/month on Warsaw Canyon. (Warsaw Canyon--untested by drilling--would have the greatest potential of being developed into a bulk tonnage Au property.)

Examination of Pirates Gold drill cuttings from south of Old Glory Spring and north of the Old Glory shows heavy white silica (unfavorable without iron oxides) with no panned pyrite or gold in the southern 4 holes of a 12 hole program. Pirates has

completed about 50 new air rotary holes to date.

The latest (Oct 7) Statement of Material Facts ($600,000 new units) with other promotional literature has been sent by Pirates and sent to the files. These include details on the deal with Wilson-Sorrel--to be paid off mostly in stock, and the legal problems with R. Johnson. Mr. Johnson informed me that since neither Asarco nor St. Joe showed up with suitcases of small unmarked bills for his Old Glory property, he will be forced to deal with Pirates--a just fate for those who are too greedy.

F. R. Koutz



AMS Sheet: Nogales

USGS Quad.: Bartlett Mtn. & Ruby Az. 7.5'

Twsp.: 23 S **Rng.:** 11 E **Sec.:**

Prospect Name: Oro Blanco Dist.

Owner:

Examined by: F.R.Koutz

Follow-up Recommended: Yes ☒ **No** ☐

State: Arizona

County: Santa Cruz

SCALE: 1"=2000'

District: Oro Blanco

MILS and/orTerradata no. /

map no. 6342 **date** 1/2/86

JDS

ASARCO

Southwestern Exploration Division

February 6, 1986

To: J. D. Sell

From: T. Dalla Vista

Oro Blanco District

Three days were spent in the district between January 7 and January 10, 1986, to conduct a general surface examination of the area west and southwest of the Margarita/Old Glory projects for similar mineralized environments outside the main district.

No new zones worthy of consideration were turned up. However, within the district two zones adjacent to the Oro Blanco vein were thought to have sufficient alteration (silicification/FeOx) to justify sampling of the outcrops.

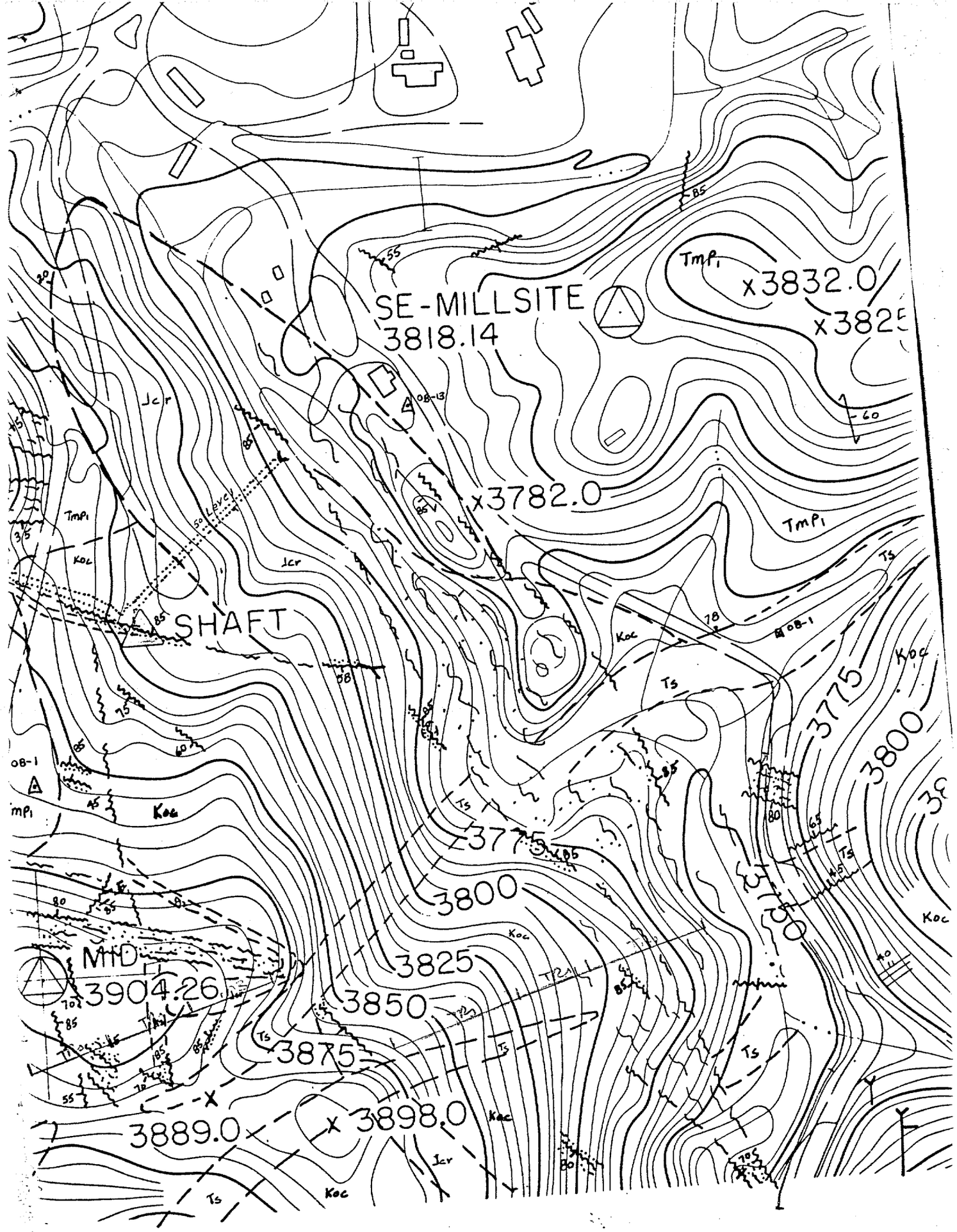
As shown on attachments A, B & C, three lines were sampled. Assay values were anomalous but rather discouraging, comparably to the Margarita project. One sample, identified as number AW86-10, representing a 15 foot zone between two shear zones, returned +10 ppm Au and 9 ppm Ag. There was nothing in the zone which would have indicated high values other than strong shearing and the presence of MnOx along the FW contact. As the two shears have dips, respectively -55°E and -84°E, the projected point of intersection can be estimated at about 30 to 40 feet below the surface, which would limit the depth potential of the zone; unless there is a change in dip. A nominal tonnage was mined in the past from this zone. Attempts should be made to gain access to the underground workings to observe the behavior and grade of this zone with depth. Also, the Oro Blanco structure, which is scheduled to be developed by Arizona Western Mining Co., should be checked at the different levels whenever accessible.

In conclusion, I feel that the primary negative aspect of this district as far as bulk type mineralization is concerned, is the rather spotty distribution of the ore. The Oro Blanco vein, if production records are correct, may have the potential for a small high grade underground venture.

