



## **CONTACT INFORMATION**

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04/02/98

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES FILE DATA

PRIMARY NAME: SUNRISE GROUP

ALTERNATE NAMES:

MAMMOTH WASH PROJECT

PIMA COUNTY MILS NUMBER: 848

LOCATION: TOWNSHIP 12 S RANGE 8 E SECTION 5 QUARTER W2  
LATITUDE: N 32DEG 24MIN 46SEC LONGITUDE: W 111DEG 33MIN 19SEC  
TOPO MAP NAME: SILVER BELL WEST - 7.5 MIN

CURRENT STATUS: EXP PROSPECT

COMMODITY:

COPPER SULFIDE

BIBLIOGRAPHY:

ADMMR SUNRISE GROUP FILE  
ADDITIONAL WORKINGS SEC. 6-8

Sunrise Group (f)  
Daybreak Group (f)

PAU Group (f)  
Silver Bell East (f)



*Sunrise Group file  
Pima Co.***JABA Inc.**  
Mining Exploration400 - 850 W. Hastings Street  
Vancouver, BC, Canada V6C 1E1  
(604) 602-9002 Fax (604) 602-9007  
1 (800) 863-1551 www.JABA.com

NEWS RELEASE

June 12, 1998

**PRELIMINARY RESULTS PHASE I DRILLING  
AT MAMMOTH WASH PROJECT IN ARIZONA  
AND OPATA PROJECT IN MEXICO**

**JABA, Incorporated** (JBA - ASE) is pleased to announce the completion of Phase 1 drilling by Cyprus Metals and its affiliates at two JABA properties in two separate joint ventures. Eight reverse circulation (RC) holes have been completed at Mammoth Wash in the Silver Bell district of Arizona, and seven have been bottomed at Oyata, near Cumpas, Sonora, Mexico.

**Mammoth Wash** This Silver Bell project was designed to seek out the 'shallowly-buried', fault-displaced western half of Asarco's North Silver Bell porphyry copper deposit, the SX-EW-based mining of which was begun by Asarco late in 1997. Two of the new Cyprus holes bottomed in propylitized monzonite, three in hematite-stained or propylitized Cretaceous sandstone, and three were terminated (at 652, 700, and 1080 feet) in post-ore gravel. Not all assays have been returned, and results are yet to be fully interpreted. Four hundred and thirty feet of 310 to 520 ppm Cu were reported in the gravels, but neither sulfides nor anomalous copper were seen in the altered monzonite. The 'easy target' remains hidden, and JABA plans interpretation of multi-element analyses to see if the rocks pierced provide lateral guides for Phase 2 drilling. JABA is aware that a significant airborne EM anomaly is known by another company to occur on the property; efforts to obtain that data (perhaps through another JV) will continue to be vigorously pursued prior to further drilling.

**Oyata** Neither drill logs nor assays have yet been received from the Oyata RC holes, where drilling was intended to penetrate a gravel-filled down-dropped fault block, or graben, thought to conceal the heart of a porphyry copper system. Again, gravels were thicker than was expected. No 'enrichment blanket' or altered porphyries were noted by the project field geologists, but drill cuttings have yet to arrive for scrutiny at the Tucson office. Here again, multi-element analyses may provide directional information for further testing, depending upon copper assays in, and the nature of, units penetrated.

JABA management would prefer to report ore intercepts starting with Hole 1 in both JVs, but we remind our shareholders that major ore discoveries are almost never made that way. Management remains realistically optimistic about Mammoth Wash and Oyata subject to viewing, reviewing, and reinterpreting the data with our own techniques. Further news releases will be made as those reviews progress.

On behalf of the Board,

James A. Briscoe  
CEOJohn M. Guilbert  
Chairman of the Board

The Alberta Stock Exchange has neither approved nor disapproved the information contained herein

**JABA Inc.**  
**Mining Exploration**



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**NEWS RELEASE**

**May 6, 1998**

**JABA ANNOUNCES START OF CYPRUS DRILLING  
ON THE OPATA JOINT VENTURE  
CUMPAS MINING DISTRICT, SONORA, MEXICO**

JABA Inc. (ASE-JBA) is pleased to report that Minera Cuicuilco, S.A. de C.V. (Cyprus), a wholly-owned subsidiary of Cyprus Amax Minerals Company of Denver, Colorado, has begun reverse-circulation (RC) drilling at the Opata project, a porphyry copper target held by JABA's 90%-owned subsidiary Compañia Minera JABA, S.A. de C.V. (JABA). Cyprus and JABA agreed to terms of a joint venture in early March of this year (See JABA News Release dated March 6, 1998). The objective of the drilling is to test the concept that a 'porphyry copper deposit' nucleus of the same size and scale as La Caridad or Cananea lies shallowly buried in an alluvial-filled down-dropped graben (basin) that cuts a swath between strongly altered and mineralized border (peripheral) rocks on either side of the swath. Six hole locations have been permitted by Cyprus, and 6000 feet of drilling is called for in the joint venture agreement with JABA. Holes will be of variable depth depending on the thickness of cover and findings in bedrock. JABA has recommended additional sites, in part to evaluate characteristics of the peripheral zones and their alteration-mineralization. The drill results will be released as soon as practical after completion of drilling and assays, including confirmation assays if indicated.

Cyprus and JABA have also announced a joint venture in the Mammoth Wash area near Asarco's Silver Bell mine. Phase One of 6,000 feet of drilling is complete; both companies await assay results and geologic interpretation from RC cuttings before an announcement is made.

Additionally, JABA awaits drilling startup later in May as part of a joint venture with Valerie Gold Resources Ltd. on East Silver Bell, and has several other projects in advanced stages of negotiation for joint venturing. For further information, please call Jim Alexander at 1-800-863-1551, visit JABA's web site at [www.JABA.com](http://www.JABA.com), or fax us at 1-520-327-7450.

On behalf of the Board,

James A. Briscoe  
Chief Executive Officer

The Alberta Stock Exchange has neither approved nor disapproved the information contained herein

**NEWS RELEASE**

**April 1, 1998**

**JABA ANNOUNCES START OF CYPRUS DRILLING ON THE MAMMOTH WASH JV  
SILVER BELL MINING DISTRICT, PIMA COUNTY ARIZONA**

JABA Inc. (ASE-JBA) reports that Cyprus Metals Exploration Corporation of Denver, Colorado (Cyprus) will start drilling on the Mammoth Wash porphyry copper exploration JV (News Release dated February 5, 1998) on Thursday, April 2, 1998. The objective of the drilling is to test the concept that the Mammoth Wash project hosts the fault-displaced western half of the North Silver Bell porphyry copper deposit hidden under thin gravel cover. As many as 20 hole locations have been permitted and six thousand feet of drilling is called for in the joint venture agreement with JABA. Holes will be of variable depth depending on the thickness of cover. The large number of permitted locations will allow new holes to be positioned strategically in relation to information from previously drilled holes. The results of this drilling will be released as soon as practical after completion of drilling and assays including confirmation assays if indicated.

The Mammoth Wash project, 100% held by JABA, comprises 4 separate parcels totaling 4,586 acres (7.2 square miles or 18.6 square kilometers). The primary target is the offset portion of the North Silver Bell porphyry center mentioned above. However, geochemistry and geology suggest other targets may be present as well.

The Mammoth Wash project is part of JABA's study of the entire Silver Bell porphyry system which is now generally recognized as part of the rim of the Laramide (65 to 72 million year old) Silver Bell volcanic caldera. JABA believes that not only has the Mammoth Wash area been offset to the south but so has the entire West Silver Bell mountain range. There on the western edge of the caldera is JABA's Gap Tank project. Extensive remote sensing, geophysical, geochemical, geologic and alteration studies, and preliminary drilling show potential for additional porphyry copper centers. This area is as large as the exposed part of the Silver Bell district owned by ASARCO. Additional analysis and technical work is ongoing to refine targets. This area is available for joint venture.

In the eastern part of the caldera -the proposed east extension of the Silver Bell zone - work on the ESB (East Silver Bell) project JV with Valerie Gold Resources Inc. (Valerie)- News Release dated March 2, 1998- is ongoing. Geophysical work is anticipated shortly and drilling should start later this Spring. Valerie is obligated to perform a minimum of 4,000 feet (1,220 meters) of RC (Reverse Circulation) drilling in the first year of the JV.

CAP II, headed by J. David Lowell of recent Arequipa fame is drilling deep RC holes (permitted to 2,500 feet or 762 meters) approximately 50 feet (15 meters) south of the East Silver Bell project border.

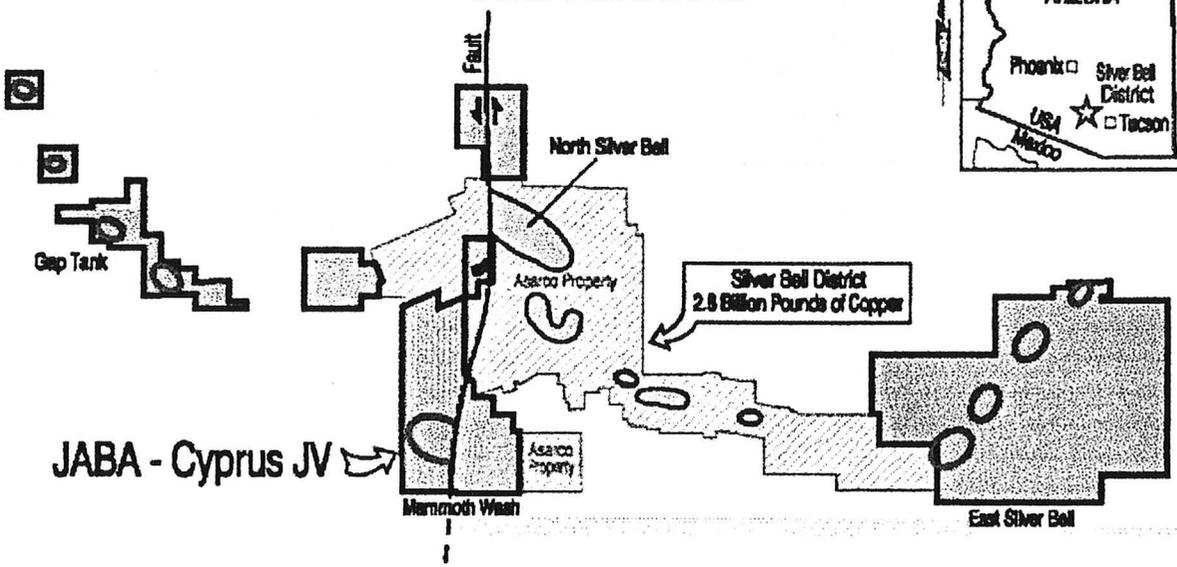
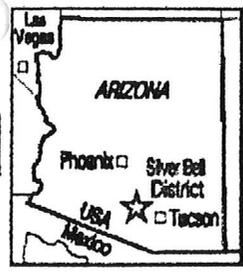
The map depicts, in simplified form, the data discussed above. (Map is available on JABA's web site or through JABA's office)

James A. Briscoe, CEO  
Chief Executive Officer

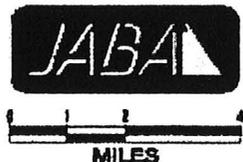
John M. Guilbert,  
Chairman of the Board

The Alberta Stock Exchange has neither approved nor disapproved the information contained herein

# JABA Inc. Properties Silver Bell District



-  JABA Properties
-  Asarco Properties
-  Copper Porphyry Targets
-  Operating Asarco Copper Porphyry Mines



News Release Dated February 5, 1998

**JABA AND CYPRUS METALS  
REACH AGREEMENT FOR A JOINT VENTURE ON  
MAMMOTH WASH PROJECT, SILVER BELL DISTRICT, ARIZONA**

JABA Inc. (ASE-JBA) is pleased to announce they have reached agreement for a joint venture with Cyprus Metals Exploration Corporation of Denver, Colorado ("Cyprus") on JABA's Mammoth Wash project in the Silver Bell Mining District in southern Arizona. Cyprus is one of the largest copper mining companies in the world and currently operates four open pit copper porphyry mines in Arizona. It is also the world's largest molybdenum producer and the largest US based mining company.

