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PRINTED: 08/30/2001

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES AZMILS DATA

PRIMARY NAME: GREEN MOUNTAIN GROUP

ALTERNATE NAMES:
MCNULTY AND MCBRIDE GROUPS
PATENTED CLAIMS MS 3090
HASSAYAMPA DISSEMINATED COPPER

YAVAPAI COUNTY MILS NUMBER: 236

LOCATION: TOWNSHIP 12.5N RANGE 3 W SECTION 25 QUARTER N2
LATITUDE: N 34DEG 26MIN 38SEC LONGITUDE: W 112DEG 31MIN 29SEC
TOPO MAP NAME: WILHOIT - 7.5 MIN

CURRENT STATUS: EXP PROSPECT

COMMODITY:
COPPER OXIDE
MOLYBDENUM

BIBLIOGRAPHY:
USGS WILHOIT QUAD
BLM MINING DISTRICT SHEET 266
BLM MINERAL SURVEY MS 3090
YAVAPAI MAGAZINE JUNE 1921 P 10
ADMMR HASSAYAMPA DISSEMINATED COPPER FILE
CLAIMS EXTEND INTO SEC 24, 25 7 26

03/24/86

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES FILE DATA

PRIMARY NAME: GREEN MOUNTAIN GROUP

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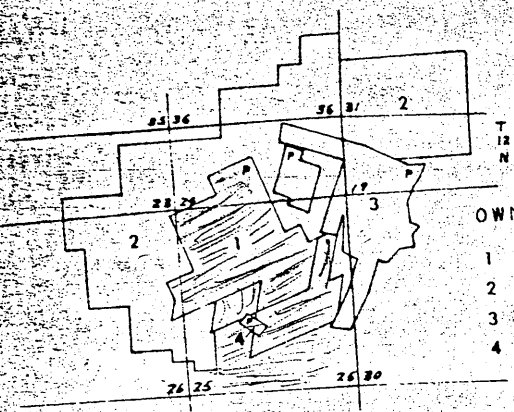
BLM PLAT 3090
YAVAPAI MAGAZINE JUNE 1921 P 10
ADMMR HASSAYAMPA DISSEMINATED COPPER FILE
CLAIMS EXTEND INTO SEC 24, 25 7 26

Figure - 2

DETAILED LOCATION MAP



OWNERSHIP SKETCH

1 TRUST
2 EARTH-DAY
3 DEANE-ROSE
4 GREEN MTN. - Trust

○ ESSEX PROPOSED DRILL HOLE

EH-2 ◉ ESSEX DRILL HOLE

PERRY, KNOX, KAUFMAN, INC.
TUCSON, ARIZONA

DRILL HOLE LOCATION & CLAIM MAP

COPPER CREEK PROSPECT (SW-37)

SOUTH OF PRESCOTT
YAVAPAI CO., ARIZONA

REVISED DEC. 1970 — RW SAYERS
REVISED MAY 1971 — RBB

500 0 500 1000 1500 2000

ESSEX

ESSEX INTERNATIONAL, INC.
1704 WEST GRANT RD., TUCSON, ARIZONA 85705
PHONE (602) 624-7421

PROJECT	HASSAYAMPA
PROSPECT	
NUMBER	
COUNTY, STATE	YAVAPAI, ARIZ.
LAT., LONG.	
T., R., & SECTION	T12N; R2W, R3W

HASSAYAMPA CLAIM MAP

SCALE	1" = 500'
DATE	6/21/73
DATA BY	PERRY, KNOX,
PREPARED BY	KAUFMAN, INC.

HASSAYAMPA DISSEMINATED COPPER YAVAPAI COUNTY

NJN WR 2/28/86: Robert Cummings Jr. (c) 7014 N. 11 Place, Phoenix, Az. 85020, ph. 944-4267 visited and reported that he is owner of the Green Mountain Group (Hassayampa Disseminated Copper - file) patented claims and would like to sell them. These claims are adjacent to Phelps Dodges' Copper Basin Property so it was suggested that he contact PD to see if they could use the property. The property has been drilled in the past for copper by several of the majors including Noranda, City Service, and Phelps Dodge. The holes have ranged 500 - 3000 feet in depth.

---

*GENERAL REFERENCES

REFERENCE 1 F1 <USBM- ABGMT FILE D Hassayampa is Copper Dep f.l>

REFERENCE 2 F2 <ABGMT CLIPPINGS FILE Data>

REFERENCE 3 F3 <>

REFERENCE 4 F4 <>

U.S. CRIB-SITE FORM

RECORD IDENTIFICATION

*RECORD NUMBER B10 <>

*REPORT DATE G1 <8,2,0,1> YR. MO.

*RECORD TYPE B20 <X,1,M>

*INFORMATION SOURCE B30 <1,2>

DEPOSIT NUMBER B40 <>

*FILE LINK IDENT. B50 <USBM-004 025>

*REPORTER(SUPERVISOR) G2 <DEWITT, ED.H. (last, first, middle initial)> ((last, first, middle initial)>

*REPORTER AFFILIATION G5 <USGS>

*SITE NAME A10 <MCNULTY AND MCBRIDE MINE>

SYNONYMS A11 <GREEN MOUNTAIN GROUP>

LOCATION

*MINING DISTRICT/AREA A30 <LITTLE COPPER CREEK DISTRICT>

*COUNTY A60 <YAVAPAI>

*STATE A50 <A,Z>

*COUNTRY A40 <U,S>

PHYSIOGRAPHIC PROV A63 <1,2,>

DRAINAGE AREA A62 <1,5,0,7,0,1,0,3,>

LAND STATUS A64 <0,1,,*,(,,,,)>

*QUADRANGLE NAME A90 <WILHOIT (1,9,6,9,)>

*QUADRANGLE SCALE A100 <2,4,0,0,0>

SECOND QUAD NAME A92 <(,,,,)>

SECOND QUAD SCALE A91 <>

ELEVATION A107 <,5,3,2,0,,FT,>

UTM

*NORTHING A120 <3,8,1,2,2,4,0,>

*EASTING A130 <3,5,9,1,1,0,>

*ZONE NUMBER A110 <+,1,2>

*ACCURACY

ACCURATE ACC (circle)

ESTIMATED EST <>

GEODETIC

*LATITUDE A70 <_ _ _ N>

*LONGITUDE A80 <_ _ _ W>

CADASTRAL

*TOWNSHIP(S) A77 <12,S N>

RANGE(S) A78 <0,0,3,W,>

*SECTION(S) A79 <25>

*SECTION FRACTION(S) A76 <C OF N2>

*MERIDIAN(S) A81 <GILA AND SALT RIVER>

*POSITION FROM NEAREST PROMINENT LOCALITY A82 <3.2 MILES NORTHWEST OF MAVERICK MOUNTAIN>

*LOCATION COMMENTS A83 <1.4 MILES WSW OF ORO FLAME MINE>

* ESSENTIAL INFORMATION
+ ESSENTIAL SOMETIMES OR HIGHLY RECOMMENDED

COMMODITY INFORMATION

COMMODITIES PRESENT C10 < C.U. / A.G.

