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James Doyle Sell Mining Collection

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EXECUTIVE OFFICES
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PLAZA 7-9700

AMAX EXPLORATION, INC.
SUBSIDIARY OF AMERICAN METAL CLIMAX, INC.
2510 N. CAMPBELL AVE., TUCSON, ARIZONA 85719

.EPHONE
CODE 602
95-4731

March 20, 1970

Mr. Rodney DeVilliers
DeVilliers Nuclear Corporation
457-B Washington St., S.E.
Albuquerque, New Mexico 87108

Re: Edwards Claim Group, Pimal County, Ariz.

Dear Rodney:

The following are the geochem analyses which we made on the bottom of the Edwards' drill core:

Sample No.	PPM Cu	Mo	Pb	Au	Ag
TE 662	70	-1	-10	-0.1	-1
TE 663	120	7	10	-0.1	-1
TE 664	995	4	20	-0.1	-1

The (-) sign reads: less than.
1 PPM = .0001 percent.

995

.0995

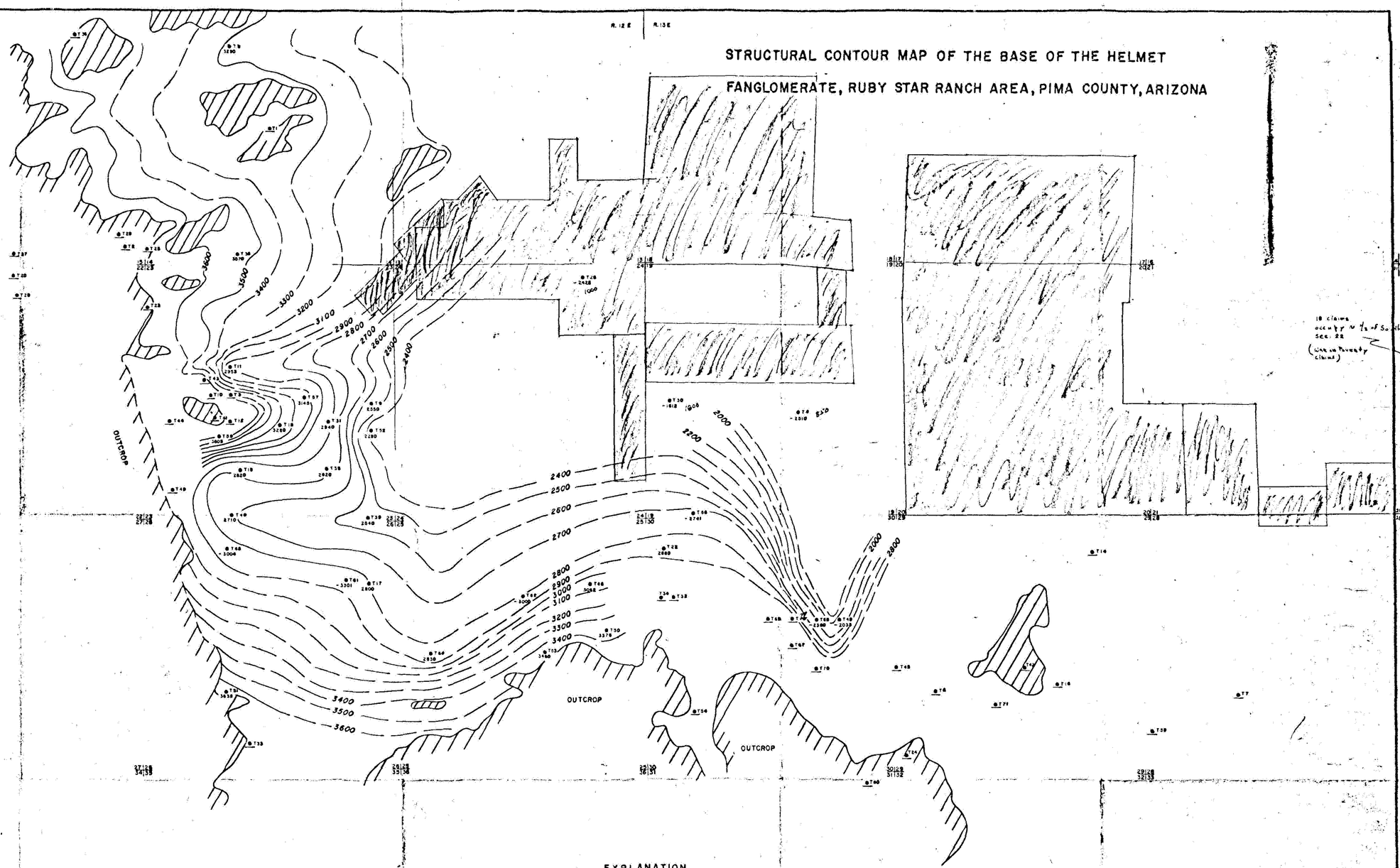
Sincerely,

Charles

Charles P. Miller

CPM:mg

STRUCTURAL CONTOUR MAP OF THE BASE OF THE HELMET FANGLOMERATE, RUBY STAR RANCH AREA, PIMA COUNTY, ARIZONA



EXPLANATION

3100 —— CONTOUR LINES WITH ELEVATIONS ABOVE SEA LEVEL (DASHED WHERE INFERRED)

26|25 / 35|36 SECTION CORNERS PLUS SECTION NUMBERS

T18 / 3000 DRILL HOLE LOCATION WITH DEPTH TO HELMET FANGLOMERATE, NEGATIVE NUMBERS INDICATE THAT THE FANGLOMERATE BASE IS BELOW DEPTH OF DRILL HOLE

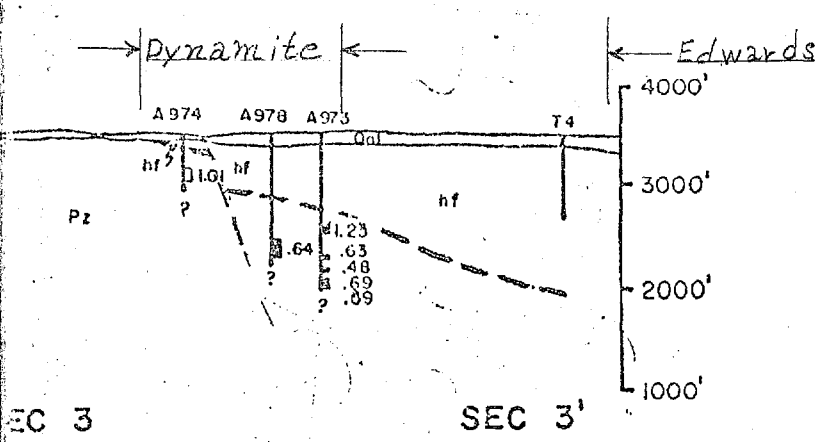
T34 HELMET FANGLOMERATE IS ABSENT IN DRILL HOLES

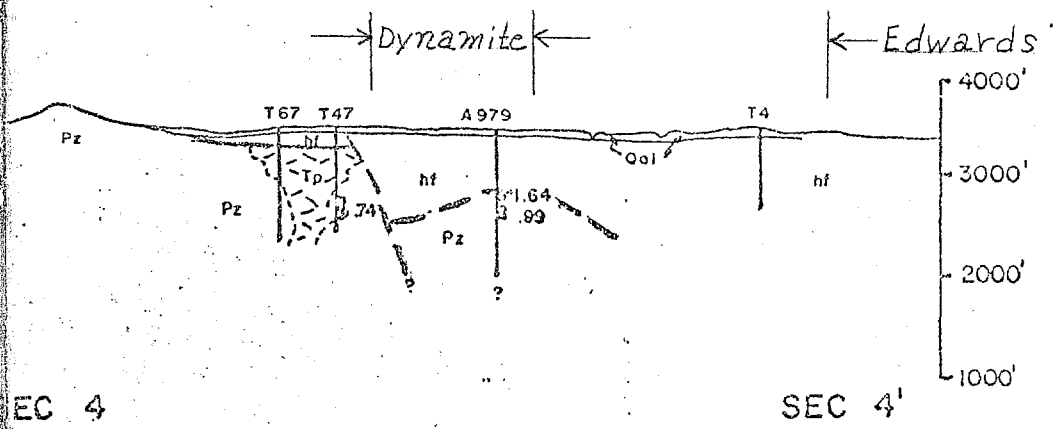
OUTCROP OF ROCKS OLDER THAN HELMET FANGLOMERATE

NOTE: CONTOUR INTERVAL 100'

0 1000 2000 3000
SCALE IN FEET

PLATE 5



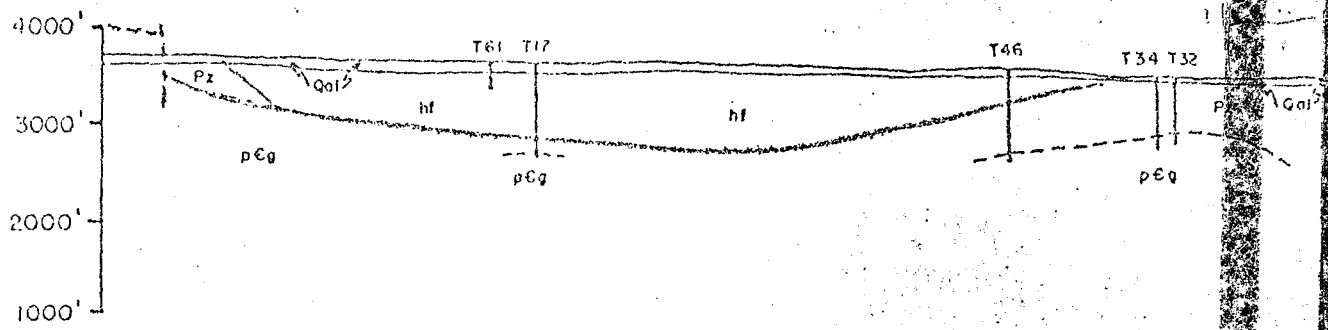


EDWARDS PROSPECT

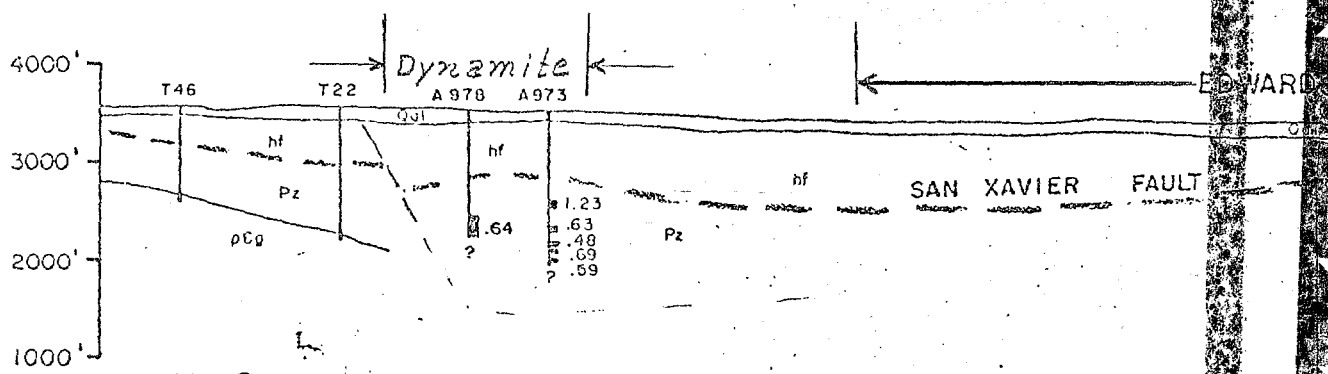
Twin Buttes - Pima District

Arizona

to accompany Report by Kenyon Richard January 1969


4000'
3000'
2000'
1000'
T61
T17
T46
T34
T32
Pz
Qal
hf
pЄg

SEC 1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3000'
2000'
1000'
Dynamite
T46
T22
A978
A973
Qal
hf
Pz
pЄg
.64
1.23
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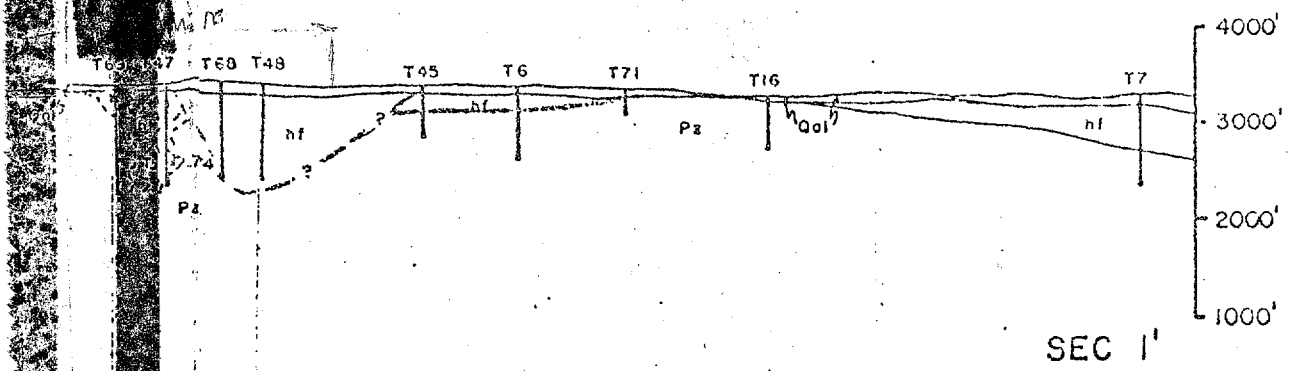
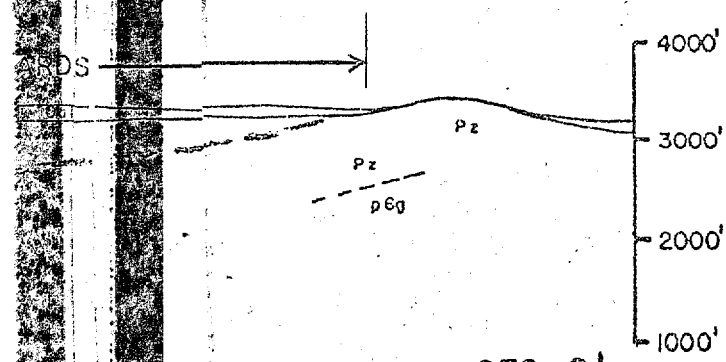
.48
.69
.59
SAN XAVIER FAULT

SEC 2



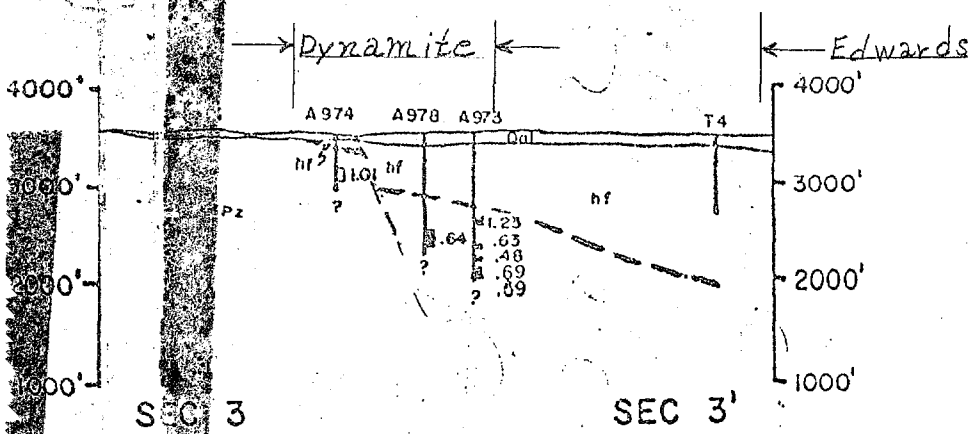
SEC 1'

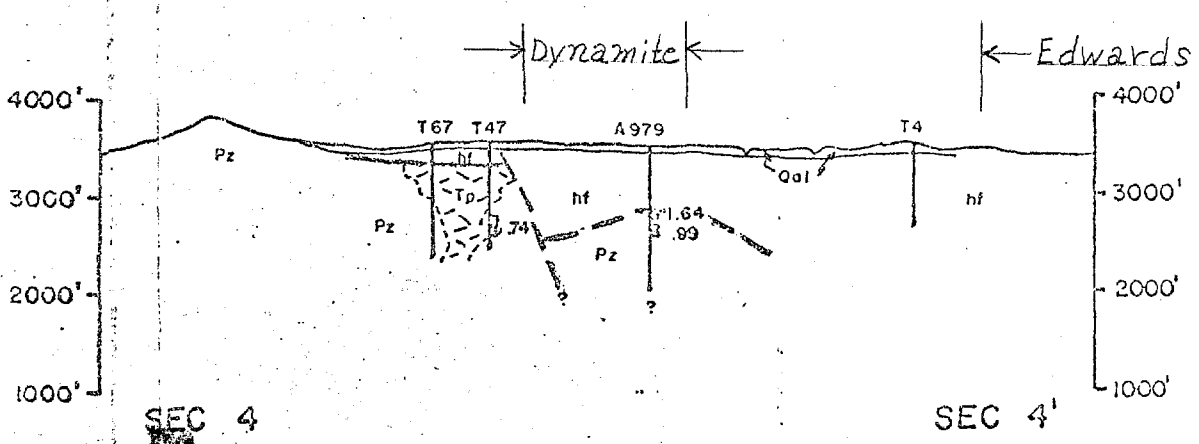


SEC 2'

SCALE: 1" = 2000'

0 2000 4000 feet



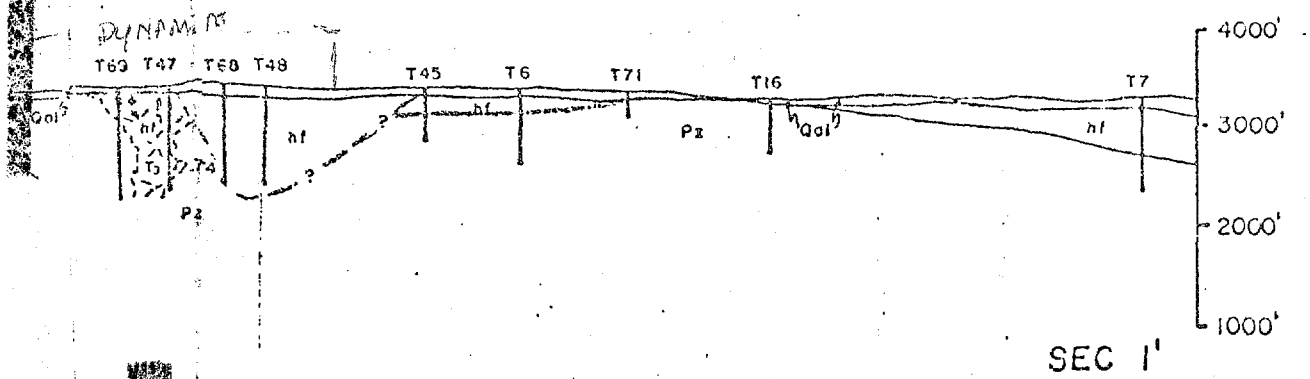


EDWARDS PROSPECT

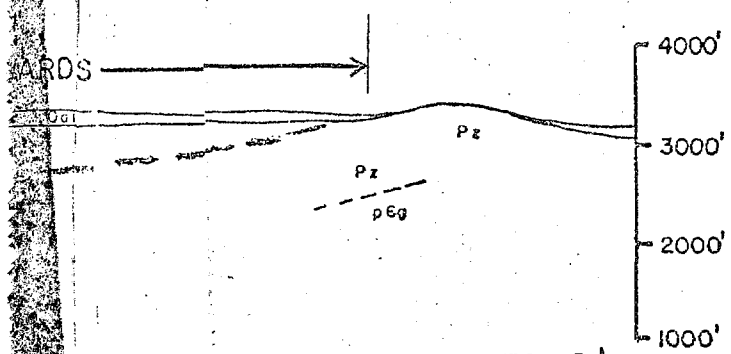
Twin Buttes - Pima District

Arizona

to accompany Report by Kenyon Richard January 1969



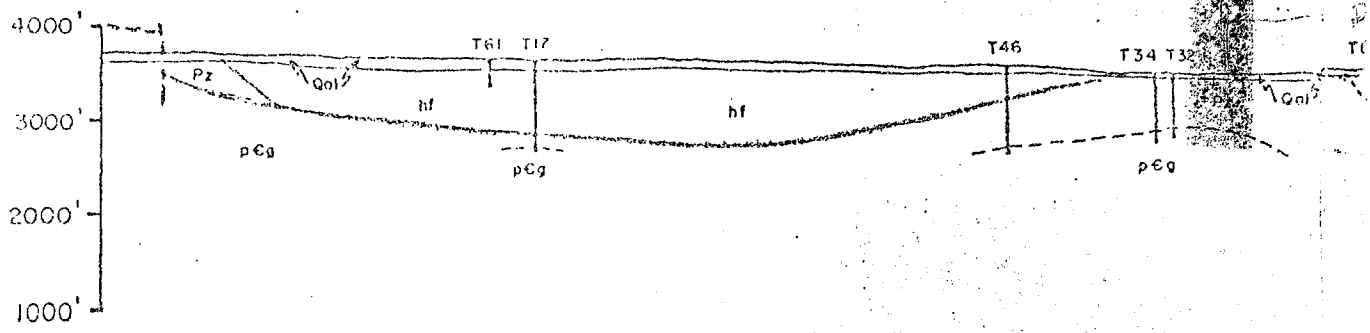
SEC 1'



SEC 2'

SCALE: 1" = 2000'

0 2000 4000 feet


4000'
3000'
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T61
T17
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Pz
Qal
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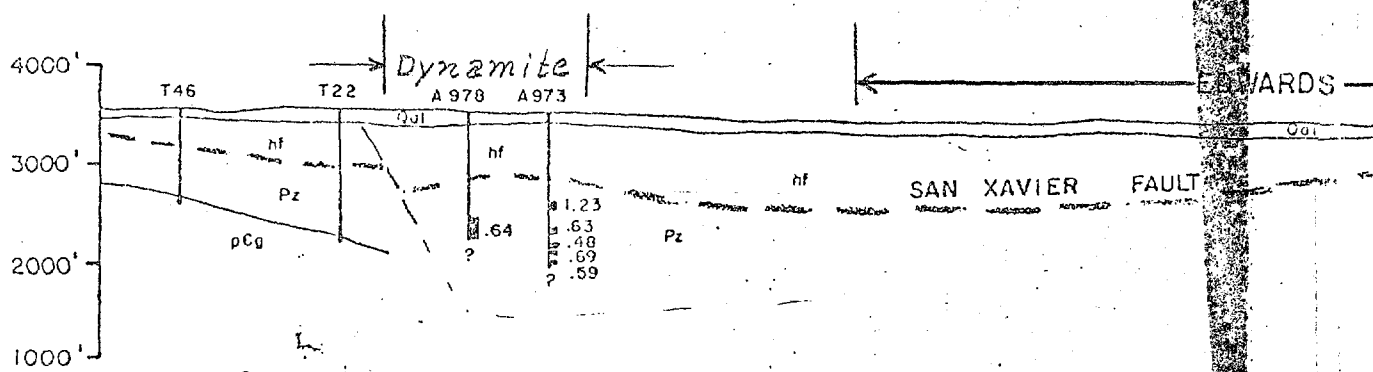
SEC 1


4000'
3000'
2000'
1000'
Dynamite
EDWARDS
T46
T22
A 978
A973
Qal
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1.23
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.48
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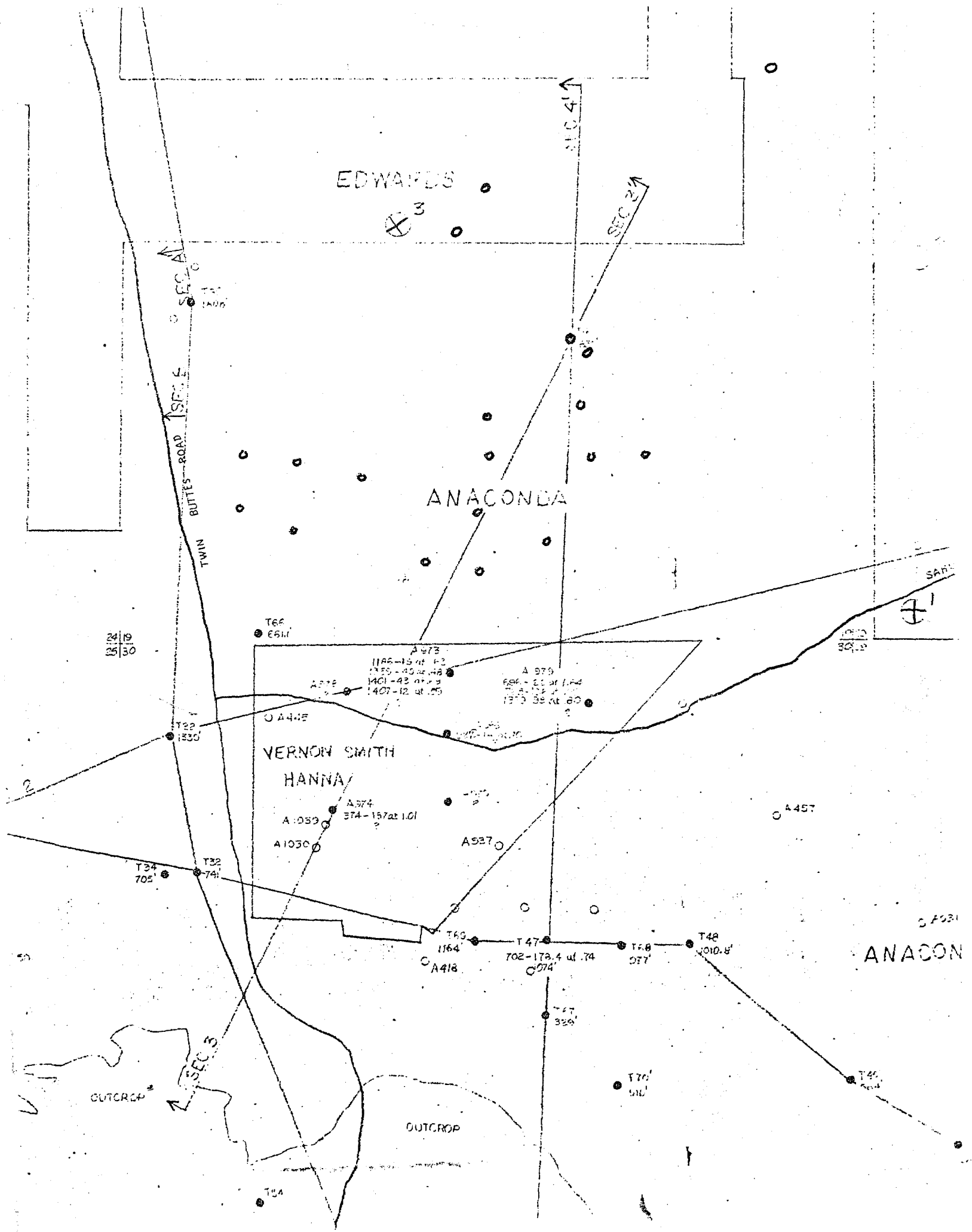
.59
SAN XAVIER FAULT

SEC 2


EDWARDS
ANACONDA
VERNON SMITH
HANNA
TWIN BUTTES ROAD
SEC 4
SEC 3
SEC 2
SEC 1
OUTCROP
OUTCROP
ANACON
T66
T22
T34
T32
T69
T47
T68
T48
T70
T54
A973
A979
A445
A374
A1030
A537
A457
A418

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2510 N. CAMPBELL AVE., TUCSON, ARIZONA 85719

TELEPHONE
AREA CODE 602
795-4731

March 20, 1970

Mr. Rodney DeVilliers
DeVilliers Nuclear Corporation
457-B Washington St., S.E.
Albuquerque, New Mexico 87108

Re: Edwards Claim Group, Pimal County, Ariz.

Dear Rodney:

The following are the geochem analyses which we made on the bottom of the Edwards' drill core:

	PPM				
Sample No.	Cu	Mo	Pb	Au	Ag
TE 662	70	-1	-10	-0.1	-1
TE 663	120	7	10	-0.1	-1
TE 664	995	4	20	-0.1	-1

The (-) sign reads: less than.
1 PPM = .0001 percent.

Sincerely,

Charles P. Miller

CPM:mg

149
6 pgs

January 15, 1969

Edwards Claims
Twin Buttes Area
Pima District, Arizona

Dear Sir:

The maps and sections which I displayed and described during your December exploration meeting accompany this report. The sections have been reduced in scale.

The structural uncertainties which I commented upon in my letter of August 22 are now fairly well resolved. It seems reasonably certain that a new and separate center of mineralization exists beneath the flat, post-mineral San Xavier fault in the area between the Twin Buttes and Pima-Mission ore bodies. This new zone should have major dimensions.

Since the last meeting the locations of a surprising number of additional drillholes have been determined. These are labelled as "new" drillholes on the accompanying 500-scale map. Most of these were drilled by Anaconda within the past 3 years.