The Silver Bell district has a combined past production and estimated reserve of 2.8 billion pounds of copper. Asarco Inc. (formerly American Smelting and Refining Company) has been continuously producing copper from this district for more than 45 years and recently invested with partner Mitsui Inc. approximately US\$70 million to construct a new mine and extraction plant for their North Silver Bell deposit. This state-of-the-art facility is scheduled to produce 36 million pounds of high-grade copper annually for the next 30 years.

JABA and Cyprus will test the concept that the Mammoth Wash project hosts the fault-displaced western half of the north Silver Bell deposit hidden under a thin gravel cover (see attached map).

The Mammoth Wash project, 100% held by JABA, comprises 4 properties totaling 4,586 acres (7.2 square miles or 18.6 square kilometers). Cyprus can earn a 50% interest in the project by spending US\$2 million in exploration and paying JABA US\$200,000 over 4 years payable in quarterly increments. The Agreement includes a firm commitment for Cyprus to complete 6,000 feet of reverse circulation drilling within the first 4 months. Upon completion of the terms of the earn-in, Cyprus may earn an additional 20% interest (for a total of 70%) by completing a bankable feasibility study and paying JABA US\$1 million, if completed within 5 years of the date of the Agreement, or US\$2 million if completed no later than 6 years from the date of the Agreement.

The potential for the Mammoth Wash project to host a major copper porphyry was first recognized by JABA's John Guilbert and Jim Briscoe. This project is an example of the large mineral potential thought to exist on many of JABA's 20 properties that are available for joint venture. The Company is in various stages of negotiation with several major mining companies and expects to complete additional joint venture agreements in the near future.

James A. Briscoe  
Chief Executive Officer

John M. Guilbert  
Chairman of the Board

The Alberta Stock Exchange has neither approved nor disapproved the information contained herein

**JABA Inc.**  
**Mining Exploration**



*Sunniso Group (f)  
Pima Co.*

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**NEWS RELEASE**

**June 25, 1998**

**DEVELOPMENTS AT JABA'S MAMMOTH WASH PROJECT,  
SILVER BELL MINING DISTRICT, PIMA COUNTY, ARIZONA**

**JABA Inc.** (JBA-ASE) announces that the joint venture with Cyprus Metals Exploration Corporation ("Cyprus") on its Mammoth Wash project (see News Releases of February 5, April 1, and June 12, 1998), has been terminated effective June 19, 1998. Cyprus drilled 6,142 feet of RC (Reverse Circulation) drilling in 8 holes ranging in depth from 440 feet to 1080 feet, satisfying their commitment which required 6,000 feet of RC drilling by June 9, 1998.

This drilling generated significant information useful to the further evaluation of the Mammoth Wash property, at no cost to JABA, thus satisfying part of JABA's objectives. Only 3 holes clearly penetrated the post mineral gravel cover, entering propylitic (outer porphyry copper type) alteration, and were clearly off target. JABA has learned from this drilling that the gravel cover in the area drilled by Cyprus is greater than suggested by previous information. JABA believes that additional useful and positive targeting information can be derived from the drill data, and is proceeding with more detailed geologic and geochemical interpretation. It must also be noted that the Cyprus drilling campaign tested only the north one-half of the south block of the project area. No test was made of the north, west or east blocks, nor the southern one-half of the south block of the Mammoth Wash project area (see map in News Release dated February 5, 1998).

Another major multinational mining corporation that has been active in the area has agreed to enter discussions regarding a possible follow-on joint venture to test a geophysical anomaly that is known on the south half of the south block of the Mammoth Wash parcel and not tested by the Cyprus drilling. A joint venture to test that anomaly may result, whereby more drilling would be undertaken. Further announcements will be made as developments occur.

On behalf of the Board,

James A. Briscoe  
Chief Executive Officer

John M. Guilbert  
Chairman of the Board

The Alberta Stock Exchange has neither approved nor disapproved the information contained herein

"That Lil Old Mine Maker Me"

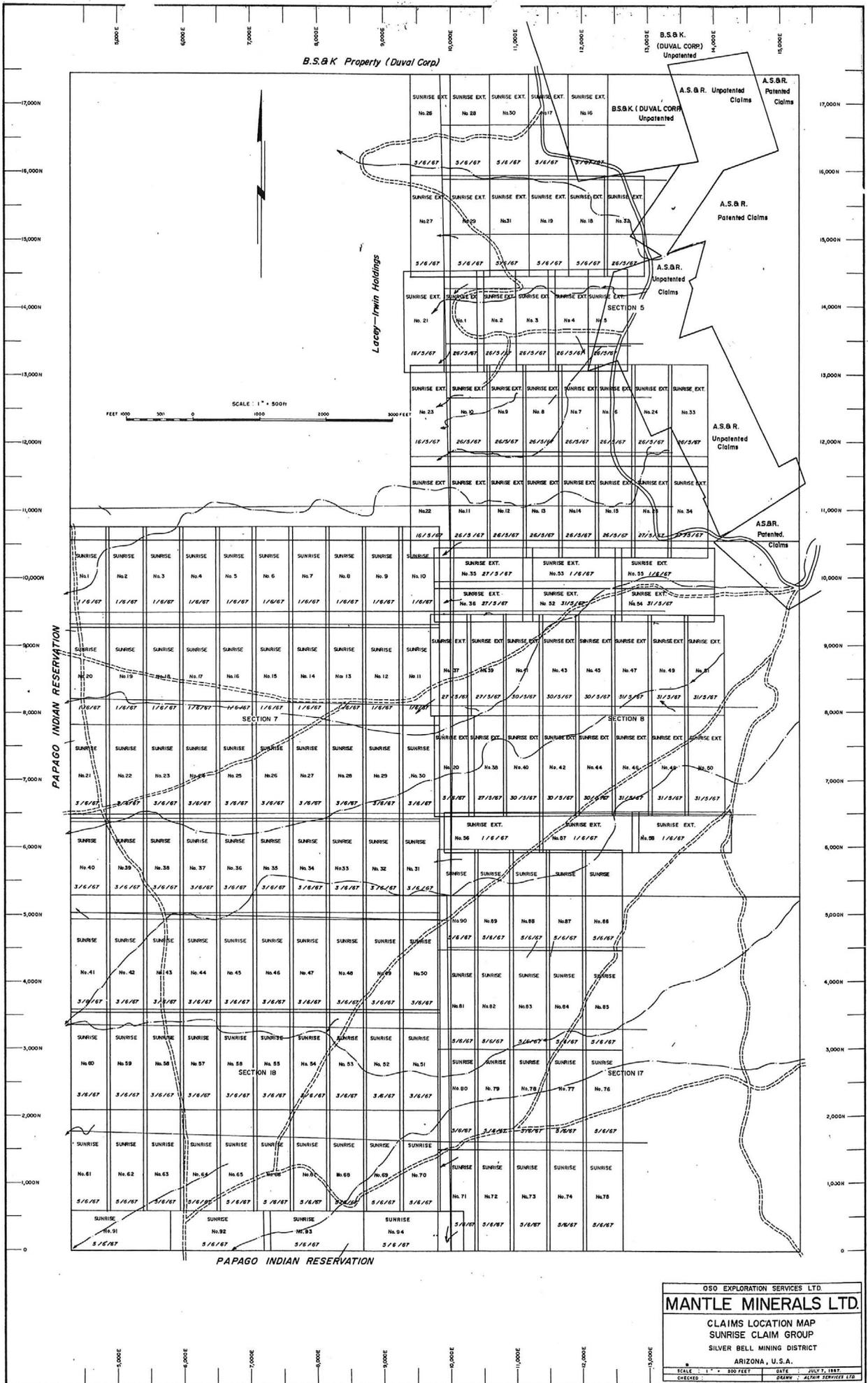
JOHN B. THOMPSON

MINERAL EXPLORATION

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947-8493



B.S.B.K. Property (Duval Corp)

B.S.B.K. (DUVAL CORP) Unpatented

A.S.B.R. Unpatented Claims  
A.S.B.R. Patented Claims

A.S.B.R. Patented Claims

A.S.B.R. Unpatented Claims

A.S.B.R. Unpatented Claims

A.S.B.R. Patented Claims

PAPAGO INDIAN RESERVATION

PAPAGO INDIAN RESERVATION

OSO EXPLORATION SERVICES LTD.  
**MANTLE MINERALS LTD.**  
 CLAIMS LOCATION MAP  
 SUNRISE CLAIM GROUP  
 SILVER BELL MINING DISTRICT  
 ARIZONA, U.S.A.  
 SCALE: 1" = 800 FEET DATE: JULY 7, 1987  
 CHECKED: GARY J. ALLEN SERVICES LTD.

PROGRESS REPORT  
SUNRISE PROPERTY,  
FEBRUARY 5 to MARCH 15, 1974,  
for  
ACHERON MINES LTD. (NPL).

March 19, 1974.  
Vancouver, B.C.

F. Holcapek, P. Eng.  
Consulting Geologist

ACHERON MINES LTD (N.P.L.)

SUNRISE PROPERTY

SILVERBELL DISTRICT, ARIZONA

PROGRESS REPORT FOR THE PERIOD OF FEBRUARY 5 to MARCH 15, 1974

WORK PROGRAM

During the past period the downhole hammer drill program to investigate the oxide potential associated with alluvial material was completed. A total of 16 holes for a footage of 1,970 feet was completed during the period. A total of 3,440 feet in 26 holes were completed.