T. Dalla Vista

T. Dalla Vista

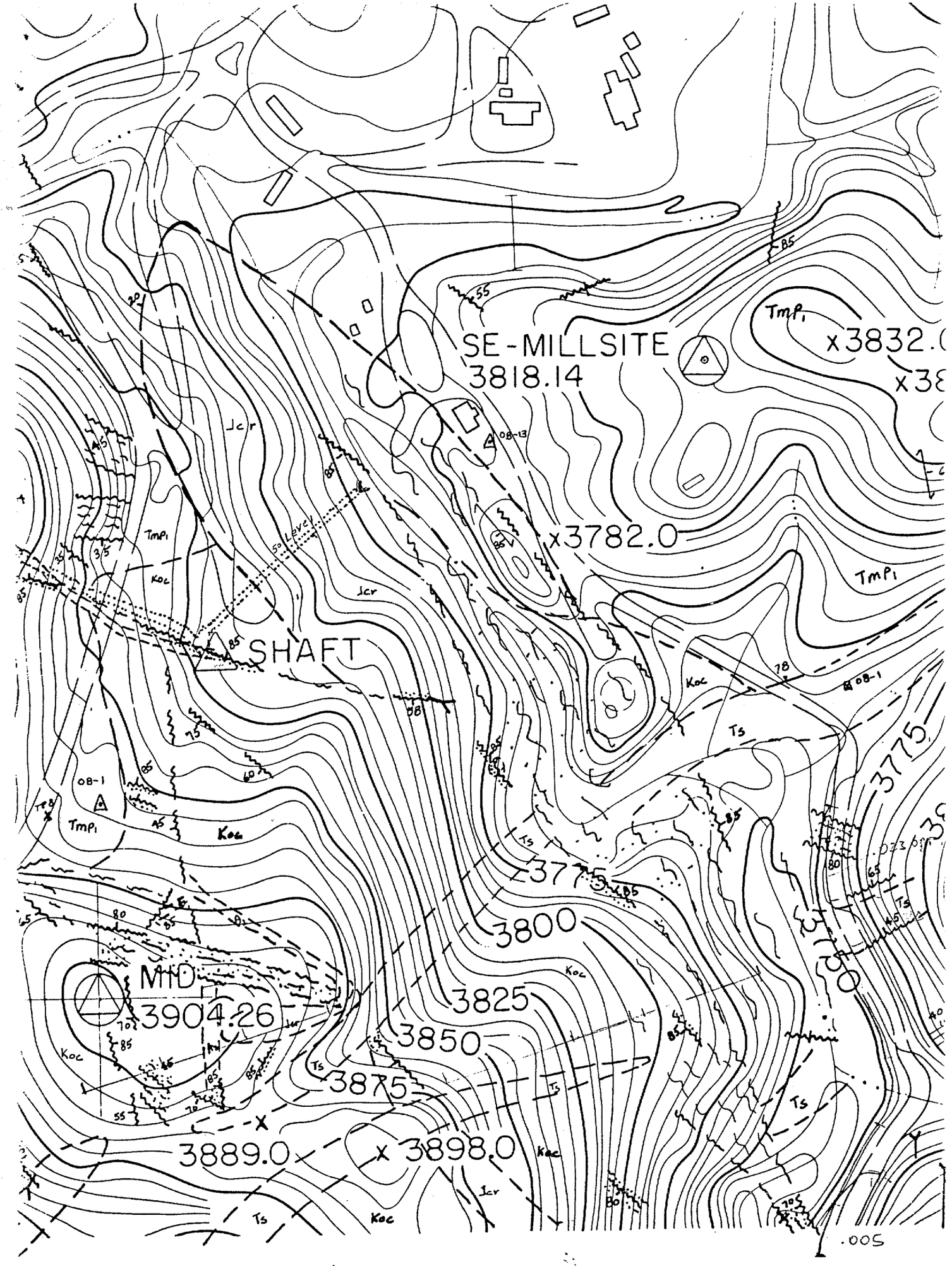
TDV:mek
Atts.



"A"

ORO Blanco DISTRICT

Scale 1" = 100'



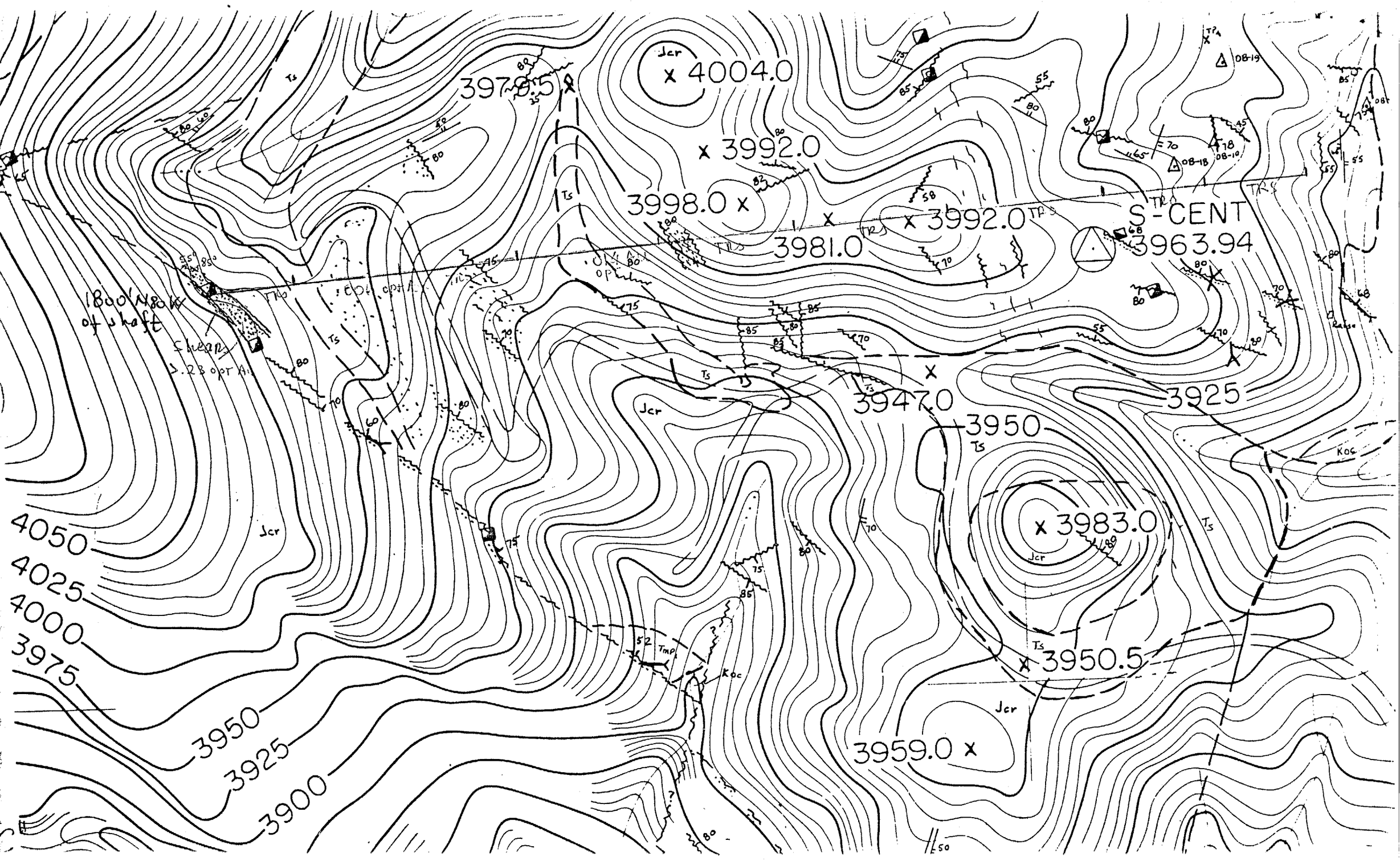
n cuts

'B'