ORE MINERALS C30 < UNKNOWNS, PROBABLY COPPER CARBONATES

COMMODITY SUBTYPES C41 <

GEN. ANALYTICAL DATA C43 <

COM. INFO. COMMENTS C50 <

* SIGNIFICANCE

PRODUCER		NON-PRODUCER	
MAJOR PRODUCTS MAJOR	C.U.	MAIN COMMODITIES PRESENT C11	
MINOR PRODUCTS MINOR	A.G.	MINOR COMMODITIES PRESENT C12	
POTENTIAL PRODUCTS POTEN			
OCCURRENCES OCCUR		OCCURRENCES OCCUR	

*PRODUCTION

PRODUCER: PRODUCTION (YES circled) (circle) PRODUCTION SIZE (SML circled) MED LGE (circle one)

NON-PRODUCER: PRODUCTION UND NO (circle one)

EXPLORATION OR DEVELOPMENT

*STATUS

PRODUCER: STATUS AND ACTIVITY A20 < 4 >

NON-PRODUCER: STATUS AND ACTIVITY A20 < >

DISCOVERER L20 <

YEAR OF DISCOVERY L10 < > NATURE OF DISCOVERY L30 < B > YEAR OF FIRST PRODUCTION L40 < 1913 > YEAR OF LAST PRODUCTION L45 < 1920

PRESENT/LAST OWNER A12 <

PRESENT/LAST OPERATOR A13 < C.J. MC NULTY (1920)

EXPL./DEV.COMMENTS L110 < PATENTED CLAIM GROUP = MS 30804 = GREEN MOUNTAIN GROUP

DESCRIPTION OF DEPOSIT

DEPOSIT TYPE(S) C40 < DISSEMINATED, VEINS

DEPOSIT FORM/SHAPE M10 < MASSIVE, TABULAR

DEPTH TO TOP M20 < > UNITS M21 < > MAXIMUM LENGTH M40 < > UNITS M41 <

DEPTH TO BOTTOM M30 < > UNITS M31 < > MAXIMUM WIDTH M50 < > UNITS M51 <

DEPOSIT SIZE M15 < SMALL (circled) > M15 < MEDIUM > M15 < LARGE > (circle one) MAXIMUM THICKNESS M60 < > UNITS M61 <

STRIKE M70 < > DIP M80 <

DIRECTION OF PLUNGE M100 < > PLUNGE M90 <

DEP. DESC. COMMENTS M110 < PATENTED CLAIMS TREND ENE; VEINS POSSIBLY PARALLEL LONG AXIS OF CLAIMS >

DESCRIPTION OF WORKINGS

Workings are: SURFACE M120 UNDERGROUND M130 (circled) BOTH M140 (circle one) OVERALL LENGTH M190 < > UNITS M191 <

DEPTH BELOW SURFACE M160 < > UNITS M161 < > OVERALL WIDTH M200 < > UNITS M201 <

LENGTH OF WORKINGS M170 < > UNITS M171 < > OVERALL AREA M210 < > UNITS M211 <

DESC. OF WORK. COM. M220 < ONE TUNNEL 366 FT LONG. MAIN SHAFT ON GREEN MOUNTAIN PATENTED CLAIM

GEOLOGY

AGE OF HOST ROCK(S) K1 < P.R.O.T.; T.E.R.T. / U/PB GREATER THAN 1760 MILLION YEARS; UNDATED, PROBABLY 65-75 MILLION YEARS

HOST ROCK TYPE(S) K1A < GRANODIORITE, SCHIST ; LATITE AND LATITE BRECCIA

AGE OF IGNEOUS ROCK(S) K2 < P.R.O.T.; T.E.R.T. / AS LINE K1

IGNEOUS ROCK TYPE(S) K2A < GRANODIORITE ; LATITE AND LATITE BRECCIA

AGE OF MINERALIZATION K3 < L.C.R.E.T.-T.E.R.T. / UNDATED, PROBABLY PALEOCENE

PERT. MINERALS (NOT ORE) K4 < QUARTZ, PYRITE

ORE CONTROL/LOCUS K5 < FAULTING, SHEARING, IGNEOUS ACTIVITY, ESPECIALLY DIKE EMPLACEMENT

MAJ. REG. TRENDS/STRUCT. N5 < FOLIATION IN PROTEROZOIC ROCKS TRENDS N 20 E

TECTONIC SETTING N15 <

SIGNIFICANT LOCAL STRUCT. N70 < MINERALIZATION IN BRECCIA PIPES AND DIKE-RELATED VEINS

SIGNIFICANT ALTERATION N75 < SERICITE, CLAY

PROCESS OF CONC./ENRICH. N80 < OXIDATION AT NEAR-SURFACE

FORMATION AGE N30 < P.R.O.T.

FORMATION NAME N30A <

SECOND FM AGE N35 <

SECOND FM NAME N35A <

IGNEOUS UNIT AGE N50 < P.R.O.T. / U/PB GREATER OR EQUAL TO 1760 MILLION YEARS

IGNEOUS UNIT NAME N50A < UNNAMED GRANODIORITE PROBABLY EQUIVALENT TO PRESCOTT GRANODIORITE

SECOND IG. UNIT AGE N55 < L.C.R.E.T.-T.E.R.T. / UNDATED, PROBABLY 65-75 MILLION YEARS

SECOND IG. UNIT NAME N55A < UNNAMED LATITE AND LATITE BRECCIA

GEOLOGY COMMENTS N85 <

GENERAL COMMENTS

GENERAL COMMENTS GEN <

THOMAS S. NYE
Consulting Economic Geologist

6921 E. Hawthorne
Tucson, Arizona 85710

Tel. (602) 296-4183

Mr. R. F. Hewlett, President
Sierra Mineral Management
4741 East Sunrise Drive
Skyline Bel Aire Plaza
Tucson, Arizona 85718

April 19, 1972

Dear Mr. Hewlett:

Enclosed is my report, Preliminary Feasibility Study, Hassayampa Disseminated Copper Deposit, Yavapai County, Arizona, together with my bill for services rendered. The feasibility study deals only with the economics of mining the near-surface ore by open pit methods and does not consider the deep ore potential, which appears to be substantial.