The purpose of these drill programs was to:

- 1) extend the copper oxide zone at the pit - Zone 1
- 2) to test the oxide potential of the indicated copper zone south west of the pit - Zone 2
- 3) to test a potential northern extension of Zone 1

An induced polarization survey was initiated to test the sulfide potential at depth.

TABLE 1

Station	Depth	Interval	Temp	W. Sample	W. Sample
S 4	0 - 100	-	100		0.00
S 11	0 - 70	-	70		0.00
S 12	0 - 110	-	110		0.00
S 13	0 - 30	00-30	30	14.00	0.00
S 24	0 - 30	0-30	30	23.70	0.00
		20-30	30	22.70	0.00
S 15	0 - 170		170		0.00
S 20	0 - 30	0-30	30	9.00	0.00
S 21	0 - 120	70-120	50	8.20	0.00
		30-100	20	7.20	0.00

TABLE 2

S 16	0 - 130	30-30	30	5.20	0.00
S 19	0 - 200	all samples less than 0.03% Ca			

TABLE 3

S 16	0 - 130	10-130	70	11.30	0.00
S 17	0 - 100	20-100	70	11.30	0.00
S 22	0 - 140	all samples less than 0.03% Ca			
S 23	0 - 135	all samples less than .03% Ca			
S 24	0 - 30	10-30	30	8.9	0.00
S 25	0 - 100	all samples less than .02% Ca			
S 26	0 - 240	all samples less than .02% Ca			

REMARKS

... has been ... estimated and ...  
 ... responsibility ... to ...  
 ... fishing ... estimated ...

zone contains an estimated 330,865 tons grading .38% Cu.

Zone 2 - S18 and S19 were located to test this zone. The results were negative. From the drill cuttings it appears as if the mineralization exposed in the trench is caused by surface enrichment.

North Zone - S16, 17, 22, 23, 24, 25 are located between Zone 1 and the northern boundary. These drill holes will have to be considered as prospecting holes along the sunrise fault. No oxide mineralization of economic grade was intersected in these holes. The area has been tested sufficiently and does not warrant further drilling.

#### AREAS NOT TESTED

Checking of assays and drill reports of Mantle Minerals shows that several percussion holes, not relocated, intersected ore grade oxide mineralization. These drill holes should be relocated in the field and checked.

#### INDUCED POLARIZATION SURVEY

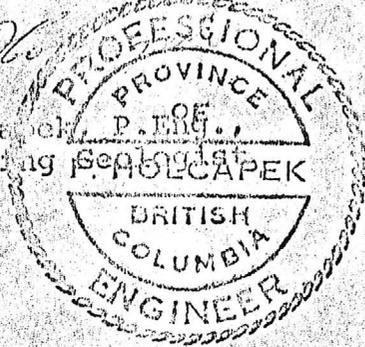
A reconnaissance induced polarization survey was initiated on March 4, 1974. The reconnaissance survey consisting of approximately 10 line miles, outlined a chargeability anomaly along the flanks of a resistivity anomaly. The line spacing for this work was 2,000 feet with 800 foot electrode spacing to obtain a depth penetration of about 600 to 700 feet. The anomaly indicated by this work appears to extend across 3 lines (4,000 feet) and is at least 400 to 1,000 feet wide. A follow up detail survey has been initiated using 400 foot electrode spacing. This detail work pin-pointed the anomalies trending northwesterly being 2.5 to 4.5 times background in magnitude and having dimensions of at least 1,000 by 700 feet.

The characteristics of the anomaly appears to suggest possible sulfides. At present, a detail survey 200 foot electrode spacing, is being completed to allow a detail interpretation and spotting of drill holes. The northwestern section of the property has not been surveyed as yet. At least three percussion drill holes to a minimum depth of 700 feet are planned.

Respectfully submitted,

*F. Holcapek*

F. Holcapek, P. Eng.,  
Consulting Geologist



March 19, 1974  
Vancouver, B.C.

ACHERON MINES LTD. (NPL)

SUNRISE PROPERTY - PROGRESS REPORT  
To February 5, 1974.

INTRODUCTION

Work on the Sunrise Property started on October 25, 1973. The initial program consisted of Geological mapping, establishing a 400 x 200 foot grid as ground control for regional mapping and magnetometer survey. Detail mapping of exposures in the vicinity of the shaft and trenching by plane table. The program was stopped during the Christmas period from December 22 to January 11, 1974. The drill program was started on January 21, 1974.

OBJECT

The object of the program is twofold;

1. to explore the alluvial copper enriched zone and the surrounding outcropping copper mineralization.
2. to look for potentially buried primary sulfides.

GEOLOGY

Geological mapping showed that in the area of alluvial copper enrichment, west of the Sunrise Fault,

Alaskite, in places strongly altered, is intruded and interfingered by quartz monzonite. Basic dykes, quartz veinlets and alteration zones with secondary copper mineralization have been found associated with the monzonite along the contact zone. Most of the mineralization located to date occurs along well defined steeply dipping zone along the east side of the Sunrise Fault

#### DRILLING

A down hammer drill contract was lent allowing for a minimum 3,000 feet. The unit is a C.P. Chicago Pneumatic 67 rig using a 6" downhole hammer. 600 cubic feet compressor 300 cubic feet air pressure. The sampling unit has been specially designed for sampling of low grade copper deposits in the Silverbell area. It consists essentially of a large approximately 12'x4'x6' metal box standing vertical containing cyclones and baffles to assure uniform mixing of the samples. The sampler is connected to the hole, which is sealed at the top to ensure no loss of dust or fine cuttings. The cutting pass via a 4" rubber hose into the sampling unit. After each 10 foot run the hole is cleaned and the sample is with-drawn from the sampling unit, split at a ratio of 3:1. the smaller sample is submitted to Hawley and Hawley assayers in Tuscon for analysis, the bigger sample is stored at the drill site.

A total of 10 holes or 1470 feet has been completed as of February 5, 1974.

DRILL RESULTS

<u>Hole</u>	<u>Footage</u>	<u>Inter-section</u>	<u>Width</u>	<u>Width %</u>	<u>Average</u>
S1	1-175 feet	50-150 feet	100 ft.	36	.36
		80-150	70	34	.485
		100-150	50	27.3	.546
		150-175	25	Bedrock	0.36
S2	0-220	90-100	20	2.20	.11
		140-180	40		.407
		170-220		Bedrock	<.03
S3	0-190	110-120			.12
		100-150			.066
		160-190		Bedrock	.0233
S5	0-90	0-40	40		.497
		40-90		Bedrock	.056
S6	0-225	110-150	40		.12
		170-200	30	.123	
		200-225		Bedrock	.023
S7	0-155	0-100	100	27.5	.275
		110-155	55		.024
S8	0-155	All values			.01 to .02
		120-135		Bedrock	.01
S9	0-95	0-30	30		.233
		10-30	20		.325
		30-95		Bedrock	<.02

<u>hole</u>	<u>Footage</u>	<u>Inter-section</u>	<u>Width</u>	<u>Width x %</u>	<u>Average</u>
S10	0-155	0-30	30		.30
		100-155		Bedrock	.032

S11 and S12 were drilled to test the eastward extension of a high grade section exposed in the trench. The visual examination of the cutting showed occasional fine specs of copper oxide (?) but it is felt the zone does not extend that far east. S13 and S14 are located to intersect the high grade section exposed in the shaft.

DISCUSSION

The first holes were drilled to check results obtained by Mantle Minerals and are in general slightly lower over the same width. (S1, S2) S3, S6, were drilled to establish the southern limits which was assumed to pass thru this area.

S3 was a step out hole to the east to check the untested area between S3 and the Sunrise Fault. S5, 7, 9, 10, 13, and 14 have been located to test the fault area.

Comparison between the Mantle Mineral drill program on Zone I and Acheron's program showed apparent discrepancy in assay results in the order of .1% to .2% Cu., but since most of the old drill holes have not been located in the field a final evaluation will have to be delayed till this has been completed.

At present it has been established that the mineralized zone overlaps approximately 40 to 50 feet in thickness grading from .3% to .7% Cu. in the form of copper oxide. An area measuring 260 x 240 feet, open to the north and west containing approximately 206,920 tons with an indicated grade of .4% Cu. has been delineated.

#### PROPOSED DRILLING

The following drill holes are proposed on Zone I:

S12 south of shaft

S13 between shaft and cut west of trench

S4 north-wards between S5 and S7 to check on extension

S14 west of S7

Further drilling on this zone will depend on the assay results of the proposed drill holes.

#### FURTHER POTENTIAL

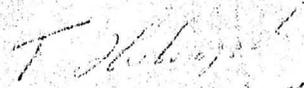
Drilling of Zone I, as of date indicates the presence of approximately 206,920 tons grading .4% Cu. The zone is open to the north and west.

Zone II to the south east of Zone I consists of an area of monzonites intruding alaskite cut by well mineralized shears and quartz veinlets. Surface samples across the best mineralized section assayed up to 1% Cu.

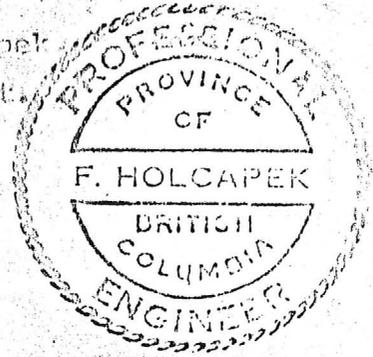
Zone III approximately 800 feet north of Zone I had 2 exploratory air holes completed by Mantle Minerals.

Assays from these holes were in the .23 Cu. range. Two drill holes were spotted to check these results and if positive further drilling will be required.