ORO Blanco DISTRICT

ts

rotary Scale 1" = 100'


4004.0
3978.5
3992.0
3998.0
3992.0
3981.0
S-CENT
3963.94
1800' N80W of shaft
3947.0
3925
3950
3983.0
3950.5
3959.0
4050
4025
4000
3975
3950
3925
3900
Jcr
Ts
Koc
Tmp

JDS

FROM: W. L. KURTZ

To: JDSell

Assume you have seen the individual results, and assessed whether we have a "low grade" gold anomaly — .5–.1 ppm and if any chance of rx chip weather/erosion depletion of gold.

Several additional samples anomalous at 0.1 ppm Au or +5 ppm Ag.

Surface still very spotty & low grade. See attached map & assay sheets.

Dumps apparently show manganese stained rocks in qtz vein, trace breccia type.

No suggestion (?) of plat basal alteration for additional central gold.

Southwestern Exploration Division

January 22, 1987

Re: Vernon Dale's
Arivaca Claim
Block

Santa Cruz Co, AZ

subject property during
were outcrop chip samples
ling program was implemented
ls values were present to
t that the outcropping rock
former vein type producers

only three samples indicated
opt Ag.

ation target with open pit/
t is recommended.

T. Dalla Vista

TDV:mek

ASARCO

Southwestern Exploration Division

JDS

January 22, 1987

To: J.D. Sell

From: T. Dalla Vista

Re: Vernon Dale's
Arivaca Claim
Block
Santa Cruz Co., AZ

A total of 126 samples were collected on the subject property during the month of November 1986. Of the total, 56 were outcrop chip samples and 70 were -80 mesh soil samples. This sampling program was implemented to determine whether sufficient precious metals values were present to warrant an interest in the property. The fact that the outcropping rock was sufficiently altered and the proximity to former vein type producers actually justified such work.

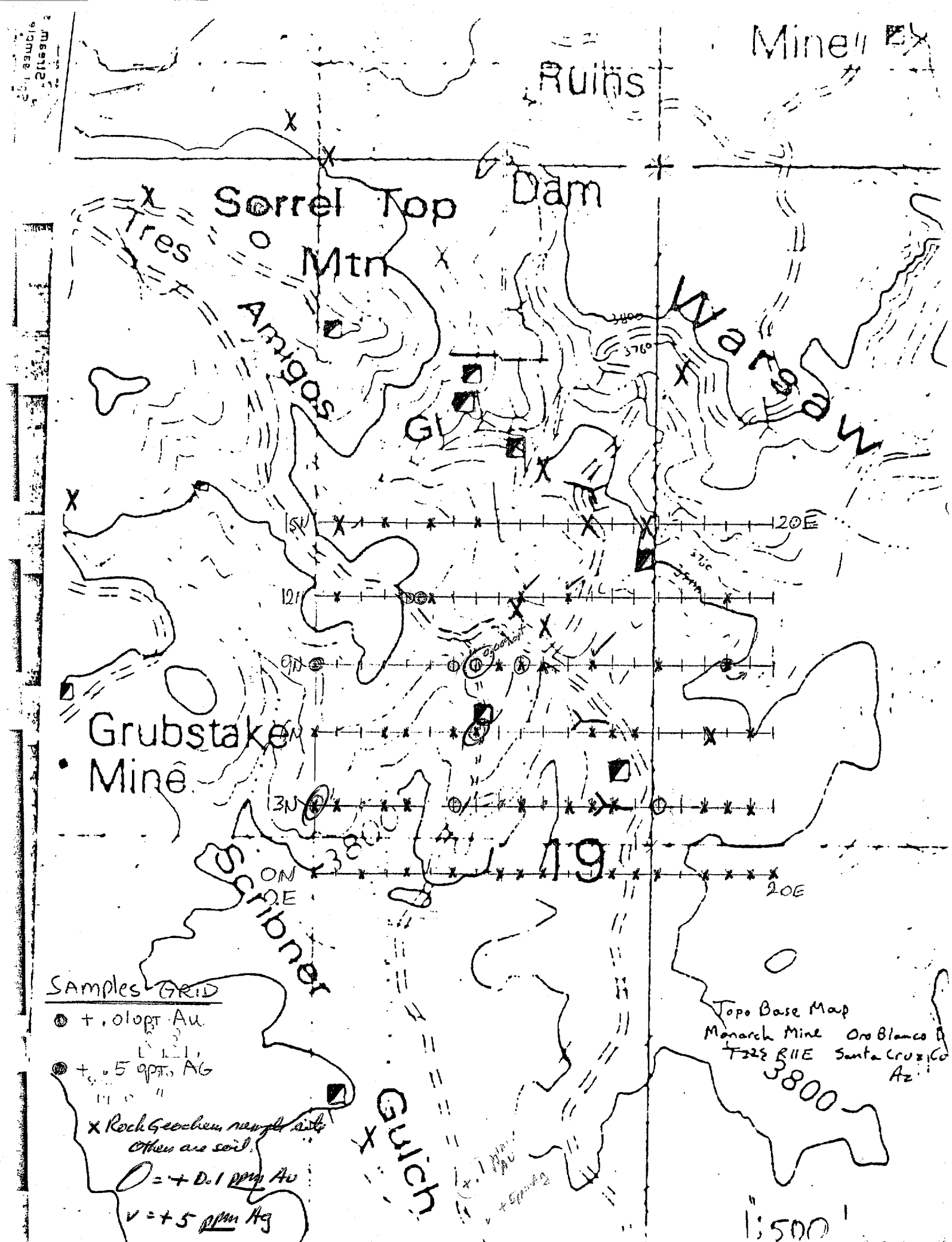
However, as shown on the attached 1:500 map, only three samples indicated a gold content of .01 opt Au or better and .5 opt Ag.

Conclusions

This prospect offers little hope as an exploration target with open pit/ bulk type potential, and no further interest is recommended.