Both the pattern and the number of Anaconda drillholes are informative, even though we do not have their results. I would judge they have not drilled enough holes either to have measured or delimited an ore body. The inference, however, is clear that they have obtained ore-grade intercepts in practically all drillholes in the south half of section 19. There is no other reasonable explanation for that many drillholes with that pattern.

The major ore bodies in the district vary from one to over two miles in length. Assuming that Anaconda 's "inferred" new ore body will have a similar size, there is good reason to expect that substantial portions of it will be found on the Edwards claims to the N. as well as to the NE. of the presently known cluster of holes.

Since it is anticipated that ore occurs only beneath the San Xavier fault, depths to the top of any ore within the claims E. of the Twin Buttes highway should range within 500' to 2000'. The implication in this is, of course, that any ore body found would be susceptible only to underground cave mining.

The data at hand for some of the older drillholes consist only of a few assay-averages. But those geologic logs which I do have indicate that for 500' or so below the San Xavier fault the mineralization occurs in tactite (mineralized Paleozoic limestone) and Tertiary porphyry. Some intercepts of mineralized igneous rock probably are Precambrian granite. It is to be expected that any ore in the Edwards claims will occur in tactite for the first few hundred feet below the fault. At greater depths all mineralization should be in granite and porphyry; and, most importanly, mineralization should continue more-or-less indefinitely in depth.

If the tactite mineralization beneath the San Xavier fault is like that in the Mission-Pima zone, and it should be, the chalcopyrite will have spotty distribution. An ore body of that type actually consists of a large number of small lenses of better-grade ore separated by about equal tonnages of waste. By selective

shovel mining the production grades at Missi[illegible] in tactite (half the ore is in lower grade argillite) are maintained at .7 to 1.0 Cu. This same mass of rock would have a production grade of about .6 Cu by cave mining, and that is what we would by looking for with the proposed drillholes.

If, as expected, mineralization continues in depth into the porphyry and granite zone, the copper there should be distributed more uniformly than in tactite.

Briefly, there is a moderately good chance to find a large tonnage, low grade, cave-mining ore body on the subject property east of the highway.

Anaconda probably has enough deep underground-mining ore both at Twin Buttes and in this inferred "new" ore body of theirs to last practically indefinitely without need for any additional ore on the Edwards property. There is no reason for acquisition of this property in order to wait for Anaconda to require it.

Three drillholes shown on the 500-scale map are proposed as a worthwhile, minimum, preliminary exploration program to test the Edwards claims. Estimated drillhole depths are as follows:

	Depth to Fault	Total Depth if Unmineralized	Total Depth if Mineralized
1	900	1300	1900
2	1400	1800	2400
3	2000	2400	3000
			7300

The holes should be drilled by rotary through alluvium and Helmet fanglomerate until the fault is crossed. Spot core-runs without casing should be made at 100' intervals beginning about 300' above the expected depths to the fault. Rotary cuttings will have to be observed continuously. Casing should be set as soon as the fault has been penetrated. Thereafter, drilling should be by wire-line coring with emphasis on core recovery. The contract should specify a stiff penalty for each core-run below 60% recovery and, in effect, a good bonus for more than 80% recovery. This point is made here because poor core recovery can result in an uncertainty of .2, up or down, in the average Cu percentage. That degree of uncertainty would wipe out the usefulness of an entire drillhole. The contractor can be informed that rock drilling conditions should be similar to those of the Mission zone and also, I would think, of the Twin Buttes zone.

The entire cost of this preliminary program, including drilling contract, sample handling, logging and supervision, should approximate $120,000.

If any one of these holes gives indication of ore grade and thickness, an "ore body measurement" program then would cost from $2 to 4 million.

The property boundaries and ownership shown on the 500-scale map have not been checked. They were derived only from material handed to me by Edwards.

Anaconda has not drilled for several months in the area east of the Twin Buttes-San Xavier highway, but during that time they

have drilled at least a couple of holes, and probably more, to the west of the highway. This westerly area involves the Continental Mine in the area of drillholes T31, T52, etc. on the 500-scale map. This was a recent commercial fiasco. The property is now owned by Anaconda. The point is, the Continental zone (mineralized but not an ore body) can be accounted for only by selecting one of several structural interpretations, all of which are quite awkard. I have always considered that this mineralized block was in the hangingwall of the San Xavier fault. Possibly a better interpretation now is that some mineralized areas exist beneath the fault, and Anaconda has been investigating leads of that kind with their latest drillholes.

After trying without success to spot Anaconda's "new" drillholes from the air, I hired Vern DeRuyter, a graduate U. of A. geology student with a built-in excuse for climbing fences into Anaconda ground: "just looking for a thesis area." Surprisingly, Anaconda security guards chased DeRuyter around and made quite an effort to learn who he was really working for. So, I stopped the work before he had checked the area west of the Twin Buttes-San Xavier highway.

The thing about all this is that Anaconda's activity west of the highway is probably more than just claim assessment work, and the Edwards claims in that area may have more value than I had formerly thought.

Although it is hardly necessary, I would like to emphasize that the information on section A-A' should not be allowed to get outside of your organization.

Yours very truly,

Kenyon Richard

Kenyon Richard

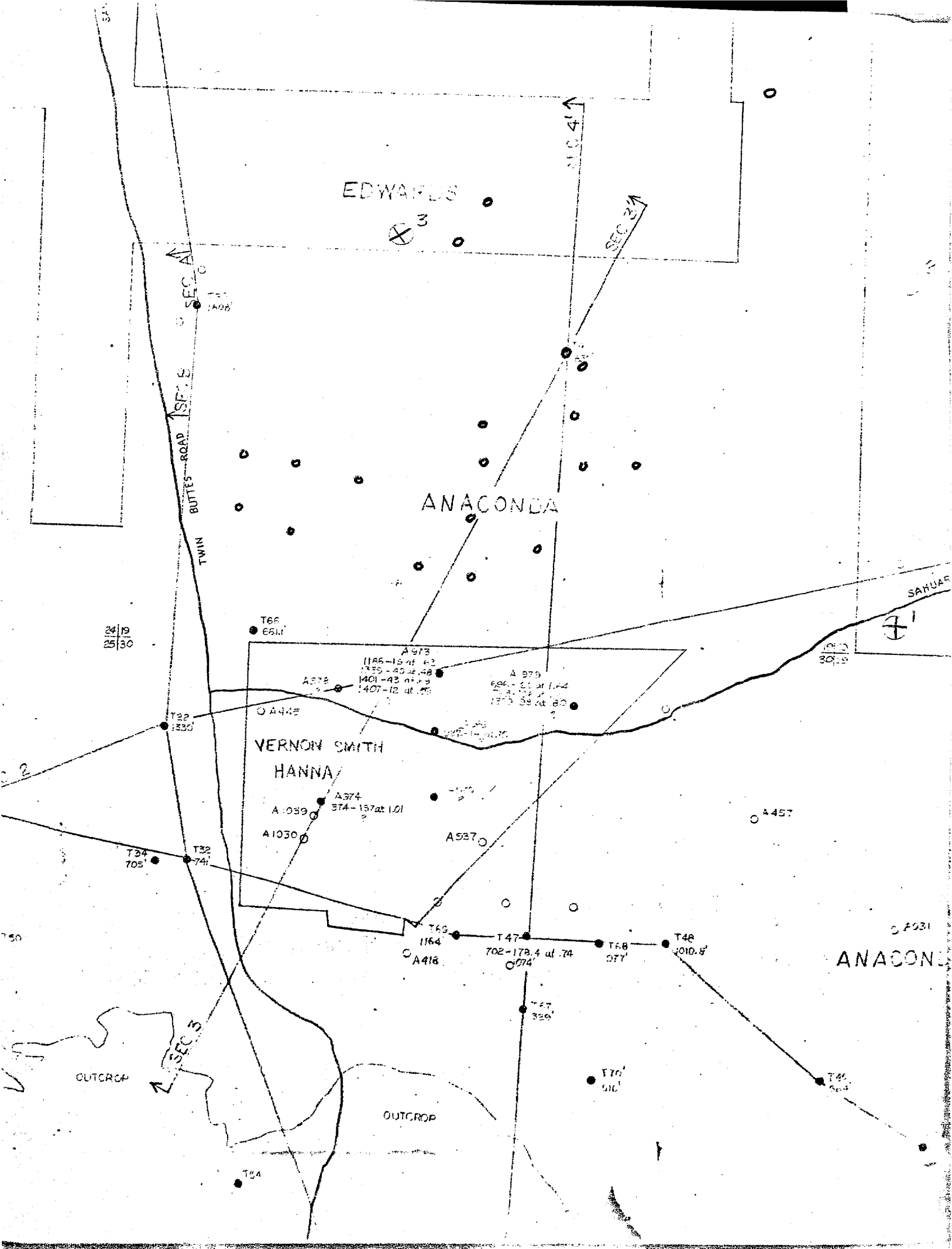
Atts:

One Plan Map 1" = 500'

One Plan Map 1" = 1 mile

One Section 1" = 2000'

One Sheet of 4 Sections 1" = 2000'


EDWARDS
ANACONDA
TWIN BUTTES ROAD
SEC 4
SEC 3
SEC 2
SEC 5
VERNON SMITH
HANNA
A973
A979
A978
A445
A374
A1039
A1030
A937
A457
A931
A418
T66
T32
T34
T69
T47
T68
T48
T70
T64
OUTCROP
OUTCROP
ANACONDA

6 Pages

Pima County Courthouse

Book 2834 Page 375

1964 ?

PRELIMINARY CALCULATIONS OF THE DYNAMITE CLAIMS

PIMA COUNTY, ARIZONA

Introduction

The Dynamite claim group lies approximately twenty-five miles south-southwest of Tucson, Arizona, in the Pima Mining district. The six unpatented Dynamite claims are located in the N.½, N ½. sec. 30, T. 27 S., R. 13 E., and are oriented in a north-south direction. They embrace an area 1500 feet by 3600 feet and occupy approximately 125 acres.

The blacktopped Twin Buttes Road approximates the western boundary of the claim group, and the maintained, dirt Sahuarita Road traverses eastward through the center of the acreage.

While the claims were under option to Anaconda a total of 9,381 feet was drilled in six holes. Five of these holes contained well mineralized intercepts, and the sixth hole was essentially barren of copper mineralization.

Method of Attack

The calculations of this study are based on five wide-spaced drill holes -. A-979, A-974, A-973, A-969 and A-976. Drill hole A-970 contained less copper values and was not considered in the calculations. The spacing of the drill holes ranges from 900 feet to 925 feet.

Areas of influence were calculated by the polygonal method, and where there wasn't any drill hole bounding the polygon, the mirror image of the controlled half of the polygon was projected. The polygons were constructed around the respective drill holes on graph paper, and the square footage of influence was measured by counting the number of squares in the polygon and multiplying the number by a constant.

To allow for easier calculations a figure of 10 $Ft.^3$/ton was used. The specific gravity of the rock containing the sulfide mineralization is about 3. This gives a value of 10.5 $Ft.^3$.ton. Thus the estimated tonnage derived in the study is very close to the actual tonnage figures.

In drill hole A-979 excellent molybdenum values were reported. In this hole only a Cu-Mo equivalent was derived. The formula used in this derivation is ¼(Mo %) + Cu % = Mo equivalent. This conversion allows for a total tonnage in Cu % while still getting the benefit of the Mo assays.

It was assumed for the purpose of this study that there was no limited area due to ownership boundary lines. Also it must be borne in mind that this study is of the rapid preliminary character, and time did not allow for double checking of the figures. It is felt, however, that the estimations are fairly accurate and closely approximate the true values.

Tonnage and Grade Calculations

A break down of the calculations are presented in appendix A. These tonnages and grades were derived from the assay data supplied to Mr. Vernon Smith by the Anaconda Company. Under Mr. Smith's direction more care in preparation of intervals over 1 % Cu was taken than in the intervening intercepts.

In the five wide spaced holes a total of 30, 136, 190 tons of 1.225 % Cu occurs as indicated ore, and a total of 99, 814, 200 tons of 0.539 % Cu. occurs as indicated ore.

Mineralization and Depth

A very brief survey of the core in Mr. V. Smith's possession indicates that mineralization consists of chalcocite, malachite, azurite, native copper, chalcopyrite, pyrite, molybdenite and very minor amounts of sphalerite and galena. This mineralization occurs in altered limestones and is of the typical contact-metasomatic type. The limestone units are altered to garnet, wollastonite, tremolite and other calc-silicate minerals. Minor veinlets of gypsum were observed.

The depth of the ore varies from hole to hole, except between A-969 and A-973 where it averages 926 feet below the surface between the two holes. In drill hole A-974, located in the extreme southwest corner of the claim group, the ore grade material comes in at 374 feet and maintains an average grade of 1.01 % Cu to 511 feet. Ore grade material over 1 % Cu occurs at various depths in the remaining two holes, and correlations of the ore grade intercepts with any degree of confidence is difficult.

Mineralization Immediately South of The Smith Property

A hole located 1000 feet south of the south end boundary of the Dynamite group intersected the following ore grade mineralization in a tactite-hornfels host rock:

From	To	Interval	% Cu
702.4	805.5	103.1	0.83
702.4	880.8	178.4	0.74
702.4	722.6	20.2	0.81
742.2	805.5	63.3	1.03
855.8	880.8	25.0	1.44

Mineralization consisted of pyrite, chalcopyrite, molybdenite, bornite and primary chalcocite.

Three holes were drilled on 500 foot centers from the ore hole mentioned above. The hole 500 feet south had 5 feet of 5.18 % oxide copper in tactite-hornfels at a depth of 329 feet. The hole 500 feet west of the ore hole had 41.3 feet of 0.75 % Cu in tactite beginning at a depth of 455 feet, while the hole 500 feet to the east of the ore hole had minor Cu values. Based on the center hole and the hole to the west an estimated 5.5 million tons of 0.80 % Cu is indicated.

Based on drilling information in the area south of the Dynamite claims, it is theorized that the mineralized zone should strike roughly N. 40°-50° W. and dip 40° NE. The mineralized zone would thus project across the Kress ground and into the Dynamite claims.

Conclusions

Tonnage and grade calculations in this report are based on wide spaced-drill hole intercepts. Also high grade intercepts were correlated between the wide-spaced holes with very little regularity. It is extremely dangerous to correlate intersections which do not lie on a straight line or regular curve. Only further closer-spaced drilling will confirm or disprove the derivations contained in this report.

S/ Richard R. Weaver
Richard R. Weaver

Appendix A

ORE CALCULATIONS - DYNAMITE CLAIM GROUP

Hole A-969 Area of influence 481, 200 Ft.^{2} 10 ft.^{3} = 1 ton

Footage	Interval	Tonnage and Grade
927.0 - 941.0	14.0	673,680 tons of 0.697 % Cu
931.0 - 941.0	10.0	481,200 tons of 0.860 % Cu
1289.0 - 1295.5	6.5	312,780 tons of 1.453 % Cu
1365.0 - 1385.0	20.0	962,400 tons of 0.740 % Cu

Hole A-973 Area of influence 438, 000 ft.^{2} 10 ft.^{3} = 1 ton

Footage	Interval	Tonnage and Grade
925.0 - 968.0	43.0	1,969,400 tons of 1.230 % Cu
925.0 - 1216.0	291.0	13,327,800 tons of 0.411 % Cu
1186.0 - 1203.0	17.0	0,778,600 tons of 0.631 % Cu
1332.0 - 1483.0	150.5	6,892,900 tons of 0.424 % Cu
1339.0 - 1379.0	40.0	1,877,800 tons of 0.482 % Cu
1401.0 - 1444.0	43.0	1,969,400 tons of 0.686 % Cu
1471.0 - 1483.0	12.0	0,549,600 tons of 0.589 % Cu

Hole A-974 Area of influence 768,000 ft.^{2} 10 ft.^{3} = 1 ton

Footage	Interval	Tonnage and Grade
374.0 - 511.0	137.0	10,521,600 tons of 1.012 % Cu
374.0 - 401.0	27.0	2,073,600 tons of 1.070 % Cu
450.0 - 459.0	9.0	0,691,200 tons of 3.370 % Cu
465.0 - 511.0	46.0	3,532,000 tons of 1.398 % Cu

Hole A-978 Area of influence 637,600 ft.^{2} 10 ft.^{3} = 1 ton

Footage	Interval	Tonnage and Grade
1078.0 - 1143.0	65.0	4,144,400 tons of 1.862 % Cu
1306.0 - 1313.0	7.0	0,446,320 tons of 0.780 % Cu
1078.0 - 1313.0	235.0	14,983,600 tons of 0.636 % Cu

Hole A-979 Area of influence 840,000 ft.^{2} 10 ft.^{3}= 1 ton

Footage	Interval	Tonnage and Grade
708.0 - 718.5	10.5	0,882,000 tons of 3.018 % Cu
763.5 - 823.0	59.5	4,998,000 tons of 0.948 % Cu
834.0 - 870.0	36.0	3,024,000 tons of 1.180 % Cu
1399.0 - 1450.0	51.0	4,284,000 tons of 0.695 % Cu
1465.0 - 1497.5	32.5	2,730,000 tons of 1.049 % Cu

Hole A-979 (continued)

Footage	Interval	Tonnage and Grade
696.0 - 718.5	22.5	1,890,000 tons of 1.64 % Cu
763.5 - 870.0	106.5	8,946,000 tons of 0.937 % Cu
1130.0 - 1136.5	6.5	0,546,000 tons of 2.424 % Cu
696.0 - 1136.5	440.5	37,002,000 tons of 0.404 % Cu
1399.0 - 1497.5	98.5	8,274,000 tons of 0.799 % Cu
1315.0 - 1497.5	182.5	15,330,000 tons of 0.568 % Cu

Tonnage And Grade For Intervals of 1 % Or More

Hole A-979

Footage	Interval	Tonnage and Grade
696.0 - 718.5	22.5	1,890,000 tons of 1.640 % Cu
763.5 - 823.0	59.5	4,998,000 tons of 0.989 % Cu
834.0 - 870.0	36.0	3,024,000 tons of 1.180 % Cu
1465.0 - 1497.5	32.5	2,730,000 tons of 1.049 % Cu
1130.0 - 1136.5	6.5	0,546,000 tons of 2.424 % Cu
subtotal		13,188,000 tons of 1.182 % Cu

Hole A-974

374.0 - 511.0	137.0	10,521,600 tons of 1.012 % Cu

Hole A-973

925.0 - 968.0	43.0	1,969,400 tons of 1.230 % Cu

Hole A-969

1289.0 - 1295.5	6.5	312,780 tons of 1.453 % Cu

Hole A-978

1078.0 - 1143.0	65.0	4,144,400 tons of 1.862 % Cu
Total		30,136,180 tons of 1.225 % Cu

Total Tonnage And Grade Average

Hole A-979

Footage	Interval	Tonnage and Grade
696.0 - 1136.5	440.5	37,002,000 tons of 0.404 % Cu
1315.0 - 1497.5	182.5	15,330,000 tons of 0.568 % Cu

Hole A-974

374.0 - 511.0	137.0	10,521,600 tons of 1.012 % Cu

Hole A-973

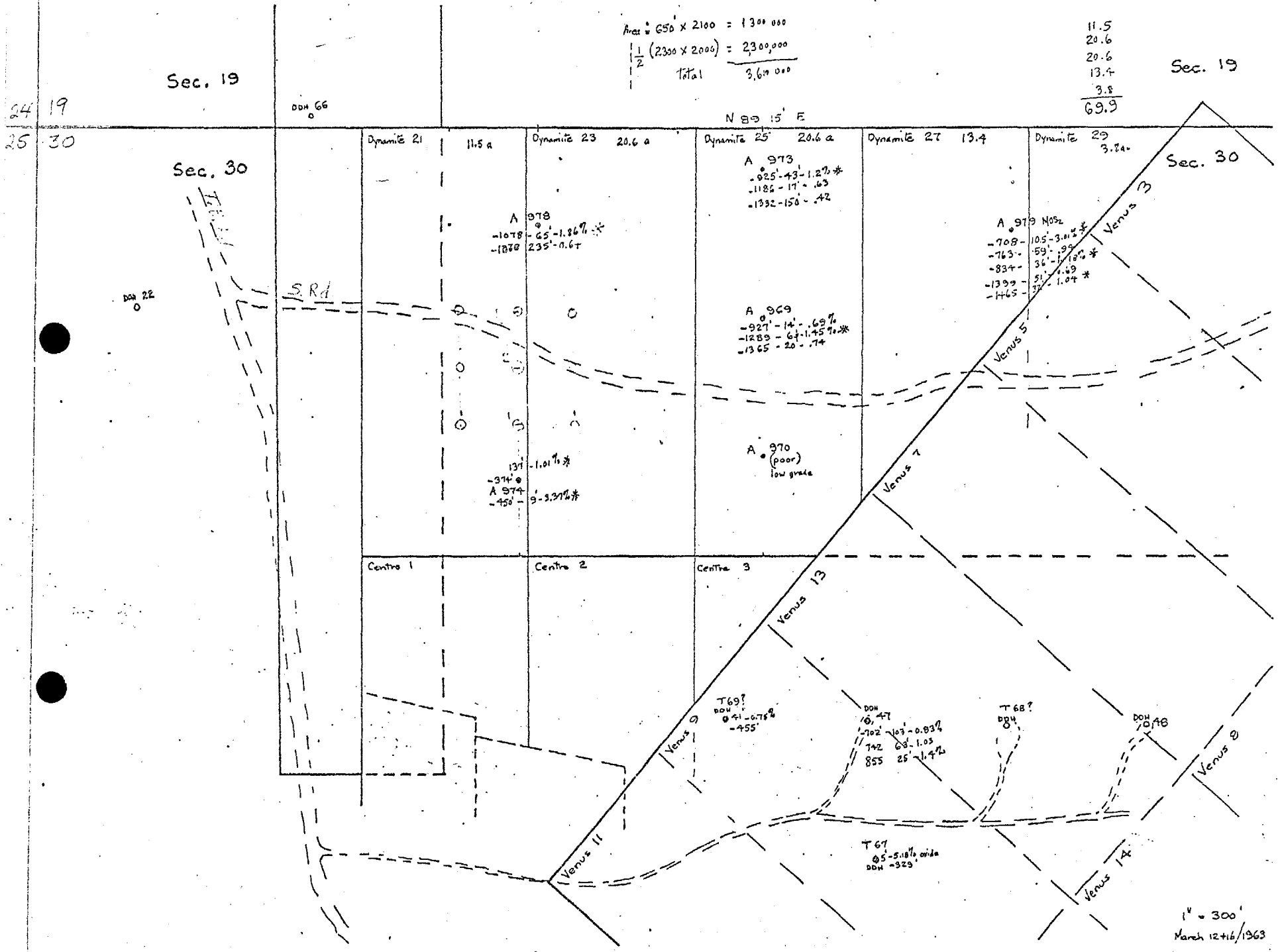
Footage	Interval	Tonnage and Grade
925.0 - 1216.0	291.0	13,327,800 tons of 0.411 % Cu
1332.0 - 1483.0	150.5	6,892,900 tons of 0.424 % Cu

Hole A-969

931.0 - 941.0	10.0	0,481,200 tons of 0.360 % Cu
1365.0 - 1385.0	20.0	0,962,400 tons of 0.740 % Cu
1289.0 - 1295.5	6.5	0,312,780 tons of 1.453 % Cu

Hole A-978

1078.0 - 1313.0	235.0	14,983,600 tons of 0.636 % Cu
	Total	99,814,280 tons of 0.539 % Cu


Area: 650' x 2100 = 1,300,000
1/2 (2300 x 2000) = 2,300,000
Total 3,600,000
11.5
20.6
20.6
13.4
3.8
69.9
Sec. 19
Sec. 19
24 19
25 30
Sec. 30
Sec. 30
DDH 66
N 89 15' E
Dynamite 21
11.5 a
Dynamite 23 20.6 a
Dynamite 25 20.6 a
Dynamite 27 13.4
Dynamite 29 3.8a
A 973
-925' - 43' - 1.27% *
-1186 - 17' - .63
-1332 - 150' - .42
A 978
-1078 - 65' - 1.26% *
-1278 235' - 0.6T
A 979 NOSZ
-708 - 10.5' - 3.01% *
-763 - 59' - .99
-834 - 36' - 1.10% *
-1399 - 51' - 1.49
-1465 - 37' - 1.04 *
A 969
-927' - 14' - .69%
-1289 - 64' - 1.45% *
-1365 - 20' - .74
A 970
(poor)
low grade
137' - 1.01% *
-374'
A 974
-450' - 9' - 3.37% *
DDH 22
S. Rd
Centre 1
Centre 2
Centre 3
Venus 3
Venus 5
Venus 7
Venus 9
Venus 11
Venus 13
Venus 15
Venus 17
T69?
DDH
41 - 0.75%
-455'
DDH
16, 47
-702' - 103' - 0.83%
742 68' - 1.03
855 25' - 1.4%
T68?
DDH
DDH
16, 48
T67
5' - 5.18% oxide
DDH -329'
1" = 300'
March 12+16/1963
Attach Warren Report

Arizona Geological Society Digest, Volume IX, November 1971

UPLIFT AND GRAVITATIONAL ADJUSTMENT RUBY STAR RANCH AREA PIMA MINING DISTRICT, ARIZONA

By

Richard R. Weaver
Humble Oil Company

INTRODUCTION

The Ruby Star Ranch area lies approximately twenty-five miles southwest of Tucson, Arizona, and is centrally situated in the Pima Mining district (Figure 1). The Pima Mining district is the largest mining district in the Southwest with a potential reserve of about a billion tons of copper and molybdenum, and nearly ten million tons reserve of lead, zinc, and silver.

In spite of the considerable geological and geophysical effort expended in the Pima district, the paucity of outcrop, the complexity of structure, and the complicated igneous activity have led to varied interpretations of the geological relationships and history. The purpose of this paper is to describe and to interpret the tectonic features in the Ruby Star Ranch area, which the writer believes are the result of uplift and gravitational adjustments and are applicable to the district as a whole.

The field work on the area commenced in June, 1960, and continued through December 1962, while the writer was employed by Bear Creek Mining Company. During this interval, detailed surface mapping was carried on and a total of 55,726 feet was drilled in 71 holes. All subsurface work was correlated to surface geology whenever possible.

Kennecott Copper Inc.

REGIONAL GEOLOGY

The southwestern part of the Pima Mining district is in foothills which are continuous with the Sierrita Mountain mass and contain the Esperanza Mine. The remainder of the district is a broad, extensive, gravel covered pediment above which project a few isolated hills such as Foy Ridge, Twin Buttes, and Helmet Peak. This gravel cover is from tens of feet thick in the western part of the district to more than 2,000 feet in the eastern section.

Rocks exposed or present in the district range in age from Precambrian (?) to Recent and consist of sediments, intrusive granitic rocks and volcanic flows.

The northern end of the Sierrita Mountains is composed of Tertiary granodiorite. South of a line passing approximately

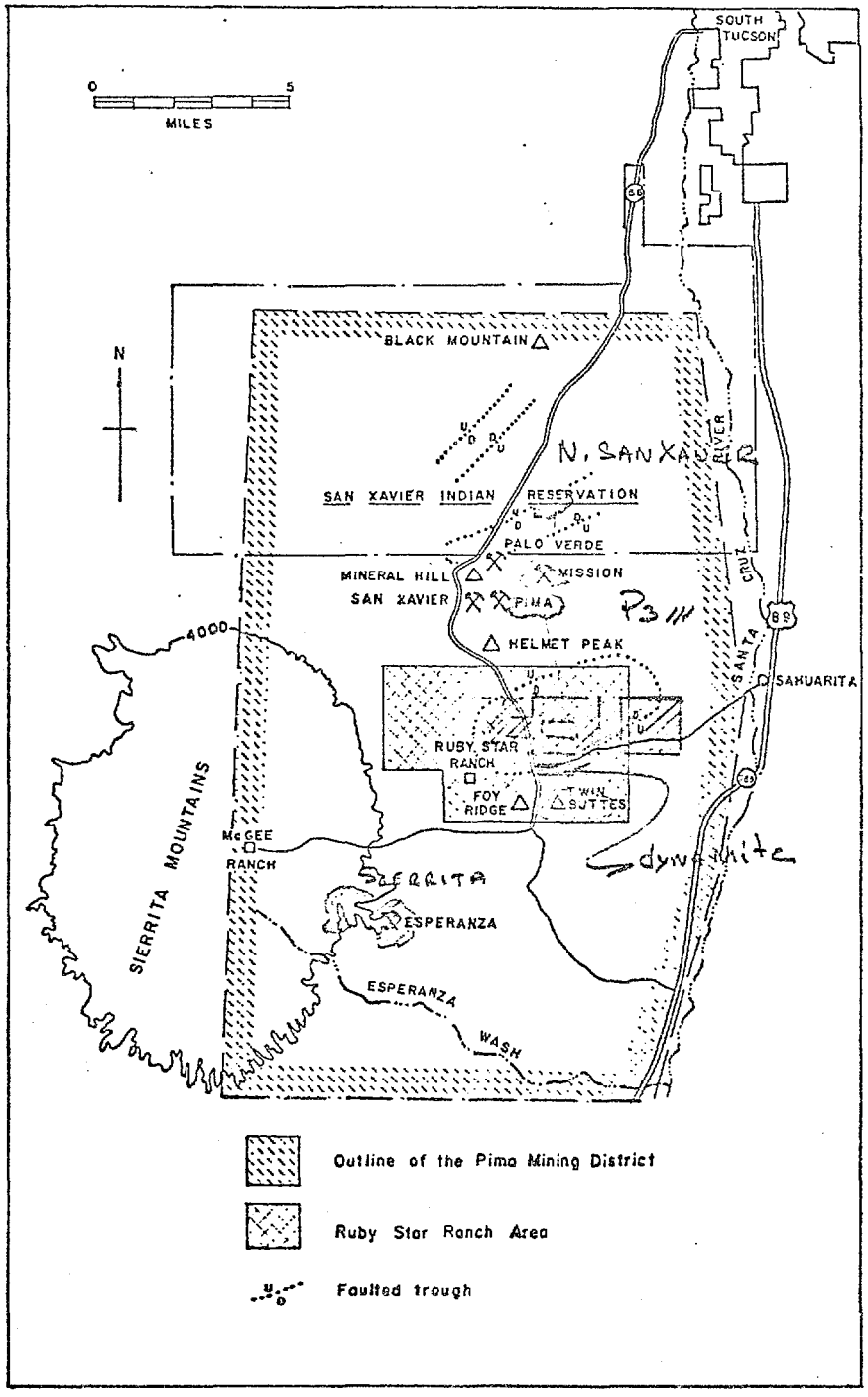


Figure 1.--Index Map of the Pima Mining District.

through the McGee Ranch, the Sierrita Mountains are composed of Cretaceous - Tertiary sediments and volcanics similar to the units in the Esperanza Pit. Southeast of the Esperanza Mine these volcanics are, in turn, overlain by Recent (?) tuffs and rhyolites.