Signed,

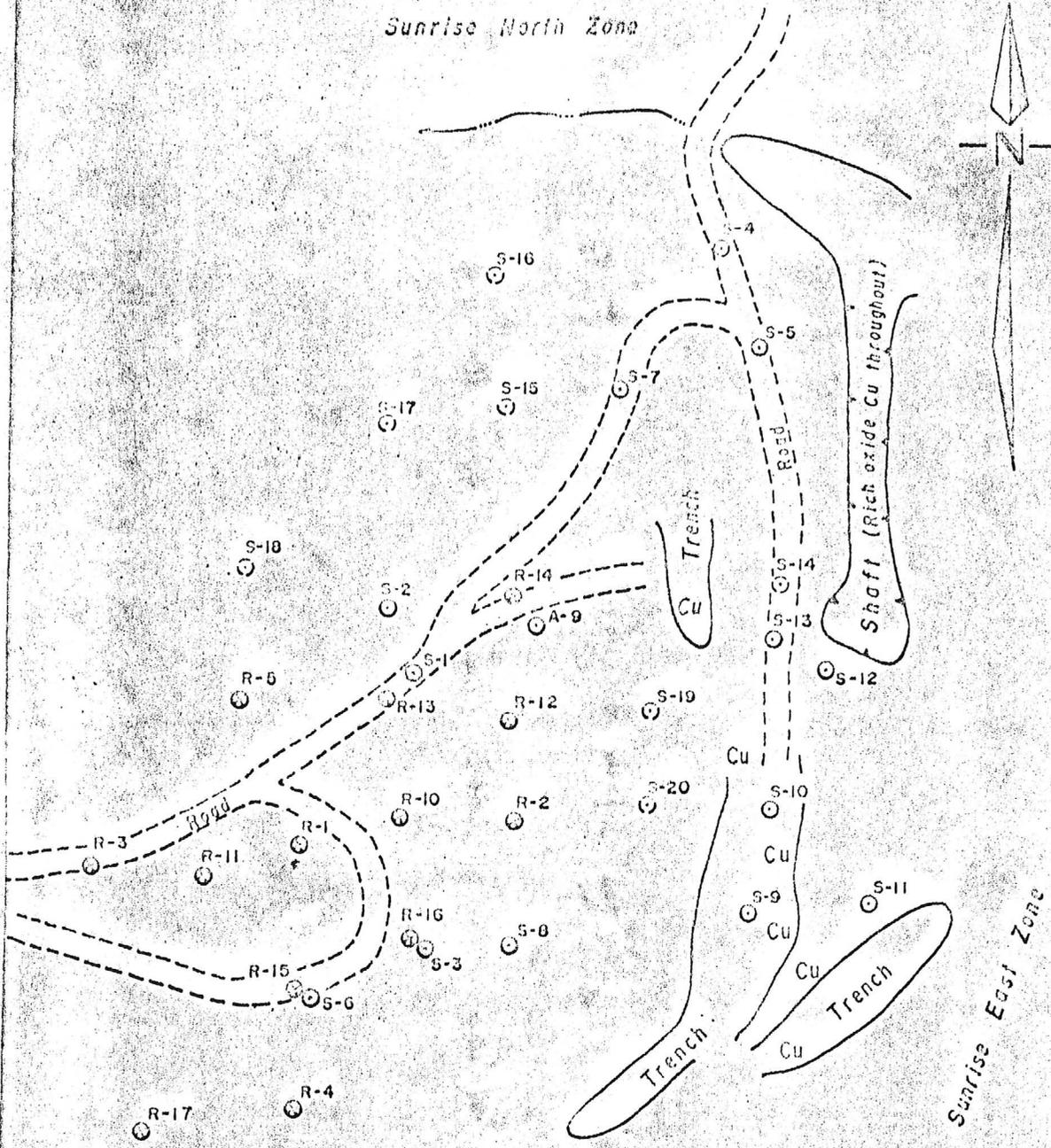


F. Holcapek  
Geologist



Vancouver, B.C.  
February 10, 1974.

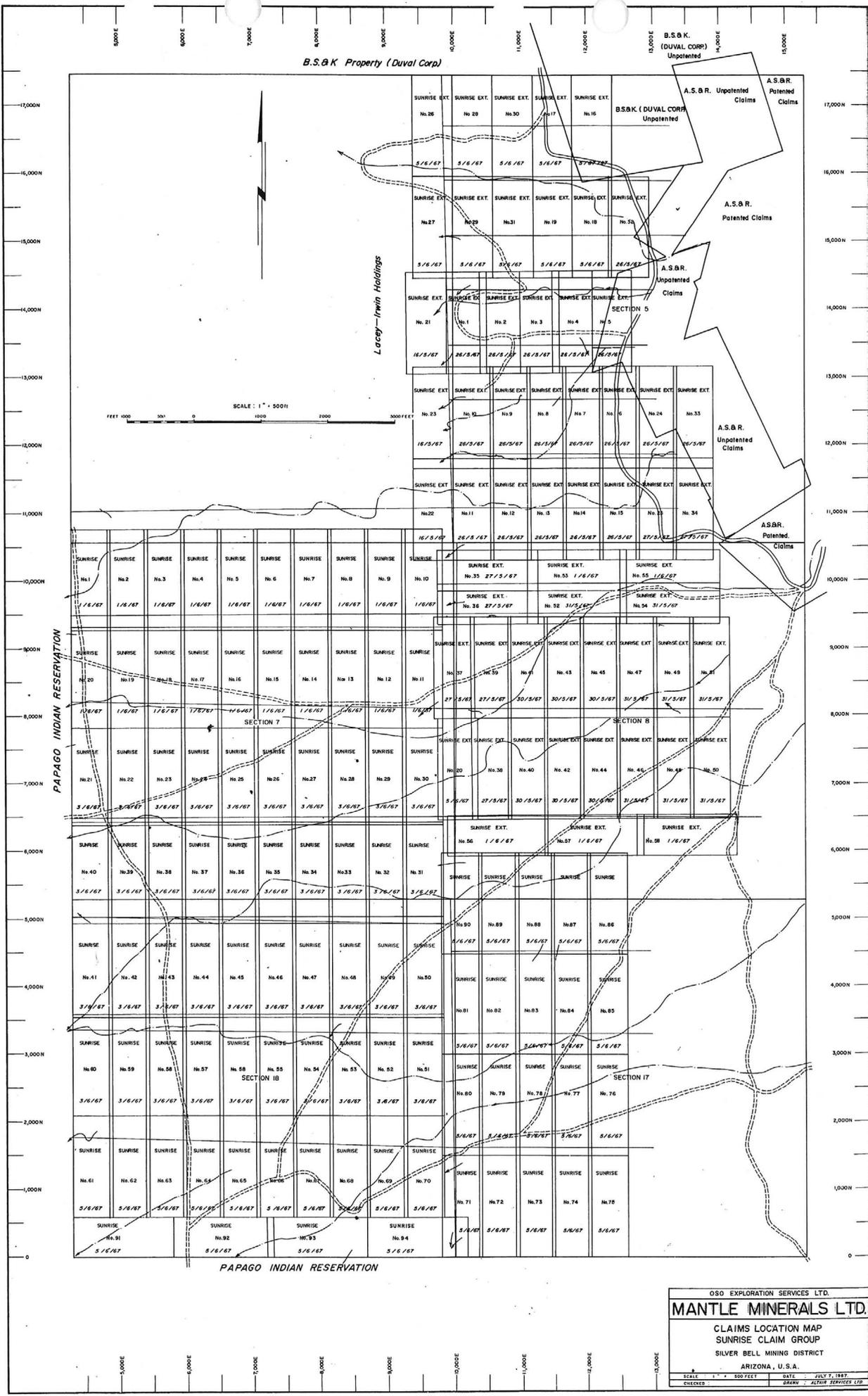
Sunrise North Zone



- LEGEND:
- ACHERON DRILL HOLES
  - ⊙ HOLES COMPLETED
  - HOLES PROPOSED
  - MANTLE DRILL HOLES
  - ⊙

ACHERON MINES LTD. (NPL)  
 PLAN SHOWING DRILL HOLES ON THE  
 SUNRISE WEST ZONE

SCALE 1" = 80'      FEBRUARY, 1974  
 Prepared by: AGILIS ENGINEERING LTD.



B.S.B.K. Property (Duval Corp)

Lacey-Irwin Holdings

B.S.B.K. (DUVAL CORP) Unpatented

A.S.B.R. Unpatented Claims

A.S.B.R. Patented Claims

A.S.B.R. Unpatented Claims

A.S.B.R. Unpatented Claims

ASBR. Patented Claims

PAPAGO INDIAN RESERVATION

PAPAGO INDIAN RESERVATION

OSO EXPLORATION SERVICES LTD.  
**MANTLE MINERALS LTD.**  
 CLAIMS LOCATION MAP  
 SUNRISE CLAIM GROUP  
 SILVER BELL MINING DISTRICT  
 ARIZONA, U.S.A.  
 SCALE 1" = 500 FEET DATE: JULY 7, 1967  
 CHECKED: DRAWN: ALTAIR SERVICES LTD.

COUNCIL OF THE DISTRICT OF COLUMBIA

TRUSTEES AREA, ARLINGTON, V.C.

OF THE DISTRICT OF COLUMBIA (1971)

JUNE 1973

VANCOUVER 1, B.C.

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REPORT ON THE SUNRISE PROPERTY, ARIZONA  
OF  
MANTLE MINERALS LTD.

INTRODUCTION:

The Sunrise claim group is a group of 202 contiguous mineral claims, covering approximately 4,000 acres, adjacent to the Silverbell mine of Asarco, 40 miles NW of Tucson, Arizona. The claims are owned by Mantle Minerals Inc., Arizona, a wholly owned subsidiary of Mantle Minerals Ltd. The location is within an area of large producing mines, just west of Silverbell and S.E of the Vekol and the newly discovered Lakeshore mine.

Major structural and geological relations to these mines give strong indications on this property of an excellent potential for development of similar large porphyry copper deposits. Work to date has outlined several target areas for deeper drilling to test for such deposits.

Shallow drilling has so far outlined a tonnage of oxide copper sufficient to support a profitable leaching operation and has indicated further untested zones which would expand the tonnage considerably. The leaching of copper oxides is a cheap method of copper production which is in operation in many parts of Arizona.

Previous calculations on this property were made on the basis of copper at a price of 38¢ per pound. The new price of approximately 70¢ per pound has radically changed the potential.

LOCATION AND ACCESS:

The claims group cover most of sections 5, 6, 7, 8, 17 and 18, Township 125, Range 8E, in the Vaca Hills quadrangle of Pima County, Arizona. It lies 41 miles by road NW of Tucson, Arizona, 36 miles of which are paved and 5 miles of which is good secondary road. Secondary roads cut most of the claims area and new ones are easily built. The present workings on the property are 28 miles from the rail head used by A.S. & R. The property is situated SE of the Vekol mine and the new Lakeshore Mine, is bordered by the B.S. & K. Mine property to the north and is adjacent to the Silverbell mine to the east, the copper workings being 1 mile SW of A.S. & R.'s El Tiro open pit.

PHYSIOGRAPHY:

Climate is semi-arid and vegetation consists of desert cacti and low thorn bushes. The claims lie in the western foothills of the Silverbell mountains, with a relief of 50 to 150 ft., and extends into the low flat plain to the west.

WATER AND POWER:

Sufficient water to supply a copper leaching operation has been located with percussion drilling at depths of approximately 100 - 150 ft. A power line runs along the east side of the property.

CLAIMS STATUS:

The Sunrise Claim Group was reportedly held for 10 years prior to 1967 and located before the A.S. & R. Silverbell copper mine was developed. Since 1967 Mantle Minerals has carefully checked ownership, restaked the property, and has held it for 6 years.

BRIEF DATA ON SOME ARIZONA COPPER MINES:

The mines in Arizona produce approximately 12.5% of the world copper production and over 70% of the total U.S. production. This production comes mainly from two sources, the milling of large tonnage, low grade, porphyry copper deposits, consisting of copper sulphides, and the acid leaching of copper oxide deposits to obtain pure cement copper.