It was not possible, within the limits of time available and alloted for this study, to consider the economics of all of the different hydrochemical extraction methods which are possible with current technology. You might wish to investigate the following methods also, which are directed to the extraction of both primary and secondary sulfides:

1. Solution of sulfides at elevated pressure and temperature in an autoclave with dilute sulfuric acid and oxygen (98% Cu recovery reported by Sherritt Gordon). This process produces native sulfur, a marketable product, and copper sulfate solution, from which copper can be electrowon.

2. The Anatred (Anaconda-Treadwell) process employs 90% sulfuric acid, hydrogen cyanide, and hydrogen to produce both native copper and native sulfur. Anaconda's pilot plant on this process suffered from corrosion problems, which might be cured with further research.

3. Oxygenated pressure-leaching of sulfides. Sulfide ore is subjected to hot water and oxygen under pressure, to produce copper sulfate solutions from which copper can then be electrowon or precipitated on iron. The AEC has experimented with in-place leaching of ores using this technique, with some laboratory success. The method might be more effective on crushed or ground ore in a mill setup, since recovery would be greater due to greater surface exposure of the sulfide-bearing rock to the extracting solutions. A.E. Lewis and R.L. Braun of the Lawrence Livermore Laboratory, University of California, Livermore, presented papers on this method at the 1972 AIME meeting in San Francisco.

Should you have any questions regarding my report, please contact me. Thank you for your consideration.

Sincerely Yours,

Thomas S. Nye

Thomas S. Nye
Consulting Geologist

REGISTERED GEOLOGIST
MINERAL SERVICES
THOMAS S. NYE
APR. 21, 1972
ARIZONA U.S.A.

THOMAS S. NYE
Consulting Economic Geologist

6921 E. Hawthorne
Tucson, Arizona 85710

Tel. (602) 296-4183

Mr. R. F. Hewlett, President
Sierra Mineral Management
4741 East Sunrise Drive
Skyline Bel Aire Plaza
Tucson, Arizona 85718

April 19, 1972

FOR SERVICES RENDERED

Feasibility Estimate, Hassayampa Copper Project

Long Distance Telephone calls, for cost data:

3/3/72	San Francisco-Fluor Utah, mining costs	$4.57		
	St. Louis-Cerro-precip smelter costs	5.17		
	Bagdad, Ariz.-acid and iron costs	3.16		
4/14/72	Ariz. Dept. Property Valuation, Ad Valorem tax	4.22		
		$17.12		$ 17.12
2/23/72	Conf. with Cerro personnel re precip smelter, at San Francisco, 1/2 day @ $150.00		$ 75.00	
3/3-3/20/72	Research & Feasibility Calculations, 4 days @ $150.00		600.00	
3/28/72	Examination of Hassayampa property, 1 day @ $150.00		150.00	
3/29-4/19/72	Feasibility study, calculations, report preparation, 6 days @ $150.00		900.00	
			$1725.00	1725.00
			TOTAL DUE	$1742.12

REGISTERED GEOLOGIST
THOMAS S. NYE
ARIZONA U. S. A.

Thomas S. Nye
Consulting Geologist

PRELIMINARY FEASIBILITY STUDY
HASSAYAMPA DISSEMINATED COPPER DEPOSIT
YAVAPAI COUNTY, ARIZONA

PRELIMINARY FEASIBILITY STUDY
HASSAYAMPA DISSEMINATED COPPER DEPOSIT
YAVAPAI COUNTY, ARIZONA

Summary and Conclusions

A preliminary study was made of the feasibility of mining the Hassayampa disseminated copper deposit near Prescott, Arizona. Data required to make a definitive analysis have not yet been developed, and the present study is based in part upon assumptions regarding the character of the deposit as well as operating and capital costs. The cost data are predicated upon the use of a "sharp pencil" by a versatile and capable operator, and there is little or no contingency factor in the calculations.

Various extraction methods were briefly considered. In-place leaching to produce precipitate copper concentrates might be done for a relatively low capital cost. The rate of, and overall, recovery of copper by this method would be low and the annual net cash flow might not be as high as for other methods. However, further studies of in-place leaching may be warranted after leachable copper reserves are better defined. A combination of agitation and heap leaching of rock mined by open pit methods, with solvent extraction and electrowinning of the copper, appeared to offer the highest annual cash flow and is the extraction method used in the cost analysis.

Mining was projected at 4000 tons of ore per day on the basis of 7.8 million tons of 0.5% copper ore having a stripping ratio of 1.72:1. 7.8 million tons of the stripped rock averaging 0.2% copper were to be heap leached, and the ore was to be treated in an agitation leach plant. 80% copper recovery was assumed for the agitation leach and 30% for the heap leach. Within the limits of the assumptions made the agitation /heap leach method might provide an annual net cash flow of about $1.6 million, a payback period of 3.75 operating years, and a discounted rate of return (equalizing rate of interest basis, or ERI) of 15%. A measure of profitability under favorable conditions is thus indicated. However, the need for additional exploration, development, and metallurgical analysis to provide the information for a more accurate feasibility estimate is self-evident.

A potential for additional reserves on the Hassayampa and adjacent property has been indicated which, if developed, would enhance the profitability of the projected operation. Projected increases in demand and the cost of pollution controls on smelters suggest that the price of copper may rise in the next few years. Electrowon copper can thus have a distinct economic advantage over smelter-produced copper. The Hassayampa deposit, depending on the results of further investigation, could be made into a viable mining operation and benefit by the projected increase in the price of copper.

April 19, 1972

REGISTERED GEOLOGIST
CERTIFICATE NO. PIMA
THOMAS S. NYE
DEC. 31, 1972
ARIZONA U. S. A.

Thomas S. Nye
Consulting Geologist

Introduction

A preliminary feasibility study of the Hassayampa copper deposit was made at the request of R.F. Hewlett, President of Sierra Mineral Management, of Tucson, Arizona. This study is a trial run to determine the economic conditions under which the Hassayampa deposit might profitably be mined based upon estimates, furnished by Sierra Mineral Management, of grade, reserves, stripping ratio, and character of the ore. Reserves were stated (see attached table, from Sierra Mineral Management), from limited drilling, as 7.77 million tons of 0.5% Cu at a stripping ratio of 1.72:1. The ore has been described as consisting primarily of chalcocite coating and replacing pyrite and minor amounts of chalcopyrite. 7.35 million tons of rock averaging 0.2% Cu have also been estimated adjacent to or overlying the ore, in addition to several million tons of +0.2% rock underlying the ore. Cash flow calculations assume that 7.8 million tons of rock averaging 0.2% Cu will be stripped for access to ore and pit control, and sent to the leach dump.