West of a general north-south line, which starts about one and a half miles east of the Esperanza Pit and continues to the gravel covered area on the San Xavier Reservation, the Tertiary granodiorite floors remarkably even pediment surface. East of this line, Cretaceous (?) sediments on the south overlie the folded Paleozoic sediments northward to Twin Buttes.

North of the Twin Buttes, in the Ruby Star Ranch area, a large, deep trough trending northeasterly has been filled with Miocene (?) sediments called by Cooper (1960), Helmet Fanglomerate. This fanglomerate fills the trough and extends northward to a line about one and a half miles south of the San Xavier mine.

Beyond the north edge of the trough to the San Xavier Mine, Cretaceous (?) sediments again overlie Paleozoic units. The basin between the San Xavier Hill and Mineral Hill is partially floored by Cretaceous arkose on the southern side. The arkose covers the Pima-Mission area, overlying Paleozoic sediments to a second northeast-trending trough on the San Xavier Reservation. On the north boundary of the district, in a third northeast-trending trough, the Recent (?) Black Mountain basalt overlies mid-Tertiary gravels and Cretaceous (?) sediments.

Based on drill core data, the southern trough appears to be a hinged structure with the northern edge remaining relatively stationary and forming the hinge line. The middle trough appears to be similar structurally, and little is known of the northernmost one.

A flat-lying fault or sole separates parts of the Paleozoic section, Cretaceous (?) complex, and Tertiary deposits from underlying Precambrian (?) granite and Laramide granodiorite. This sole fault extends from at least the Mission Mine southward through the Palo Verde and Daisy Mines, the Pima Mine, and the San Xavier Mine to just north of Twin Buttes. This is approximately six and one-half miles in a north-south direction, and the total area underlain by the sole fault is at a minimum thirty-four square miles.

STRATIGRAPHY OF SEDIMENTARY ROCKS

Post-Permian metamorphism has complicated the identification of the stratigraphic units in the Ruby Star Ranch area. Recrystallization of the limestones and alteration of the shales and sandstones to hornfels and quartzites obliterated the majority of fossils, except for several reef structures in the Martin Formation and a few brachiopods and gastropods in the Naco Group. The Paleozoic sequence is best represented in the Twin Buttes and Foy Ridge sections.

N. SAN XAVIER MINE UNKNOWN AT TIME OF WEAVER'S REPORT!
PEC

AGE	UNIT	THICKNESS IN FEET	DESCRIPTION
Pennsylvanian-Permian	Naco Group	600 +	Thin beds of limestones, shale and sandstone. All members metamorphosed. Contains interbeds of gypsum.
Lower Mississippian	Escabrosa Limestone	550	Massive, light gray to white, coarsely crystalline marble.
Upper Devonian	Martin Limestone	440	Light tan to gray, slightly dolomitic limestone with occasional zones of fine-grained marble.
Upper Cambrian	Abrigo Formation	200	Banded limestone with alternating layers of hornfels, quartzite and limestone.
Middle Cambrian	Bolsa Quartzite	500	Fine to medium grained arkosic quartzite.

TABLE 1. Generalized Sequence of the Paleozoic Sediments, Ruby Star Ranch Area.

Unconformably overlying the Paleozoic sequence is a complex of arkose, graywacke, pebble conglomerate, quartzite, shale, pyroclastics and thin beds of limestone. The age of the complex is assigned to the Cretaceous on fossil evidence (Mayuga, 1942), but could be upper Jurassic, lower Cretaceous, or both.

The Helmet Fanglomerate of Miocene age (Cooper, 1960) is the most wide-spread formation in the area, but it is mainly confined to the southernmost trough. It has an average strike of N.60°E. and dips about 55°SE, with dips lessening to approximately 20° in the southern part of the area. The Helmet is a poorly-sorted conglomerate containing cobbles and boulders set in a silty matrix. The conglomerates tend to be finer grained in the eastern section of the area, and tend to be more monomictic and coarser in the western part. This suggests that the source area was located to the west.

MEMBER	LOCATION	DESCRIPTION
Upper Member	Southern Third	Fragments of all rock types found in the lower two members. Monolithologic breccias. Southwest of the Ruby Star Ranch 50% of the fragments are granodiorite.
Middle Member	Central Third	Fragments of the Cretaceous (?) complex and minor granodiorite and Paleozoic rocks, including copper stained tactite. Interbeds of tuff and detached blocks of members of the Naco Group.
Lower Member	Northern Third	Andesite flows Fragments of Cretaceous (?) complex. Few granodiorite fragments. No paleozoic or Precambrian (?) fragments.

TABLE 2. Generalized Stratigraphy of the Helmet Fanglomerate.

IGNEOUS ROCKS

Two periods of igneous activity are recognized in the Ruby Star Ranch area: (1) Precambrian (?) granite and diorite, and (2) Cretaceous-Tertiary intrusions and flows.

Precambrian

The Sierrita granite is of probably Precambrian age (Lacy, 1959) and is found cropping out along the western perimeter of the sole fault, in outcrops west of Foy Ridge, and in drill holes beneath sediment in the northern three-quarters of the area.

A diorite of probable Precambrian age intrudes the Sierrita granite. Surface exposures and drill hole data indicate that the diorite extends from the SE/4, sec. 15, to the S/4, sec. 26, T. 17 S., R. 12 E., a distance of 11,000 feet in a N.15°W trend. It has a minimum width of 2,500 feet.

Cretaceous - Tertiary

Quartz Latite Breccia. A quartz latite breccia is found resting either conformably or unconformably upon the Cretaceous (?) complex in the western part of the area. In part, this unit is a welded tuff. If this quartz latite is a forerunner of the Larimide granodiorite batholith, found in the western part of the district, it is probably of upper Cretaceous age.

Andesite. Andesite is found intruding and lying unconformably on top of the Cretaceous (?) complex and the quartz latite breccia. It is probably of upper Cretaceous in age.

Granodiorite. A granodiorite batholithic complex occurs in the western part of the Pima Mining district, and the

easternmost exposures are found in the Ruby Star Ranch area. The Laboratory of Geochemistry of the University of Arizona obtained an age of 58.7 ± 1.9 million years (Damon, et. al., 1964).

Another granodiorite intrusion forms the core of the Twin Buttes-Foy Ridge anticline, and is probably of the same age and related to the granodiorite batholith.

Quartz Monzonite Porphyry. Small stocks of quartz monzonite porphyry intrude the sole fault and the overlying brecciated formations in the northwestern part of the area. The stocks post date the sole fault, but they are not found cutting the Helmet Fanglomerate. This confines the age to the Eocene or Oligocene Epochs. The stocks are probably late-stage derivatives of the Laramide granodiorite pluton.

Andesite Flows and Dikes. Andesite flows with plagioclase phenocryst attaining one-half inch in length are interbedded with the Helmet Fanglomerate, and separate the lower and middle members of the formation. Similar flows in the Tucson Mountains have been dated at 28 ± 2.6 million years (Damon, et. al., 1964). The andesite dike cutting the Helmet was dated at 24 million years (Creasy and Kistler, 1962).

STRUCTURE

Introduction

After the emplacement of the Sierrita granite and the intrusion of the diorite in Precambrian times, the district was relatively quiet throughout the Paleozoic Era and the early part of the Mesozoic Era. In the Cretaceous, however, the area became unstable, as shown by the complexity of the Cretaceous strata.

By the end of the Cretaceous a granodiorite batholith began rising in the western sector of the district, causing doming of the whole Sierrita Mountain area. As doming progressed, peripheral stretching in the eastern fringe zone of the dome produced at least three radial troughs. Thus, the consequent increases in relief, produced by doming and crustal sagging in the troughs, set the stage for the gliding of sediments from the roof of the batholith.

Development of the Structural Troughs

In the vicinity of the McGee Ranch (Figure 1) platy flow structures in the Laramide granodiorite batholith have a N.10°-20°W. trend and dip vertically to steeply westward. In the easternmost exposure of the batholith, the same platy flow structure trend is maintained, but the dip is 55°-60° eastward. North of the Esperanza Mine, a more weakly developed flow structure trending N.65°-75°E. and dipping steeply cuts across the stronger N.15°W. trending ones.

Steeply dipping aplite dikes trend N.50°-70°E. across the batholith. Joints parallel to the aplitic dikes are coated with quartz, muscovite, epidote, chlorite, and small amounts of sulfide. They are striated locally. Normal faults within the batholith trend N.65°-75°E. and dip southward 25 - 30 degrees.

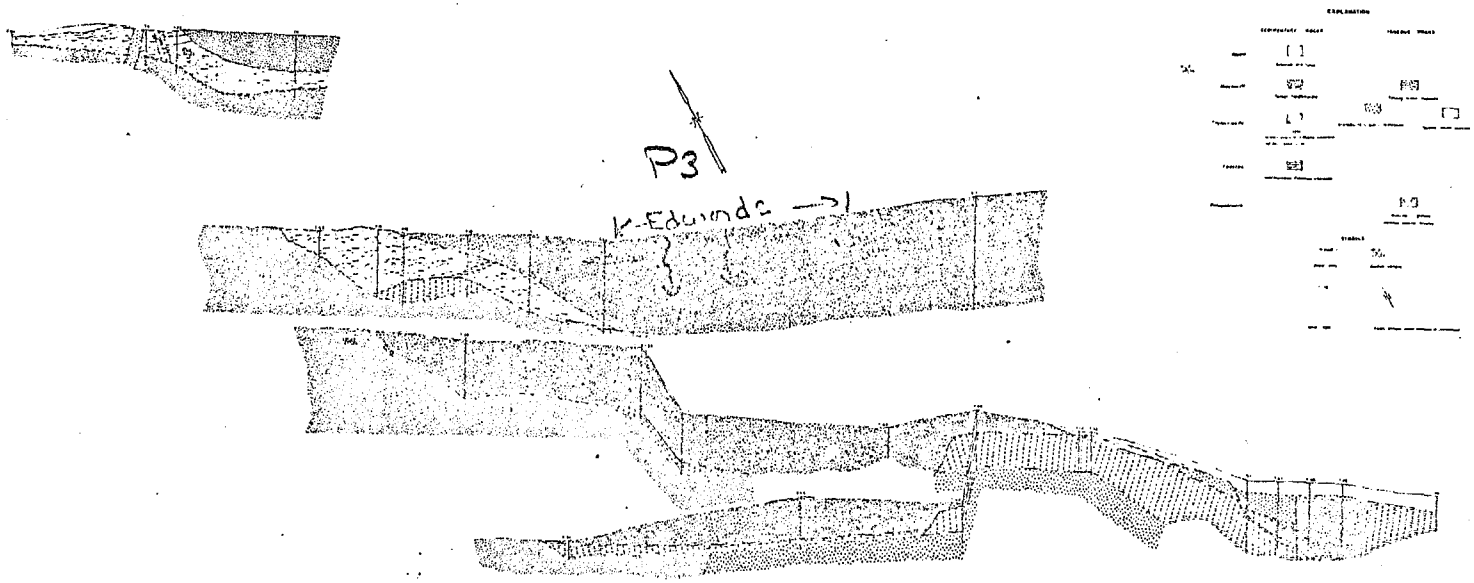


Figure 2.--Geological Cross Section Interpretations Based on Drill Core Data, Ruby Star Ranch Area.

The structural elements in the batholith suggest that the pluton rose as a dome along a N.15°W. trending axis, and as doming progressed the pluton stretched along its northerly trending axis producing tension fractures striking N.50°-70°E.

As suggested by the flow structure in the batholith, the older rocks in the fringe zone not only adjusted to the conformation of the invading pluton by stretching in a vertical direction, but they also adjusted to the longitudinal tensional forces produced by the lengthening of the pluton in a northerly direction. The longitudinal stresses resulted in peripheral stretching around the eastern fringe zone of the batholith. Relief from the peripheral stretching was gained by fracturing in an east to northeast direction as recorded in the Pima Mining district. Stresses resulting from continual uplift and peripheral stretching were relieved by extension on these fracture systems, giving rise to radial sags and troughs.

The three known troughs in the district tend to form a fan-shaped pattern, which converges toward the batholith (Figure 1). The southern trough trends N.60°E. as does the middle one, but where the fringe zone begins to swing northwest around the northeast flank of the Laramide batholith, the northern trough assumes a N.40°E. trend. This radial pattern also suggests that the troughs are related in origin to the domal structure.

After the initial stages in the development of the southern trough, the western end of the trough was invaded and healed by the granodiorite batholith, and may have been somewhat uplifted as doming progressed. The stratigraphy of the Helmet Fanglomerate indicates that the trough probably formed over a considerable length of time; at least from the late Cretaceous through late Miocene times.

Gravitational Gliding

Drill hole data demonstrates that in the southern part of the area, beginning just north of Foy Ridge, members of the Naco Group are in flat fault contact with the underlying Precambrian (?) granite and portions of the Laramide granodiorite. In the northern part of the area, the Cretaceous (?) complex is found separated by a flat fault from the underlying Sierrita granite. This fault contact, or sole, usually dips eastward 10° to 25°, and a black gouge zone from six inches to six feet in thickness separates the granitic rocks from the overlying strata. Both the granitic rocks and the overlying strata are strongly brecciated and sheared. It is upon this fault that the portions of sedimentary and volcanic shell of the domal structure glided eastward to their present position in the trough. Since no formations older than the Naco Group were found while drilling the glide plate, it is proposed that gliding was initiated by failure in the gypsum beds of the Naco.

As the plate of sediments migrated eastward, it rode over the Sierrita Granite in a N.75°-80°E. direction as indicated by the striations in the granite in the western part of the area (Figure 2). Segments of the Naco Group were thinned by frictional drag along the basal shear plane, and some segments became retarded by the lows present in the irregular surface along the sole of the plate.

A good example of retardation of segments of the glide plate, and overriding by younger units, can be seen in the drill hole data

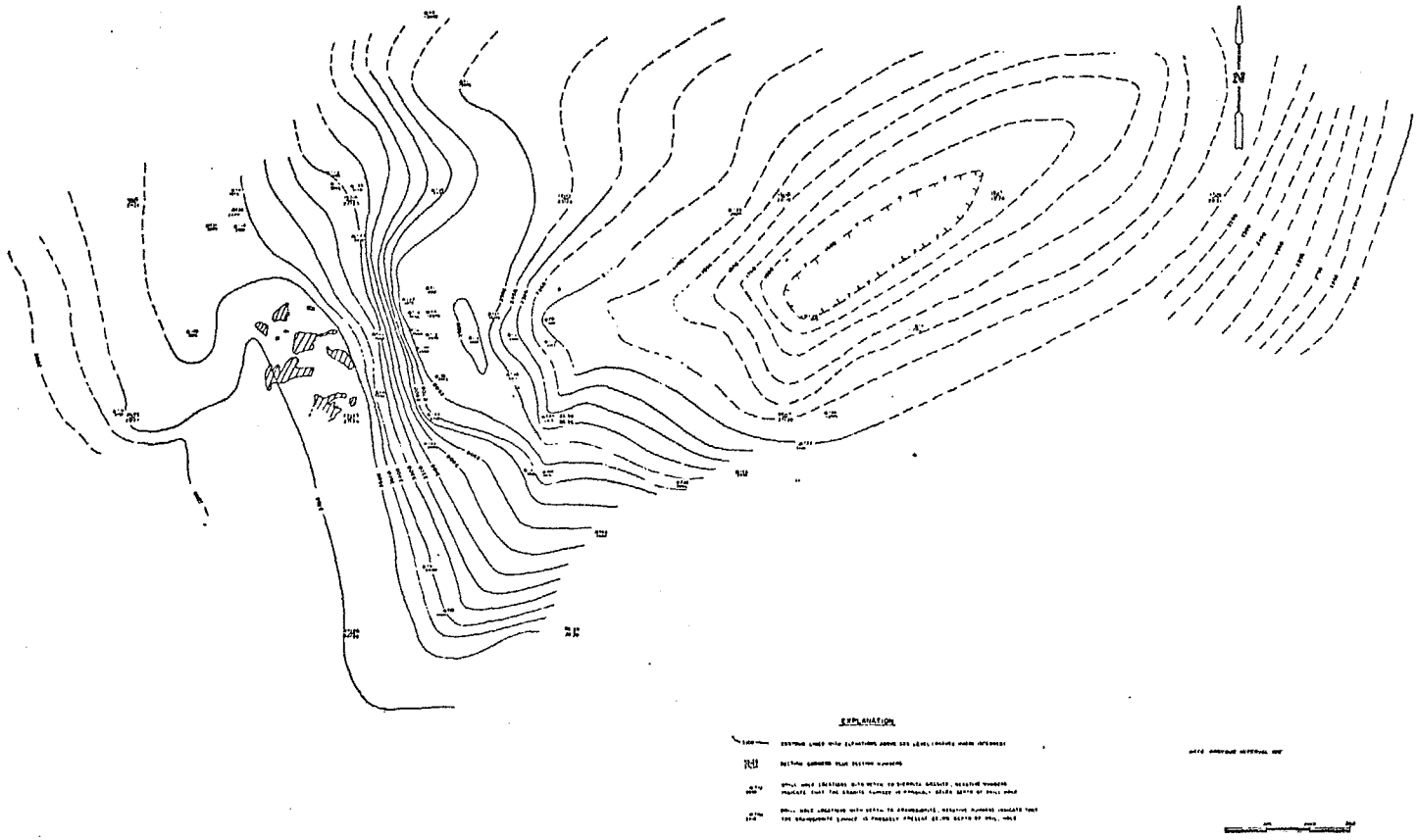


Figure 3.--Structural Contour Map of the Top of the Sierrita Granite, Ruby Star Ranch Area, Pima County, Arizona.

from the western half of sections 23, T. 17 S., R. 12 E. (Figure 2). A configuration resembling a glacial step is present. The closely spaced contour lines in Figure 3 would be the riser, the flat plane to the east would be the tread, and the high that terminates the plane to the east would be the riegel. This riegel in the Sierrita granite acted as a barrier and retarded basal members of the Naco Group as the gliding mass moved across the step.

As this Naco block became arrested and formed the "island" of limestone (Fig. 4), overlying younger units continued to glide east over the retarded block on flat-lying, imbricate, shear planes formed as indicated by slivers of the Naco thrust over Cretaceous units.

As gliding of the whole plate progressed, frictional drag along the sole fault produced north trending tensional faults. The formation of these faults was facilitated by the plate moving over small highs in the underlying granite. Also, local differences in frictional drag along the sole of the plate caused different rates of motion throughout the gliding block. As the differences in velocity of motion increased, the rocks of the plate yielded by shears forming N.70°-80°E. strike-slip or tear faults. Adjustments along these shears opened and caused more movement along the north trending normal faults.

Foy Ridge - Twin Buttes Anticline

The Foy Ridge - Twin Buttes fold is a northwest-plunging anticline, the axis of which strikes N 45°W and plunges 35 to 45 degrees northwest. Beds on both flanks of the fold have a general northwest strike and dip steeply. Part of the succession on the southwest limb of the anticline is repeated and overturned to the northeast, suggesting that thrust faults also developed along the southwest limb of the fold carrying older Paleozoic formations northeastward over younger Paleozoic rocks.

The structure of the anticline is controlled primarily by the emplacement of the Laramide granodiorite stock in the core of the fold. As the stock intruded, it caused doming and breaching of the sedimentary cover. As intrusion into the core progressed the sedimentary shell was also stretched longitudinally. The beds yielded along northeast-trending tensioned faults, perpendicular to the direction of extension. These faults show vertical as well as horizontal movement, indicating adjustments in several directions as doming progressed. This situation is analogous to structural development of troughs in the Pima District, but on a smaller scale.

It is not known if the granodiorite stock in the Foy Ridge-Twin Buttes fold is the same age as the Laramide batholith or is slightly younger. The writer believes that is is slightly younger than the batholith and classifies it as a late stage derivative of the batholith.

Drill information indicates that just north of Twin Buttes in sec. 29 and 30, T. 17 S., R. 13 E., detached blocks of Naco and granodiorite are both interbedded with and overlie the Helmet Fanglomerate beneath the Recent alluvium. Also the limestone hill located about a quarter of a mile northeast of Twin Buttes contains beds that strike parallel to the strata in the Twin Buttes, but dip much more steeply northward. The limestone belongs to the lower Naco Group and thus is out of

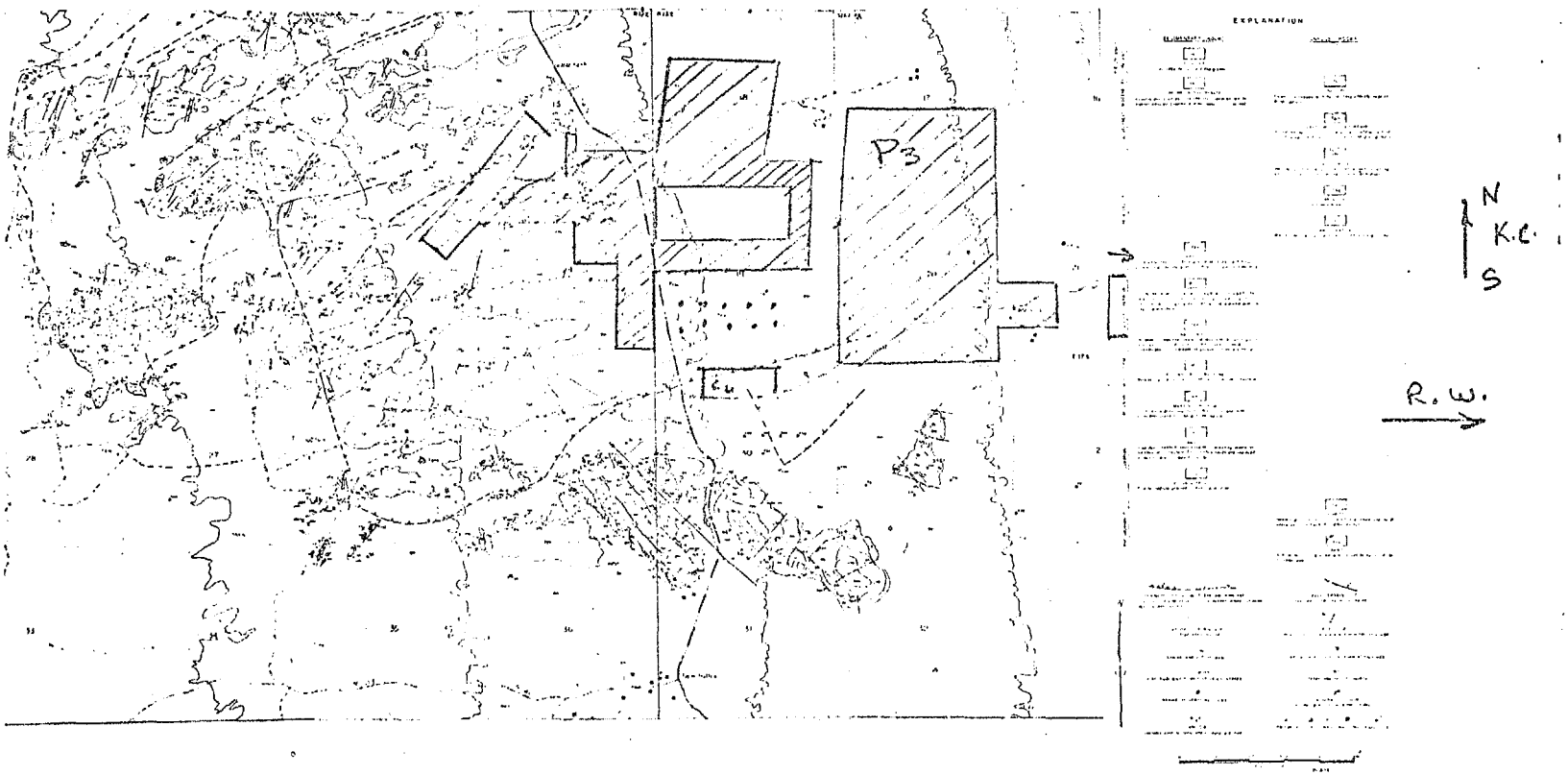


Figure 4.--Geologic Map of the Ruby Star Ranch Area, Pima County, Arizona.

stratigraphic position with respect to the surrounding sequence. Perhaps the detached blocks and the limestone hill are parts of slip sheets that glided northward off the Twin Buttes fold.

Tectonic Activity During the Deposition of the Helmet Fanglomerate

Large lentils derived from the Naco Group are found interbedded with the middle and upper members of the Helmet. These units are brecciated and show slippage along their contacts with conglomerate beds and with volcanic ash units. Stratigraphically these lentils are inverted. It does not seem probable that three different lentils scattered throughout the Helmet should break off from larger blocks and be inverted in the process. It is more likely that they were inverted by drape folding before becoming detached or inverted during emplacement. This would mean that uplift and gliding were still in progress while the Helmet was accumulating.

A reversal in age sequence of the fragments composing the fanglomerate--i.e. arkose fragments deposited before Paleozoic fragments--plus lenses composed of rock fragments of one type suggest that the Helmet is at least in part a product of break up and erosion of Paleozoic and Cretaceous (?) slip sheets as they migrated toward the faulted trough. The Naco lentils of the Naco are parts of these slip sheets, but are still intact even though strongly brecciated. Presumably additional fragmentation was inhibited because of the lubricating effect provided by the soft ash beds associated with some of the lentils.

Thus the fanglomerate was not only deposited by mud flows but by migrating slip sheets from the still tectonically active dome in the western part of the district. That this doming was still active during the deposition of the Helmet can also be demonstrated by the fragments present in the upper member of the Helmet; these represent all rock types found in the lower units plus an abundance of granodiorite fragments. These fragments, except for the granodiorite ones, are probably reworked from earlier deposits of fanglomerate in the western part of the area.

The general trend of the Helmet today is N 60° E with dips decreasing to the south. Thus tilting occurred both during and after deposition. The added weight of the Helmet plus continued uplift in the western part of the district caused major adjustments along the southern boundary fault of the trough. The north limb and floor of the trough also dropped but to a lesser extent so that the hinge-line effect along the northern border was retained; hence tilting the Helmet Fanglomerate southward.

CONCLUSIONS

Based on all available surface and subsurface data in the Ruby Star Ranch area, the writer's conclusions are as follows:

1. Beginning in Cretaceous time, as indicated by the deposits of that age, the area became tectonically unstable. The instability may possibly record the first stages of magma emplacement at depth.

2. Uplift was climaxed by the emplacement of a large granodiorite batholith in the western part of the district. A stock of granodiorite was also intruded into the core of the Foy Ridge-Twin Buttes anticline at approximately the same time, and it lifted, overturned and thrust aside its Paleozoic cover.

3. During intrusion, the region rose as a unit, and failed along transverse and radial fractures. Structural sags along these radial fractures gave rise to faulted troughs, thereby increasing and steepening the tectonic relief.

4. Striations, and the presence of an extensive sole fault, as well as the peculiar distribution and variations in thickness of Paleozoic limestones, very strongly suggest that the sedimentary shell of the rising dome slipped off into a large east-northeast-trending trough.