T. Dalla Vista

TDV:mek


Mine
Ruins
Dam
Sorrel Top
Mtn
Tres Amigos
Warsaw
Grubstake
Mine
Scribner
Gulch
15N
12N
9N
6N
3N
0N
20E
3800
3760
Samples GRID
+.01 opt Au
+.5 opt Ag
x Rock Geochem sample site
Others are soil.
O = +0.1 ppm Au
v = +5 ppm Ag
Topo Base Map
Monarch Mine Oro Blanco
T22S R11E Santa Cruz Co
Az
1:500'

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. TAJ 471
January 14, 1987
1987

ASARCO Incorporated

JAN 16 1987

SW Exploration

ASARCO INCORPORATED
Attn: Mr. Dalla-Vista
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 56 Rock Chip Samples

ITEM	SAMPLE NUMBER		Au (ppm)	Ag (ppm)
1	0N-0E		<.02	<.2
2	0N-2E		<.02	1.6
3	0N-4E		<.02	3.4
4	0N-6E		.04	2.6
5	0N-8E		.04	3.0
6	0N-9E		.05	2.2
7	0N-10E		<.02	.2
8	0N-13E		.02	1.2
9	0N-14E		<.02	.8
10	0N-15E		.03	1.0
11	0N-17E		.04	6.4
12	0N-18E		.03	.4
13	0N-19E		<.02	1.0
14	0N-20E		.03	.6
15	3N-0E	0.0058	.20	1.6
16	3N-1E		<.02	.4
17	3N-3E		<.02	2.2
18	3N-4E		.06	1.0
19	3N-6E	0.0496	1.70	8.2
20	3N-9E		.02	1.6
21	3N-11E		<.02	2.2
22	3N-12E		.04	2.6
23	3N-13E		.02	.4
24	3N-15E	0.011	.36	3.2
25	3N-17E		<.02	3.4

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

x0.0292

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)	
26	3N-18E	.02	.2	
27	3N-19E	<.02	.4	
28	6N-0E	<.02	<.2	
29	6N-3E	<.02	.2	
30	6N-4E	.06	1.2	
31	6N-6E	<.02	1.0	
32	6N-7E	— .17	1.6	
33	6N-12E	<.02	2.4	
34	6N-13AE	<.02	1.2	
35	6N-14EA	<.02	.2	
36	6N-19E	<.02	.8	
37	9N-0E	.09	22.0	0.642
38	9N-6E	0.0137 .47	1.2	
39	9N-7E	0.0093 .32	3.2	
40	9N-8EA	<.02	1.0	
41	9N-9E	— .12	3.6	
42	9N-10E	.02	.2	
43	9N-12E	.05	6.8	—
44	9N-15EA	<.02	.4	
45	9N-18E	<.02	.6	
46	9N-19E	0.0064 .22	14.0	0.409
47	9N-19EA	— .12	6.0	
48	12N-1EA	<.02	.4	
49	12N-4EA	0.0117 .40	30.0	0.876
50	12N-5E	<.02	1.0	

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

ITEM	SAMPLE NUMBER	Au (ppm)	Ag (ppm)
51	12N-9EB	.07	5.2
52	12N-11E	.09	8.4
53	12N-18E	<.02	1.2
54	15N-3E	<.02	<.2
55	15N-5E	<.02	.8
56	15N-7E	<.02	1.8

*NOTE: Sample Numbers 6N 19E and 9N 10E, item numbers 36 and 42 respectively, are extra samples not included on advise.

cc: ASARCO INC.
Attn: Mr. J. D. Sell
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

ASARCO INC.
Attn: Ms. Mary Kavanagh
Southwestern Exploration
P.O. Box 5747
Tucson, AZ 85703

REGISTERED ASSAYER
CERTIFICATE NO.
9425
WILLIAM L.
LEHMBECK
DATE SIGNED
Arizona

Vernon Dale Ore Blanco Property 10/30/86
w/TDV.

1. $540,000 pd out in 7-8 years + 10% interest on unpaid. + 1/2 of 1% royalty value in place.

/or

2. 350,000 6 = annual payments in advance + 10% interest on unpaid + 1/2 of 1% royalty on value in place.

/or

3. $200,000 cash.
No royalty.

Total Buy Out Options

JDS

ASARCO

Exploration Department
Southwestern United States Division

August 3, 1987

Mr. Vernon Dale
1802 West Saxony
Tucson, AZ 85713

Arivaca Claims

Dear Vernon:

The following itemized list shows the amount of work/dollar value expended on your Arivaca claims during November 1986 by the undersigned and W.Gay:

Salary* W. Gay	$ 450.00
Salary* T. Dalla Vista	750.00
Assay Costs 56 samples (Au,Ag) Skyline Labs Job #TAJ 471	543.20
Total	$1,743.20

* Time spent surveying sample lines and collecting a total of 120 samples (chips and soil) of which the 56 rock chip samples were assayed. These figures are approximate.

Sincerely,

T. Dalla Vista

TDV:mek
enc. Assay Invoice

cc: J.D. Sell
W.D. Gay

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

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

INVOICE
NET 30 DAYS

JOB NO.TAJ 471
January 14, 1987
1987

ASARCO INCORPORATED
Attn: Mr. Dalla-Vista
Southwestern Exploration
P.O. Box 5747
Tucson, Arizona 85703

Analysis of 56 Rock Chip Samples

56 Au(ppm) @ $ 4.40	$ 246.40
56 Ag(ppm) @ $ 2.80	$ 156.80
56 Samples crushed, split and pulverized @ $ 2.50	$ 140.00
TOTAL	$ 543.20

ASARCO Incorporated
JAN 16 1987
SW Exploration

APPROVED FOR PAYMENT
By: James A. Martin
(Signature)

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

7/2/87

FROM: W. L. KURTZ

TO: JDS/FRK/MARY

FTG would like a copy of the cross section thru the Trench holes showing the replacement horizons, whatever is the latest, detailed FRK section which was drawn 3 years? ago.

→ WLK/JDS 7/7/87

TO: F.T.G.

I've Enclosed: TM-13, TCH-1 x.s. (Fig 2 TCH-1 Rept)
* TM-8 → TCH-1 x.s. (Fig 2 TCH-2 Rept)
TCH-2 + 2A x.s. (TCH 2A Rept) 1"=200'
Copy of overlay plan 5/82 TCH Summary Report
(1"=1000' EPA 1983 Sunnyside Report Phase)

* Geology Roughly updated in DDH TM-14 thru 1985 (Detailed logging completed to 3500')
May GET TO 4000' THIS MONTH.
Note All of HDS Fm (or almost all) cut out by Chief Fm, QFP, QMP. DEPTH TO PZ Seds ??

FRK

Bill
This may be of interest. John

JDS-cy

J. C. r

MAR 25 1988

RECEIVED
MAR 24 1988
SPOKANE

NEWFIELDS MINERALS INC.