(A) PORPHYRY COPPER OPERATIONS:

There are nearly 30 large porphyry copper operations scattered throughout southern Arizona, the greatest concentration of these being around Globe, with seven mines, and South Tucson with 6. The largest mine in the U.S., Twin Buttes, with reserves of ore over 2 billion tons grading over .5% copper, is one of the South Tucson Group.

To the NW of Tucson, extensive mining development has been carried out in the Silverbell area since the opening of the first major mine in 1865. Intermittent selective mining had produced usually from high grade contact and vein deposits, about 100 million pounds of copper by 1930. In 1954, A.S. & R. began producing at the rate of 18,000 pounds of copper annually. A molybdenum recovery plant was added in 1957 and a leaching plant in 1960. In 1968, 11,500 tons per day of sulphide ore was milled and production has been increasing since then due to discovery of more ore and mineability of lower grade ore due to higher copper prices.

The B.S. & K. mine, to the north of the Sunrise group, along the Sunrise fault, produced lead, zinc, and copper for a number of years from a high grade contact deposit underground. Porphyry copper deposits in underlying monzonites have been intersected and are being evaluated on this property at present.

To the NW of the Sunrise Group, probably along an offset of the same productive belt as at the Silverbell, a new discovery, the Lakeshore mine is being developed. To date about 4 - 5 hundred million tons of copper grading, about .7% copper have been proven with the zone not yet limited. This is one of the largest discoveries in the U.S. in a decade, and it should be noted that at the depth sulphides were encountered, 700 ft., no indication was given by I.P. Surveys.

The Vekol mine, a short distance NW of the Lakeshore, has developed a considerable tonnage, but figures are not available.

#### (B) COPPER LEACHING OPERATIONS:

Briefly the leaching procedure consists of building dumps of copper oxides, which are not millable, and which are amenable to leaching. These dumps are then saturated with an acid solution, or water if the ore contains sufficient sulphides to generate its own acid, and the solution is allowed to percolate through the dumps to a catchment area where a pond of solution pregnant with copper sulphate accumulates. This pregnant solution is then circulated through cement vats, or launders, filled with iron in the form of roasted tin cans or iron pellets. Iron then goes into solution and native copper is precipitated in the launder. The launders are periodically washed and a very pure copper, called cement copper, is recovered and placed on pads to dry. The barren solution is then re-circulated to the dumps. The valley in which the dumps are built is often covered with tar or asphalt to prevent leakage. This is a very cheap and successful method of producing pure copper. Copper production can be expected within a few weeks from the beginning of spraying a dump. If the tonnage available is sufficient the plant may be connected to a more expensive, about 3 million dollars, ion exchange plant which handles a greater amount of solution and produces a purer form of copper.

Many of the large porphyry copper mines have accessory leaching operations where the unmillable copper oxides, which exist as enriched cappings over the sulphides are treated. A.S. & R. move about 5,000 tons per day, grading around 0.3% copper, to the leach dumps at the Silverbell.

Bahgdad has a large leaching operation in conjunction with sulphide mining and has converted to an ion exchange plant. Several of the mines around globe, such as Inspiration have large leaching operations.

Some mines are exclusively leaching operations. Examples of these are the Ox-hide mine (I.C.C.Co.), the Zonia Mine (McAllister Fuel Co.) and the Bluebird (Ranchers Co.). The Ox-hide mine has reserves of several million tons averaging .35% copper and is mining 5,000 tons per day. The Zonia mine began with reserves of several million tons of waste. Mining is done at a cost of 26 cents per ton, delivered to the dumps. About 7 pounds of acid produce 1 pound of copper. One of the most interesting is the Bluebird mine. This mine started with very small reserves, using cement launders. It has now developed to reserves of 30 million tons grading .55% copper, mining 9,000 tons of ore and 9,000 tons of waste per day. They have now converted to a \$3 million LIX, (ion exchange) plant, expect 40% recovery in the first year of the life of a dump, and are obtaining about 1 million pounds of copper per year with the amount increasing.

Many other, much smaller, operations are producing copper by this method in Arizona and more can be expected with the reduction of cost in acid. This reduction is due to scrubbers being mandatory on the smelter stacks resulting in cheap acid such as at the Heyden smelter where 750 tons of acid per day are recovered from one smelter stack.

DISCUSSION OF PORPHYRY COPPER (CU SULPHIDE) POTENTIAL ON  
THE SUNRISE GROUP:

(A) REGIONAL MINERALIZED BELT:

Narrow mountain ranges outcroppings sporadically on the borders of the desert valleys, (such as the Avra valley, N.W. of Tucson, and the Papago Indian reservation NW of the Silverbell), offer the only bedrock exposures. Where these outcroppings intersect a NW line between the mines south of Tucson, through the Tucson mountains, the Silverbell mountains, the Slate and the Vekol mountains, a trend of mineralization is noted in this direction. This trend is indicated by a series of outcroppings of Laramide intrusives, (cretaceous - tertiary rocks - including copper productive monzonites); by numerous copper and copper-silver-lead showings; old mine workings and developed mines.

In the Tucson mountains, just west of Tucson, many copper showing and some partially developed ore bodies are known but development is not allowed since this is park land.

In the Silverbell range, 40 miles NW of Tucson, many old mines were worked for many years and A.S. & R. are currently operating two large open pits.

In the Slate mountains, 20 miles NW of the Silverbell, across the Papago desert valley, the large Lakeshore discovery is being developed.

Just NW of the Lakeshore and Vekol mines is located in the Vekol mountains.

These areas are all similarly characterized by high-grade silver-copper veins in the volcanics copper-lead-zinc-silver replacement bodies in the limestones (such as at the B.S. & K. mine north of the Sunrise group). These volcanics and limestones overly Laramide monzonite intrusives which contain large tonnage,

low grade, porphyry copper bodies, usually containing chalcocite as the main copper mineral. These porphyry bodies are usually accompanied by leached copper oxide cappings and the sulphide zone is often at considerable depth, as at the Lakeshore mine, where the sulphide ore, covered by oxides in volcanics and limestone, was intersected at a depth of about 700 feet.

(B) MINERALIZATION ON THE SUNRISE GROUP:

On the Sunrise Group, 4,000 acres favourably located bordering A.S.&R. on the west, B.S.&K. on the south and lying SE of the Lakeshore and Vekol mines, the main features are similar geology to the productive areas, and the Sunrise fault. This fault is a strong major structural feature, dipping  $42^{\circ}$ W and striking  $N20^{\circ}$ E through the centre of the group. It has been traced by mapping for over five miles through the group and the B.S.&K. property to the north and is indicated to extend much further. This fault, or fault system, appears to be post mineralization and to offset the regional mineralized belt, with the west side being moved south.

Evidence for this is:-

1. The termination of the A.S.&R. mineralized zone at the intersection of the Sunrise fault where it strikes across the B.S.&K. property to the north. Sulphide bodies have been found at or near this intersection.
2. The apparent offset of possibly 3 miles between the ranges of the Silverbell and West Silverbell mountains. The mineralized zone in the the Silverbell mountains lies south of overlying barren andesites. Several shafts on high grade silver showings lie south of similar barren andesites in the West Silverbell mountains.

This mineralization is on the edge of the desert and may represent the northern edge of the same mineralized zone, the south part of which would be covered by the Papago desert.

3. If the continuation of the mineralized belt is projected from the SW part of the property in the same general NW direction, from the west side of the fault across the Papago desert, it lines up directly and intersects the mineralized areas of the Lakeshore and the Vekol. This is consistent with the postulated offset. In this area of the property, sections 7 & 18, outcrops of limestone, the same as that overlying the A.S. & R. area, occur, as well as minor intrusives outcrop, indicating fairly shallow overburden. The area is scattered with float of hematite and magnetite with seams of copper oxides, and contains relatively strong magnetic anomalies, which is indicative of contact deposits similar to those overlying the porphyry copper deposits. Two shallow air-track holes encountered increasing copper values with depth, in sandy overburden.

4. Copper oxide deposits which have been developed by trenching and drilling west of the fault occur in breccia and gouge zones and probably indicate sections dragged along the fault from sulphide body cappings. Elsewhere on the property there are other indications of copper deposits. One other untested area is the NW section, west of the fault, where geochemical and magnetic anomalies occur. Here considerable copper oxide float is found in the alluvium. Monzonite float containing chalcocite also been located. Float found on the west side of the fault does not appear to have come from the Silverbell area since none is found in the intervening area east of the fault.

The only area surveyed in detail by geophysics and shallow drilling is the NE part, concentrating mainly east of the fault and near the area of developed oxides. Here IP (induced potential), mercury vapour, and geochemical surveys were conducted. Copper oxides are found in loose breccia on the west side of the fault and in shears and fractures in intrusive bedrock on the east side. Minor veinlets and quartz stock work containing pyrite, chalcopyrite, and some chalcocite were also noted. Several areas of anomalous soil gas mercury values were obtained, some of them coinciding with geochemical anomalies and surface oxides. Some of these anomalous zones have not been delimited. Two zones of low resistivity at depth were located by IP. The southernmost one is not covered by mercury survey. The north zone parallels and partially overlaps a mercury anomaly, in bedrock east of the fault where abundant copper oxide shows in intrusive outcrop. This zone, apparently indicative of sulphides beginning at moderate depth, within an oxidized shear zone, becomes stronger to the east and has not been limited. Deep drilling below the penetration of the IP should intersect stronger sulphide ore.

Mineralization surveyed east of the fault has many similarities to that of the El Tiro pit, and much of this may be connected to extensions of, or separate structures similar to those in the Silverbell part of the mineralized belt.

DISCUSSION OF POTENTIAL FOR A CU LEACHING PLANT ON THE  
SUNRISE GROUP:

The copper oxide body outlined to date is located at an old shaft in the west central part of section five, on one of the smaller geochemical anomalies where mercury vapor and IP anomalies have also been obtained. Work was concentrated here since it was the only area of exposed oxides and only shallow drilling and trenching have been done.

Two types of ore occur here. West of the Sunrise fault the copper occurs in fault breccia and gouge in the form of chrysocolla, azurite, malachite, and a very fine powdery black oxide which is often quite high grade. This ore breaks quite fine and could be removed by scraper. The ore on the east side of the fault consists mainly of the same minerals, with less black oxide, grading slightly lower, and occurring in shears and fractures in solid intrusive bedrock. This ore would have to be blasted and would make coarser material.

Mixing of these ores is ideal since a mixture of coarse ore with the fine helps prevent packing in the dumps.

Proven ore is that which is outlined by drilling on the west side of the fault. Probable ore is what can reasonably be expected with conservative extensions beyond the drilled areas. On the eastside of the fault only surface trenching and occasional wagon drill holes have been sampled and probable ore here is calculated by extending surface zones to a 50ft. depth. Since some of the trenches are blasted up to 20ft. deep the figure is conservative. A small stockpile of over 10,000 tons has been built up to date.