5. Subsequent to the emplacement of the allochthonus strata several small quartz monzonite porphyry stocks intruded them. These stocks are probably structurally controlled and are late derivatives of the granodiorite pluton.

6. The deposition of the Helmet Fanglomerate, with minor Paleozoic slip-sheets, upon the allochthonus rocks was a result of continued upheaval of the domal area.

7. Development of the steep southward dips in the sediments filling the trough was a result of further tensional adjustments and sagging consequent upon continual uplift.

8. The final development of a pediment throughout the area indicates ultimate attainment, or very close approach, to equilibrium.

It is suggested that the concept of uplift (primary tectongensis) and gravitational adjustments (secondary tectongensis) offers the possibility of rational explanation of the otherwise puzzling features of the Ruby Star Ranch area geology.

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BEAR CREEK MINING COMPANY

SOUTHWEST DISTRICT

REPORT ON THE PETRO PROPERTY, TWIN BUTTES AREA, PIMA COUNTY, ARIZONA

By

Richard R. Weaver

Table of Contents

GEOLOGICAL REPORT OF THE PETRO PROPERTY

Introduction

On July 28, 1960, Bear Creek Mining Company entered into agreement with Marion Chilson, et al, for the exploration of 29 unpatented mineral claims in the Pima Mining District, Arizona. The agreement was terminated Jan. 28, 1963.

The claims lie on the north flank of the Twin Buttes, approximately 30 miles southwest of Tucson, Arizona. They are located in Sections 19, 29, 30, and 32, T17S, R13E.

Work accomplished by Bear Creek Mining Company on this area consisted of geologic mapping, 5.2 miles of geophysical IP traverses, a gravity survey and 8,546.0 feet of diamond drilling.

Method of Attack

Geologic mapping was done on 1"≈500' aerial photos and transferred uncorrected to a 1"≈500' overlay (see Plate 1). The geology and claim outlines are slightly distorted, due to the normal distortion inherent in air photos. A corrected 1"=500' claim survey map accompanies this report.

Geology

Outcrops are sparse on the property except in the northeast corner where a hill of Pennsylvanian-Permiam limestone is exposed, and in the extreme southwest corner a small outcrop of Mississippian limestone is mappable.

These two units are metamorphosed to marble, hornfels and minor amounts of calc-silicate minerals. The average strike of the stratigraphic units are 40°-45° and dip 65°-vertical NE.

The rest of the area is covered by Recent alluvium tens of feet thick, which is underlain by Helmet fanglomerate of Miocene(?) age.

(a) A small amount of mineralization is exposed on the surface in the area. The limestone hill in the northeast corner of

the area has some disseminated digenite(?) and chalcopyrite plus minor copper carbonates. The extent of surface mineralization is very limited.

Drilling

Eleven holes were diamond drilled on the property during 1960, 1961 and 1962 for a total of 8,546.0 feet.

Summary of Drilling

Hole	RB	NX	BX	Total
T- 6	270.0	105.4	377.9	753.3
T-16	42.0	125.5	378.0	545.5
T-42	2.0	542.3	- - -	544.3
T-45	10.0	554.0	- - -	564.0
T-47	200.0	387.3	487.0	1074.3
T-48	240.0	770.8	- - -	1010.8
T-67	168.0	958.4	- - -	1126.4
T-68	197.9	779.1	- - -	977.0
T-69	200.0	964.1	- - -	1164.1
T-70	196.0	314.0	- - -	510.0
T-71	148.0	128.3	- - -	276.3
	1673.9	5629.2	1242.9	8546.0

Claims

A claim map given to Bear Creek Mining Company by Richard Chilson and the legal claim descriptions on file in the Pima County Court House display and describe, respectively, the Venus claims as a contiguous claim group.

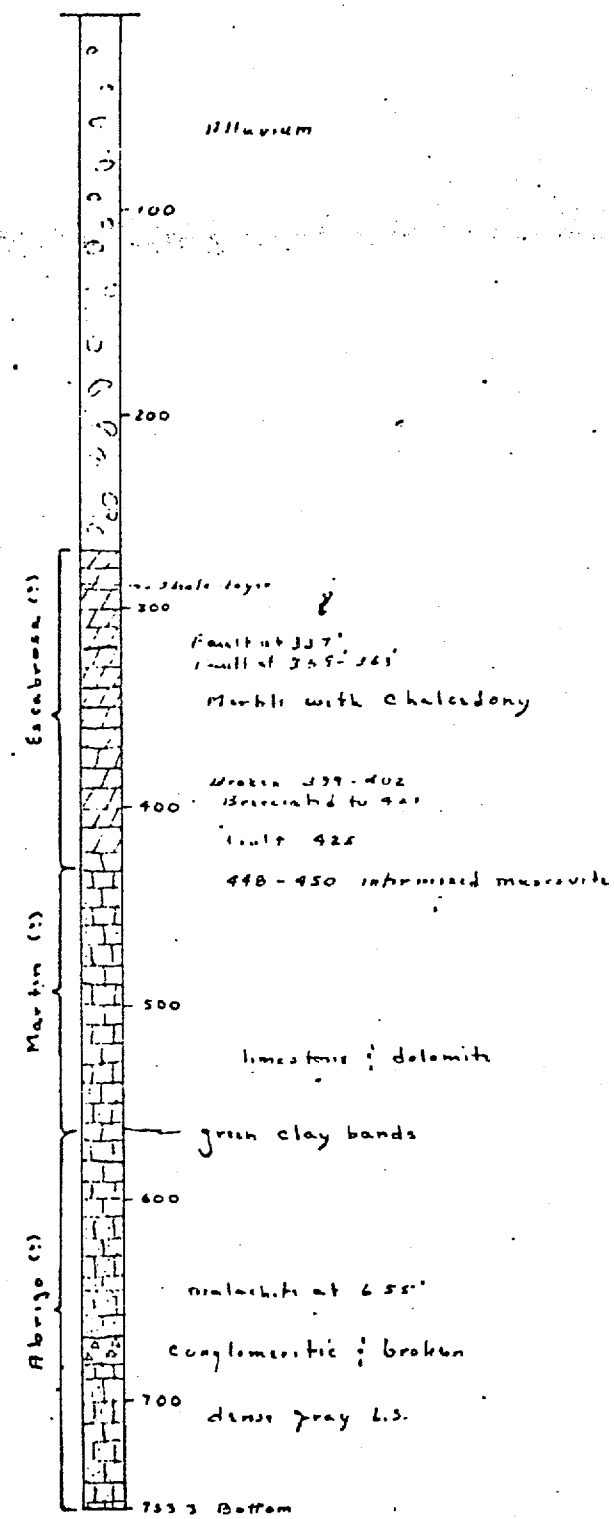
Upon surveying the Venus claim group, it was discovered that the claim notices for Venus 9 and 11 were positioned in the field as shown on Plate 2, thus creating a gap between the location of Venus 9 and 7. No claim notices were found for Venus 10 and 12, so their exact position is not known.

According to claim descriptions describing Venus 10, it can be located southwest of Venus 8 or southeast of Venus 9. Venus 12, according to claim descriptions, may be located southeast of Venus 9 or southeast of Venus 11.

Because of the possible existing gap, Bear Creek Mining Company located Venus 13 and Venus 14, which will be quit-claimed to the optionors.

Richard R. Weaver

T-6 Collar Elevation _____

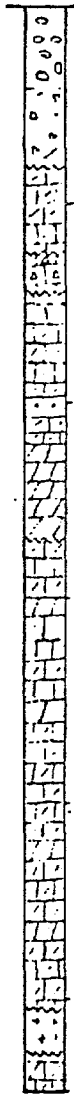


No assays

Scale 1" = 100'

T-16

Collar Elevation ____



Rockbit - Alluvium

Hornfels breccia - 60% q'tz & 40% diopside

Silicated limestone. Some malachite & pyrite mottled & banded

Silicated limestone breccia 60°-70° dip

Silicated limestone - tremolite, diopside and wollastonite

181.0' - Garnet begins to appear 30°-40° fractures

Black to brown silty garnet phase

At 207.1' 80° fracture. Last 2.0 - Wollastonite & tremolite

Marble with zones of garnet & tremolite. Streaked along 70°-80° fractures
30° bedding
30° shears

50° Streaking.

Silicated limestone & marble

Cv-Cc(?) at 215'
Cv-Bn at 285'
Cv-Cp at 300'
Mo at 314.7
} Weak

427' - 465' 2 hornfels zones, black horizontal contacts

483 - hornfels with 30° contact

494' 20°-30° breccia zone

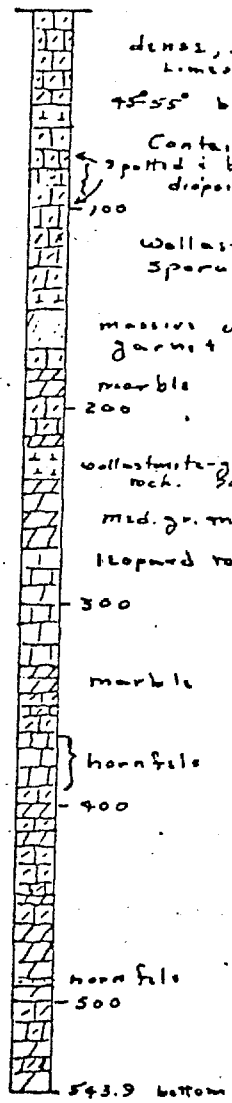
Argillite hornfels

Silicated limestone

Scale 1" = 100'

T-42

Collar Elev. _____



Assays very low

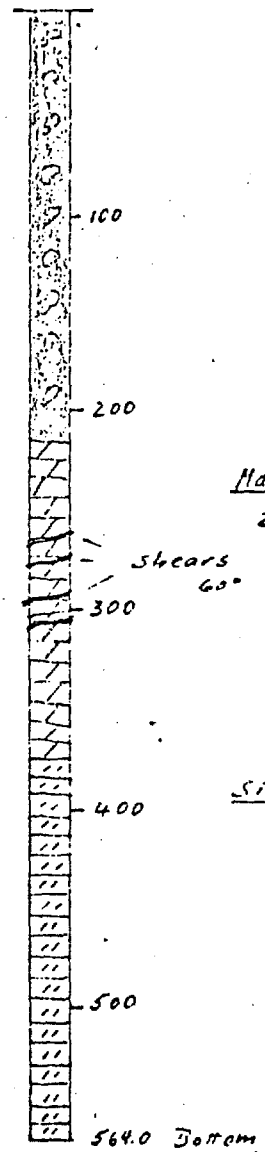
bornite & chalcopyrite scattered throughout - usually in favorable horizons.

Scale 1" = 100'

Collar Elevation _____

Scale : 1" = 100'

7-45



Helmet fonglomerate

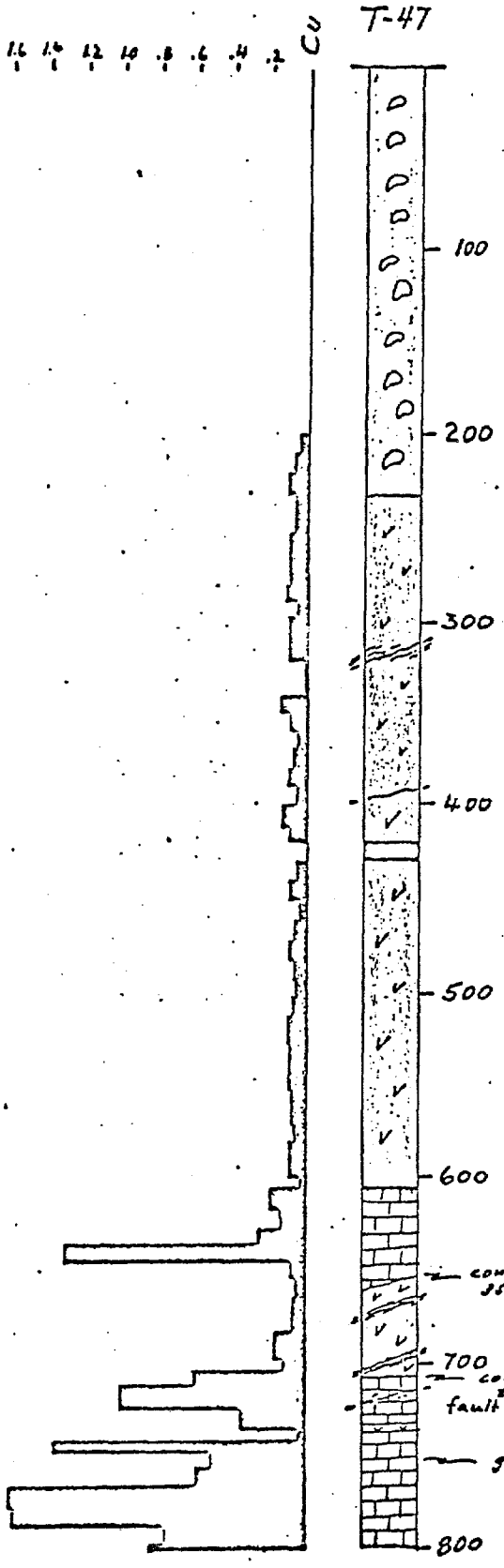
Marble - Escabrosa ls.

217.5 - 225.8 Talc, white to green, soft
coarse to medium grained
some diopside developed
rock is highly fractured

Silicified ls.

dense, microcrystalline,
exhibits l'green bands of diopside
no sulfides

Scale : 1" = 100'



Helmet fanglomerate

Quartz Monzonite - soft, crumbly, clayey, highly alt. to clay-sericite, original texture distroyed.

rock consists of quartz, feldspar and fine grained biotite.
pyr. is fine dissem. throughout the rock and occurs also smeared along fractures
Occasionally fine grains of MoS_2 and Cp are visible, usually associated with broken up quartz and feldspar veinlets.

Rock is still highly sheared and alt. to sericite, clay, chlorite

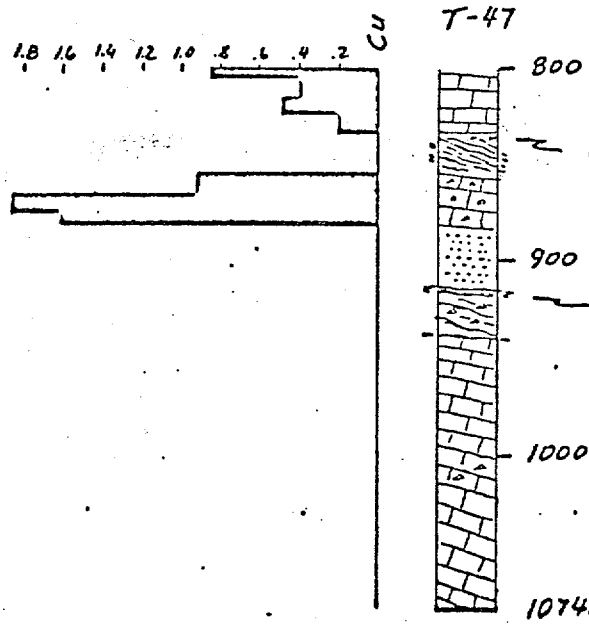
There seems to be an increase in MoS_2 + Cp mineralization.

Hornfels - d'green/gray, highly sheared w/ calcite stringers, occasional pieces of garnet rock are present.
very good fine dissem. Cp.

Quartz Monzonite - dike, highly alt. to clay-sericite, good pyr., trace cp.

Hornfels - d'green, highly sheared + brecciated very good cp mineral, fine dissem. and as breccia filling material.

Scale: 1" - 100'



Hornfels - green. gray, fractured and brecciated. Cp occurs dissem. and in small veinlets.

Quartz Monzonite and Gouge zone, dips 30-4
no sulfide mineralization

Concha ls. ? - brecciated, d'gray. Cp is dissem and in veinlets

Tuff ? - l'gray, porous, well sorted, not mineralized

gouge zone

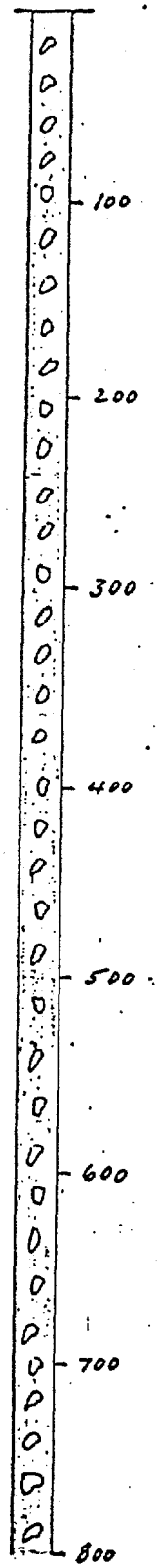
Qtzite breccia & gouge w/ hemat. staining at 937.5 - 938.9 Turkey Track porph.

Hornfels - l' green. gray to white, dense microcrystalline. locally brecciated. Some interbedded bands of argillite occur toward the bottom no sulfide mineralization

Collar elevation _____

Scale: 1" = 100'

T-48



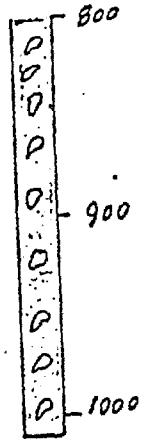
Helmet fanglomerate

containing very angular fragments of arkose, volcanics, limestone and granite.
Size of fragments varies from <1" to few feet.
Matrix is usually brown to red

no assays

Scale: 1" = 100'

T-48



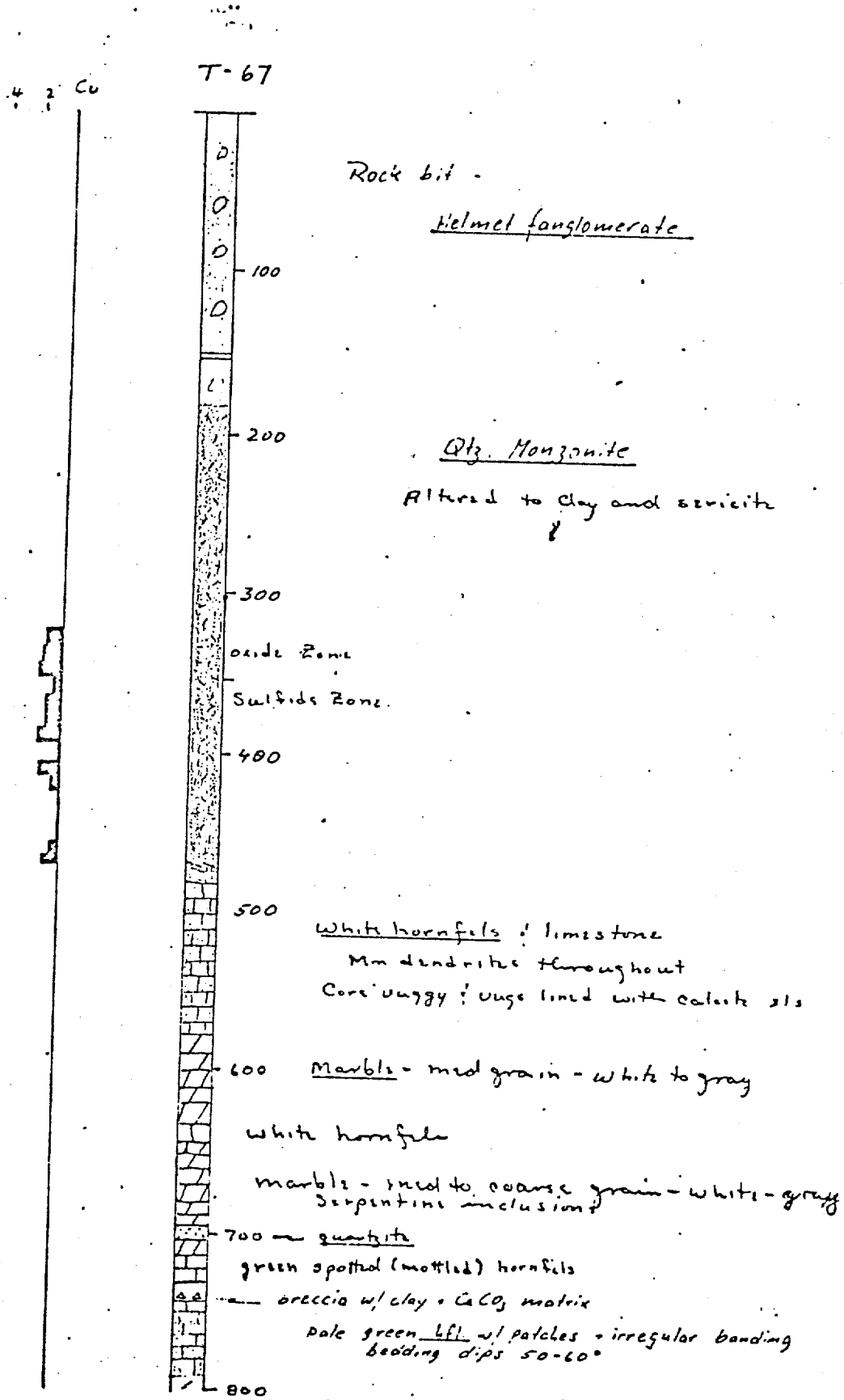
Helmet fanglomerate

no assays

1010.8 bottom

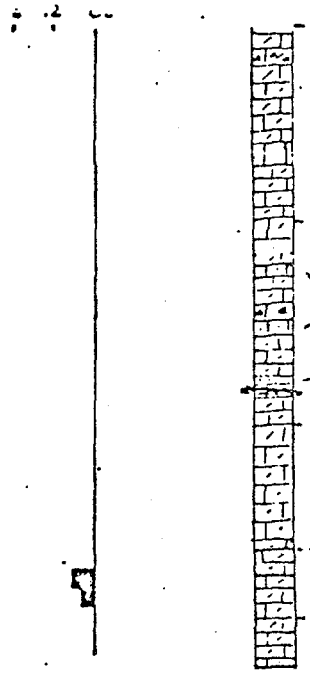
Collar Elevation _____

Scale: 1" = 100'



Scale : 1" = 100'

T-67



800

Marble - med grained, white w/ yellow green clay mineral along fractures

Cu ox at 806.

hornfels, dense, gray-green w/pink clay mineral along shear zone

900

argile - d'gray, fine grained

hornfels - w/some patches of garnet

tremolite, wollast. in marble (med grained)

argillite - d'gray

1000

marble - coarse grained, pinkish hue hemat.(?) along fract. and dissem.

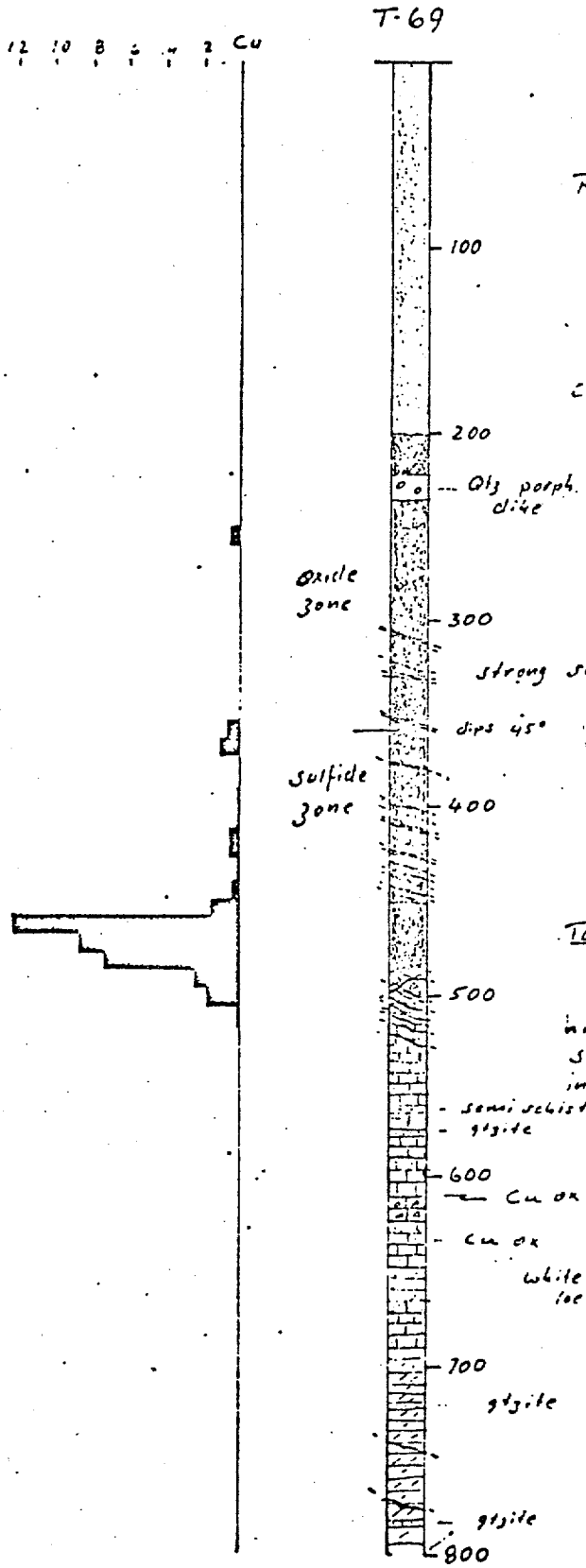
marble - med. grained, pink. gray; fine dissem. sulfides

1100

1126.4 bottom

Collar Elevation _____

Scale: 1" = 100'



Rock bit - Conglomerate

contact congl - bedrock not exactly defined

Quartz Monzonite -
med grained & highly alt to clay - sericite
For the most part soft and crumbly
abundant limon. staining after pyr, cp.

strong shearing, dips 35°

Highly alt. to clay, sericite, chlorite
extremely sheared.
pyr commonly smeared along fract. & shears
cp fine dissem. associated w/ K-feldspar flooding

rock completely sheared toward contact

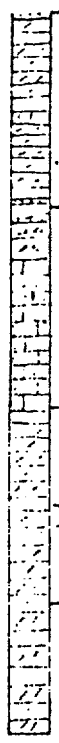
Tactite - d'brown garnet rock, w/ small blebs of
Cu ox. cp w/ qtz. veinlets, abundant Fe staining

highly alt. is, chalky texture, extensively
sheared.
interbedded sequence of marble & hornfels

white marble, fine to med. grained
locally some clay alt.

Scale : 1" = 100'

T-69



800 qtzite w/ wollastonite

Marble - white, med. grained, dense
contains some clayey banding
locally solut. cavities w/ calcite lining

- hornfels

900 - black, dense argillite

Diorite - [illegible] med. grained, contains little pyr

interbedded [illegible] marble, green [illegible] layers and some garnet zones

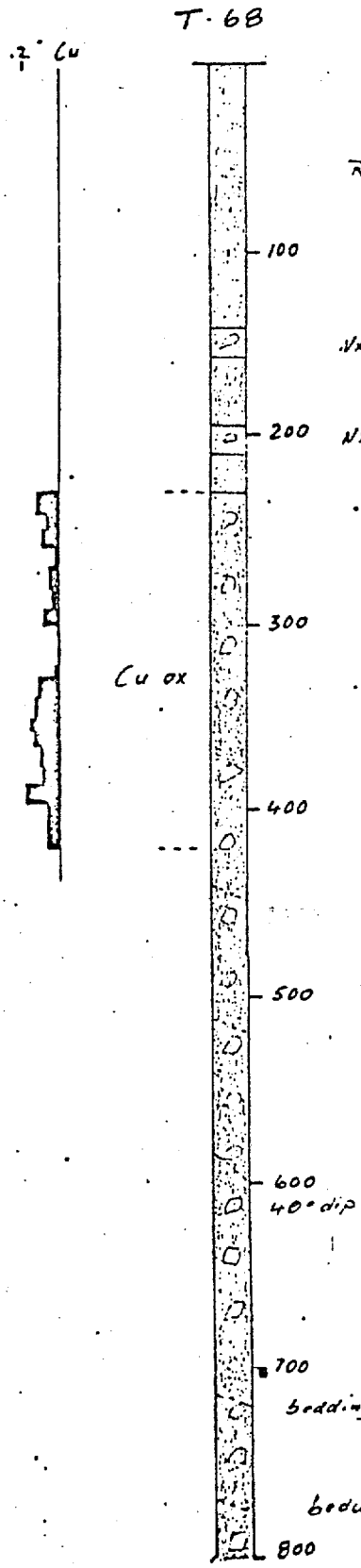
Marble - med to fine grained [illegible] gray to reddish and green gray.

locally some talc zones and bands
tourmaline in fine needles occurs throughout.

little cp, br

Collar Elevation _____

Scale: 1" = 100'



Rock bit - Fanglomerate

Nx core

Fanglomerate

Nx core

Fanglomerate

equal sized fragments of marble, hfl, arkose in sandy calcareous matrix
Abundant Cu ox (Chrysocolla) staining around and within fragm. & limon. staining.

no Cu ox observed below 420'.

Helmet fanglomerate

fragments attain boulder size. Locally a bedded sandy matrix becomes very distinct. dips 20-30°
Fragm. are mainly l'gray to reddish arkose latite and limestone.