808 - 750 W. PENDER ST., VANCOUVER, B.C. V6C 2T8 (604) 683-4518 FAX: (604) 681-3209
TORONTO OFFICE: (416) 363-8866 FAX: (416) 363-8870

NEWS RELEASE

March 16, 1988
T.S.E. - V.S.E. Symbol: NWM / N.A.S.D.A.Q. Symbol: NWMIF
Total Issued: 6,623,373 Shares (633,554 Restricted) Authorized 10,000,000 Shares

Newfields Minerals Inc. is pleased to announce that the Company has signed a Letter of Intent to allow Western Gold Exploration and Mining Company (Western Gold) to earn up to a 60% interest in Newfields' Margarita Gold property which hosts 500,000 Tons @ 0.0723 Oz. Au/Ton and is located 75 miles southwest of Tucson, Arizona. Western may earn its interest by expending $1,000,000.00 U.S. in exploration and development, on the Margarita, over a 2½ year period. In addition, Western will acquire 50,000 Newfields common shares out of the open market through the services of the Toronto Stock Exchange at a price of up to $3.40 per share. The aforementioned agreement is subject to the approval of the regulatory bodies.

Western Gold Exploration and Mining Company is an associate Company of the Minorco, Inspiration Resources Inc. and Mingold Inc. group of Toronto, Canada.

Newfields is also pleased to announce that on March 14, 1988 the Company's common shares were called for trading on the N.A.S.D.A.Q. system under the symbol "NWMIF".

In addition, the Company is pleased to announce that $6,000,000.00 has been secured, during the past 30 days, concerning the private placements announced in February 1988 as well as through the liquidation of marketable securities owned by the Company. It is expected that final closings of all private placements will net the Company a further $3,000,000.00 by April 1, 1988.

Furthermore, drill hole results on the Teck-Hughes property in Kirkland Lake, Ontario, from the Narrows Break are as follows:

Hole No.	Depth ft.	Width ft.	Ozs. Au/Ton
44	350	1.8	.11
45	550	1.3	.11
50	200	4.5	.14
52	600	8.2	.35
59	90	11.3 (includes 3.4 ft. of .71)	.30
60	100	12.4 (includes 3.0 ft. of .40)	.14

D.M.R. (Dan) Clark has prepared this News Release on behalf of the Company and accepts full responsibility for its content.

On behalf of the Board,

Dan M. Clark

D.M.R. (Dan) Clark
President

The Vancouver Stock Exchange neither approves nor disapproves the information contained herein.

CANADA'S BUSINESS NEWSPAPER

REPORT ON BUSINESS

26th YEAR, NO. 6,449 ■ FRIDAY, FEBRUARY 5, 1988

PRINTED IN CANADA.

JDS

ASARCO

Exploration Department
Southwestern United States Division
James D. Sell
Manager

April 28, 1988

Mr. Curtis Risley
14460 N. Chalk Creek Drive
Tucson, AZ 85737

Big Dike, et al
Sec. 20, T22S, R10E
Oro Blanco Mining Dist.
Santa Cruz Co., AZ

Dear Mr. Risley:

Your note, map, and assay sheet arrived today. The low gold values do not enhance the material for smelter flux.

I will have one of our geologists review the files and try to arrange for a visit for a better idea of the continuity and grade of the structure. At the present time we are all preparing to head north, so the review may not be soon.

Thank you for submitting the information.

Sincerely,

James D. Sell

James D. Sell

JDS:mek

cc: T. Dalla Vista/W.D. Gay
W.L. Kurtz

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

Curtis Risley
14460 N. Chalk Creek Dr.
Tucson, AZ. 85737

TUCSON AZ 857
1 PM
27 APR
1988

ASARCO Incorporated
APR 28 1988
SW Exploration

ASARCO Mining Co.
P.O. Box 5747
Tucson, AZ. 85703

ATTN. JA
S.

Santa Cruz Co
NW 1/4, Sec 20, T22S,

The Big Dike #I, Shadows, #I, 2

MINING CLAIMS

ORO BLANCO MINING DISTRIC

INTRODUCTION

LOCATION AND PROPERTY

The Big Dike #I, and Shadows #I,2, lode mining claims consist of three full claims in width and in length.

unpatented in surveyed section, 20, township 22 south, range, IO east.

about sixty miles from Tucson south.

Six miles from Arivaca south, over forest road that goes to Tresballotas ranch and on in to mexico.

one and one fourth miles from Las Jarillas ranch house south.

These claims are located in full complyance with BLM and Forest .

All assessment work has been done and recorded with BLM and Santa Cruz county for I980 and I98I.

The Big Dike and Shadows #I are located on the strike of the Big Dike and are end to end and just cover the length that is exposed on the surface.

Width varys and in places will be I50' to 200' wide on surface projecting verticaly from a few feet to fifteen feet above surface.

There is two shafts on the BIG DIKE claim and the most west one has a depth of some 85' just alittle from verticle, one drift to south west about 35' and one in a north east about 25' and did not go through dike or wall, these drifts are on the bottom of shafts or just a few feet above the other shaft was not checked but apears to be about the same depth. ore from both dumps assay just about the same. these shafts are about I00' or more apart on the same dike.

ORANCO Incorporated
APR 2 8 1988
SW Exploration

SOUTHWESTERN ASSAYERS & CHEMISTS, Inc.

WIL WRIGHT
ARIZONA REG. NO. 5875
DNYANENDRA A. SHAH
ARIZONA REG. NO. 8888

REGISTERED ASSAYERS

P. O. BOX 7517
TUCSON, ARIZONA 85725

710 E. EVANS BLVD.
PHONE 602-884-5811

Mr. A. J. Allen
P. O. Box 223
Aravaca, Arizona 85601

JOB NO. 025073
RECEIVED 9-5-80
REPORTED 9-9-80

Big Dike

SAMPLE NUMBER		Au oz/T	Ag oz/T	Cu %			
Big Dyke							
1-Cross	dyke	.002	3.60	.44			
2-Upper	Dump	.002	3.78				

REGISTERED ASSAYER CERTIFICATE NO. 8888 Dnyanendra Amrutlal Shah DATE SIGNED 9-9-80 Arizona U. S. A.