After the initial plant outlay the only further costs are moving more ore, and maintenance, which is low on leach plants, and this would come out of production. Copper production would be expected to begin after the first 50,000 to 100,000 tons are placed on the dumps.

At a conservative grade of 0.5% Cu, 450,000 tons would contain 4.5 million lbs. of copper. At a current rate of 70¢ per lb of copper this represents a dollar value of roughly \$3 million dollars.

Therefore, for an outlay of less than \$0.5 million, a potential profit on presently known reserves is of the order of \$2.5 million less smelter fees and possible changes in cost estimates when they are up dated, though these changes should be relatively small.

Though only minor leach tests have been done, the ore appears to be a fast leaching ore, and if modern methods are used as at Bluebird and Zonia mines, initial returns in the first year could be as high as theirs, that is up to 40% recovery.

Through allowing for downgrading in drilling, testing new areas indicated by geochemical anomalies and reconnaissance drilling, extending known zones, and possible new discoveries through deep drilling for sulphides, a very large leaching operation could be developed on this property.

#### CONCLUSIONS:

This property has been held for approximately 16 years, since major interest in large scale copper production in the area began. Little detailed work has been done during this time for two reasons; (1) the property has been held for most of this time by individuals with no major financing; (2) due to more overburden coverage in the low foothills, the potential was not as obvious as in the highlands of the Silverbell mountains. Work done by Mantle Minerals to date has outlined the potential for a significant leaching operation as well as discovery of

possibly several porphyry copper bodies.

(A) COPPER OXIDE:

1. A commercial tonnage of copper oxides has already been developed, approximately 450,000 tons of over 0.5% Cu.
2. The cost of constructing a leaching plant is of the order of \$250,000.00.
3. Ore should be moved for approximately 30¢ per ton to the dumps, resulting in a cost of less than \$150,000 to move 450,000 tons.
4. Part of the moving costs would be paid out of production since copper production could begin with the first 50,000 to 100,000 tons placed on the dumps.
5. The dollar value of the known ore to date, using a price of 70¢ per lb for copper, is of the order of \$3 million. Therefore, for an outlay of less than \$500,000, part of which could be paid out of production, a potential profit exists of over \$2 million on known reserves.
6. Extension of known zones, development of other targets along the Sunrise fault, and deep drilling for sulphides in hitherto untested areas, could produce a leaching operation of major proportions.

(B) COPPER SULPHIDES:

1. Two untested areas of interest, the SW and NW parts of the property, where no detailed work has been done, have been indicated by geological and aeromagnetic evidence.

2. The SW section is of the greatest interest since the overburden here is shallow, there is a greater amount of copper bearing and intrusive float, there are stronger anomalous magnetic values, and it appears to be the continuation of the Silverbell mineral belt offset by the Sunrise fault.

3. In the area surveyed by IP two zones of low resistivity at depth were located. The northernmost is of most interest since it coincides with mercury vapour and geochemical anomalies and is in an area of abundant surface copper oxides. This zone presents a prime target for deeper drilling.

4. If detailed IP and possibly mercury vapour surveys are done on the untested areas, to more clearly define drill targets, then deep drilling, 500 - 1,000 ft on these areas and on the presently known zones, could result in the discovery of possibly several porphyry copper deposits, which in this region are usually of considerable size.

#### RECOMMENDATIONS AND COST ESTIMATES:

This property should first be tested for copper sulphide bodies since this work may result in increased oxide tonnage, as well as sulphides, which would alter plans for further development.

The area in the SW should be surveyed with IP and possibly mercury vapour tests, to more clearly define drill targets. This should be followed up with deep drilling, 500-1,000ft. holes. In the area already surveyed, at least two holes, should be drilled on the known targets to depth of at least 700ft.

COST ESTIMATE:

IP survey in SW section with some reconnaissance in NW - 10 miles of IP @ \$400/mile	\$ 4,000.00
Mercury soil gas survey in above areas 10 mile @\$200/mile :	\$ 2,000.00
Drilling two deep holes on known targets in surveyed area, 1500ft @ 6/ft	\$ 9,000.00
Follow up drilling after surveys in SW section, 3,000 ft. @ \$6/ft.	\$18,000.00
Administration, assaying and contingencies	<u>\$ 7,000.00</u>
Total	<u><u>\$40,000.00</u></u>

An amount of \$40,000.00 should be made available for this program. Depending on results further plans should be made to either begin construction of a leaching operation of in the case of discovery of sulphide bodies, to go into a stage of major development.

Submitted by \_\_\_\_\_

R.G. Hawley.

SUMMAPY REPORT  
SUNRISE CLAIM GROUP  
SILVER BELL DISTRICT, ARIZONA,  
FOR  
ACHERON MINES LTD. (NPL).

Vancouver, B.C.  
April 26, 1974.

H.J. Toohey,  
Geologist.

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## SUMMARY REPORT

### SUNRISE CLAIM GROUP SILVER BELL DISTRICT, ARIZONA, FOR ACHERON MINES LTD. (NPL).

#### INTRODUCTION

The Sunrise Claim Group is comprised of 202 contiguous mineral claims located in the Silver Bell District of Arizona, approximately 42 road miles northwest of Tucson. They are in T 125 N and R 8 E, in sections 5, 6, 7, 8, 17 and 18 in the Vaca Hills quadrangle of Pima County. Asarco's El Tiro and Oxide pits are directly to the east and the Lakeshore deposit lies approximately 8 miles northwest of the group. The Sunrise group has been held by location by Mantle Minerals, Ltd. since 1967 and at the present time the claims are in good standing.

Exploration work completed to date consists of the following;

1. I.P. Survey by Siegel Associates Ltd. (report dated September 23, 1968) on behalf of Mantle Minerals Ltd.
2. I.P. Survey by McPhar Geophysics, Inc. (report dated May 17, 1972) for Iso Nevada Ltd. of the Teck Mining Group.
3. I.P. Survey by James Sorrell (report dated March 26, 1974) for Agilis Engineering Ltd. on behalf of Acheron Mines Ltd.
4. Two mercury vapor soil gas surveys completed by James I. Barnes, Reno, Nevada for Iso Nevada Ltd.
5. Geological report by R.G. Hawley, Agilis Engineering Ltd. covering local and regional geology and a discussion of heap leaching techniques in Arizona (report dated June, 1973)

6. Detailed geologic mapping and report by J.C. Heedoba, Agilis Engineering Ltd. (report dated Jan. 3, 1974).
7. Progress reports by F. Holcapek, P. Eng. dated Feb. 10, 1974 and March 19, 1974.

The present report summarizes the information contained in these reports, draws conclusions regarding the results and makes recommendations for further exploration work.

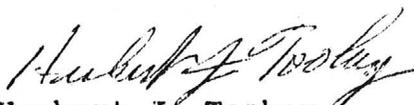
### CONCLUSIONS

1. The Sunrise claim group has been covered by induced polarization surveys on line spacing up to 800 feet. The latest survey completed in March, 1974 indicated a relatively strong polarization high with coincident rising resistivity in the southwestern area of the claims. The same survey outlined two weaker polarization highs with coincident flanking resistivity lows in the southeastern and south-central areas.
2. It is not considered likely that a large low grade sulfide deposit, accessible by open pit mining methods and within 700 feet of the surface, exists in the balance of the area surveyed.
3. The limited copper oxide deposit in Zone I is considered to be too small to support an economic open pit and heap leaching operations. It's volume and grade has been sufficiently outlined by drill hole sampling.
4. The Sunrise claim group has been thoroughly tested by geophysical and geological methods. The copper oxide and carbonate mineralization has probably been transported and much of it is found only in the alluvium.

RECOMMENDATIONS

1. The induced polarization anomaly in the southwestern area of the claim group holds the highest priority at the present time. It is recommended that it be tested by at least three vertical drill holes in an east west fence across the polarization peak. The minimum depth should be 700 feet.
2. The two lesser induced polarization anomalies should be tested by drilling at least one hole on each to a minimum depth of 700 feet.
3. Further recommendations would be contingent upon the results from the above drill holes.

Respectfully submitted,



Herbert J. Toohy,

Mining Geologist.

April 26, 1974.

Vancouver, B.C.

## REVIEW OF PREVIOUS WORK

### Induced Polarization Survey by Siegel and Associates

Wenner array  
was used
 A reconnaissance I.P. Survey was completed by Siegel and Associates for Mantle Minerals Ltd. on sections 5, 6, 7, 8, 17, and 18 and presumably covered the entire claim group except for parts of section 6 and 7. Line spacing in the northern part of the group was 400 feet using a three electrode array with electrode spacing of 500 and 1000 feet and station intervals of 500 feet. In the southern part of the group line spacing was from 1400 feet to 3000 feet with stations every 500 feet. Parts of two profiles were detailed using the three electrode array with electrode spacing of 300 and 100 feet. Grid lines were oriented east and west, normal to the general trend of geologic structural features.

There were no significant I.P. Responses indicating little possibility that a large low grade deposit of metallic conductors lies within about 700 feet of the surface of the area surveyed. Deposits of non-conducting secondary copper mineralization would not respond to induced polarization and the possibility of the existence of such a deposit was not ruled out. The very wide line spacing in the southern part of the group was such that an economic deposit of sulfides could exist between survey lines.

### Induced Polarization Survey By McPhar Geophysics Inc.

A report dated May 17, 1973 and a supplementary report dated January 17, 1973 describes induced polarization surveys completed by McPhar Geophysics Ltd. The earlier survey covered the northern part of the claims and in the later survey the grid was extended 5,000 feet to the south. The purpose of the first survey was to prospect for sulfide conductors in the area of an east-west trending mercury soil gas anomaly. The

areas was traversed with 500 foot dipoles along 6 north-south lines spaced 500 feet apart.

NE part only

The resistivity results indicated a possible extension of the Sunrise fault trending northeast through the claim group and a fault or shear trending east-west and corresponding with the mercury soil gas anomaly. The metal factor and PFE anomalies were weak and not significant. Weak copper mineralization was known to exist along the Sunrise fault.

Three lines extending the grid 5,000 feet to the south were completed late in 1972 by McPhar Geophysics Inc. Electrode interval was 500 feet and the lines were spaced 500 feet apart. Several zones of low resistivity were attributed to the presence of ground water at moderate depths. Very weak PFE and metal factor anomalies were probably the result of EM coupling.

#### Mercury Vapor Survey By J.I. Barnes

During August and September, 1973 a mercury vapor survey employing a technique that measures the equilibrium soil mercury value at each sample station, was completed. The survey was conducted over specific areas in an attempt to aid interpretation of geologic structure and locate areas of hydrothermal alteration and deposition of sulfides. A second survey by the same operator in March 1972 was completed as an expansion of the grid covered in the first survey.