A visit to the Hassayampa property was made on March 28, 1972 to examine the terrain and general geologic features.

The formulation of detailed mining and extraction plans was considered but deferred as the data upon which to base these estimates are not yet available.

Extraction Methods

Several methods of extracting the copper are technically possible, including the following:

a) Leaching in place and precipitation or LIX-electrowinning of the copper in solution.

b) Mining the ore, placing it on a leach dump, and extraction of the copper from solution by precipitation or LIX-electrowinning.

c) Mining the ore, sending +0.4% Cu ore to an agitation leach plant and +0.1-0.4% Cu rock to a leach dump, and extracting the dissolved copper by LIX-electrowinning.

HASSAYAMPA LEACH OPEN PIT

Bench	+ .40% Cu Tons	Grade	0.2 - 0.4% Cu Tons	Grade	+0.2% Cu Tons	Grade
5400						
5375						
5350			85,000	.29		
5325	235,000	.53				
5300	365,000	.44				
5275	835,000	.45				
5250			535,000	.23	1,005,000	.11
5225	400,000	.46	850,000	.25	1,175,000	.10
5200	750,000	.46	1,010,000	.25	580,000	.05
5175	1,565,000	.59	445,000	.22	140,000	.05
5150	1,640,000	.55	505,000	.24	155,000	.13
5125	1,980,000	.44	1,560,000	.24		
5100			2,080,000	.29	530,000	.16
5075			1,330,000	.25		
5050			585,000	.33		
5025			430,000	.33		
5000			305,000	.34		
	7,770,000	.50	9,720,000	.27	3,640,000	.10

SUMMARY

Cut-Off	Tons	Grade	Sr
0.00	21,130,000	.325	-0-
0.20	17,490,000	.372	.208
0.30	9,090,000	.476	1.32
0.40	7,770,000	.500	1.72

Copper precipitate could be sent to a smelter, or could be smelted on the property using a small smelter designed by Cerro Corporation to treat precipitate copper. Precipitate copper has at times been considered undesirable by some smelters owing to dust problems but, being sulfur-free, can be smelted with little or no air pollution in contrast to standard sulfide ore concentrates. Recent smelting and refining charges have ranged from 7¢ to 9¢ per pound of copper on a toll basis, and the net smelter price per pound of copper in precipitate concentrates has been reported to be 8¢ to 14¢ less than the quoted market price for refined copper.

The capital and operating costs of pollution controls which have been or are being installed in the smelters may result in higher smelting charges. Recent industry estimates (Dr. W. C. Lacy, oral communication, 12/71) of the smelting cost increase due to pollution controls have ranged from 4¢ to 20¢ per pound of copper, depending upon the severity of the controls imposed.

Data provided by Cerro on the precip smelter indicate that a small smelter capable of treating one ton per hour of copper precipitates might be constructed for $100,000-$150,000. The resulting blister copper might be sold for between 5¢ and 12¢ under the price per pound for refined copper, depending on the buyer. Operating costs for this smelter, with 90% recovery, might be in the range of 5¢ to 10¢ per pound of recovered copper. There might be a small cost advantage, depending on specific conditions, in producing blister copper on the property over shipping concentrates to a smelter. The greater advantage of having a precipitate smelter is in not being dependent upon the ability or willingness of a given smelter to accept precip copper. Pollution control requirements have reduced the already-strained capacities of existing smelters in recent months, forcing the stockpiling of concentrates and, in one case, the shutdown of a major copper mine (Esperanza, south of Tucson) for lack of smelter capacity. In any case, the precip-smelter-refinery route reduces the profit margin substantially.

A LIX-electrowinning plant of sufficient size to treat the Hassayampa ore can be constructed for a capital cost of 2-4¢/pound of recovered copper (vs. 3.5-5¢ of iron/lb of recovered Cu in precipitate) depending on the grade of the ore and amount of copper produced. The production cost for this method is reported to range from 3¢ to 5¢ per pound of recovered copper, depending on the size of the facility. Recovery is reported to be close to 100% of the copper in solution. The resulting electrolytic copper can be marketed, at or slightly below the quoted price for refined copper, to a wide range of consumers. Thus the profit margin for the LIX-electrowinning route is greater than that for the precipitate/smelter/refinery route.

Leaching in place and heap leaching may not require as high a capital expenditure as that for an agitation leach plant. However, recoveries for these methods are in the range of 30% to 50% of the leachable copper in the rock and a period of months to years is required to effect recovery. The retention time for agitation leaching is a few hours at most, and recovery can be as high as 95%.

Solutions from in-place or heap leaching would have a lower copper concentration than solutions using the agitation leach method, thus requiring a larger LIX-electrowinning plant for the same rate of copper production. Hence there might not be a significant capital cost reduction for heap or in-place leaching unless precipitates were produced. However, the cost of iron per pound of copper is more or less equivalent to the capital cost of a LIX-electrowinning plant, and the precipitate concentrates have the additional burden of smelter plus refining charges.

General considerations suggest that a combination of agitation leaching of ore averaging 0.5% Cu and heap leaching of rock averaging 0.2% Cu (overburden) with LIX-electrowinning of the resulting solutions may provide the largest annual net cash flow of the different methods discussed. This combination extraction method is therefore used in the trial run of economic feasibility which follows. However, leaching in place with precipitate or electrolytic copper production could have merit depending on the results of leaching tests, and may warrant further investigation.

Economic Assumptions

Available data are insufficient to make a precise evaluation of the economic feasibility of mining the Hassayampa deposit. More drilling is required to prove up the reserves, grade and stripping ratio; acid consumption, minimum grinding required for effective copper extraction, and the amount of leachable copper as a percentage of total copper are not presently known. Consequently this study is based upon a series of assumptions, which are outlined below. One of the most critical assumptions is the potential operator's ability to hold capital and operating costs to a minimum. There is little or no contingency factor in the calculations which follow.