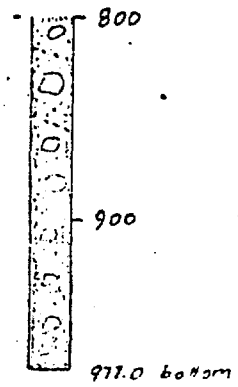
matrix is reddish brown, fine sandy to clayey.

bedding dips 30°

bedding dips 30°

Scale: 1" = 100'

T-68

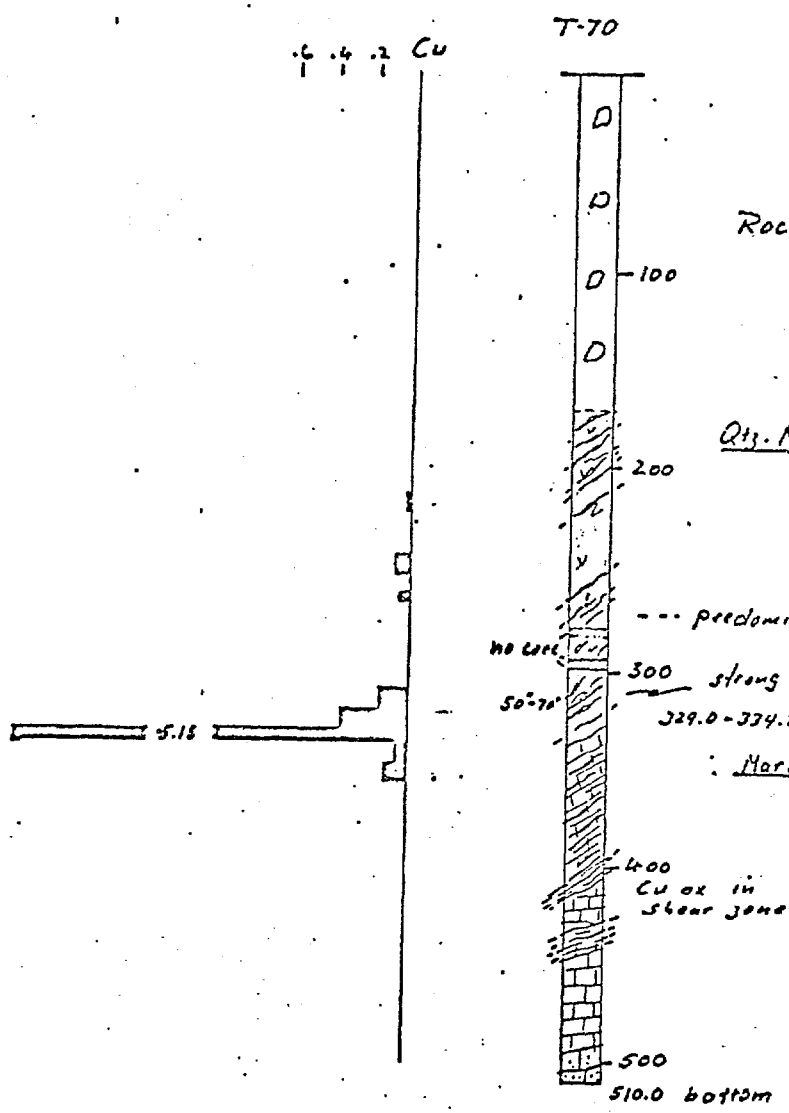


Helmet fanglomerate

ill-sorted, reddish sandy matrix
some bedding present, dips 30°

Collar Elevation _____

Scale : 1" = 100'



Rock bit - Fanglomerate

Qtz. Monzonite - highly alt. to clay-sericite
rock is very sheared & fractured
strong Fe staining along fractures and in zones of orthoclasation w/ sericite
locally strong Mn oxide + tenorite? staining
--- predominant green clay alteration

strong shearing + alteration w/ Mn oxide + tenorite?
329.0-334.2 strong Cu oxide

Marble - fine grained, strongly alt. to talc and serpentine locally, especially along shears.
little Cu ox visible

locally strong shear zones
400.0 - 410.0
430.7 - 442.0

rock becomes highly bleached toward bottom of hole, grading into white clay stone locally

Collar Elevation _____

Scale: 1" = 100'

T-71

Rock bit

Fanglomerate

limest. breccia

Silicif. ls. fragments imbedded in caliche
little Cu oxides

Silicified limestone - dense, microcrystalline, green. gray w/ typical "leopard pattern" of diopside

no sulfides present

SHEET NO. 7

DATE STARTED 8/22/60

DIAMOND DRILL ASSAY LOG

DATE COMPLETED 9/10/60

HOLE NO. T-6

COORDINATES 5,400 S 14,800 E COLLAR ELEVATION _____ BEDROCK ELEVATION _____

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.
					NO ASSAY		

DATE STARTED 6/02/61

DATE COMPLETED 6/14/61

DIAMOND DRILL ASSAY LOG

HOLE NO. T-16

COORDINATES 5,000 S. 17,500 E COLLAR ELEVATION _____ BEDROCK ELEVATION _____

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.		Cu.						
279.0	293.3	14.3	13.2		BX		1509-1		0.03						
293.3	302.1	8.8	9.9		"		1510-1		0.03						

DATE STARTED 11/2/61 DIAMOND DRILL ASSAY LOG

DATE COMPLETED [illegible]

HOLE NO. T-42

COORDINATES 16,500 E 5000 S COLLAR ELEVATION BEDROCK ELEVATION

Footage From	To	Interval	Measured core Recovery	% Recovery	Hole Size	S.G.	Sample	Cu
2.0	10.8	8.8			NX		2859	.07
10.8	18.8	8.0			"		2860	.02
18.8	24.6	5.8			"		2863	Tr
24.6	32.3	7.7			"		2866	.03
32.3	40.9	8.6			"		2869	.18
40.9	48.1	8.2			"		2870	.03
48.1	58.7	8.6			"		2874	.09
58.7	68.7	10.0			"		2875	Tr
68.7	78.9	10.2			"		2876	.02
78.9	90.3	11.4			"		2877	.02
90.3	100.0	9.7			"		2891	.02
100.0	112.8	12.8			"		2892	Tr
112.8	120.4	7.6			"		2893	Tr
120.4	130.4	10.0			"		2894	Tr
130.4	140.6	10.2			"		2897	Tr
140.6	150.9	10.3			"		2898	.02
150.9	158.9	8.0			"		2903	.02
[illegible]9	168.2	9.3			"		2904	.02
[illegible].2	173.3	5.1			"			
173.3	183.5	10.2			"			
183.5	191.0	7.5			"			
191.0	193.7	2.7			"		2905	Tr
193.7	203.9	10.2			"		2906	.02
203.0	214.0	10.1			"			
214.0	223.4	7.4			"		2910	Tr
330.5	342.3	11.8			"		2921	Tr
342.3	352.4	10.1			"		2922	Tr
372.7	380.3	7.6			"		2923	.02
443.8	451.9	8.2			"		2924	Tr
451.9	462.1	10.2			"		2925	Tr

SHEET NO. 1

DATE STARTED 1-21-62

DIAMOND DRILL ASSAY LOG

DATE COMPLETED 2-10-62

HOLE NO. T-45

COORDINATES 14,0002 5,0008 COLLAR ELEVATION BEDROCK ELEVATION

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.		Cu					
335.3	269.1	3.8					3256		.79					
	370.5					2.55								

SHEET NO.

DATE STARTED 1-30-62

DIAMOND DRILL ASSAY LOG

DATE COMPLETED 4-12-62

HOLE NO. T-47

COORDINATES 12,000E 4,000S COLLAR ELEVATION BEDROCK ELEVATION

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S. G.	Sample No.	Cu	Mo
-0-	200.0				BB			No Core	
200.0	210.0	10.0			NX		3366	0.06	Tr
210.0	221.0	11.0			"		3367	0.09	.002
221.0	231.8	10.8			"		3368	0.11	Tr
231.8	241.3	9.5			"		3369	0.03	.003
241.3	252.8	11.5			"		3370	0.03	.002
252.8	263.4	11.4			"		3371	0.10	.002
263.4	275.3	11.8			"		3394	0.10	Tr
275.3	287.8	12.5			"		3395	0.11	Tr
287.8	297.5	9.7			"		3396	0.07	.002
297.5	310.0	12.5			"		3397	0.10	Tr
310.0	319.4	9.4			"		3398	0.11	Tr
319.4	328.3	8.9	2.0-		"		3399	0.02	.003
328.3	339.5	11.2	8.5-		"		3400	0.02	Tr
339.5	348.9	9.4	3.5-		"		3401	0.14	.008
348.9	358.8	9.9	4.0-		"		3402	0.10	.004
358.8	368.9	10.1	6.0-		"		3403	0.08	.006
368.9	379.2	10.3	8.0-		"		3404	0.08	.002
379.2	389.5	10.3	8.0-		"	2,55	3413	0.10	.004
389.5	400.6	11.1	9.0-		"		3414	0.06	.002
400.6	410.7	10.1			"		3417	0.13	Tr
410.7	419.7	9.0			"		3418	0.10	Tr
No Core									
430.0	439.8	9.8	9.0-		NX		3432	0.06	.008
439.8	449.3	9.5	8.0-		"		3433	0.09	.012
449.3	461.8	12.5	9.0-		"		3434	0.04	.005
461.8	472.0	10.0	9.0-		"		3435	0.07	.011
472.0	481.1	9.1	6.0-		"		3436	0.10	.015
481.1	491.8	10.7			"		3449	0.08	.008
491.8	502.2	10.4			"		3450	0.06	.010
502.2	513.3	11.1			"		3488	0.07	.008
513.3	524.1	10.8			"		3489	0.11	.013
524.1	530.8	6.7			"		3490	0.09	.012
530.8	539.4	8.6			"		3491	0.09	.031
539.4	549.4	10.0			"		3514	0.10	.020
549.4	559.8	10.4			"		3515	0.08	.021
559.8	570.5	10.7	6.0		"		3551	0.09	.016
570.5	580.5	10.0	6.0		"		52	0.07	.020
580.5	587.3	6.8			"		53	0.09	.007
587.3	597.8	10.5	6.0		RX		70	0.09	.023
597.8	604.9	7.1	6.0		"		71	0.06	.016
604.9	615.8	10.9	9.0		"		3572	0.20	.010
615.8	626.0	10.2	7.0		"		3573	0.15	.035
626.0	635.5	9.5	5.0		"		3574	0.27	.054
635.5	644.0	8.5	1.0		"		3575	1.31	.016

SHEET NO

DATE STARTED 1-31-62

DATE COMPLETED 4-12-62

DIAMOND DRILL ASSAY LOG

HOLE NO. T-47

COORDINATES 12,000 E 4,000 S COLLAR ELEVATION _____ BEDROCK ELEVATION _____

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.		Cu	Cu B'dg	Mo	Mo B'dg	Ag	Au
664.6	675.7	11.1			BX		3778		0.07	0.08	.012	.018		
675.7	685.8	10.1			"		3779		0.07		.005			
685.8	695.5	9.7			"		3780		0.18		.020			
695.5	702.4	6.9			"		3781		0.12		.024			
702.4	711.6	9.2			"	2.80	3782		0.59		.010			
711.6	722.6	11.0			"	2.95	3783		1.00		.010		0.20	0.00
722.6	733.8	11.2			"	2.96	3784		0.34		.006			
733.8	742.2	8.4			"	2.34	3785		0.04		.003			
742.2	747.6	5.4			"	2.41	3790		1.35		.004		0.35	0.00
747.6	755.7	8.1			"	2.45	3791		0.51		.005			
755.7	765.7	10.0			"	3.21	3792		0.58		.009			
765.7	775.8	10.1			"		3793		1.60		Tr		0.45	Tr
775.8	785.8	10.0			"		3794		1.58		.009			
785.8	795.8	10.0			"	3.01	3795		0.76		.013			
795.8	805.5	9.7			"		3807		0.86		.013		0.40	Tr
805.5	813.0	7.5			"	3.24	3808		0.40		.010			
813.0	823.0	10.0			"		3809		0.49		.004			
823.0	833.7	10.7			"		3810		0.20		.006		0.10	0.00
855.8	865.8	10.0			BX	2.71	3822		0.92		.013		0.35	Tr
865.8	875.8	10.0			"	2.67	3823		1.86		.012		0.95	0.00
875.8	880.8	5.0			"	2.79	3824		1.61		.006		0.50	Tr

SHEET NO.

DIAMOND DRILL ASSAY LOG

DATE COMPLETED 3 - [illegible]

HOLE NO. T-48

COORDINATES 13,000 E 4,000 S

COLLAR ELEVATION

BEDROCK ELEVATION

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.
NO ASSAYS							

SHEET NO. 1

DIAMOND DRILL ASSAY LOG

HOLE NO. T-67

COLLAR ELEVATION _____ BEDROCK ELEVATION _____

Depth From	Depth To	Interval	Measured Core Recovery	% Recovery	Hole Size	S. G.	Sample No.		Cu		Mo				
180.8	190.2	10.6			NX		4726		0.04						
190.2	298.3	8.1			"		4727		.07						
239.1	249.2	10.1			"		4756		.07						
326.6	335.7	9.1			"		4823		.10						
335.7	345.6	9.9			"		4824		.12						
345.6	355.9	10.3			"		4825		.14		.002				
355.9	366.3	10.4			"		4826		.06		Tr				
366.3	375.2	8.9			"		4827		.10		Tr				
375.2	386.5	11.3			"		4828		.10		Tr				
386.5	395.5	9.0			"		4829		.14		.009				
395.5	406.1	10.6			"		4830		.02		.002				
406.1	415.1	9.0			"		4831		.13		.004				
415.1	425.6	10.5			"		4832		.07		.004				
425.6	434.8	9.2			"		4833		.02		.010				
434.8	444.9	10.1			"		4834		.03		.002				
444.9	455.4	10.5			"		4835		.02		.004				
455.4	464.3	8.9			"		4898		.07		.004				
464.3	470.4	6.1			"		4899		.10		.007				
1073.0	1083.2	10.2			"		5134		.11		.002				
1083.2	1093.3	10.1			"		5135		.07		.003				

SHEET NO. ___

DATE STARTED [illegible]-62

DATE COMPLETED [illegible]-62

DIAMOND DRILL ASSAY LOG

HOLE NO. T-63

COORDINATES [illegible] E 4,000 S

COLLAR ELEVATION ___ BEDROCK ELEVATION ___

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S. G.	Sample No.	Cu
230.9	241.9				NX		5251	.12
241.9	249.2				"		5252	.08
249.2	258.0				"		5253	.10
258.0	268.1				"		5254	.02
268.1	278.9				"		5255	.03
278.9	290.2				"		5256	.04
290.2	298.2				"		5257	.09
298.2	306.5				"		5258	.02
306.5	315.5				"		5259	.02
315.0	327.3				"		5260	.03
327.3	338.6				"		5261	.11
338.6	349.6				"		5262	.12
349.6	356.2				"		5263	.15
356.2	367.6				"		5264	.13
367.6	376.0				"		5265	.11
376.0	385.2				"		5266	.10
385.2	394.0				"		5267	.18
394.0	407.7				"		5268	.07
407.7	420.4				"		5269	.07

DIAMOND DRILL ASSAY LOG

HOLE NO. T-69

COLLAR ELEVATION | BEDROCK ELEVATION

From	To	Core Recovery	% Recovery	Hole Size	Sample No.	Cu	Mo	Zn
249.2	260.3	11.1	8.5	NX	5237	.06	.012	
353.5	364.5	11.0		"	5270	.08	.006	
365.5	373.7	9.2		"	5271	.10	.004	
390.5	401.9	11.4		"	5272	.03	.006	
401.9	410.3	8.4		"	5273	.02	.005	
410.3	420.0	9.7		"	5274	.06	.005	
420.0	427.3	7.3		"	5275	.06	.012	
427.3	438.5	11.2		"	5327	.02	.002	
438.5	448.3	9.8		"	5328	.04	.002	
448.3	455.0	6.7		"	5329	.14	.003	.1
455.0	465.4	10.4		"	5371	1.22	.009	.2
465.4	476.0	10.6		"	5372	.86	.010	.1
476.0	484.3	8.3		"	5373	.73	.002	Tr
484.3	496.3	12.0		"	5374	.24	Tr	Tr
496.3	507.7	11.4		"	5375	.18	.002	Tr
507.7	518.1	10.4		"	5376	.02	Tr	Tr
634.2	642.2	8.0		"	5443	Tr	.002	-
1032.4	1041.8	9.4		"	5545	.02	Tr	Tr
1041.8	1049.6	7.8		"	5546	.03	.002	Tr
1060.4	1070.5	10.1		"	5643	.04	Tr	
1070.5	1080.7	10.2		"	5644	.02	Tr	
1080.5	1088.2	7.7		"	5645	.02	.002	
1139.1	1154.0	14.9		"	5646	.10	Tr	
1154.0	1164.1	10.1		"	5647	.02	Tr	

69

BEAR CREEK MINING COMPANY
SOUTHWEST DISTRICT

REPORT ON EDWARDS ET AL GROUND
TWIN BUTTES AREA
PIMA COUNTY, ARIZONA

September 25, 1962

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

GEOLOGICAL REPORT OF THE EDWARDS ET AL PROPERTY

LOCATION AND HISTORY

On January 15, 1960, Bear Creek Mining Company entered into agreement with Edwards, Hunziker and Sevits for the exploration of 94 unpatented mineral claims in the Pima Mining District, Arizona. The agreement was terminated August 9, 1962.

The claims lie on the northeastern flank of the Sierrita Mountains and approximately 20 miles southwest of Tucson, Arizona. They are located in Sections 17, 18, 19, 20 and 30, T17S, R13E.

Work accomplished by Bear Creek Mining Company on this area consist of geologic mapping, 6.8 miles of geophysical I.P. traverses and 6085.6 feet of drilling in 6 holes.

GEOLOGY

There are no outcrops in the area which is entirely covered by recent alluvium. Drilling indicates that the alluvium is underlain by Helmet fanglomerate, which is of probable Miocene(?) age.

All the drill holes, T-4, T-30 and T-66 failed to reach bedrock even though the respective footages were 839.9 feet, 1808.7 feet and 661.1 feet. They cored Helmet fanglomerate only.

Drill hole T-22 encountered bedrock at approximately 548 feet and penetrated limestone. The limestone contained very sparse sulfides consisting of galena, chalcopyrite and bornite and was altered to hornfels and garnet zones. At approximately 1304 feet quartz monzonite was penetrated which was unaltered and unmineralized.

In holes T-32 and T-34, oxides of copper were encountered at the bedrock surface and extended to the base of oxidation. Below this point, no significant copper mineralization was intersected.

The rock consists of an interbedded sequence of fine grained marble and fine grained siltstone(?) members. The latter are commonly highly altered to clay. Locally small beds of tactite occur but do not show any sulfide mineralization.

Drill holes T-32 and T-34 penetrate quartz monzonite at 690.0 feet and 645.0 feet respectively, but it was not mineralized.

July 16 - July 31, 1960

T-4:

0' - 158.4'	Alluvium and San Xavier (Helmet) Conglomerate. Sand and gravel to 140, becoming caliche to 142.5 where entered the red pebble to boulder conglomerate locally known as San Xavier conglomerate and termed Helmet fanglomerate by Cooper. No "bedrock" by end of period.

August 1 - August 15, 1960

T-4:

158.4' - 306.0'	Rockbit, no core
306.0' - 733.3'	San Xavier (Helmet) Conglomerate, clay to boulder size angular particles of arkose, sandstone, quartzite, limestone and porphyry in matrix of red mudstone which is somewhat calcareous, semi-consolidated.

August 15 - August 31, 1960

T-4:

726.6' - 839.3'	San Xavier (Helmet) fanglomerate

July 16 - July 31, 1961

T-30:

0' - 181.0'	Rockbit

August 1 - August 15, 1961

T-30:

181.0' - 724.0'	Rockbit

T-32:

00.0' - 96.0'	Rockbit
96.0' - 175.3'	Limestone - quartzite breccia composed of angular fragments in a calcareous matrix. Contains much manganese. Also contains chrysocolla and chalcocite, which is mostly in upper part. 1% sulfides.
175.3' - 374.0'	White, fine-medium grain marble containing zones of garnet. Mn dendrites strong. No sulfides observed. Some malachite and chrysocolla present.
374.0' - 483.1'	Marble zone with 30-45° laminations of garnet and chloritic material. Zones of garnet throughout. No observed sulfides.
483.1' - 673.9'	Marble-garnet zone with laminations 70-80°. Contains sphalerite, galena, chalcopyrite, pyrite and malachite. Less 1% sulphides.
673.9' - 686.2'	Black hornfels with biotite near bottom. 1% sulfides.
686.2' - 691.9'	Quartz monzonite with biotite and sphene. 1% sulfides.

August 15 - August 31, 1961

T-30:

724.0' - 991.0'	Rockbit through Helmet fanglomerate

T-32:

691.9' - 741.0'	Medium grain, biotite, sphene, quartz monzonite, which is equilgranular. Trace of sulfides.

T-34:

0' - 21'	Rockbit
21' - 30.3'	Caliche cemented gravel.
30.3' - 70.0'	Rockbit
70.0' - 77.4'	Jasperoid breccia containing veins of chrysocolla.
77.4' - 245.7'	Marble with tactite zones throughout, tactite zones consist of hornfels, garnet and calc-silicates. Trace of sulfides.
245.7' - 374.2'	Coarse grained, white, marble. Escabrose unit(?). Less than 1% sulfides and carbonates of copper.
374.2' - 554.5'	Tactite with interbedded medium grain marble and hornfels. No observed sulfides. Laminations throughout. Trace of sulfides.
554.5' - 705.0'	Biotite, sphene, quartz monzonite of equal granular, medium grain material. Trace of moly and chalcopyrite.

September 1 - September 15, 1961

T-30:

991.0' - 1327.6'	San Xavier fanglomerate

September 16 - September 30, 1961

T-30:

1327.6' - 1659.3'	San Xavier fanglomerate

October 1 - October 15, 1961

T-30:

1659.3' - 1803.7' Helmet fanglomerate

July 1 - July 14, 1962

T-66:

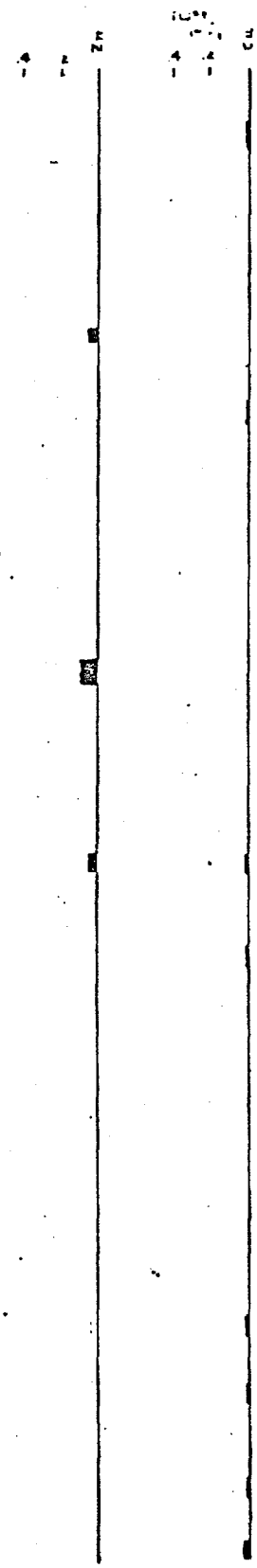
0.0' - 275.8' Helmet fanglomerate

July 15 - July 31, 1962

T-66:

275.8' - 661.1' Helmet fanglomerate

T-1 Collar Elevation _____



Rockhit - Alluvium

Arkosic Breccia with Siltstone
Bedding dips 25°
84.6 - 85.9 intense oxidation
89.2 - 92 fault
91.0 s.p. trying to appear
120.0 - fault

2'3 monzonite porphyry

fault at 15'4'
fault at 166
fault at 178-186'

fault 210-212
fault 223-223.9

highly brecciated & poor recovery

Bedding dips 30°
Gypsum

50° contact Biotite in porphyry
Gypsum

Highly brecciated & chlorite
op & gypsum
much Biotite

fault 549.5 - 550.4

bedding dips 60°
Gypsum & becoming siliceous

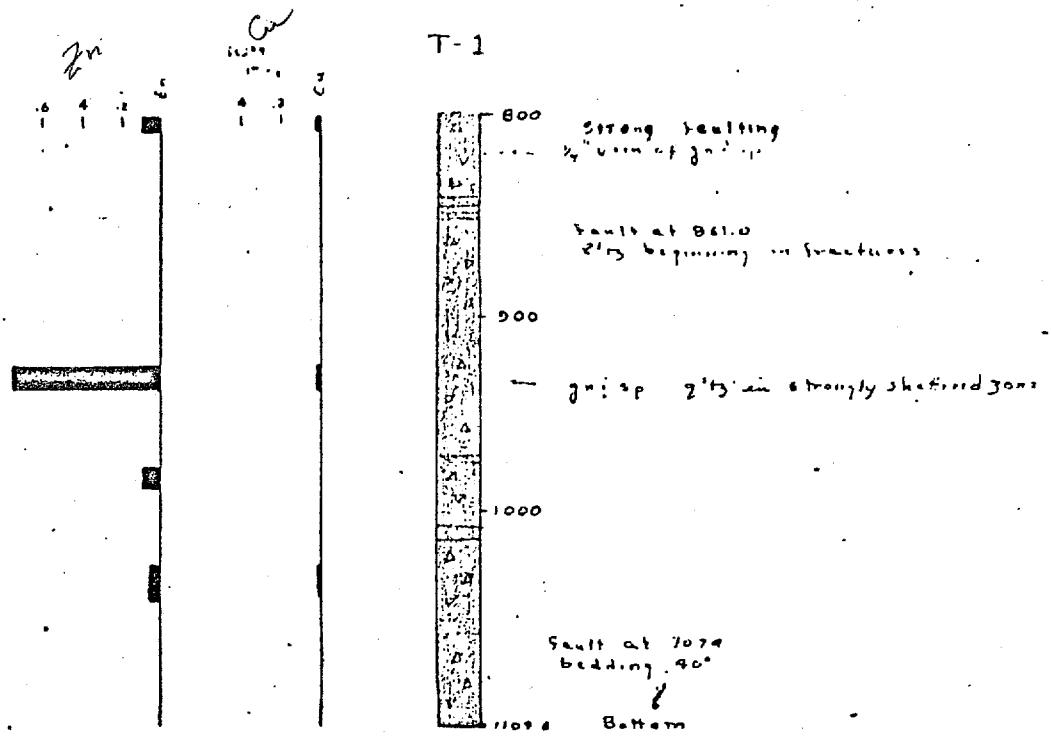
40° contact

Secondary Feldspar & gsp dropping off

733' fault
782' fault

100
200
300
400
500
600
700
800

Scale 1" = 100'


Zn
Cu
T-1
800
Strong faulting
900
1000
Fault at 7074
bedding 90°
Bottom

Scale 1" = 100'

SHEET No.