Subsequent checking of several moderately high soil gas mercury values by induced polarization indicated they were not caused by a sulfide conductor. The soil gas survey, however, was moderately successful in interpreting the trend and attitude of the Sunrise fault and related structures.

### Induced Polarization Survey By J. Sorrell

Reconnaissance I.P. with 800 feet spacing was completed early in 1974 over the southern portion of the claim group. This was followed by a detail survey using a 200 feet and 400 feet array in areas of interest. The detailed survey outlined one area in the southwest corner where a gradually rising resistivity corresponded with a polarization high of the order of 12 milliseconds.

The resistivity effect was interpreted as being caused, at least in part, by a small limestone hill. The polarization effect could be due to a mineralized fault or dike structure striking north-south and dipping to the east. The resistivity data over the balance of the area surveyed suggests a thick volcanic cover typical of many valleys in southern Arizona.

### Geological Report by R.G. Hawley

R.G. Hawley discussed the porphyry copper potential on the Sunrise claims and copper leaching operations and technique in Arizona. In the Silverbell area copper mineralization generally occurs in three different types of deposits;

- a. High grade copper silver veins in volcanics.
- b. Copper-lead-zinc-silver replacement deposits in limestone.
- c. Leached copper oxide cappings overlying deeper copper sulfide zones.

At the Sunrise group the geologic environment is similar to the adjacent Asarco, B.S. and K deposits and the Lakeshore and Vebol deposits to the west. In addition the Sunrise fault, a major regional structure feature; trends southeast through the centre of the claim group. This fault, which is probably post mineralization, offsets a northwest trending mineral belt which contains the Asarco, B.S. and K, Lakeshore and



and to prospect for sulfide mineralization. In the program he recommends induced polarization surveying, additional mercury soil gas surveying and drilling.

Detailed Geological Mapping and Report By J.C. Needoba

The detailed geologic mapping and accompanying report by Mr. Needoba enlarges upon and supplements the work of R.G. Hawley. He outlines the geologic environment common to several producing and post-producing mines in the area and points out their similarity to lithology, structure and mineralization present on the Sunrise claims.

The following rock types were mapped by Needoba on the Sunrise group:

1. Medium-grained quartz monzonite and granite which forms a stock east of the Sunrise fault and extending eastward to the Silverbell Mine.
2. Fine grained quartz monzonite which is a slightly younger phase of the main intrusive.
3. Rhyolite to andesite volcanics which are commonly pyroclastic and have a northwesterly strike and an average dip of 10 degrees to the southwest.
4. Massive, thick-bedded, relatively pure limestone in the southwest corner of the claim group.
5. Diabase to diorite dikes
6. Unclassified volcanic intrusive rocks.
7. Wide veins of barren (bull) quartz striking north-south with a vertical dip.
8. Alluvial cover; here mentioned because it contains transported copper oxides and masks bedrock in all areas of possible projection of mineralized zones.

Fracturing and faulting of the host intrusive appears to be the predominant structural control of mineralization. The Sunrise Fault is exposed intermittently for some 4,000 feet on the claims from the pit area to the northern boundary. To the south the trace of the fault is covered by alluvium. Slickensides indicate a vertical component also as well as the transverse component of approximately 2 miles. The predominant trend of minor faulting and fracturing is north and northwest.

Copper mineralization is in the form of transported (?) copper oxides in narrow fault-fissure zones and in the fault gouge of the Sunrise Fault which he suggest may have been a channel for hydrothermal fluids. There is a lack of limonite suggesting the absence of primary sulfides. The main zone of mineralization along the fault (Zone I) measures 200 feet by 250 feet. Rotary drilling has outlined its attitude, grade and volume. The zone is 10 to 60 feet thick and plunges to the west and southwest at about 45 degrees. Zone II is east and southeast of Zone I and contains copper oxides in narrow fracture zones over an area about 600 x 600 feet. The fracture zones are from 10 to 30 feet wide and average 0.20 to 0.50% Cu.

Hydrothermal alteration is not well developed in the claim group. Where intense silicification accompanies intruding quartz veins, propylitic alteration is strong, however, there are no visible associated sulfides.

Among his conclusions, Mr. Needoba states:

- a. The strongest mineralization developed is in the fault gouge, the hanging wall and in the overlying alluvium near the Sunrise test pit.
- b. Copper mineralization appears to be concentrated around the pit area, appears to be transported and occurs as malachite, azurite, chrysocolla, and tenorite.

He recommends testing the extent of Zones I and II, preferably by diamond drilling, and testing for unknown mineralization north and south along the fault. He concluded that soil geochemistry is of doubtful value in the climate of the southwest and that the mercury gas survey didn't yield positive results. The magnetometer survey indicates the magnetic relief is flat and even over the area surveyed suggesting thick overburden as well as the absence of magnetic conductors.

He further recommends that previous induced polarization surveys be extended further into the northwest section of the claim group and over the southern part of the claims.

Progress Reports By. F. Holcapek, P. Eng.

Two progress reports by F. Holcapek outline the exploration progress to March 15, 1974. During this period 16 holes were completed to extend the oxide zone near the pit, to test a possible northern extension of this zone and to test the oxide potential in Zone II. In addition a reconnaissance induced polarization survey with a subsequent detailed survey was completed by James Sorrell.

The drilling was done with a Chicago Pneumatic 67 Drill using a down-the-hole hammer bit and a closed sampling system. The results of this program indicated that:

- a. Zone I Contained a limited deposit of copper oxides in a somewhat tabular form and dipping to the west away from the Sunrise fault. The volume and grade of the deposit accessible by open pit mining methods was estimated by Mr. Holcapek to be approximately 331,000 tons grading 0.38% Cu.

- b. Holes drilled north of Zone I indicated this zone does not extend in that direction.
- c. Two holes were drilled in Zone II and the results were negative and suggest that mineralization exposed in trenches is the result of surface enrichment.

The induced polarization survey indicates the presence of a northwest trending conductor 2.5 to 4.5 times background with dimensions of at least 400 ft x 1,000 ft.

# SHATTUCK DENN MINING CORPORATION

and

## SUBSIDIARIES

Humboldt Office

Date..... September 16, 1966

TO: Mr. C. R. Sundeen

SUBJECT: SILVER BELL AREA-SUNRISE GROUP  
 % Mr. Frank Fisk  
 Grande Vista Motel  
 Coolidge, Arizona

FROM: J. N. Mayor

TYPE: CopperLOCATION:

The property is located in the Silver Bell area, Pima County, Arizona. More exactly T12S, R8E, parts of Sections 5,6,7,8. The gravel road from Silver Bell to Red Rock passes through the NE of the claim group.

OWNERSHIP:

The property consists of 99 unpatented claims as follows:  
 Sunrise Group 84 claims, staked 1960  
 " Ext. 15 claims, " 1964  
 Ownership is vested in 5 persons.

In May 1966 an agreement was reached between the above owners and a partnership involving Calix Mines Ltd. (40%) and Cascade Molybdenum Mines Ltd. (60%). The terms of the agreement being a 5% royalty to a total of \$600,000 or 5% for 30 years.

TERMS:

In August 1966 the Calix-Cascade partnership offered the property to Shattuck Denn Mining Corporation for consideration with an option to purchase up to 75% interest.

GEOLOGY:

In the Silver Bell area the Paleozoic, Cretaceous and Tertiary sediments and volcanics have been intruded by various igneous rocks attributed to the Laramide period of igneous activity.

The pronounced structural feature of the area is the WNW trend of the intrusives and the closely related zone of hydrothermal alteration.

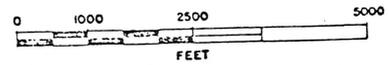
Primary mineralization consists principally of pyrite and chalcopyrite occurring along with quartz in systems of narrow veinlets, generally vertical and a few inches in width. These veinlets occur as groups within the zone of hydrothermal alteration predominantly oriented in a NE direction.

\* Two orebodies are known in the district at the El Tiro and Oxide pits of A.S.A.R. Co. and these coincide with the two large groups of closely spaced veinlets. They

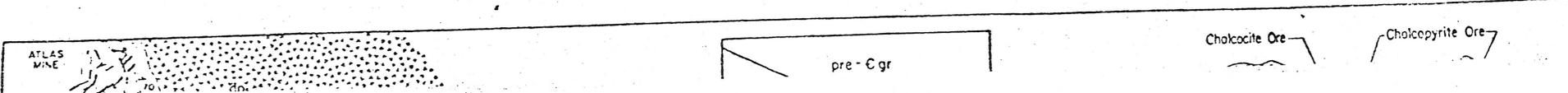
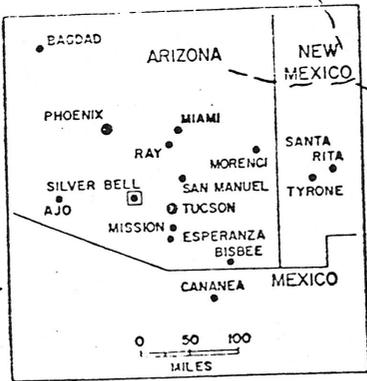
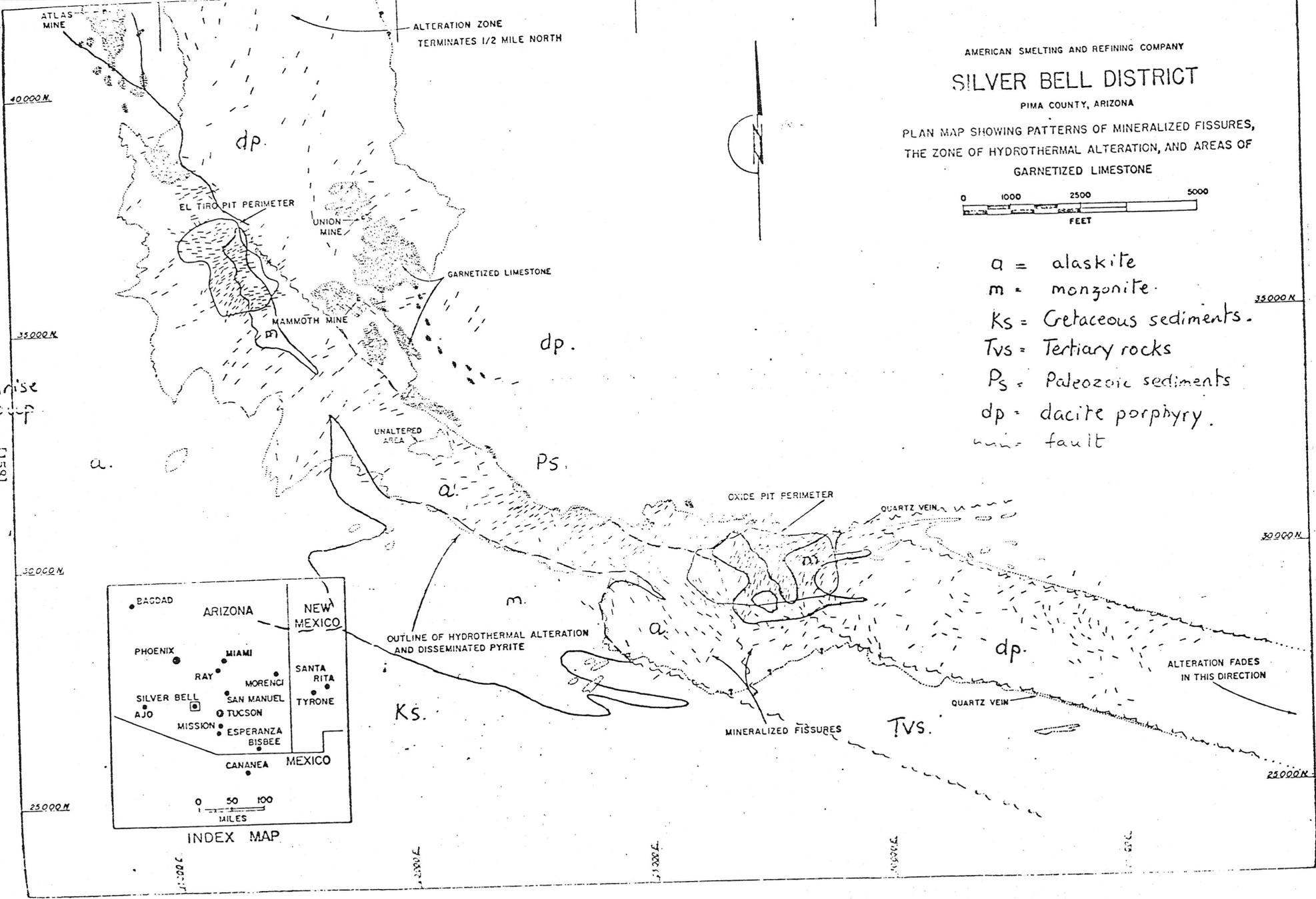
Fig. I.