Sources of cost data used to estimate various individual costs in this report are:

Surface Mining, by E.P. Pfleider, AIME, 1968
R. Medhi, Bagdad Copper Corporation (acid and iron costs)
G. Roseveare, Ariz. Bur. Mines, Tucson, (grinding costs and acid consumption)
Cerro Corporation (copper precipitate smelter)
Recent analysis of existing operations (agitation leach costs)
J. Dorlach, General Mills Corporation, Tucson (LIX-electrowinning capital and operating costs)
D. Rabb, Ariz. Bur. Mines, Tucson (acid & iron costs and availability)
G.W. Irvin, Ariz. Dept. Mineral Resources (Arizona Taxation)
V. Dale, Ariz. Dept. Property Valuation, Phoenix (Arizona Taxation)
Possible Effects of Tax Equalization on the Mining Industry of Arizona, by G.W. Irvin, unpublished M.S. thesis, 1968, University of Arizona
Mining Equipment Salesmen (equipment purchase, owning, and operating costs, and performance data)

Capital requirements have been estimated from existing agitation plant costs and from data provided by J. Dorlach of General Mills on LIX-electrowinning plant costs. Dorlach has stated that the cost of a LIX-electrowinning plant may be reduced to one-half or one-third of that of a turnkey installation by independent equipment purchase and contracting of the installation, or installation by the operator. The cost of an agitation leach plant can be much higher than that estimated here, if an elaborate turnkey installation is made with outside engineering services.

Below are the assumptions made for the cash flow calculations.

1. 7.8 million tons of 0.5%Cu, stripping ratio 1.72:1, including 7.8 million tons averaging 0.2% Cu of strip rock.

2. 0.5%Cu rock sent to agitation leach plant, 0.2% rock sent to heap leach, copper solutions processed by LIX-electrowinning to produce electrolytic copper.

3. Mining by open pit, using truck/wheel loader combination.

4. Plant within 1/4 mile downhill from the open pit.

5. Water is reasonably available. The water table is at or near the bottom of the valleys, and diversion dams should be constructed to avoid flooding in the mine area. These dams may also serve for water storage, and furnish part or all of the water required for the operation.

6. Mining 3 shifts/day, approx. 3600 tons of rock/shift, 4000 tpd ore, 350 days/year, 5.6 year operating life (60% operating rate first year).

7. Mobile equipment leased, drilling & blasting equipment purchased second-hand.

8. Mining costs:

Drilling & blasting	$0.06
Loading	0.06
Hauling	0.05
General	0.07
	0.24
+ 10% (inflation)	0.03
+ leasing cost	0.11
Total Mining, per ton	$0.38
Cost/ton of ore, 1.72 S.R.	$1.03

Mining cost is from "Surface Mining", pp.874-896, average of different operations, and includes operating and maintenance costs. "General" cost is average of 15 mines and includes labor overhead, development drilling, pumping, assays, office, supervision, etc. Leasing cost estimate is based on allowing lessor a reasonable profit under competitive conditions. Depending on specific negotiations and equipment this cost could be higher or lower. The utilization rate of the equipment is assumed to be 90% or better. A rough check of mining costs was made using manufacturer's ownership and operating cost estimates under specific operating conditions, + labor + leasing costs. This estimate resulted in a mining cost of $0.39/ton vs. the $0.38/ton cost used here.

Most of the mines from which cost data were obtained are much larger than the projected Hassayampa operation, and benefit from the economies of large-scale operation. However, the Hassayampa operation has generally a much shorter haul distance which is largely downhill, in contrast to the other mines. Furthermore, the equipment utilization rate was quite low for some of the mines whose costs were used in estimating the cost for the Hassayampa operation.

The plant site is assumed to be located topographically below most of the ore which is in the surrounding hills. The area is highly dissected, with steep slopes, and the low mining cost assumes that up to 25% of the waste overburden may be blasted, or blasted and dozed off, the tops of the ridges to roll down and fill the adjacent gullies with little further handling. Some of the partly-filled gullies could then be

prepared as leach pads. Part of the leach rock and ore could similarly be blasted and allowed (or aided with a dozer) to roll off the ridges to the bottom, reducing the haul distance. Part of the waste would be used in diversion/storage and settling pond dam construction, and in constructing level sites for plant installation.

A small part of the near-surface rock may be rippable, which could reduce the mining cost somewhat. However, this was not considered in the present calculation.

The attached map from Sierra Mineral Management shows the area of the proposed pit, on a scale of one inch = 500 feet. Holes drilled in the pit area are shown as circles with crosses. In the present study the plant site is assumed to be located in the low area southwest of the pit; waste and leach material would be deposited in the gullies north and east of the pit, and the settling pond(s) would be located in the main draw south of the pit, below the plant site.

Depending on the equipment selected, the figures for loading and hauling may vary, but the overall rock moving cost should remain the same, approximately. Proper selection and scheduling of mobile equipment for minimum turnaround and haul time with maximum loads and utilization rates is critical to the mining cost. Inefficient equipment management can sharply increase the mining cost.

9. Acid cost $25.00/ton delivered from Bagdad, or $0.0125/lb; 2 lb acid/lb Cu recovered required.

10. Solvent extraction/electrowinning cost $0.03/lb recovered Cu (per J. Dorlach, General Mills).

11. Overall Cu recovery (90% recoverable, approx. 90% recovery) 80% from agitation leach, 30% from heap leach (ignoring for now the variation in recovery rates and overall recovery with time).

12. Agitation leach cost/ton of ore, based on scale-up from existing operations and assuming low crushing and screening costs, coarse grind:

Acid	$0.20
Crush & Screen	0.50
Slimes	0.25
Plant Maintenance	0.20
Water, Air, Power	0.10
Assays	0.06
Plant Administration	0.12
Total	$1.43

13. Leach Dump costs, per ton:

Preparation & Collection	$0.04
Acid	$0.03
Misc.	$0.02
Total	$0.09

14. LIX-electrowinning cost per ton, @ $0.03/lb Cu recovered:

Ore	$0.24
Leach Dump	$0.04

15. Overall cost and profit per ton of ore @ $0.52/lb of recovered copper:

Ore: 0.5% Cu, 80% recovery @ $0.52 = $4.16 Gross
Leach Dump: 0.2% Cu, 30% " " = $0.62 Gross

Operating Cost, Ore	
Mining (1.72 s.r.)	$1.03
Agitation Leach	1.43
Lix-Electrowinning	0.24
Overall administration & sales	0.20
	$2.90
Net per ton	$1.26

Operating Cost, Leach Dump	
Extraction	$0.09
Lix-Electrowinning	0.04
	$0.13
Net per ton	$0.49

Combined operating net, ore & leach dump, $1.75/ton of ore.