DATE STARTED 6/22/60

DIAMOND DRILL ASSAY LOG

DATE COMPLETED 7/26/60

HOLE NO. T-1

COORDINATES 6100 N 60 U E

COLLAR ELEVATION

BEDROCK ELEVATION

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.	Cu.	Zn.
0.0	10.0	10.0			NX				
10.0	20.4	10.4	9.3	90	"				
20.4	31.7	11.3	9.6	85	"				
31.7	44.0	12.3	11.5	94	"			0.02	Tr
44.0	55.1	11.1	11.0	99	"				
55.1	65.9	10.8	9.2	85	"				
65.9	76.8	10.9	10.9	100	"				
76.8	89.0	12.2	11.2	100	"				
89.0	99.4	10.4	8.7	84	"			Tr	Tr
99.4	109.4	10.0	10.9	109	"				
109.4	118.1	8.7	7.6	87	"				
118.1	129.9	11.8	11.3	96	"				
129.9	140.9	11.0	10.6	97					
140.9	149.8	8.9	7.6	86	"			Tr	0.05
149.8	159.8	10.0	10.0	100	"				
159.8	171.0	10.2	9.4	92	"				
171.0	182.6	11.6	10.7	93	"				
182.6	193.3	10.7	8.7	82	"				
193.3	203.5	10.2	6.7	66	"			0.02	Tr
203.5	212.6	9.1	6.6	73	"				
212.6	223.9	11.3	10.4	93	"				
223.9	233.9	10.0	4.3	43	"				
233.9	254.4	20.5	4.3	21	"				
254.4	277.6	23.2	0		BX	No core changed to Bx at 258.2			
277.6	278.2	0.6	0.3	50	"				
278.2	300.0	21.8	0	no core	"				
300.0	312.5	12.5	2.4	19	"				
312.5	324.8	12.3	6.2	50	"				
324.8	337.4	12.6	3.1	25	"			Tr	0.10
337.4	342.2	4.8	4.6	96	"				
342.2	352.0	9.8	9.7	99	"				
352.0	361.7	9.7	10.0	103	"				
361.7	371.7	10.0	10.0	100	"				
371.7	381.7	10.0	10.0	100	"			Tr	Tr
381.7	381.7	10.0	10.0	100	"				
391.7	401.7	10.0	10.0	100	"				
401.7	411.7	10.0	9.7	97	"				
411.7	421.5	9.8	9.9	101	"				
421.5	431.4	9.9	9.8	99	"			0.02	0.05
431.4	441.4	10.0	10.0	100	"				
441.4	451.4	10.0	10.0	100	"				
451.4	461.4	10.0	10.0	100	"				
461.4	471.4	10.0	9.6	96	"				
471.4	481.3	9.9	9.9	100	"			0.02	Tr
481.3	491.2	9.9	9.8	99	"				
491.2	501.2	10.0	10.0	100	"				
501.2	511.2	10.0	9.5	95	"				

DATE STARTED 6/22/60
DATE COMPLETED 7/26/60

DIAMOND DRILL ASSAY LOG

HOLE NO. T-1

COORDINATES 6100 N 60 U E

COLLAR ELEVATION

BEDROCK ELEVATION

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	Sample No.	Cu.	Zn.
521.2	531.2	10.0	10.0	100	BX		Tr	Tr
531.2	540.6	9.4	9.4	100	"			
540.6	550.4	9.8	9.5	97	"			
550.4	560.2	9.8	9.8	100	"			
560.2	570.2	10.0	9.2	92	"			
570.2	579.7	9.5	9.0	94	"		Tr	Tr
579.7	589.6	9.9	9.2	93	"			
589.6	599.4	9.8	10.0	102	"			
599.4	609.3	9.9	9.9	100	"			
609.3	619.3	10.0	9.8	98	"			
619.3	629.1	9.8	9.8	100	"		Tr	Tr
629.1	639.1	10.0	9.8	98	"			
639.1	649.1	10.0	9.9	99	"			
649.1	658.8	9.7	9.5	98	"			
658.8	669.0	10.2	9.7	95	"			
669.0	679.0	10.0	9.6	96	"		0.02	Tr
679.0	688.6	9.6	9.6	100	"			
688.6	698.6	10.0	9.8	98	"			
698.6	705.8	7.2	6.9	96	"			
705.8	715.3	9.5	9.2	98	"		0.02	0.05
715.3	725.2	9.9	9.5	96	"			
725.2	735.2	10.0	9.7	97	"			
735.2	747.8	12.6	11.7	85	"			
747.8	757.8	10.0	9.8	98	"			
757.8	765.8	8.0	7.8	98	"		0.02	0.05
765.8	775.8	10.0	9.7	97	"			
775.8	785.4	9.6	9.1	94	"			
785.4	792.4	7.0	6.9	94	"			
792.4	799.4	7.0	6.9	99	"			
799.4	807.4	8.0	7.8	98	"	8745	0.03	0.10
807.4	816.0	8.6	7.9	92	"			
816.0	822.6	6.6	6.4	97	"			
822.6	832.6	10.0	10.0	100	"			
832.6	840.0	7.4	6.6	89	"			
840.0	852.6	12.6	11.4	91	"	8746	Tr	Tr
852.6	863.0	10.4	10.0	97	"			
863.0	868.3	5.3	5.2	98	"			
868.3	878.1	9.8	9.4	97	"			
878.1	885.0	6.9	6.5	94	"			
885.0	895.0	10.0	9.5	95	"	8747	Tr	Tr
895.0	902.0	7.0	7.0	100	"			
902.0	911.6	9.6	9.5	99	"			
911.6	918.6	7.0	6.7	96	"			
918.6	927.4	8.8	8.8	100	"			
927.4	939.2	11.8	11.1	94	"	8748	0.03	0.75

DATE STARTED 6/22/60

DATE COMPLETED 7/26/60

DIAMOND DRILL ASSAY LOG

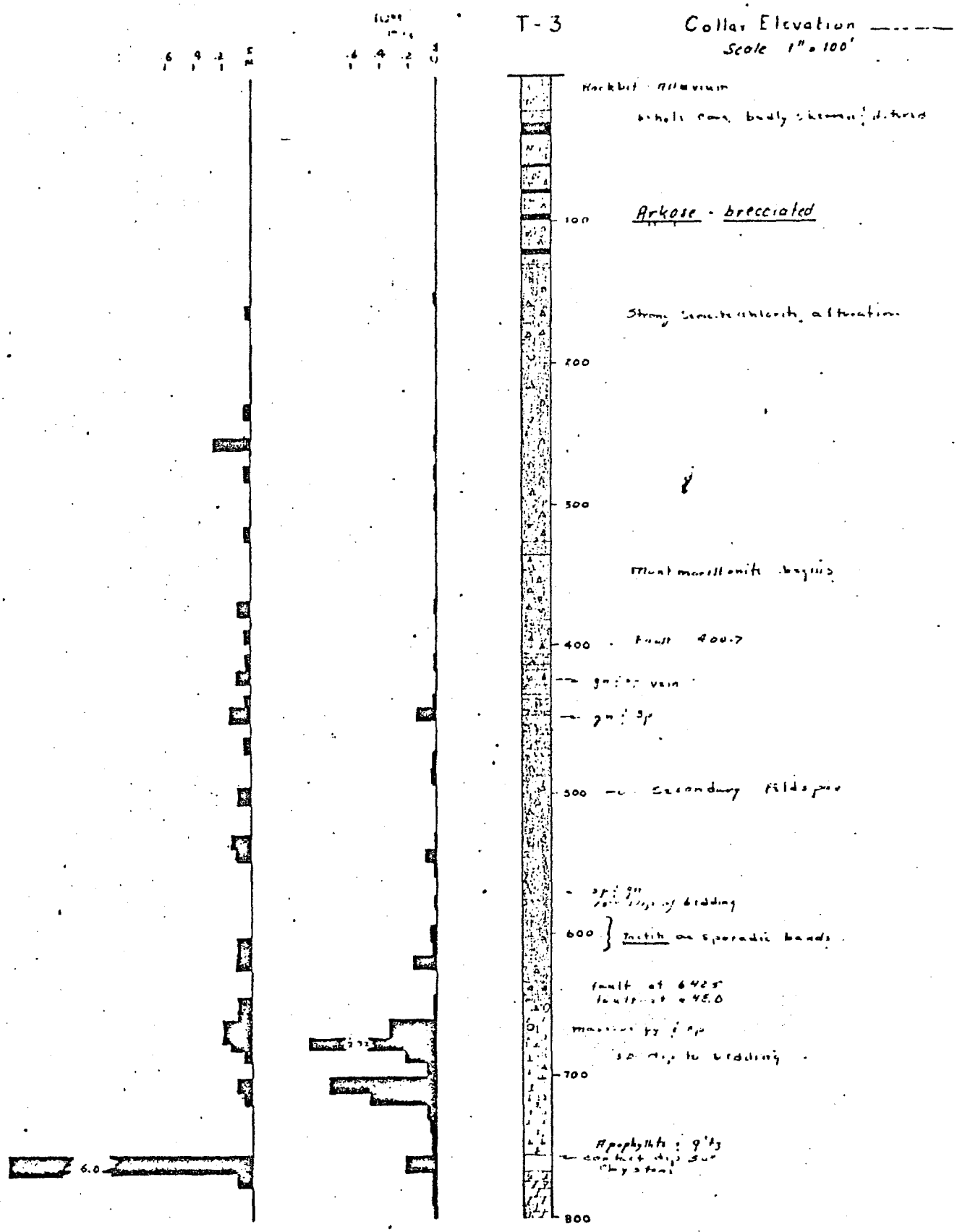
HOLE NO. T-1

COORDINATES 6100 N 60 U. E.

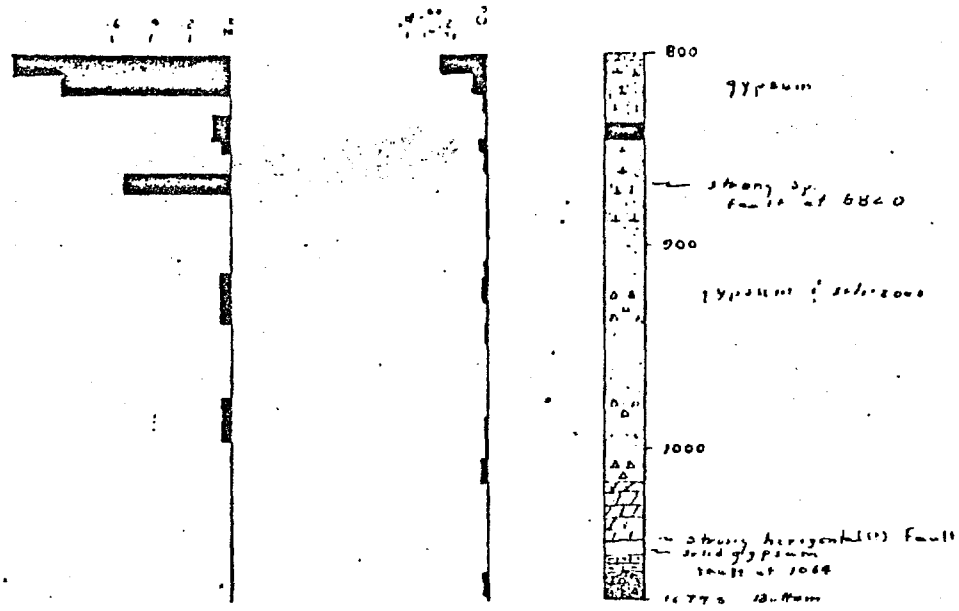
COLLAR ELEVATION

BEDROCK ELEVATION

Footage From	Footage To	Drilled	Measured Core Recovery	% Recovery	Bit Size	Sample No.	Cu.	Zn.
959.6	969.6	10.0	10.9	109	BX			
969.6	979.4	9.8	9.8	100	"			
979.4	989.2	9.8	9.6	97	"	8749	Tr	0.20
989.2	999.3	10.1	10.0	101	"			
99933	1009.3	10.0	9.9	99	"			
1009.3	1019.1	9.8	10.0	102	"			
1019.1	1029.1	10.0	9.9	99	"			
1029.1	1043.3	14.2	14.2	100	"	8750	0.02	0.05
1043.3	1053.1	9.8	9.7	99	"			
1053.1	1062.9	9.8	9.9	101	"			
1062.9	1072.7	9.8	9.8	100	"			
1072.7	1082.7	10.0	9.6	96	"			
1082.7	1091.7	9.0	8.9	99	"	8876	Tr	Tr
1091.7	1101.5	9.8	9.8	100	"			
1101.5	1109.6	8.1	7.9	97	"			


T-3
Collar Elevation
Scale 1" = 100'
Arkose - brecciated
100
200
300
400
500
600
700
800
6.0

T-3



Scale 1" = 100'

SHEET NO. 1

DATE STARTED 7/6 /60

DIAMOND DRILL ASSAY LOG

DATE COMPLETED 8/17/60

HOLE NO. T-3

COORDINATES 500 K 00 W COLLAR ELEVATION BEDROCK ELEVATION

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.	Cu.	Zn.
0	23.0	23.0			EB				
23.0	30.6	7.6	3.3	44	EX				
30.6	40.0	9.6	2.0	21	"				
40.0	52.6	12.6	4.5	36	"				
52.6	61.0	10.4	1.3	13	"				
61.0	74.2	13.2	2.0	15	"				
74.2	85.1	10.9	2.9	27	"				
85.1	100.0	14.9	3.3	22	"				
100.0	112.4	12.4	4.3	35	"				
112.4	124.3	11.9	5.8	49	"		8651	Tr	Tr
124.3	132.4	8.1	5.9	72	"				
132.4	144.4	12.0	2.4	20	"		8652	Tr	Tr
144.4	151.0	6.6	4.9	75	"				
151.0	160.1	9.1	8.4	93	"		8653	0.02	Tr
160.1	169.3	9.2	9.4	102	"				
169.3	181.1	11.8	12.4	102	"		8654	Tr	0.05
181.1	189.0	7.9	7.9	100	"				
189.0	199.0	9.0	9.0	100	"		8655	Tr	Tr
198.0	209.0	11.0	8.6	78	"				
209.0	220.0	11.0	10.6	97	"		8656	Tr	Tr
220.0	229.0	9.0	8.0	89	"				
229.0	240.6	11.6	9.9	93	"		8657	Tr	0.05
240.6	251.4	10.8	9.5	88	"				
251.4	260.6	9.2	9.2	100	"		8658	0.02	0.25
260.6	272.0	11.4	9.9	87	"				
272.0	282.1	10.1	10.1	100	"		8659	0.02	0.05
282.1	293.5	11.4	10.4	92	"				
293.5	305.1	11.6	9.2	79	"		8660	0.02	Tr
305.1	315.1	10.0	8.4	84	"				
315.1	326.2	11.1	9.6	86	"		8661	Tr	0.05
326.2	335.2	9.0	9.0	100	"				
335.2	341.5	6.3	6.3	100	"		8662	Tr	Tr
341.5	351.9	10.4	10.4	100	"				
351.9	359.6	7.7	7.7	100	"		8663	Tr	Tr
359.6	367.2	7.6	7.6	100	"				
367.2	378.1	10.9	10.9	100	"		8664	0.02	0.10
378.1	388.1	10.0	10.0	100	"				
388.1	399.3	11.2	11.2	100	"		8665	Tr	0.05
399.3	405.5	6.2	4.9	79	"				
405.5	415.3	9.8	10.0	102	"		8666	0.02	0.05
415.3	425.3	10.0	10.0	100	"		67	Tr	0.10
425.3	435.3	10.0	10.0	100	"		68	Tr	Tr
435.3	443.2	7.9	7.9	100	"		69	0.03	0.05
443.2	452.4	9.2	8.4	91	"		8670	0.12	0.15
452.4	462.0	9.6	9.6	100	"		71	Tr	Tr
462.0	472.0	10.0	10.0	100	"		72	Tr	0.05

SHEET NO. 2

DATE STARTED 7/6/60

DIAMOND DRILL ASSAY LOG

DATE COMPLETED 8/17/60

HOLE NO. 1T-3

COORDINATES 500 N 00 W

COLLAR ELEVATION

BEDROCK ELEVATION

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.	Cu.	-Mo-	Pb.	Zn.	Ag.	-Au-
481.4	494.6	13.2	12.5	95	Nx		8674	0.02			Tr		
494.6	506.7	12.1	11.6	96	"		75	Tr			.10		
506.7	516.7	10.0	8.7	87	"		76	Tr			Tr		
516.7	527.5	10.8	10.1	94	"		77	Tr			Tr		
527.5	538.8	11.3	10.8	96	"		78	.02			.15		
538.8	547.6	8.8	8.7	99	"		79	.07			.10		
547.6	559.9	12.3	12.0	98	"		8680	.02			Tr		
559.9	571.0	10.1	10.1	100	"		81	Tr			Tr		
571.0	581.0	10.0	9.2	92	"		82	.02			Tr		
581.0	592.4	11.4	9.2	81	"		83	Tr			Tr		
592.4	603.1	10.7	7.4	69	"		84	.04			Tr		
603.1	614.3	11.2	6.0	54	"		85	.03			.10		
614.3	624.2	9.9	6.8	69	"		86	.16			.10		
624.2	634.4	10.2	7.8	77	"		87	Tr			Tr		
634.4	643.3	8.9	7.3	87	"		88	Tr			Tr		
643.3	652.7	9.4	6.7	71	"		89	.02			.05		
652.7	660.4	7.7	1.3	17	"		8690	.02			.05		
660.4	674.3	13.9	9.0	65	"		91	.32		.2	.20	.6	.005
674.3	682.6	8.3	8.2	99	"		92	2.32		.2	.15	.8	.005
682.6	691.7	9.1	9.0	100	"		93	.23	612'@ 0.112%	Tr	.05	.3	Tr
691.7	701.6	9.9	9.9	100	"		94	.07	—	Tr	Tr	.3	Tr
701.6	711.6	10.0	10.0	100	"		95	.74		Tr	.10	.2	Tr
711.6	721.6	10.0	10.0	100	"		96	.47		.1	.05	.6	.005
721.6	727.3	5.7	4.3	75	"		97	.07		Tr	Tr	.1	Tr
727.3	737.5	10.2	10.2	100	"		98	.06		Tr	Tr	.1	Tr
737.5	747.4	9.9	9.9	100	"		99	.04		.1	Tr	.3	.005
747.4	756.3	8.9	9.1	102	"		8700	.04		.1	Tr	.4	.005
756.3	769.7	13.4	13.4	100	"		01	.23	21.1@ 3.85% Zn	3.2	6.00	3.4	.01
769.7	777.4	7.7	7.7	100	"		02	.03		.1	.10	.1	.005
777.4	787.4	10.0	10.0	100	"		03	.03		Tr	Tr	.4	Tr
787.4	800.4	13.0	12.5	96	"		04	.02		Tr	Tr	.3	Tr
800.4	810.1	9.7	9.7	100	"		05	.23	16.1@ .97% Zn	Tr	1.10	1.2	.005
810.1	820.0	9.9	9.9	100	"		06	.08		Tr	.85	.8	.005
820.0	830.2	10.2	10.2	100	"		07	.02		Tr	Tr	.3	Tr
830.2	844.0	13.8	4.5	73	"		08	Tr			.10		
844.0	850.6	6.6	2.7	40	"		09	.04			.05		
850.6	860.4	9.8	9.8	100	"		8710	.02			Tr		
860.4	870.4	10.0	9.0	90	"		11	Tr			.55		
870.4	877.4	7.0	7.8	111	"		12	Tr			Tr		
877.4	886.8	9.4	9.4	100	"		13	Tr			Tr		
886.8	901.2	14.4	8.3	57	"		14	Tr			Tr		
901.2	908.1	6.9	5.9	85	"		15	Tr			Tr		
908.1	916.0	7.9	7.0	89	"		16	.02			Tr		
916.0	929.2	13.2	10.7	81	"		17	.03			.05		
929.2	939.2	10.0	9.6	96	"		18	Tr			.05		
939.2	949.2	10.0	6.0	60	"		19	.02			Tr		

SHEET NO.

DATE STARTED 7/6/60

DIAMOND DRILL ASSAY LOG

DATE COMPLETED 8/17/60

HOLE NO. T-3

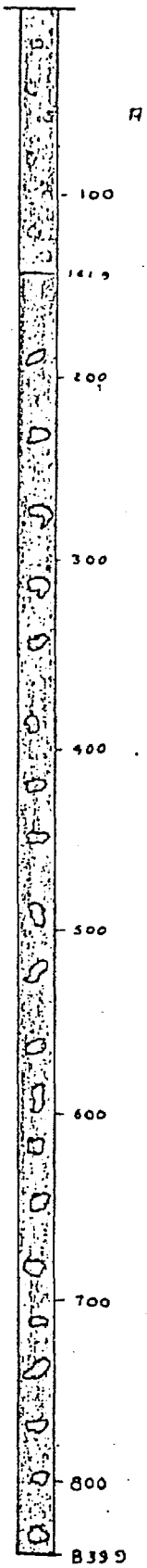
COORDINATES 500 N 00 W

COLLAR ELEVATION

BEDROCK ELEVATION

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.	Cu	Zn
962.3	974.8	12.5	12.4	103	Bx		8721	Tr	Tr
974.8	985.2	10.4	10.2	98	"		22	Tr	0.05
985.2	995.1	9.9	9.7	97	"		23	0.02	0.05
995.1	1005.9	10.8	9.5	88	"		8887	0.02	Tr
1005.9	1016.6	10.7	7.6	71	"		8888	0.04	Tr
1016.6	1027.9	11.3	10.8	95	"		8912	Tr	Tr
1027.9	1037.8	10.9	9.9	91	"		13	Tr	Tr
1037.8	1048.1	10.3	6.2	60	"		14	Tr	Tr
1048.1	1058.3	9.8	9.7	98	"		8933	Tr	Tr
1058.3	1067.0	8.7	5.2	59	"		34	Tr	Tr
1067.0	1075.3	8.3	7.8	93	"		35	0.02	Tr

T-4 Collar Elevation _____



Alluvium

Helmet Fanglomerate

?

Cuprite

Cuprite & Malachite

Fault 400.9

Bedding 30°

No assay

core broken from 777.4 - 839.9

Bottom

Scale 1" = 100'

DATE STARTED 7/27/60

DATE COMPLETED 8/19/60

DIAMOND DRILL ASSAY LOG

HOLE NO. T-4

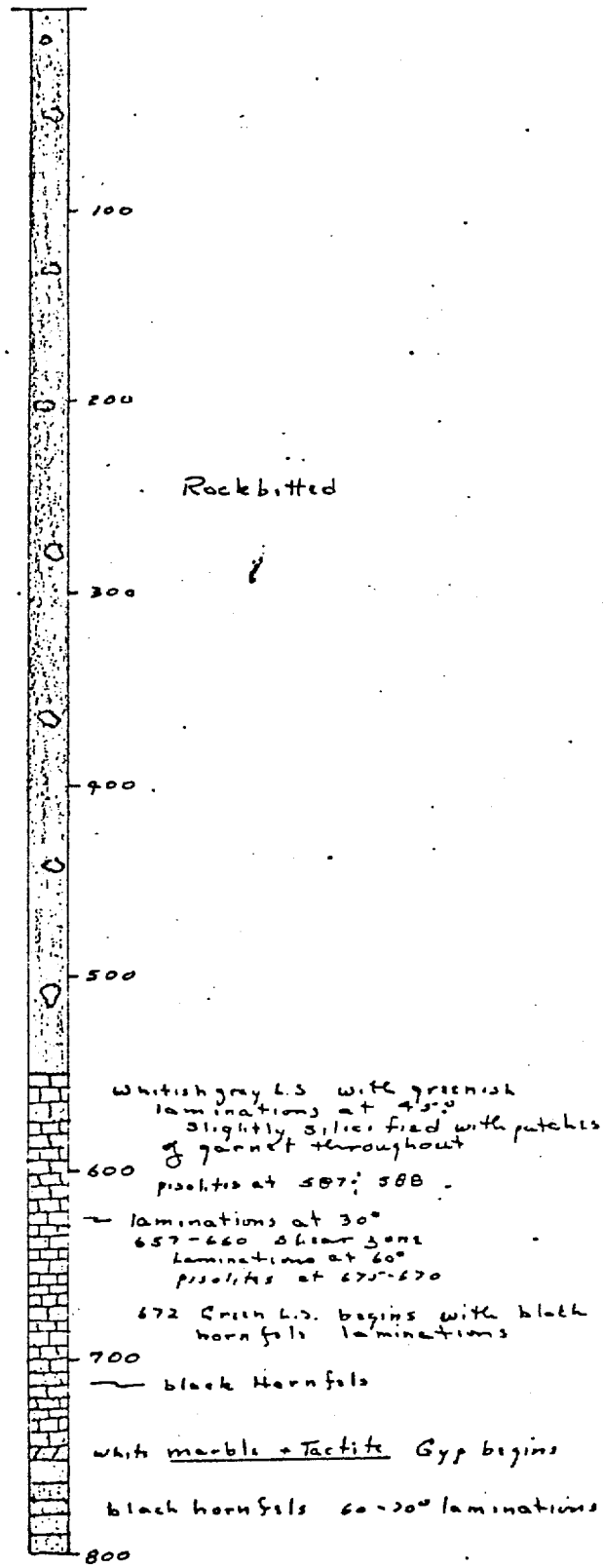
COORDINATES 500 N 11,800 E COLLAR ELEVATION _____ BEDROCK ELEVATION _____

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S. G.	Sample No.							
				NO ASSAYS										

T-22

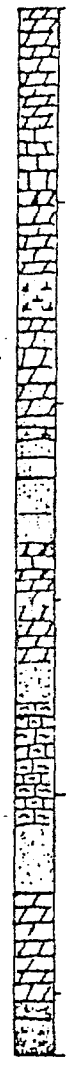
Collar Elevation _____

All assays very low



Scale: 1" = 100'

T-22



800 marble, white 45° laminations
Some garnet

silicified L.S. 50° laminations

900 marble with some tactite deposits

Tactite
coarse xlline. Marble - grey to black
Magnetite? gypsum

1000 lt. brown to green hornfels
black siltstone

laminations 70-75°
silicified L.S.

1100 Marble - white to light brown
with some tactite

black hornfels with garnet
laminations at 45°

Marly L.S. with garnet zones

1200 1192 gyp forms laminations at 60°

Red & green siltstone
laminations at 45°

Marble with 45-60° laminations
and garnet zones & tactite

1300 basement granite
Biotite & hb monzonite

1330.5 bottom

Scale 1" = 100'

DATE STARTED 6/26/61

DATE COMPLETED 8/11/61

DIAMOND DRILL ASSAY LOG

HOLE NO. T-22

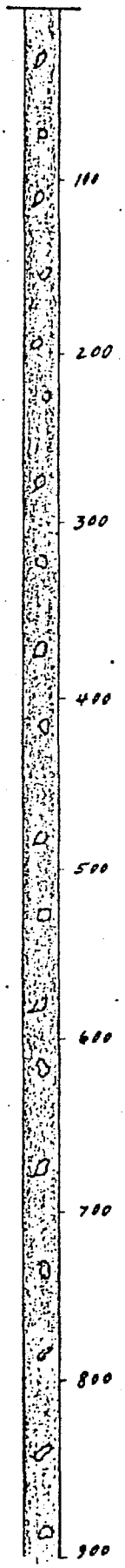
COORDINATES 2,300 S 9,100 E COLLAR ELEVATION _____ BEDROCK ELEVATION _____

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.	Cu	Mo	Pb	Zn	Ag	Au
689.7	703.7	14.0	13.5		NX		1834	Tr	Tr	Tr	.1	.2	Tr
713.9	725.4	11.5	11.5		"		1835	Tr	Tr	Tr	Tr	.3	Tr
736.6	752.0	15.4	14.1		"		1836	Tr	.004	.1	.1	.1	Tr
752.0	762.0	10.0	10.0		"		1837	Tr	Tr	Tr	Tr	.2	.005
762.0	772.0	10.0	10.0		"	3.26	1838	.03	Tr	Tr	.1	.4	.005
772.0	781.5	9.5	9.5		"	2.70	1839	.02	Tr	Tr	Tr	.2	Tr
781.5	791.4	9.9	9.9		"	2.86	1840	Tr	Tr	Tr	Tr	.5	.005
791.4	801.4	10.0	10.0		"	2.65	1841	Tr	Tr	Tr	Tr	Tr	Tr
981.0	991.0	10.0	10.0		"		1897	.16					
1094.5	1104.4	9.9	9.9		"								
1124.1	1134.2	10.1	10.1		"		1971	.05	Tr	Tr	.1	.3	.005
1134.2	1144.3	10.1	9.4		"		1972	.08	Tr	.1	Tr	.5	.005
1144.3	1152.5	8.2	9.1		"		1973	.02	Tr	Tr	Tr	.3	Tr
1152.5	1162.2	9.7	9.5		"		1938	.02	Tr	Tr	Tr	.1	.005
1162.2	1172.2	10.0	10.0		"		1939	.03	Tr	Tr	Tr	.2	.005
1172.2	1182.2	10.0	10.0		"		1974	.03	Tr	Tr	Tr	.3	Tr
1182.2	1192.3	10.1	9.8		"		1975	Tr	.002	Tr	Tr	.2	Tr
1192.3	1202.1	9.8	10.2		"		1976	.02	Tr	Tr	Tr	.3	Tr
1202.1	1212.1	10.0	10.0		"		1940	.02	Tr	Tr	Tr	Tr	Tr
1212.1	1222.1	10.0	10.0		"		1977	.03	Tr	Tr	.1	.2	Tr
1222.1	1232.1	10.0	10.0		"		1978	Tr	Tr	Tr	Tr	.4	.005
1232.1	1240.6	8.5	8.5		"		1979	Tr	Tr	Tr	Tr	.3	Tr
1240.6	1249.1	8.5	5.7		"		1980	Tr	Tr	Tr	Tr	.2	Tr
1249.1	1258.5	9.4	9.9		"		1981	Tr	Tr	Tr	.1	.3	Tr
1258.5	1267.9	9.4	9.4		"	2.65	1982	.02	Tr	Tr	Tr	.2	Tr
1267.9	1277.3	9.4	9.4		"		1983	.05	Tr	.1	.1	.1	.005
1277.3	1287.0	9.7	9.7		"	3.00	1984	.02	Tr	.1	Tr	.2	Tr
1287.0	1296.4	9.4	9.4		"		1985	Tr	Tr	Tr	Tr	Tr	Tr
1296.4	1304.8	8.4	8.4		"	3.30	1986	Tr	.002	Tr	Tr	.1	Tr
1304.8	1312.9	8.1	7.9		"	2.54	2011	Tr	.002	Tr	Tr	.1	.005
1312.9	1323.0	10.1	9.6		"	2.50	2012	Tr	Tr	Tr	Tr	Tr	Tr
1323.0	1330.5	7.5	7.7		"		2013	Tr	Tr	Tr	.1	.1	Tr

T-30

Collar Elevation _____

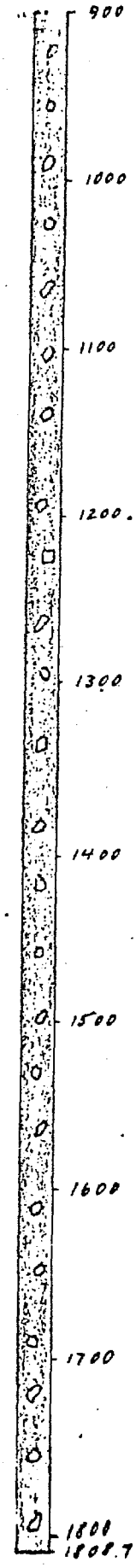
Scale : 1" = 100'



Helmet fanglomerate
(San Xavier fangl.)