CHARGE $ 18.10 Paid

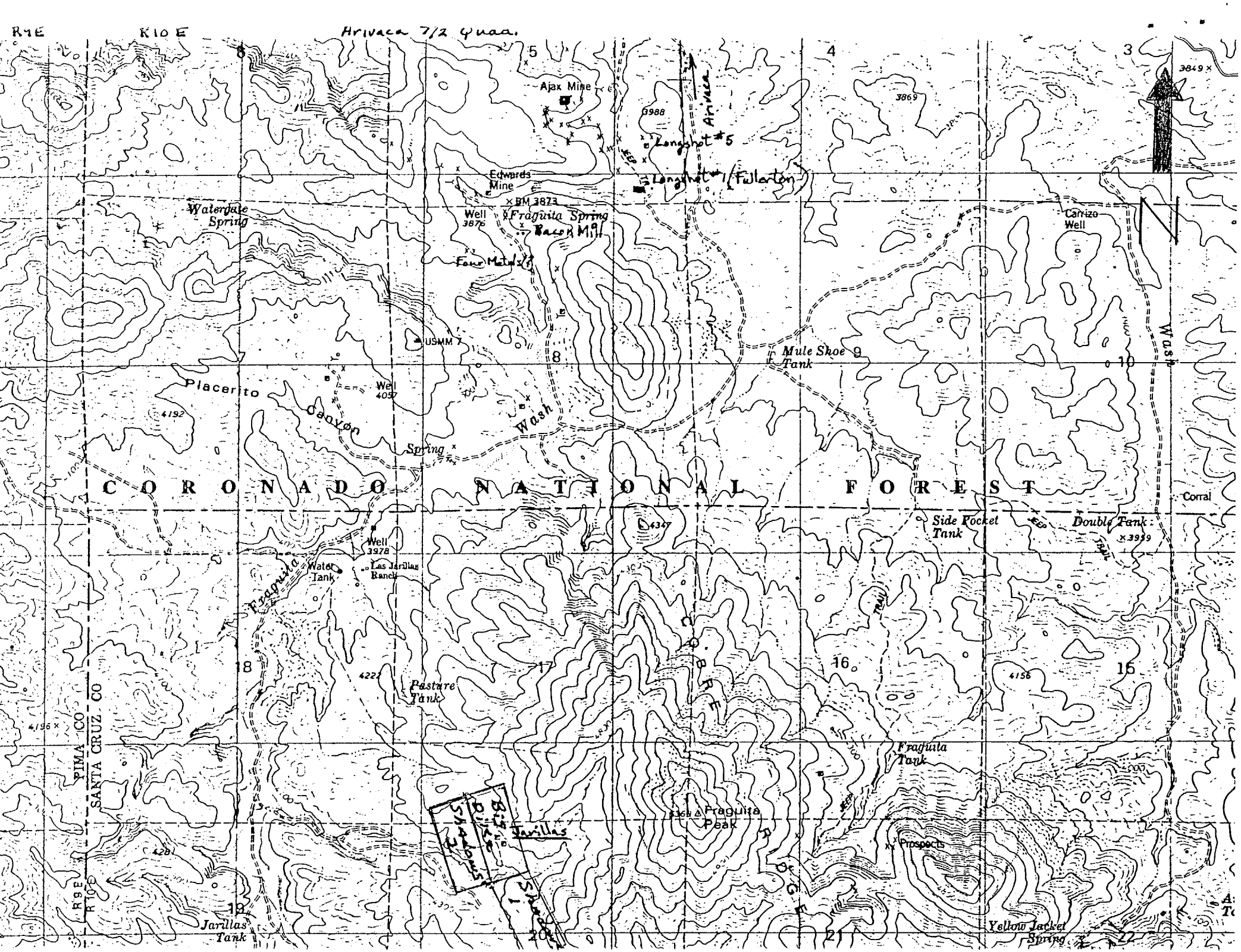
* Gold and Silver reported in troy oz. per 2,000 lb. ton.

INVOICE

NOTE:
I purchased these Claims in Sept of 1987
From Mr. A.J. Allen.

C. Risley

ASARCO Incorporated
APR 28 1988
SW Exploration


R9E
R10E
Arivaca 7½ quad.
Ajax Mine
Longshot #5
Arivaca
Edwards Mine
Longshot #1 (Fullerton)
BM 3873
Fraguita Spring
Bacon Mill
Four Mile
Waterdale Spring
Well 3876
Carrizo Well
USMM 7
Mule Shoe Tank
Wash
Placerito Canyon
Well 4057
Spring
C O R O N A D O N A T I O N A L F O R E S T
Corral
Side Pocket Tank
Double Tank
Well 3978
Water Tank
Las Jarillas Ranch
Fraguita
Pasture Tank
Fraguita Tank
Fraguita Peak
Prospects
Jarillas
Jarillas Tank
Yellow Jacket Spring
PIMA CO
SANTA CRUZ CO
R8E
R10E

JDS

ASARCO

Southwestern Exploration Division

JDS

April 25, 1989

FILE NOTE

Cominco-Kerr McGee
Red Mountain
Santa Cruz County, AZ

I have learned that Cominco has taken an option on the Kerr McGee Red Mountain property in the Patagonia Mountains.

It is rumored that Sillitoe believes that the high level enargite signifies high gold in the top portion of the porphyry-breccia pipe development.

Thus, as KM had long ago stated that they had a gold intercept, this may have sparked Sillitoes interest in his model.

R. Corn states that the enargite-gold vein they hit appears to be a very late stage feature and not very extensive.

Cominco will apparently test the secondary high-level chalcocite blanket as this should be in Sillitoes' gold zone. R. Corn stated that their composites of the blanket mineralization had very low gold values.

James D. Sell

JDS:mek

James D. Sell

cc: F.T. Graybeal
W.L. Kurtz

JDS

ASARCO

Southwestern Exploration Division

September 10, 1991

FILE NOTE

Mowry Mine
Santa Cruz Co., AZ

Mason Coggins called on 9/9/91, to say that he has learned that a private investment (homeowners) group has purchased the Mowry Mine and intends to trade it to the Forest Service for lands elsewhere.

The Mowry group is composed of 21 patented claims.

James D. Sell

JDS:mek

James D. Sell

cc: W.L. Kurtz

J. Prochnau

J.P. Sell: For your INFO

Cando Hills (CHClaims) Santa Cruz Co, AZ

NEVADA MINE PROPERTIES

127 CHENEY STREET
RENO, NEVADA 89501

OFF. (702) 348-1800
FAX (702) 348-1401

ASARCO Incorporated
NOV 18 1991
SW Exploration

RECEIVED
JUL 8 1991
ASARCO GBED

June 26, 1991

Mr. Peter Vickre
Asarco Inc.
510 E. Plumb Lane
Reno, Nevada 89502

Dear Mr. Vickre:

Please find enclosed summaries of various prospects in Nevada and California held 100% by Nevada Mine Properties. We will structure lease terms to provide for several years of low cost exploration with little risk. If you have further interest in any of the claims feel free to contact either John Prochnau or myself.

Very truly yours,

Herb Duerr

Herb Duerr

HD:cb

These were part of A HUGE property package from W. US. (mostly Dogs)

If any Interest Contact Duerr

F. Kurz

11/15/91

Canelo HILLS (CH CLAIMS), SANTA CRUZ COUNTY, ARIZONA

LOCATION

Sections 14 and 23, T22S, R17E, Canelo Hills, Red Rock Mining District, Santa Cruz County, Arizona.

PROPERTY

Sixteen unpatented lode mining claims; CH #'s 21-30 and Sandy #'s 4-9.

OWNERSHIP

John Prochnau & Herb Duerr
127 Cheney Street
Reno, Nevada 89501
(702) 348-1800

WORK COMPLETED

Twenty-two rockchip samples and sketch mapping at 1"=100'.

HISTORICAL

Several old adits, shafts, pits, and dozer trenches.