16. Development drilling and startup costs, expensed, $0.5 million.

17. Capital costs (independent purchase and contracting of construction, used equipment where feasible, assumed):

LIX-Electrowinning plant	$1.6	million
Agitation Leach Plant(incl. ponds)	2.4	"
Mining Equipment	0.5	"
Misc. Facilities & vehicles	0.4	"
Water Supply	0.25	
Total	$5.15	"

18. Straight line depreciation of plant over 6 years.

19. Ad Valorem tax. This tax is based on 60% of the full cash value of the operation, at county/state tax rates. The tax rate has varied from year to year and the estimate of the full cash value has been the subject of some negotiation.

The average ad valorem tax in 1963-1965 was $4.87 per $100.00 of assessed value (60% of full cash value). The full cash value is the total net after tax earnings of the operation plus depletion and depreciation, discounted (Hoskold formula) over the life of the operation at a 6% safe and 10% risk rate. The full cash value varies from year to year as it is recomputed annually based upon previous and projected earnings. In years of no production the assessed value (25%, commercial rate) of plant and property is taxed. Formal ad valorem tax estimates can become quite complex (per V. Dale, Ariz. Dept. Property Valuation).

For simplicity, the full cash value in the present calculations was based on an average annual income of $1.66 million for 6 years ($1.606 million + contingency for income/tax changes) discounted to a total of $6.72 million. The assessed valuation (60% of FCV) was $4.032 million, which at a tax rate of $5.00 gave an ad valorem tax of $0.202 million which was, again for simplicity, assumed to be constant during years 1-5 of production. The rate for year 0 was assumed to be the assessed value of the capital expenditure. The ad valorem tax can vary substantially without drastically changing the cash flow estimate, and is not considered critical for present purposes.

20. Property payments were capitalized, on the assumption that the property might ultimately be purchased. Payments through 1972 were assumed to be $25,000.00. Minimum annual payments are $100,000 thereafter, with a 2.5% net smelter basis royalty on production. The royalty is calculated here on gross receipts minus LIX-electrowinning costs. A slightly higher cash flow can be obtained by expensing the property/royalty payments.

Cash Flow and Rate of Return

The projected cash flow is shown on the attached work sheet. Calculations for the discounted cash flow, equalizing rate of interest method, periodic basis, are shown below. The projected and discounted cash flows are in millions of dollars. The cash flows for years -1 and 0 below consist of the capital expenditures for those years plus or minus the net operating cash flow.

Year	Cash Flow	x	15% Factor	=	Discounted Cash Flow
-1	(3.225)		0.86957		(2.804)
0	(1.575)		0.75614		(1.191)
1	1.599		0.65752		1.051
2	1.625		0.57175		0.929
3	1.625		0.49718		0.808
4	1.625		0.43233		0.703
5	1.582		0.37594		0.595
					+ 0.091

Discounted Cash Flow, Periodic ERI Basis, slightly in excess of 15%.

Conclusions and Recommendations

Cash flow calculations indicate, within the limits of the assumptions made in this study, a discounted rate of return of slightly more than 15% and an annual net cash flow of about $1.6 million. Whether or not this can be achieved depends on factors yet to be determined, as indicated previously.

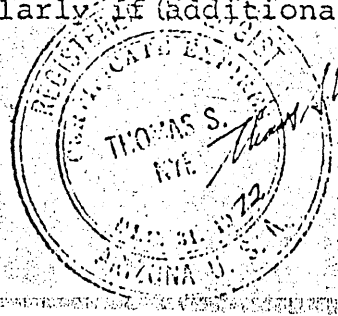
Additional reserves may exist on the property, which has not been fully explored, and on adjacent land which is reported to be favorable for ore. Reserves developed on the adjacent land may be available for exploitation under an agreement between Sierra Mineral Management and the adjacent land owners. Further exploration, and development of reserves, on both the Hassayampa and adjacent land is recommended.

Acid consumption, the percentage of leachable copper to total copper in the rock, grinding necessary to achieve 90% or better recovery in an agitation leach process, and the percentage of copper which can be extracted (and time required) by heap and in-place leaching should be determined.

The results of this work and development drilling will provide a more accurate basis for estimating the operating requirements and profitability of a mining operation on the Hassayampa copper deposit.

The economics of mining different ratios of grade and tonnage of ore to waste and leach rock should be studied, after the metallurgical studies recommended above are completed. A different ratio of ore/leach rock/waste might provide a better profit margin.

Industry predictions are that the demand for copper will increase relative to supply in the next few years, which may result in a higher price for copper. Smelter pollution control costs may also force the price of copper up, as long as the output of foreign copper producers is restricted by inefficiency and political turmoil. Should foreign competition become too severe it is likely that tariffs would be imposed to put domestic copper on a more equal footing. Price increases due to pollution control costs would work to the advantage of the projected Hassayampa operation, which would not be dependent upon the purchase of its copper production by smelters. The outlook, although not certain, is that future rising copper prices may enhance the profitability of the projected Hassayampa operation, particularly if additional reserves are developed.



April 19, 1972

Thomas S. Nye
Consulting Geologist

Copper Creek

Arizona Testing Laboratories

815 West Madison · Phoenix, Arizona 85007 · Telephone 254-6181

For Mr. Clair Hanna
1937 ~~West Indianola~~
Phoenix, Arizona 85015

Date June 21, 1977

ASSAY CERTIFICATE

LAB NO.	IDENTIFICATION	OZ. PER TON		PERCENTAGES			
		GOLD	SILVER	COPPER	MOLYBDENUM		
4534	L. C. Creek	trace		0.12%			
	Moly Queen #2				0.07%		

Respectfully submitted,
ARIZONA TESTING LABORATORIES

Claude E. McLeod

ATL
ARIZONA TESTING LABORATORIES
A DIVISION OF CLAUDE E. McLEAN & SON LABORATORIES, INC.
815 WEST MADISON ST. PHOENIX, ARIZONA 85007 PHONE 254-6181

For: Mr. Clair Hanna
1937 West Indianola
Phoenix, Arizona 85015

Date: June 30, 1977

Lab. No.: 4575

Received: 6-27-77

Marked: Copper Creek Mine Water sample

Submitted by: same

REPORT OF WATER TESTS

Total Dissolved Solids @180°C		1200 mg/l
Chromium, hexavalent	lt*	0.01
Iron		11.5
Calcium		192
Magnesium		66
Sodium		47
Chloride		18
Carbonate		0
Bicarbonate		0
Sulfate		850
Nitrate		5
Fluoride		0.9
Phenolphthalein Alkalinity		0
Methyl Orange Alkalinity		0
Calcium Hardness		480
Magnesium Hardness		272
Total Hardness		752
pH		3.6
Arsenic	lt*	0.01
Copper		0.70

lt* = less than
above reported in mg/l

Respectfully submitted,
ARIZONA TESTING LABORATORIES

Steven Hankins

Steven Hankins

page 2

IRON KING ASSAY OFFICE

ASSAY CERTIFICATE

BOX 14 — PHONE 632-7410
HUMBOLDT, ARIZONA 86329

Submitted for assay by: ESSEX INTERNATIONAL INC.
1704 West Grant Road
Tucson, Ariz. 85705