T-30

Scale : 1" = 100'



Helmet fanglomerate
(San Xavier " ")

30° dip of bedding

1024.6 - 1025.6 solid gypsum w/ anhydrite

25-35° dip
½-1' fine sandy zones

fine sandy beds
40° dip

25-30° dip of sandy beds
no gypsum
arkose-gtsite fragments

reddish matrix

well indurated fragm. of arkose & black shale

bottom

SHEET NO. 1

DATE STARTED 7/28/61

DIAMOND DRILL ASSAY LOG

DATE COMPLETED 10/10/61

HOLE NO. T-30

COORDINATES 800 N 9,100 E COLLAR ELEVATION _____ BEDROCK ELEVATION _____

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S. G.	Sample No.								
					NO ASSAY										

T-32

Collar Elevation _____

Assays

90'-96' - .48% Cu

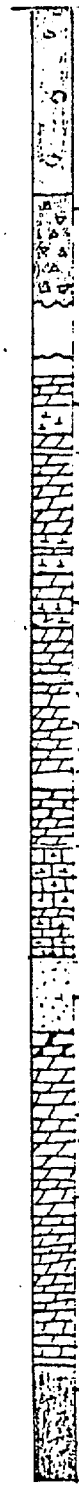
96'-103.3' - 1.16% Cu

103.3'-113.6' - 0.54% Cu

113.6'-123.8' - 0.31% Cu

123.8-133.9' - 0.25% Cu

other assays very low



Rockbit - missed bedrock
bedrock: oxids zone at approx. 75'

100

Qtzite: Arkose breccia, mon g'ite toward bottom. Oxids zone carrying Chrysocolla. Strong Mn dendrites

clay: sericite - Mn dendrites

white hornfels

white med- coarse gr. marble

200

garnet & white hornfels with pink mineral

222.2 - 225.2 Shear with clay: garnet

garnet zone

272-276 white course gr marble

300

med gr. marble 325-334 - gypsum pink

black hornfels + garnet mineral

fine gr marble + garnet - salt & pepper texture

brown fine gr. marble - hornfels: garnet

dk. green hornfels: pisolites + lamin. at 30°

400

marble: garnet modified by 30° green laminations

anesite

Green laminated (45°) silicified l.s. with garnet

silicified L.S: marble garnet zone 45° laminations

500 Black siltstone with 60° laminations some garnet.

marble: green siltstone - 60° laminations

lamination 70-80 (flowage or fossils(?))

gray, med. gr. - heavily laminated marble

garnet zones at 30°-85°

600 laminations vertical

white marble: Garnet zones 75°-60° laminations

black fine gr. marble

green-black biotite hornfels

700

Biotite, g'ite monzonite

741' Bottom

Scale 1" = 100'

SHEET No.

DATE STARTED 8/4/61

DIAMOND DRILL ASSAY LOG

DATE COMPLETED 8/17/61

HOLE NO. T-32

COORDINATES 3,500 S 9,400 E

COLLAR ELEVATION

BEDROCK ELEVATION

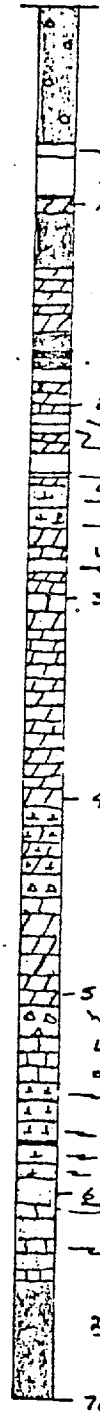
Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.	Cu	Mo	Pb	Zn	Ag	Au
546.5	551.5	5.0	5.0		Nx		2030	.02	Tr	Tr	Tr	.5	
551.5	562.8	11.3	11.3		"		2049	.02	Tr	Tr	Tr	.6	
562.8	569.0	6.2	6.2		"		2050	.05	Tr	Tr	Tr	.5	
569.0	579.2	10.2	10.2		"		2051	.04	Tr	Tr	Tr	.4	
579.2	589.3	10.1	10.1		"		2052	Tr	Tr	Tr	Tr	.4	
589.3	599.3	10.0	10.0		"		2053	.13	.002	.2	Tr	.2	
599.3	606.3	7.0	7.0		"		2054	.04	.002	Tr	Tr	.3	
606.3	615.2	8.9	8.9		"		2055	.02	Tr	Tr	Tr	.3	
615.2	628.2	13.0	13.0		"	3.18	2056	.04	Tr	Tr	Tr	.6	
628.2	643.4	15.2	15.2		"		2078	.05	Tr	Tr	Tr	.5	
643.4	653.7	10.3	10.3		"	2.60	2079	.05	.002	.1	Tr	.7	
653.7	663.9	10.2	10.2		"	2.89	2080	.06	.002	.1	Tr	.9	
663.9	673.9	10.0	10.0		"		2081	.07	.002	.1	Tr	.9	
673.9	684.2	10.3	10.3		"		2082	.05	Tr	Tr	Tr	.5	
684.2	691.1	6.9	6.9		"	2.51	2083	.04	.003	Tr	Tr	.2	

	Cu %	Zn %	Ag %
65-70	0.63	0.2	0.8
70-77.4	1.73	0.2	1.4
77.4-87.7	0.36	3.5	1.3
87.7-98.1	0.07	0.4	1.0

other assays low

T-34

Collar Elevation _____



San Xavier fanglomerate

Jasperoid Breccia with Crysocolla
shear zone - 45° Strong Mn dendrites
100 fine gr Marble - Mn dendrites

fine gr. Marble with hornfels

white, L.S. hornfels Shear 190.5-192.5
200 below this is marble. 20-30 lamin
strong Mn Stain
Tan Hornfels
2' tuff
225-235.2 strong Shear
235.2-237.0 Ugly garnet zone
Marble, L.S. garnet
Shear 245.7-255.9
White, course gr. marble
cream colored hornfels
300 Gray marble with phyllitic layers
60° Contact with below

Course gr. marble with garnet zones throughout

20° laminations

400 fine gr. black marble →
60° drawmont Brach Valois

40°-50° Dip
hornfels breccia

Banded marble-hornfels Tactite
20°-30° dip

500
marble breccia
L.S. 20°-30° green lamin. - core broken
60-60° laminations
hornfels & garnet
vertical laminations
garnet 70% - hornfels 20%
green hornfels - 40°-50° laminations
600 70° 30° laminations in hornfels & garnet.
Pink mineral
smeared laminations in hornfels & L.S

2' tz monzonite

705.0 Bottom

Scale 1" = 100'

SHEET NO. 1

DATE STARTED 8/17/61

DATE COMPLETED 8/29/61

DIAMOND DRILL ASSAY LOG

HOLE NO. T-34

COORDINATES 3,500 S 9,200 E

COLLAR ELEVATION

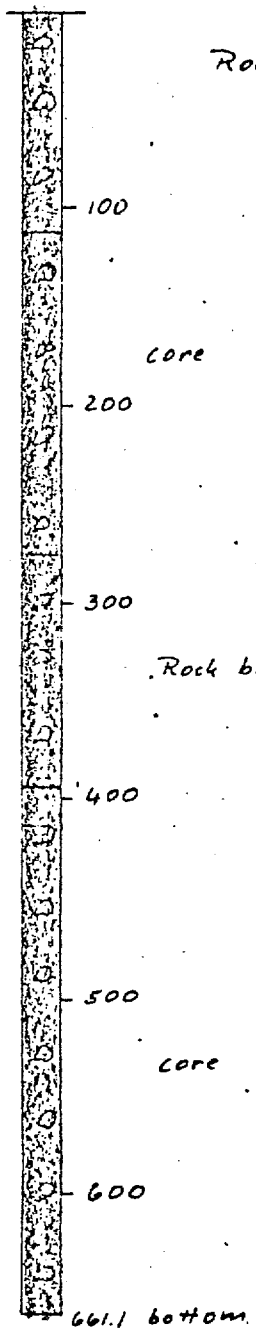
BEDROCK ELEVATION

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No	Cu	Mo	Pb	Zn	Ag	Au		
60.0	65.0	5.0			RB		2104	.04		Tr	Tr	.3			
65.0	70.0	5.0			RB		2105	.63		.2	.2	.8			
70.0	77.4	7.4	7.0		NX		2106	1.73	27.7 .709%	Tr	.2	1.4			
77.4	87.7	10.3	10.3		"		2107	.36		Tr	3.5	1.3		38.1	0.23% .95%
87.7	98.1	10.4	10.4				2108	.07		.1	.4	1.0			
98.1	105.0	6.9	6.9		"	2.65	2109	Tr		.1	.2	.5			
105.0	115.2	10.2	10.2		"	2.52	2110	Tr		Tr	Tr	.7			
205.8	215.4	9.6	9.6		"		2122	Tr		Tr	Tr	.8			
215.4	225.6	10.2	10.0		"		2123	.02		Tr	Tr	.3			
225.6	235.2	9.6	9.0		"		2124	Tr		.1	Tr	.7			
235.2	245.7	10.5	10.4		"		2125	Tr		Tr	Tr	.6			
245.7	255.9	10.2	10.2		"		2126	.02		Tr	Tr	.6			
255.9	265.1	9.2	9.2		"		2127	Tr		Tr	Tr	.4			
265.1	275.9	10.8	10.6		"		2139	Tr		Tr	Tr	.7			
275.9	290.1	14.2	14.2			2.67	2140	.04		Tr	Tr	.2			
290.1	297.3	7.2	7.4		"		2141	.03	.002	.1	.1	.7			
297.3	305.8	8.5	8.5				2142	.04	Tr	Tr	Tr	.3			
305.8	314.8	9.0	9.8		"	2.52	2143	.02	Tr	Tr	Tr	.2			
314.8	324.8	10.0	10.0				2144	.02	Tr	.1	Tr	.6			
324.8	334.8	10.0	10.0		"		2145	Tr	.002	Tr	Tr	.2			
334.8	344.9	10.1	9.4		"		2146	Tr	Tr	Tr	Tr	.2			
344.9	354.2	9.3	9.8		"		2147	.03	Tr	.1	.1	.4			
354.2	364.2	10.0	9.9		"		2148	Tr	Tr	.1	.1	.2			
364.2	374.2	10.0	10.0		"		2149	.02	Tr	Tr	Tr	.1			
374.2	387.5	13.3	13.5		"		2150	.02	Tr	Tr	.1	.5			
387.5	395.9	8.4	8.4		"	2.63	2151	.03	Tr	Tr	.1	.1			
395.9	403.5	7.6	7.6		"	2.76	2152	Tr	Tr	Tr	Tr	.5			
403.5	412.0	3.5	8.5		"		2153	Tr	.002	Tr	Tr	.6			
412.0	422.0	10.0	9.9		"	2.63	2154	.02	.002	.1	.1	.5			
440.7	450.5	9.8			"		2156	Tr	.004	Tr	.3	.5			
530.7	543.7	13.0	12.6		"		2206	Tr			.1				
563.8	573.9	10.1	10.1				2207	Tr			Tr				
574.2	584.3	10.1	10.0		"		2208	.02			Tr				
612.5	623.8	11.3	10.0		"		2209	Tr			.1				

Collar Elevation _____

Scale: 1" = 100'

T-66



Rock bit

Helmet fanglomerate

core

Rock bit

core

DATE STARTED _____

DATE COMPLETED _____

DIAMOND DRILL ASSAY LOG

HOLE NO. T-66

COORDINATES _____ _____ COLLAR ELEVATION _____ BEDROCK ELEVATION _____

Footage		Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.								
From	To														
	No Assay														

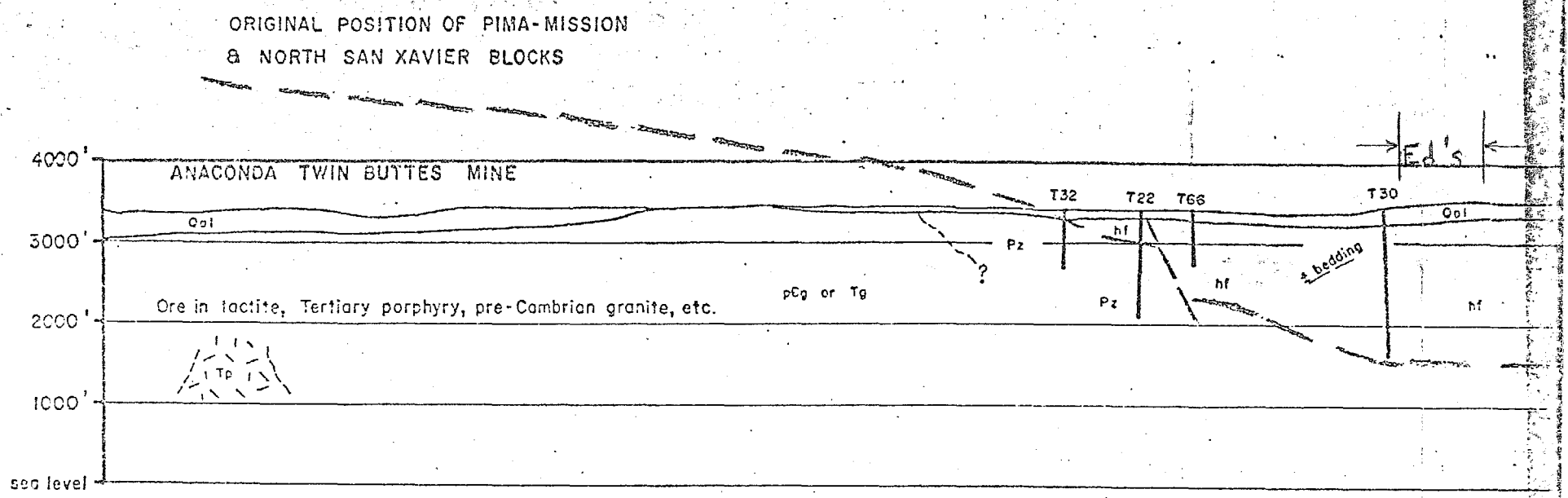
DATE STARTED 11-10-62
COMPLETED 11-16-62

DIAMOND DRILL ASSAY LOG

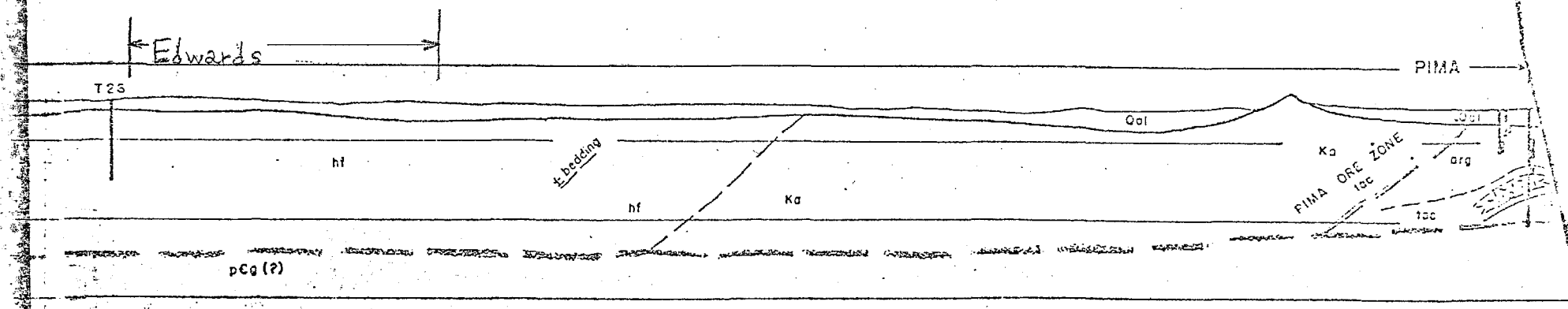
HOLE NO. T-71

COORDINATES 16,200 E 5,700 S COLLAR ELEVATION _____ BEDROCK ELEVATION _____

Footage From	Footage To	Interval	Measured Core Recovery	% Recovery	Hole Size	S.G.	Sample No.
			No Assays				


ORIGINAL POSITION OF PIMA-MISSION
& NORTH SAN XAVIER BLOCKS
4000'
3000'
2000'
1000'
sea level
ANACONDA TWIN BUTTES MINE
Qal
Pz
pCg or Tg
Ore in tactite, Tertiary porphyry, pre-Cambrian granite, etc.
Tp
T32
T22
T66
T30
hf
bedding
Ed's

SEC A



LEGEND

Qal	Quaternary Alluvium
hf	Helmet Fanglomerate
	San Xavier and other post-mineral faults

↑ POST-MINERAL ROCKS

↓ PRE-MINERAL ROCKS

Tp	Tertiary Porphyry	
Ka	Cretaceous Sediments (clastic)	
mb	Marble	Paleozoic Sediments
tac	Tactite (silicated limestone)	Paleozoic Sediments
Pz	Limestone	Paleozoic Sediments
pCg	Precambrian Granite (includes a granitoid rock which may be Late Cretaceous or Early Tertiary)	

Scale: 1" = 2000'

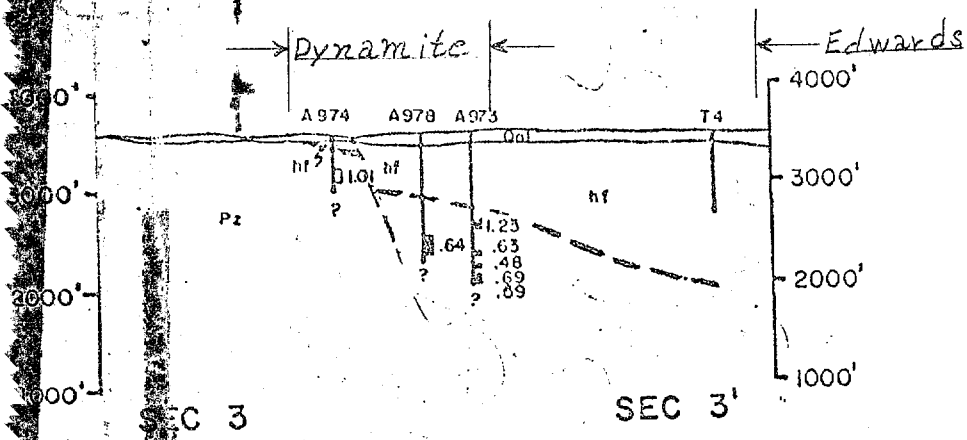
0 2000 4000 feet

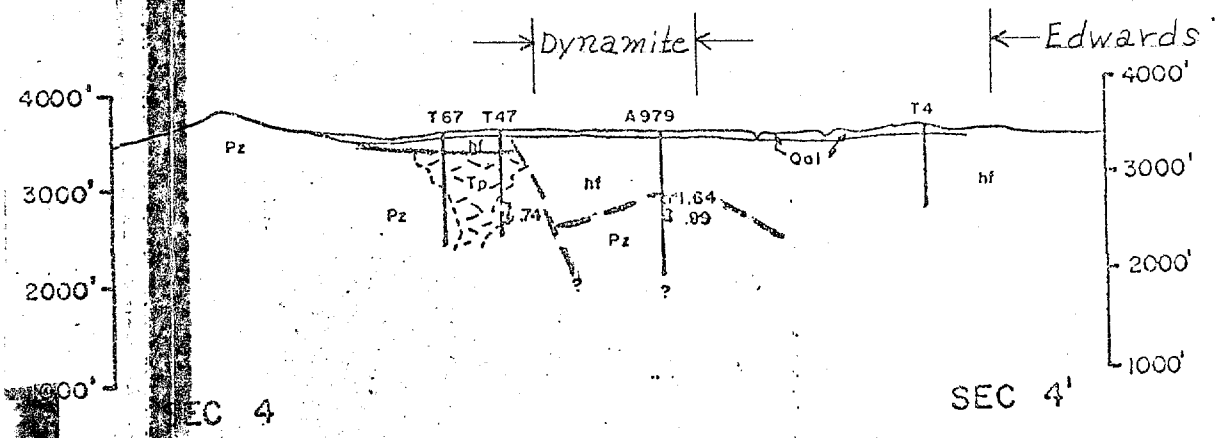
EDWARDS PROSPECT

Twin Buttes - Pima District

Arizona

to accompany Report by Kenyon Richard



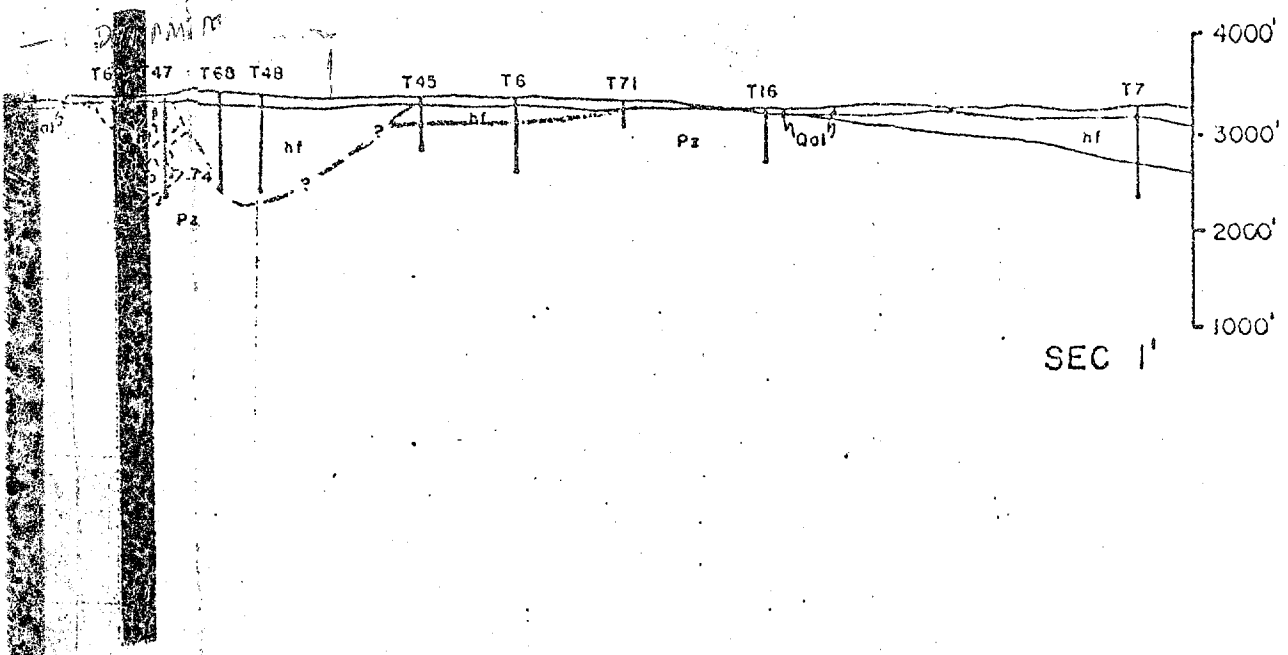


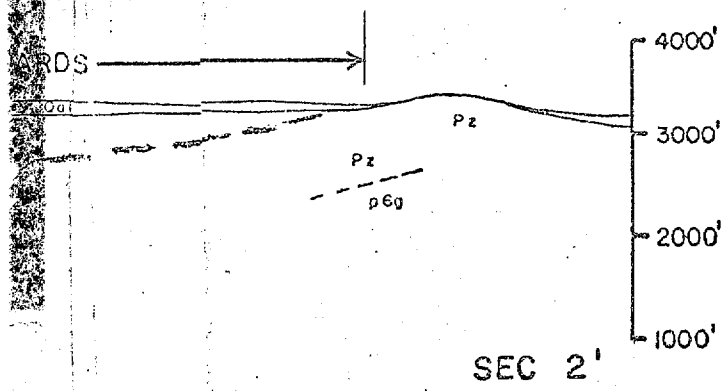
EDWARDS PROSPECT

Twin Buttes - Pima District

Arizona

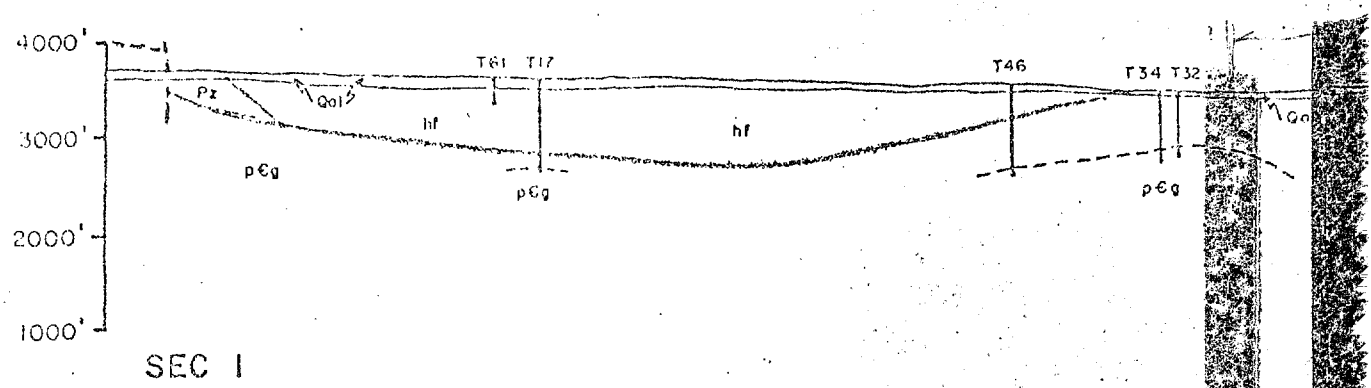
to accompany Report by Kenyon Richard January 1969



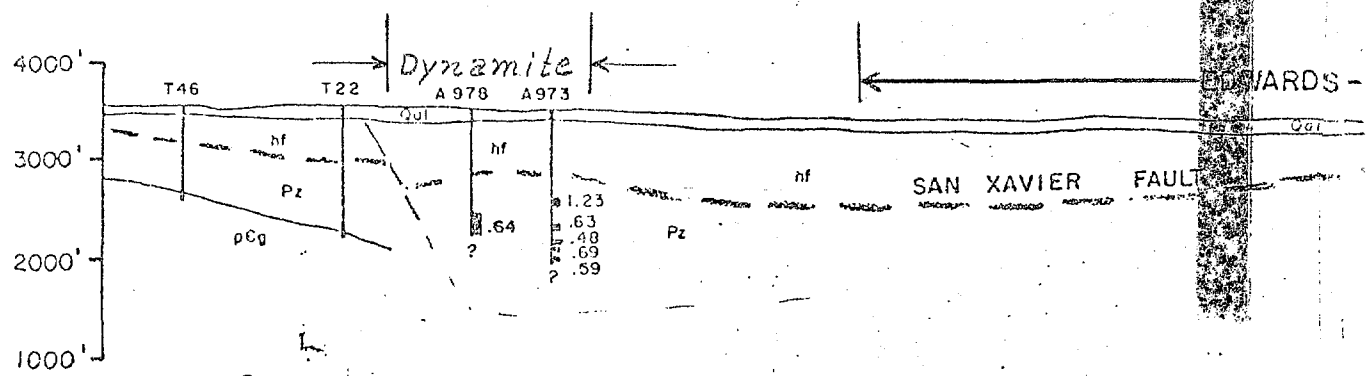


SCALE: 1" = 2000'