GEOLOGY-STRUCTURE

A 100' to 200' band of limy sediments, in part altered to marble, with a strike length of over 3000'. Conformable and crosscutting zones of copper-stained, magnetite skarn and gossan. Diorite dikes and plugs.

GEOCHEM

Sampling to date shows gold values form .1 ppm to 2.13 ppm, silver to 35 ppm, copper from .2 to 5.3%, and zinc from .1 to 6.5% over widths of 25 feet or more.

TARGETS

Untested precious metals-bearing skarn system.

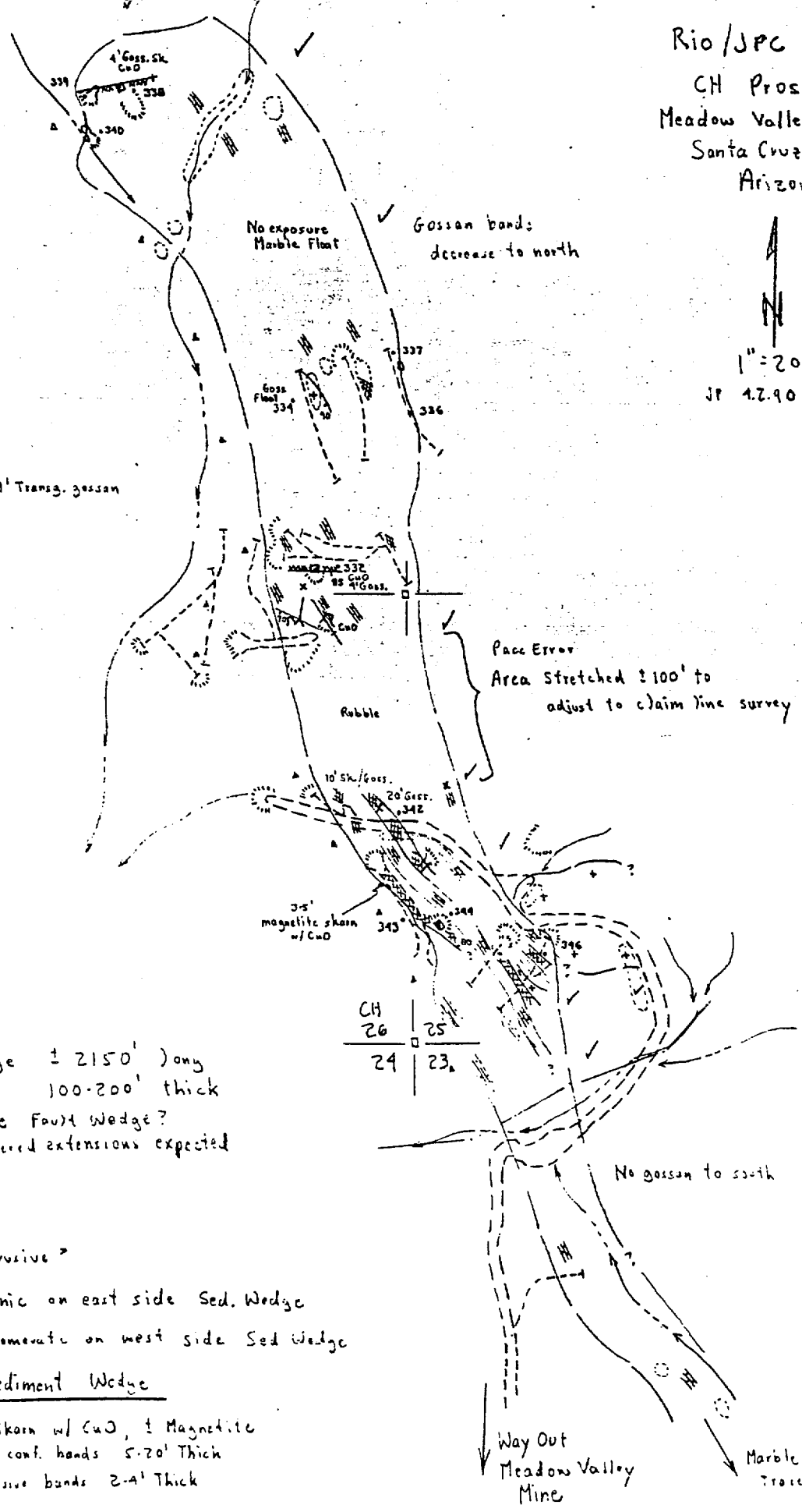
JP/HD 6/91

Rio/JPC Project
CH Prospect
Meadow Valley Area
Santa Cruz Co.
Arizona

1" = 200'
JP 4.2.90 Pace/Compass

Located Samples

	ppm Au	ppm Ag	
332	.015	1.8	
4	.276	5.9	
6	.007	—	
7	.002	—	
8	.413	10.1	
9	2.13	35.5	4' Transg. gossan
340	.041	6.7	
2	.069	5.3	
3	.129	17.7	
4	.051	0.6	
6	.207	1.6	



Sediment Wedge ± 2150' long
100-200' thick
High angle Fault Wedge?
No covered extensions expected

+ Granitic Intrusive?

✓ Felsic Volcanic on east side Sed. Wedge

▲ Felsic Agglomerate on west side Sed Wedge

Sediment Wedge

Gossanous Skarn w/ CuO, ± Magnetite
Bedding conf. bands 5-20' Thick
Transgressive bands 2-4' Thick

Marble

Silicified shale/hornfels

Sandy drift

J. Prochnau

J.P. Sell: For your INFO

New York Mine Area Santa Cruz Co, AZ

NEVADA MINE PROPERTIES

127 CHENEY STREET
RENO, NEVADA 89501

OFF. (702) 348-1800
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Herb Duerr

HD:cb

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If any Interest Contact Duerr

Fakurz

11/15/91

NEW YORK MINE AREA, SANTA CRUZ COUNTY, ARIZONA

LOCATION

Sections 10, 15, 16, T22S, R17E, Red Rock Mining District, about 12 miles SE of Patagonia.

PROPERTY

Eight unpatented lode mining claims; NY #'s 3-10.

OWNERSHIP

John Prochnau & Herb Duerr
127 Cheney Street
Reno, Nevada 89501
(702) 348-1800

HISTORICAL

Numerous shafts, adits and pits date to the late 1800's when a small production is reported for the property. From 1975 to 1984 Martin Troste and Assoc. held the ground and drilled at least 5 holes; no data available.