Sept. 16, 1978

SAMPLE DESCRIPTION	% Cu	
# 09330	0.41	EH-16
# 09334	0.15	"
# 09340	0.21	"
# 09341	0.24	"
# 09350	0.42	"
# 09352	1.36	"
# 09356	0.30	"
# 09357	0.05	DH EH17
# 09359	0.10	"
# 09360	0.12	"
# 09361	0.07	"
# 09365	0.07	"
# 09367	0.09	"
# 09369	0.04	"
# 09370	0.04	"
# 09372	0.09	"
# 09379	0.54	"
# 09381	0.14	"
# 09385	0.19	"
# 09386	0.24	"
# 09387	0.14	"
# 09388	0.40	"
# 09389	0.20	"
# 09390	0.28	"

Evaluation

9/11/78

page 2

IRON KING ASSAY OFFICE

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BOX 14 — PHONE 632-7410

HUMBOLDT, ARIZONA 86329

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# 09356	0.30	"
# 09357	0.05	DH EH 17
# 09359	0.10	"
# 09360	0.12	"
# 09361	0.07	"
# 09365	0.07	"
# 09367	0.09	"
# 09369	0.04	"
# 09370	0.04	"
# 09378	0.09	"
# 09379	0.54	"
# 09381	0.14	"
# 09385	0.19	"
# 09386	0.24	"
# 09387	0.14	"
# 09388	0.40	
# 09389	0.20	
# 09390	0.28	

Assaying ampl

Walter Hale
9/17/73

7.8 million tons @ 0.8% Cu, 80% recovery, 1.72 [illegible]

7.8 million tons is leach dump @ 0.2% Cu, 30% recovery

(60% rate)

Year	-1 (1972)	0	1	2	3	4	5
Gross		4.015	6.692	6.692	6.692	6.692	6.501
Devel/Oper cost	0.200	2.545	4.242	4.242	4.242	4.242	4.121
Operat. Profit	(0.200)	1.470	2.450	2.450	2.450	2.450	2.380
Startup cost	(0.150)	(0.150)					
Loss carry-forward		(0.350)	(0.035)				
	(0.350)	0.970	2.415	2.450	2.450	2.450	2.380
2% sales tax on gross		0.080	0.134	0.134	0.134	0.134	0.130
		0.890	2.281	2.316	2.316	2.316	2.250
Ad Valorem Tax		0.065	0.202	0.202	0.202	0.202	0.202
		0.825	2.079	2.114	2.114	2.114	2.048
Depreciation, S/L		0.860	0.860	0.860	0.860	0.860	0.860
		(0.035)	1.219	1.254	1.254	1.254	1.188
Ariz. Inc. Tax			0.038	0.039	0.039	0.039	0.037
			1.181	1.215	1.215	1.215	1.151
Depletion			0.590	0.607	0.607	0.607	0.575
			0.591	0.608	0.608	0.608	0.576
Fed. Inc. Tax, 48%			0.284	0.292	0.292	0.292	0.276
Net After Tax	(0.350)	(0.035)	0.307	0.316	0.316	0.316	0.300
+ Depreciation		0.860	0.860	0.860	0.860	0.860	0.860
+ Depletion			0.590	0.607	0.607	0.607	0.575
Cash Flow	(0.350)	0.825	1.757	1.783	1.783	1.783	1.735
Property Pay.	0.025	0.100	0.158	0.158	0.158	0.158	0.153
NET CASH FLOW	(0.375)	0.725	1.599	1.625	1.625	1.625	1.582
Capital Exp.	2.850	2.300					
Cap. Outstand.	2.875	5.175	4.450	2.851	1.226		
Cap. Payback		0.725	1.599	1.625	1.625		
Cap. Balance	2.875	4.450	2.851	1.226	0.000		

Payback Period: Approximately 3.75 production years.

Exh. 4
page 1

IRON KING ASSAY OFFICE

ASSAY CERTIFICATE

BOX 14 — PHONE 632-7410

HUMBOLDT, ARIZONA 86329

ESEX International Inc.
1704 West Grant Road
Submitted for assay by: Tucson, Ariz. 85705 Sept. 25, 1973

SAMPLE DESCRIPTION	%Cu		
# 09378	0.13	EH-16	Hassayampa
# 09353	1.11		
# 09324	0.09		
# 09325	0.08		
# 09328	0.25		
# 09329	0.21		"
# 09331	.50		
# 09335	0.17		
# 09336	0.21		"
# 09337	0.15		
# 09342	.30		
# 09347	0.25		
# 09354	.26		
# 09354	0.42		
# 09358	0.11	EH-17	Hassayampa
# 09362	0.12		"
#	0.17		
# 09376	0.10		
# 09383	0.16		
# 09392	0.26		
# 09395	.04		
# 09396	0.09		
# 09402	0.14		
# 09406	0.21		

Walter Hall
9/25/73

IRON KING ASSAY OFFICE

ASSAY CERTIFICATE

BOX 14 — PHONE 632-7410

HUMBOLDT, ARIZONA 86329

ESSEX INTERNATIONAL INC.
1704 West Grant Rd.
Tucson, Ariz. 85705

Submitted for assay by:

Sept. 20, 1973

SAMPLE DESCRIPTION	%Cu			
# 09327	0.11			
# 09332	0.33	DH		
# 09343	0.38			
# 09349	0.46			
# 09355	0.16			
# 09363	0.11	EH17	HASSayamPA	
# 09364	0.08	EH17	"	
# 09366	0.15	EH-17	"	
# 0 368	0.15	EH-17	"	
# 09371	0.10	EH-17	HASSAYAMPA	
# 0 372	0.09	"		
# 09373	0.07	"		
# 09375	0.12			
# 09380	0.08			
# 09382	0.15			
# 09384	0.17			
# 09397	0.12			
# 09401	0.27			
# 09403	0.17			
# 09404	0.14			
# 09407	0.05			
# 09408	0.04			
# 09412	0.06			
# 02413	0.07			

11/20/73

page 1

IRON KING ASSAY OFFICE

ASSAY CERTIFICATE

BOX 14 — PHONE 632-7410

HUMBOLDT, ARIZONA 86329

U.S.E. Universal Coal Inc.
1208 West Grant Road
Submitted for assay by: Tucson, Ariz. 85705 Sept. 25, 1973