AMERICAN SMELTING AND REFINING COMPANY  
SILVER BELL DISTRICT  
PIMA COUNTY, ARIZONA

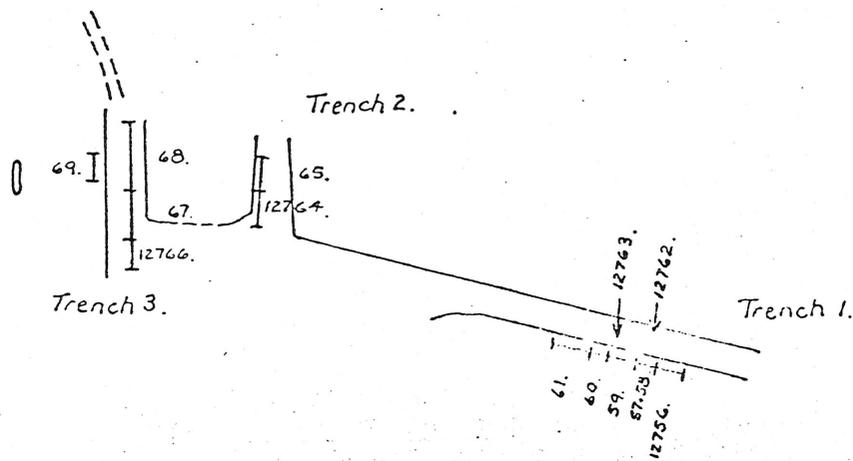
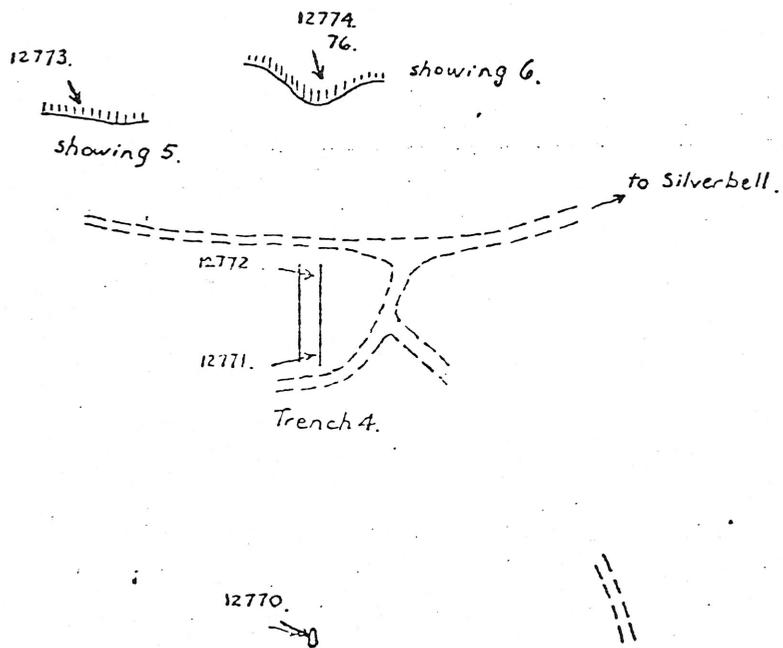
PLAN MAP SHOWING PATTERNS OF MINERALIZED FISSURES,  
THE ZONE OF HYDROTHERMAL ALTERATION, AND AREAS OF  
GARNETIZED LIMESTONE



- a = alaskite
- m = monzonite
- Ks = Cretaceous sediments
- Tvs = Tertiary rocks
- Ps = Paleozoic sediments
- dp = dacite porphyry
- = fault



site of old  
X leaching tanks.



Silverbell Area - Sunrise Group.

Calex option.

Scale: approx 1" = 100'.

Fig. II.

\*

They consist of tabular accumulations of chalcocite from 100'-200' thick lying beneath 100' of leached capping.

The leached cappings usually carry minor copper values mingled with the limonites of chalcocite derivation.

The geology of the Sunrise claim group is indicated on figure I, which also serves to locate the property with respect to the pertinent regional geology--the zone of hydrothermal alteration and known orebodies. It is situated some 3000' to the SW of the hydrothermal zone.

The western two-thirds of the claim group is covered by overburden but the claims appear to be underlain by a c.gr. "granitic" rock deficient in ferromagnesian minerals and probably belonging to the alaskite suite.

F. gr. aplitic phases occur within the alaskite (and within the alaskite) and within the mineralized outcrops.

The intrusive appears to be emplaced in an andesitic rock.

SAMPLING:

Four trenches have been exposed by bulldozing work. These are shown on figure II, along with the other showings.

Trench #1, 2 & 3

C. Gr. alaskite with local aplitic phases and minor hydrothermal (?) alteration. Generally massive and lacks obvious copper staining. Three narrow (1'-4') zones of secondary copper mineralization exposed. These appear to have a N-NNE trend and consist of fractured and altered alaskite with traces of blue azurite and blackish tenorite (variety: melaconite). Limonitic material is rare.

<u>Trench</u>	<u>Sample No.</u>	<u>Width</u>	<u>Au</u>	<u>Ag</u>	<u>Cu</u>
1.	12756	15'	Tr	Tr	0.06
"	12757	10'	0.01	Tr	0.06
"	12758	2'	Tr	Tr	0.16
"	12759	10'	Tr	Tr	0.14
"	12760	7'	Tr	Nil	0.08
"	12761	15'	Tr	Tr	0.06
"	12762	1'	Tr	Nil	0.72
"	12763	1'	Tr	Nil	0.22
2.	12764	3'	Nil	Nil	0.82
"	12765	3'	Tr	Nil	0.30
3.	12766	3'	0.01	Nil	0.26
"	12767	3'	Tr	Tr	0.26
"	12768	3'	Tr	Tr	0.42
"	12769	4'	Tr	Tr	0.64

Trench #4

Approximately 4' zone intensely altered to a whitish material. Green and blue copper staining present and black tenorite on frs. reddish haematite staining common. This may represent a fault zone trending approximately N-S.

\*

<u>Trench</u>	<u>Sample No.</u>	<u>Width</u>	<u>Au</u>	<u>Ag</u>	<u>Cu</u>
4	12771	1'	Nil	Nil	0.50
"	12772	1'	0.01	Tr	2.12

Showing #6

This exposure was the source of leaching material for a previous operator.

This is a continuation along strike of Trench #4.

<u>Sample No.</u>	<u>Width</u>	<u>Au</u>	<u>Ag</u>	<u>Cu</u>
12774	3'	0.01	Tr	2.08
12776	grab 10'	0.01	Nil	0.46

Showing #7

Outcrop of alaskite highly altered to a white chalky material. Minor molybdenite. Possible fault having continuity with Trench #4 and Showing #6.

<u>Sample No.</u>	<u>Au</u>	<u>Ag</u>	<u>Cu</u>	<u>Mo</u>
12770	Nil	Nil	0.16	0.036

PRODUCTION PLANS & RESERVES:

Mr. Frank Fisk, the Calix representative, offered the following data:

1. The property is viewed as a dump leaching operation.
2. Cost of work to date .....\$95,000.00  
 Pre-production expenses.....\$100,000.00
3. Mr. Fisk estimates 90 days to produce a leaching pile of 250,000 tons and anticipates a return of \$30,000 gross per month.
4. Reserves are placed at 5 million tons grading 0-75% Cu.

However, on the basis of observation and sampling of the exposed ground, there appears to be four narrow (1'-3') zones trending N-NNE and grading between 0.47-0.89% Cu. A weighted average of all the samples taken grades 0.17% Cu and reference to figure II shows that sampling in the barren alaskite was incomplete. It may reasonably be assumed that a final grade of much less than 0.17% Cu would be the case.

Further, an estimate of tonnage potential on the basis of the work completed to date is certainly not justified.

The property is viewed by Calix Mines Ltd. as a dump leaching proposition. To date no preliminary test work regarding the amenability of the occurrence to such an operation has been carried out. It seems presumptuous, therefore, to assume that \$100,000.00 will establish a plant of sufficient capability to return \$30,000 gross per month.

From limited acquaintance with the leaching technique, the writer feels that the absence of pyrite at this property could add appreciably to the acid costs.

\*

CONCLUSIONS & RECOMMENDATIONS:

1. The Sunrise claim group is situated some 3000' SW of the zone of hydrothermal alteration. It is only within this zone that potential orebodies can be anticipated.
2. Copper mineralization occurs on the Sunrise group in widely spaced narrow N-NNE trending zones of no proved continuity.

A weighted grade of all samples taken (incomplete in the barren alaskite) is 0.17% Cu.

3. No estimate of tonnage potential is possible.
4. No test work exists to prove the feasibility of dump leaching on the scale suggested.

It is recommended that Shattuck Denn Mining Corporation takes no further interest in this property.

JNM/ab

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