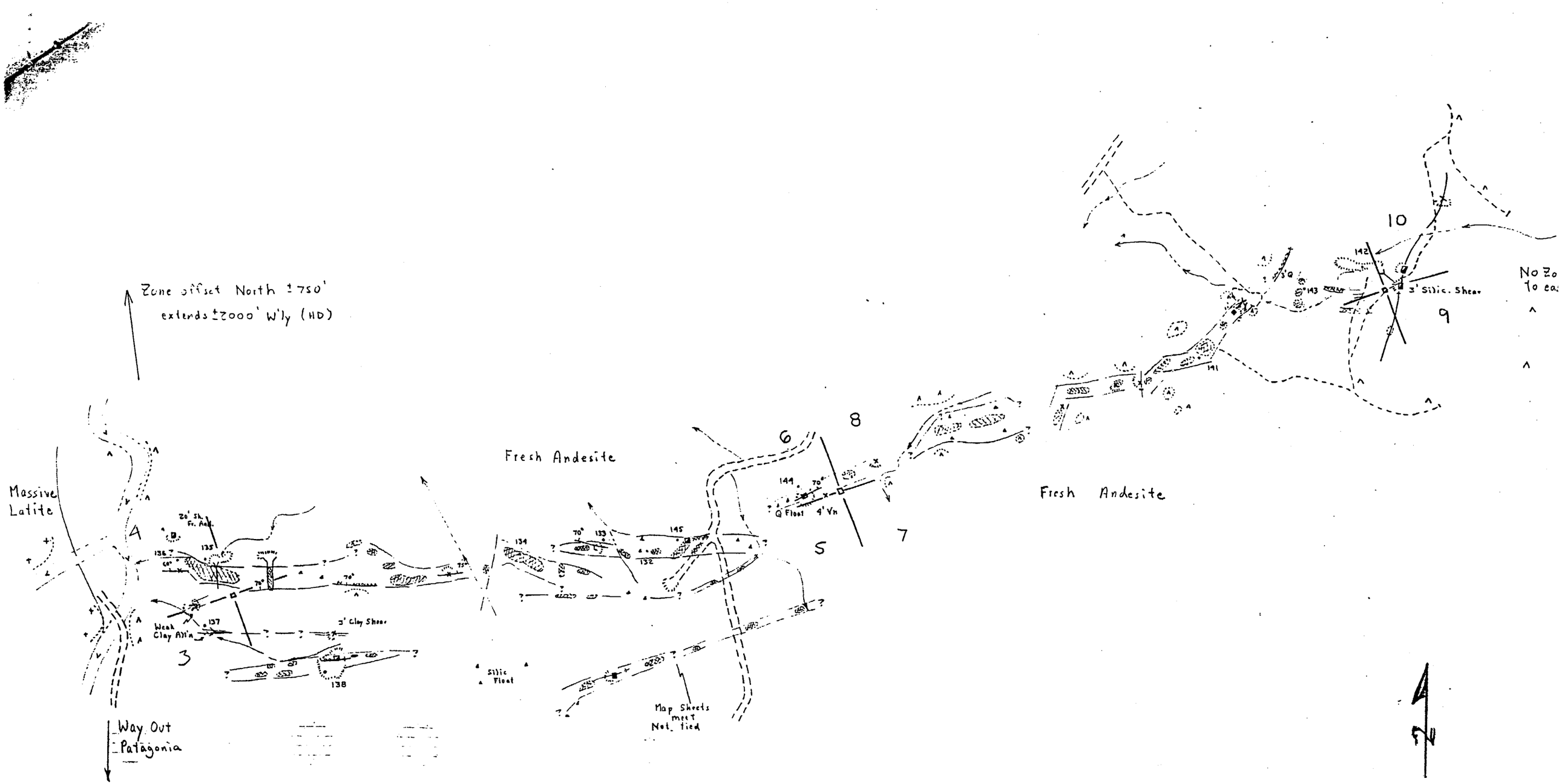
GEOLOGY-STRUCTURE

Principal feature is an east-northeast-trending quartz vein system traceable for a strike length of 2000 feet with overall thickness up to +50 feet. Country rocks are andesitic volcanics. Values from 23 samples along the zone average 2 opt Ag and 0.003 opt Au.

TARGETS

Mineralized quartz vein system with dimensions 2000' x 20-50' warrants direct drill test. Large areas of pervasively silicified volcanics, and other sheeted vein zones, occur in the area and have been inadequately prospected and sampled.

JP/HD 6/91



New York Zone
±3000' long to 40' thick

Ave Sample #'s 132-136 West half zone
2.37 opt Ag
.009 opt Au

Ave Sample #'s 141-145 East Half Zone
1.87 opt Ag
.003 opt Au

JPC/Rio Program
New York Claims
Santa Cruz Co, Ariz

JP 2.9.90
Pace/Compass

ASARCO

Exploration Department

April 7, 1994

Mr. Harold W. Holmberg
Director of Metal Exploration
Kerr-McGee Corporation
Kerr-McGee Center
123 Robert S. Kerr Avenue
Oklahoma City, OK 73102

Dear Sir:

Thunder Mountain Project
Patagonia Mountains
Santa Cruz County, Arizona

The attached letter has been received from the EPA. I also submit a copy of the letter dated October 1, 1993, from Mr. Maley stating that the Blue Nose (unknown) was included in the notice of termination, along with a copy of Appendix D of the EPA form NPDES.

Copies of the above had previously been sent to Mr. Phil Jones (June 23, 1993).

Asarco has no need to respond to this letter; however, should Kerr-McGee still have the Blue Nose (unknown), they may wish to respond.

Sincerely,

James D. Sell

James D. Sell w/o atts
Telephone: (602) 798-7714

JDS:brw
Attachments
cc: P. J. Maley w/o att.

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

Reference Number: EPAAZR00A822

March 7, 1994

RECEIVED

APR 0 4 1994

EXPLORATION DEPARTMENT

James D Sell
Asarco Inc So-w Exploration Dv
Po Box 5747
Tucson, AZ 85703-0747

Dear James D Sell:

You recently submitted a Notice of Intent (NOI) form for coverage under the U.S. Environmental Protection Agency's storm water general permit for use in the State of Arizona for the following facility:

Name: Blue Nose Unknown
Address: Santa Cruz County
, AZ -
Lat/Long: /
Quarter, Section: 05; Township, Range: T23S R16E

You have not been granted permit coverage because the information on your NOI form was incomplete or indicated that the discharge from your type of industrial activity is not covered by EPA's storm water general permits.

An NOI form is incomplete if certain critical information was not submitted. Such information includes the owner/operator address and phone number, the facility address, latitude/longitude, or the quarter/section and township/range; the State in which the facility is located; the primary industrial activities or standard industrial classification (SIC) code; an authorized signature and date; and for construction activities, the project start date and the number of acres that will be disputed.

A facility is determined to be eligible for coverage if the industrial activity or SIC code indicated on the NOI corresponds to those activities listed as covered under EPA's storm water general permits. Industrial activities not covered under EPA's storm water general permits will not be issued a storm water discharge permit number.

If, after reviewing EPA's storm water general permits, you determine that you want to seek coverage, you must submit a newly completed and signed NOI form to:

Storm Water Notice Of Intent
P.O.Box 1215
Newington, VA 22122

If you do not wish to seek coverage, no response to this letter is necessary. If you have questions regarding the types of industrial activities covered by EPA's storm water general permits, please refer to the general permits or contact the Storm Water Hotline at (703)821-4823.