SAMPLE DESCRIPTION	%Cu		
# 09378	0.13		
# 09353	1.11		
# 09324	0.09		
# 09325	0.08		
# 09328	0.25	EH-14	Hassayampa
# 09329	0.21	"	"
# 09331	.50		
# 09335	.17		
# 09336	0.21		
# 09337	0.15		
# 09342	.30		
# 09347	0.25		
# 09354	.26		
# 09351+	0.42		
# 09358	0.11	EH-17	Hassayampa
# 09362	0.12	"	"
	0.17		
# 09376	0.10		
09393	0.16		
# 09382	0.26		
395	.04		
09396	0.09		
# 09402	0.14		
# 09406	0.21		

4.19.72

HASSAYAMPA LEACH OPEN PIT

Bench	+ .40% Cu Tons	Grade	0.2 - 0.4% Cu Tons	Grade	-0.2% Cu Tons	Grade
5400						
5375						
5350			85,000	.29		
5325	235,000	.53				
5300	365,000	.44				
5275	835,000	.45				
5250			535,000	.23	1,005,000	.11
5225	400,000	.46	850,000	.25	1,175,000	.10
5200	750,000	.46	1,010,000	.25	580,000	.05
5175	1,565,000	.59	445,000	.22	140,000	.05
5150	1,640,000	.55	505,000	.24	155,000	.13
5125	1,980,000	.44	1,560,000	.24		
5100			2,080,000	.29	530,000	.16
5075			1,330,000	.25		
5050			585,000	.33		
5025			430,000	.33		
5000			305,000	.34		
	7,770,000	.50	9,720,000	.27	3,640,000	.10

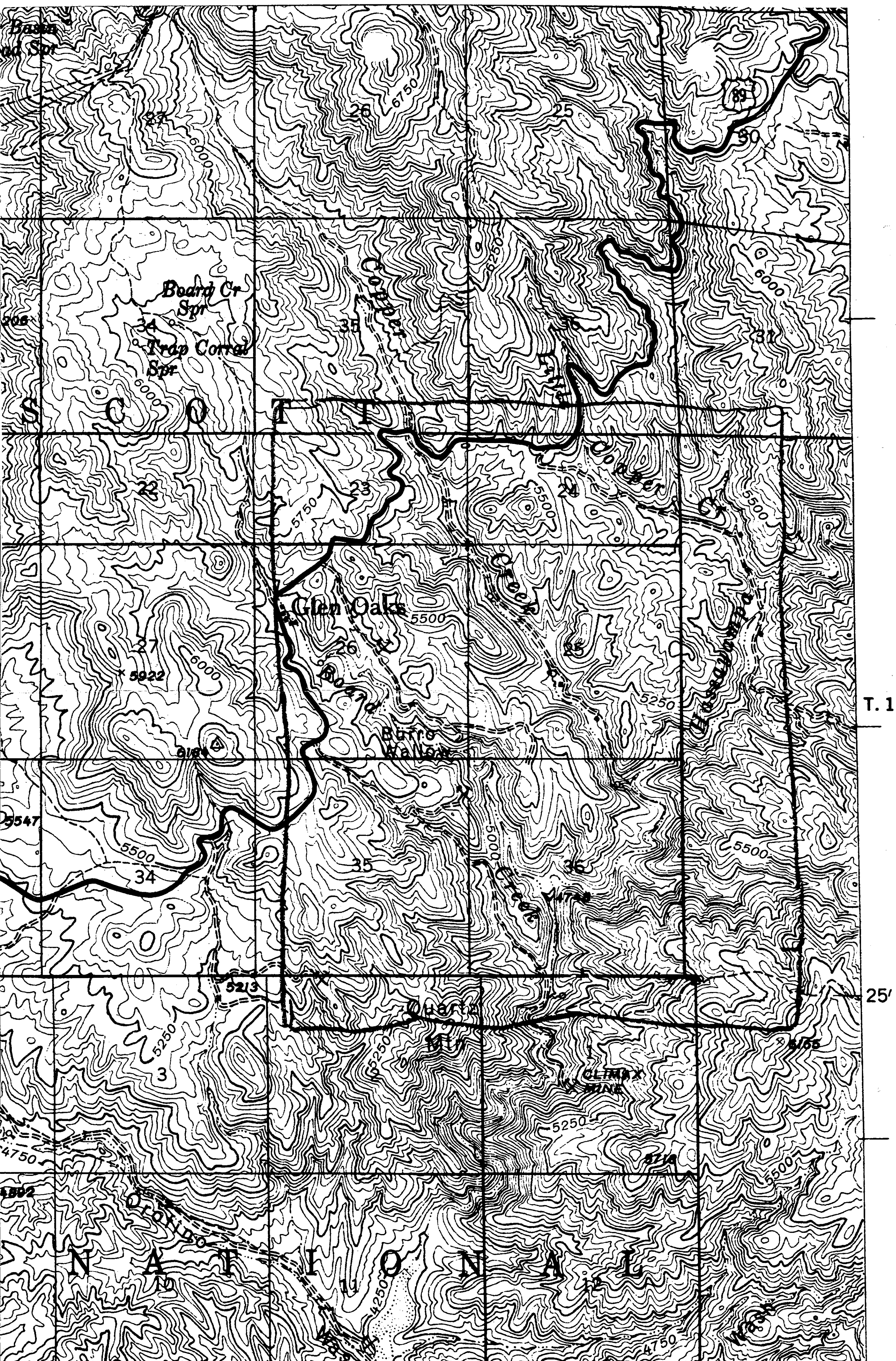
SUMMARY

Cut-Off	Tons	Grade	Sr
0.00	21,130,000	.325	-0-
0.20	17,490,000	.372	.208
0.30	9,090,000	.476	1.32
0.40	7,770,000	.500	1.72

Cross Section on 52 page

Thomas A. Rye
Consulting Economic Geologist
4.19.72

4000 T p/day
on 7.8 million Tons of ore
Stripped rock - averaging .20% Cu
80% recovery in agitation tanks
Annual net cash flow $1.6 mil
pay back in 3.75 years



5280'

1 mile @ 1" = 1000' Scale

0

R3W R2W
T13N
T12½N

26 25
35 36

Sketch Map
Geochemical Profiles
Glen Oaks Project

Values in ppm
probable error ± 10%

Approx Scale 1" = 1000'

Base control After Allan

Heinrichs Geoexploration Co.

10/June/60 F.A.S.