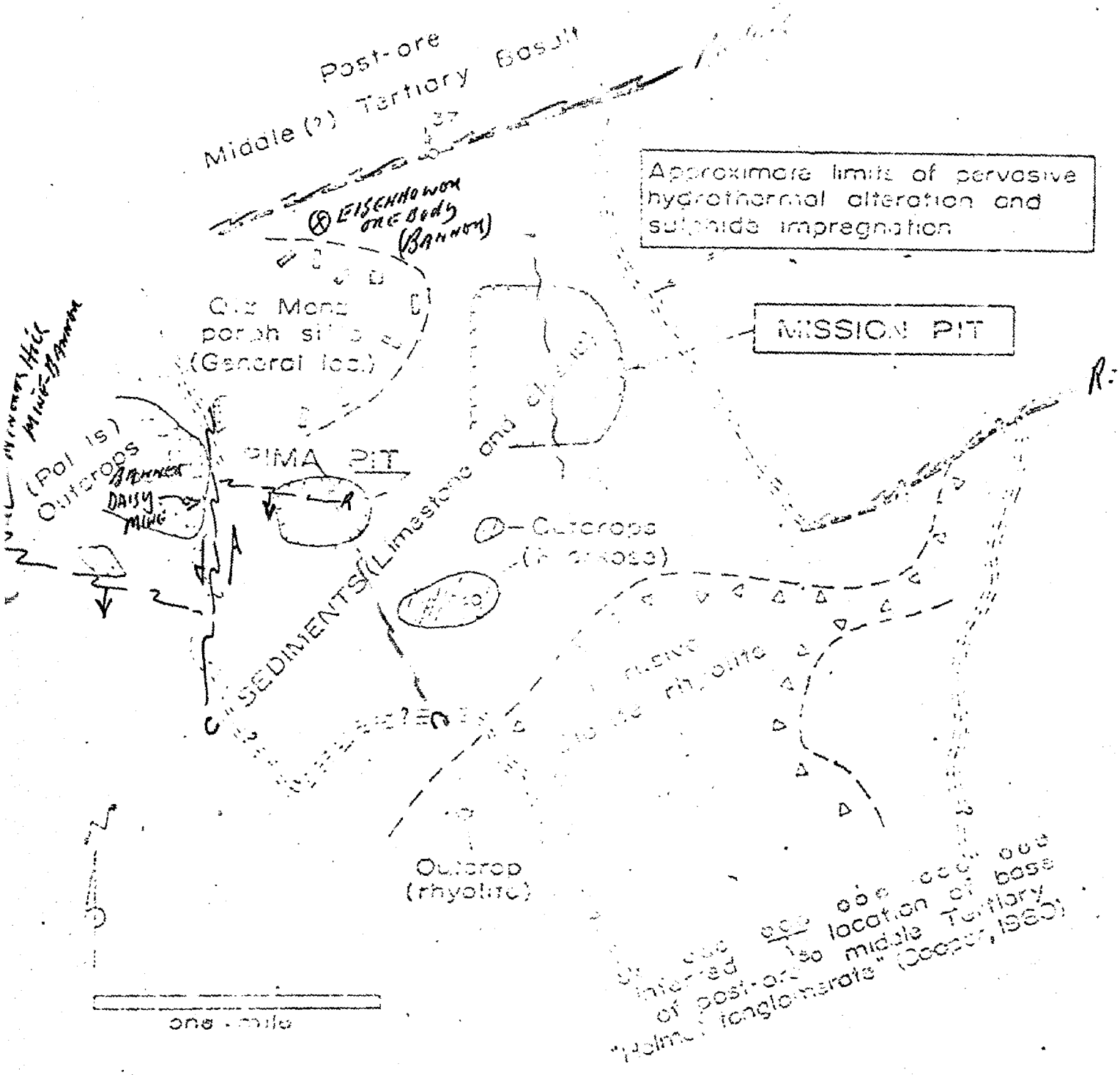
0 2000 4000 feet


4000'
3000'
2000'
1000'
T61
T17
T46
T34
T32
Pz
Qal
hf
pЄg

SEC 1


4000'
3000'
2000'
1000'
Dynamite
T46
T22
A 978
A973
Qal
hf
Pz
pЄg
.64
1.23
.63
.48
.69
.59
SAN XAVIER FAULT

SEC 2



GENERALIZED MAP SHOWING DISTRIBUTION OF SEDIMENTS, IGNEOUS ROCKS AND ALTERATION BENEATH THE ALLUVIAL PLAIN AS KNOWN THROUGH DRILL DATA

F[illegible] J.E. Kinnison

TWIN BUTTES AREA
BASEMENT TYPE
MINERALIZATION
(I) TWIN BUTTES PIT
AT DEPTH - BROWN
REPLACEMENT ORE IN
LIMEST AND CLASTICS (ARKOSES)

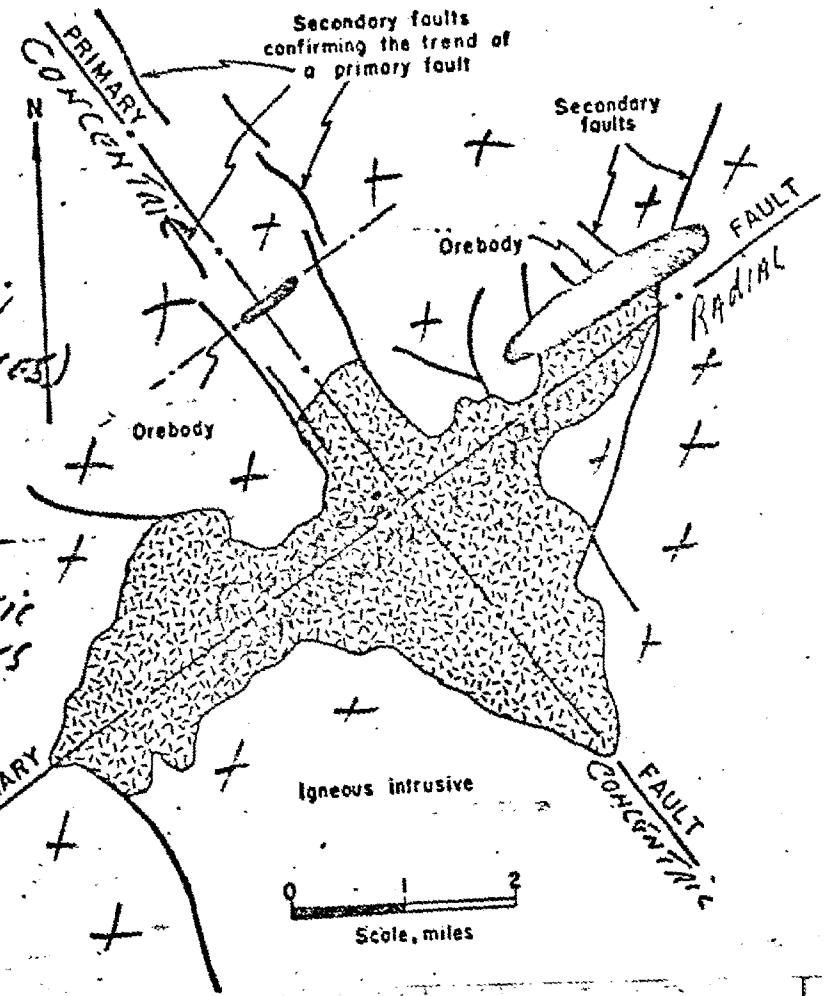


Fig. 3 — Inference of primary faults through elongation of intrusives.

(II) NUVAL MINES GRANITIC
ORE = 100% BASEMENT ROCKS
1. SIERRITA MINE
2. ESPERANZA MINE

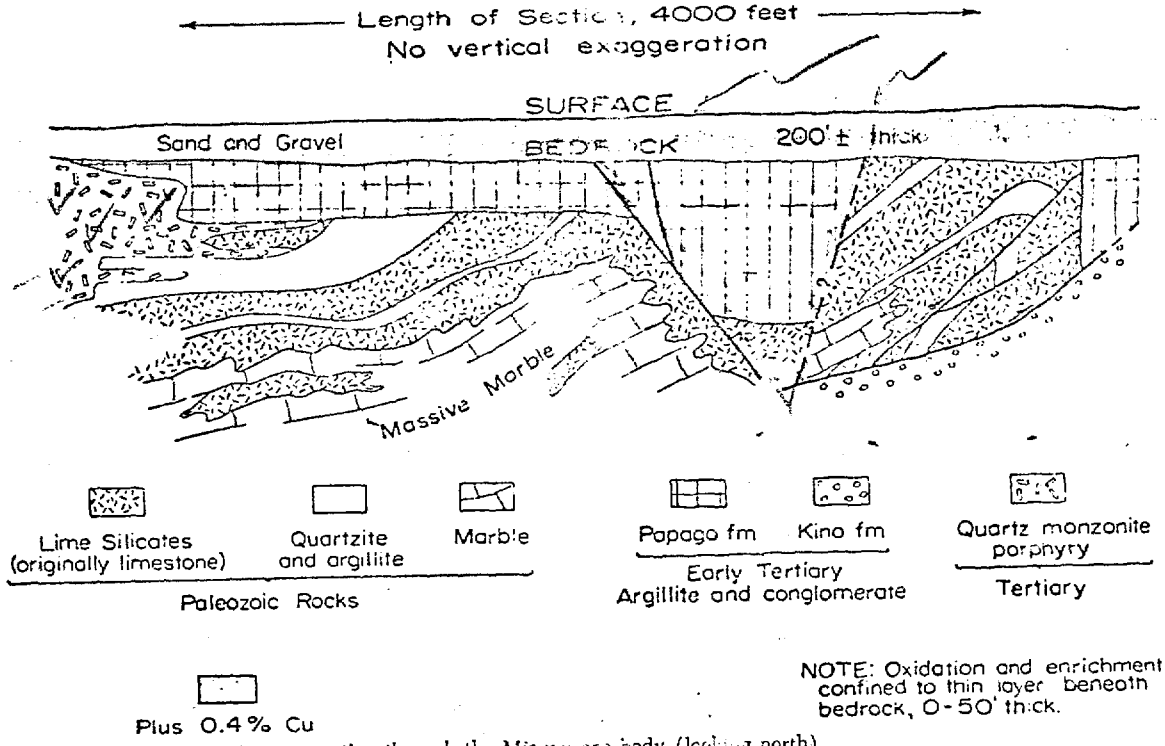


FIGURE 5.—Diagrammatic cross section through the Mission ore body (looking north).

small discrete grains, in thin irregular veinlets, in narrow replacement fissures, and as large pods of massive sulfides that locally assay 5 to 15 percent Cu.

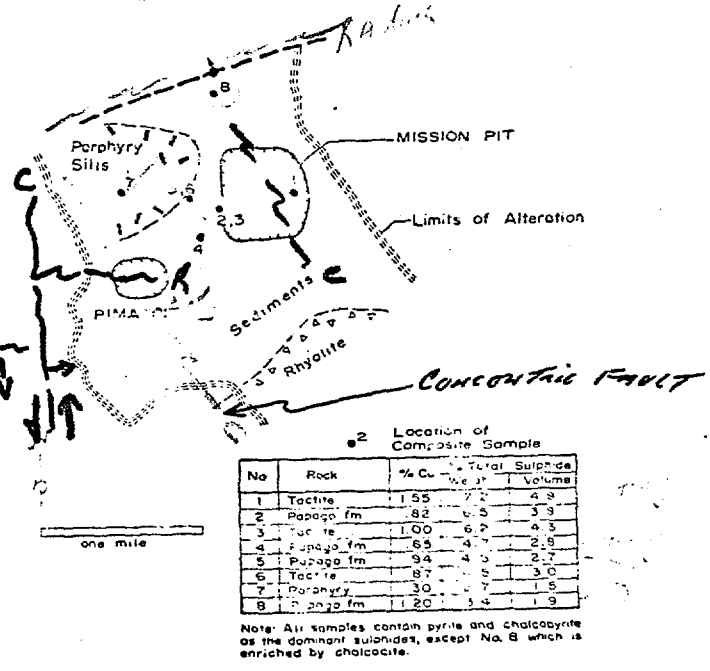
The hornfels type commonly is composed of a variable hard-to-soft, white fine-grained aggregate, which in thin section proves to be equigranular diopside with variable amounts of calcite (as much as 20 percent). A variation is a hard greenish variety, which in thin section is seen to be composed of stubby prismatic crystals of diopside. The refractive indices of the white granular variety are slightly higher than those of pure diopside, and the prismatic crystals range about midway between the indices of hedenbergite and those of diopside. Thus, iron metasomatism is obviously a major factor in the formation of both the hornfels and the andradite-tactite previously described.

In the western part of the ore body a characteristic feature of the hornfels is the presence of small veinlets of blue-green actinolite, commonly 1/16 to 1 inch wide, but not everywhere, having a medially disposed stringer of pyrite and chalcopyrite. The actinolite commonly is altered slightly to chlorite. Sulfides are distributed in the hornfels in the same manner as in tactite.

As a group, the limy rocks—tactite and hornfels—constitute the main source of copper and have a higher average grade than ore in argillite, which is the second principal copper host rock.

Sulfide Impregnation

Hypogene sulfide mineralization is, from an economic viewpoint, the most important change or altera-



No	Rock	% Cu	% Total Sulfide Weight	% Total Sulfide Volume
1	Tactite	1.55	[illegible]	4.9
2	Papago fm	.82	[illegible]	3.9
3	Tactite	1.00	6.7	4.3
4	Papago fm	.65	4.7	2.8
5	Papago fm	.94	4.0	2.7
6	Tactite	.87	[illegible]	3.0
7	Porphyry	.30	[illegible]	1.5
8	Papago fm	1.20	5.4	1.9

Note: All samples contain pyrite and chalcopyrite as the dominant sulfides, except No. 8 which is enriched by chalcocite.

FIGURE 6.—Total sulfide content, Mission mine.

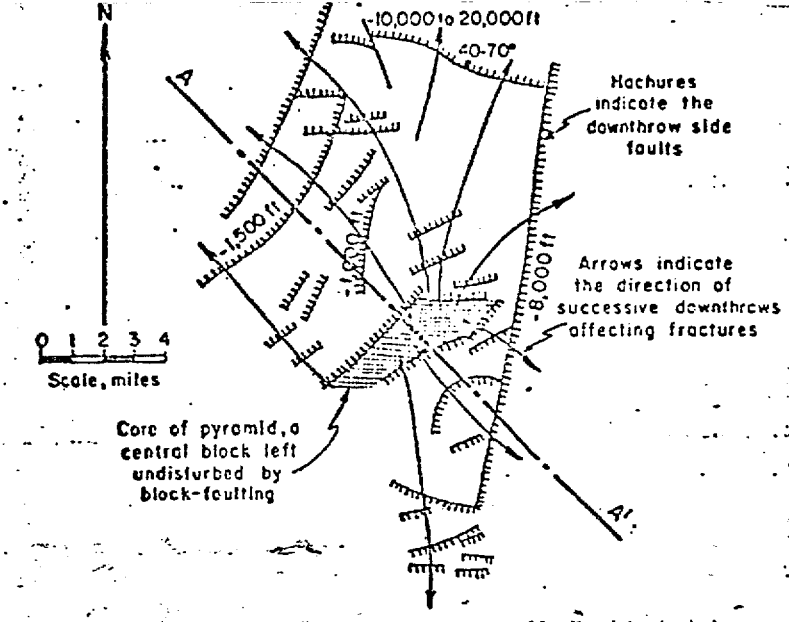
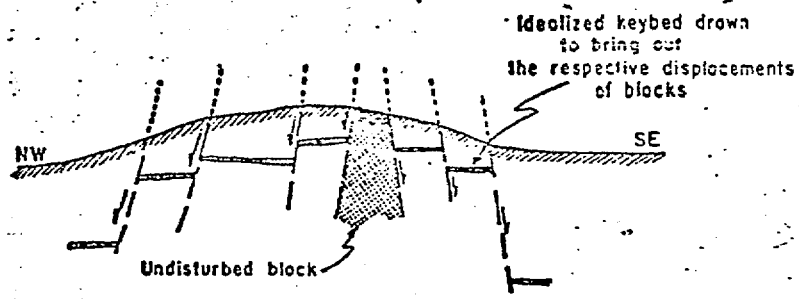
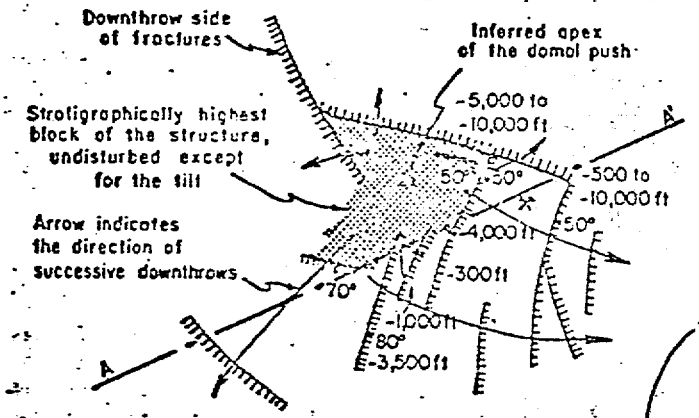


Fig. 6 — Typical pyramid pattern, result of block-faulting.





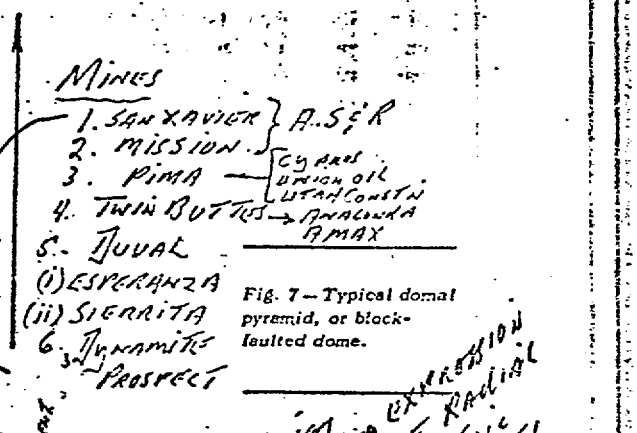
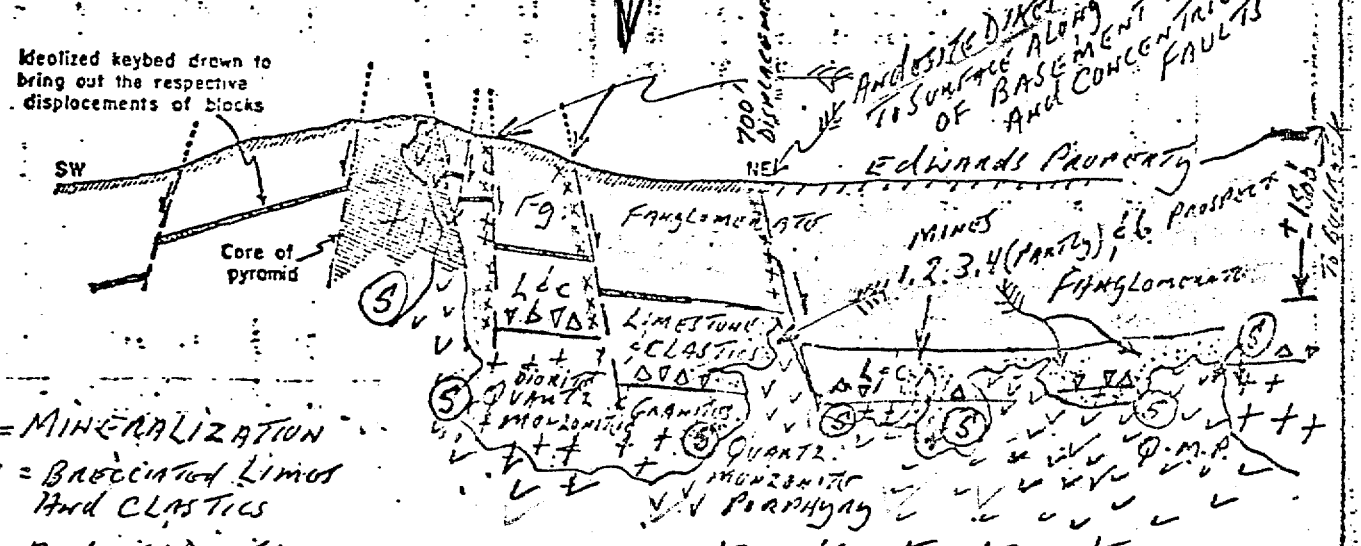


Fig. 7 — Typical domal pyramid, or block-faulted dome.



LOGS, EDWARDS CLAIMS
Summarized from Anaconda detailed logs

Hole No.

D106 1331' Banner hole NW/NW 17 No log
281-283.5 0.51 % Cu fng(?)

D273 1192' on map, log 757.5' All fng, SW/SW16 1961
Ann Sullinger #31 claim

421 925' NE/NW 28
0-681 all
-808 ls, some qte, slt, sandy slt
-833 EOH 1/11/65 Broken zone in qte
-925 lt gry qte, feldspathic (hole re-entered)

424 750' 1/23/65 all fng SE/NE 20

442 479' 3/11/65 SE/SE 20
-470 fng
-474 ?
-479 gar seds .02% Cu (visible $CuFeS_2$)

443 1500' 3/3/65 SW/NE 20
-245 all
-1500 EOH 4/16/65 fng

444 1526' EOH 4/20/65 all fng ~~(not on map)~~

446 331' EOH 5/3/65 all fng SW/SE 13

450 817' EOH 7/22/65 all fng SE/SE 13

467 695' SE/NW 21
-340 br fng(?)
-695 EOH 6/27/66 drk & lgt gry ls, lgt yel brn ls, silty ss, sandy ls to limey ss, buf gry ls, slt, etc.
(no mention of skarn)

483 869' Fan group NE/SW 19
-215 fng
-329 ls bx
-378 gar & alt ls, calc sil argl, Cu Ox, Cu_2S, bx
-484 ls fng, minor to mod CuOx, some Cu_2S (?)
-869 Gar seds, mnz
776-780 dike, prob QMP w/aph grdms
-946 EOH fng

Mnz:	325-378	av .8-1.0% Cu
	481-515	" " "
	569-603	" .75
	661-681	" .5
	841-869	" .5

491 727' SE/NW 21
-435 sand & gravel
-727 EOH 4/6/67 silty sandy ls, slt, etc (no mention of skarn)

Logs, Edwards Claims (cont'd)

534 957' all fng 12/19/64 SE/NE 17

535 1010' CDH 8/24/64 NW/NW 18
-485 fng (?)
-1010 EOH cong (fng ?) 12/14/64

582 755' all fng 3/31/66 NE/SE 18

971 1504' all fng NW/SE 19

975 1246' just N of Dynamite SW/SE ~~(or SE/SE)~~ 19
-309 fng
-688 gar & sil ls & slt, loc qtz & chdny stringers, Cu_2S & $CuFes_2$
-812 QMP shattered & alt FeS_2 grt than $CuFeS_2$ & MoS_2
-1246 EOH fng

Mnz: (av approx)	309-378	.8%Cu	
	378-344	.18	
	444-485	.75	(485-581 poor core recov)
	548-560	.35	
	568-574	.75	
	574-614	.18	
	643-695	.7	

976 1500' SE/SE 19
-138 all
-492.5 frag bx cng of sil gar ls, some CuOx cement, some chdny & qtz masses & seams
-1500 fng

977 723.5' SW/SE 19
-230 all & fng
-322 ls cng
-387 ls bx to cng
-696 qtz gar ls, limey slt, slt
-709 QM (?) mod to stg alt, weak $CuFeS_2$, trace MoS_2
-710 (?) fng feldspathic qte, trace $CuFeS_2$
-723.5 fng

mnz: (approx av)	393-403	.25% Cu
	567-642	.5
	713-723.5	.25

980 1434' Fan Group all fng occ 6" of .3 - .6% Cu NW/SE 19

981 2111' 700' SE of 980 SE/SE 19
-2050 fng
-2053 broken QMP, weak $CuFeS_2$
-2073 gar seds
-2111 QM loc porph, trace FeS_2 & $CuFeS_2$ on stringers
mnz: 2053-2055 8.5% Cu gar, near mass $CuFeS_2$
2055-2061 .3

984 860' SW/SE 19
-181 all & fng pyroclastics, sil & alt ls, some CuOx
-255 ls cng, some gar
-508 gar sil ls, sil limey slt, qte, alt slt
-702 QM part porph, strongly alt, broken, loc chl
-860 fng
mnz: 255-311 .3% Cu 356-453 .6% Cu 508-702 QM [illegible]

997 1363' near Twin Buttes Rd., just NW of SW cor Dynamite
-313 fng
-1242 meta alt seds
-1265 QMP strong K spar flooding, lack of S except 1244-1247
-1363 EOH QM looks more like "granodiorite" bio in descrete bks, not strongly alt
mnz: approx av 386-390 2.13% Cu
400-420 .5
499-520 .4
530-540 .5

1030 547' just SE of SW cor Dynamite
-119 caliche cng
-199 QM P(?) str alt
-205 slt, serp
-396 QM P(?) str alt, broken
-444 alt slt & ls
-485 QM P(?) alt
-547 seds, some serp, many slips (EOH)
mnz: 199-205 .35% Cu
407-416 .8

1032 1275' W of W side Dynamite
-779 cng & fng
-802 alt ls
-822.5 alt QMP (?)
-1247 ls & dol, some argl, all alt
-1258 QM P(?)
-1260 argl
-1275 EOH QM P(?) looks like Cooper's granodiorite
mnz: 822.5-868 av approx 1% Cu

1039 752' 200' E of 1030, 300' E of SW cor Dynamite
-125 QM P(?) str alt (-120 fng)
-142 silty ls, str alt
-373 QM P(?) str alt
-390 gar silty ls
-395 QMP str alt
-3[illegible] gar silty ls
-4[illegible]5 QMP str alt
-448 silty ls
-484 fault zone
-618 serp ls
-737 QMP str alt, bx
-752 EOH serp ls 9/9/66
mnz: approx av 118-142 .6% Cu
373-399 .5
419-448 .4

1091 800' Fan #5 ~~SW/SE~~ SE/SW 19
-522 cng &fng
-722 alt blue gry ls w/some qte
-800 EOH fng
mnz; 523-572 .13% Cu 640-703 2.10% Cu
572-602 .26 (602-703 1.49)
602-640 .48 703-722 .10

Logs, Edwards Claims (cont'd)

1107 760' all fng Helmet Pk. NE/NW 18

1136 402' all fng(?) CDH Helmet PK. Monday #4 10/26/68 NW/NW 18

1174 1064' Helmet Pk. Ann Sullinger #15 SW/NW 18
-372 cuttings "washed"
340-372 arkose (br at 340)
-717 EOH fng
-891 and porph, Turkey Track
-917 fng
-1064 EOH 1/12/74 gr & shc mafic. Notes: Mafic intruded by lt col equi grn granite, gen chl & kaol, some close to QM less alt

1183 2514' Tues #6 N of Edwards NE/NE 18
-79 all(?)
-215 Turkey Track and
~~-1499 fng~~
-1706 EOH fng
-1835 fng
2514 EOH bio rhy tuff

1200 513' NE/NW 21
-386 fng
-461 ls & mixed ls-qte bx
-513 EOH 4/28/68 gr, somewhat alt milky felds & pink K spar w/patchy and/or flakes chl & bio, some FeOx & Fe_3O_4 some bx & rehealing

1202 1594' Elizabeth mine SE/NW 24
-1227 fng
-1266 frags ls, qte,gar ark qte in silty sandy matrix
-1442 mixed ark qte, slt
1415-1424 qtzose limey stringers to near massive FeS_2 w/scat PbS & ZnS mixed w/ FeOx
-1451 clastic tuff frags, reworked
-1502 fng(?) qte bx
-1548 fng, mixture ls & qte bx
-1594 EOH 7/23/68 fng (1502 EOH 6/24/68)
mnz: 1230-1239 .14- .56% Cu
1365- 1366.5 .25% Cu .68% Zn .31% Pb
1415-1424 little Cu .21% Zn .21% Pb

1204 915' SW/SW 19
-691 fng
-843 ls
sharp contact
-915 fng EOH 8/14/68
mnz: 251- 261 .20% Cu 721-829 .13% Cu 829-843 1.13% Cu

1235 975' All fng 4/1/70 NE/NE 30 near sec cor (out of numerical order)
950-975 some ls frags show gar & FeOx

1207 1259' all fng 9/9/68 SW/SW 19 1060-1065 .37% Cu

Logs, Edwards Claims (cont'd)

1208 1572' CWT group Midland #6 SE/SE 24
-1262 fng
-1331 serp alt ls
-1512 crs xl pinkish ls
-1572 EOH 10/11/68 strg alt grd, somewhat bx & rehealed, bio to chl, abundant pink K spar, trace S

1209 1363' CWT group Midland #6 SE/SE 24
-936 fng
-1190 pinkish crs xl ls
-1296 serp alt silty ls
-1363 EOH 11/6/68 alt grd , trace Fe_3O_4, trace to nil S

1210 1760' CWT group Midland #26 NE/SE 24
-805 fng
-848 bio porph pyritic and
-1617 fng
-1696 ark & ark qte
-1708 fault zone
-1760 EOH 12/20/68 strg alt gr or grd, bx destroyed text

1218 1015' Emmons #17 NW/NW 21
-831 fng
-858 blu gry ls
-952 slt, 952 strg bx crushing
-985 qte
-1015 ls

1219 915' Fan #3 SW/SW 19
-523 fng
-708 blu gry ls, bx to frgmtl bx (?), fng(?)
-816 EOH 3/11/72 gar & minor calc sil argl; loc mod to strg $CuFeS_2$, FeS_2, sctrd ZnS, PbS, MoS_2
-915 EOH 8/5/72 as above
mnz: 708-713 5.36% Cu 713-862 .16% Cu
724-734 .4 862-915 .97
774-779 .73 also other spots mnz

1235 (see page 4)

1242 1125' Venus #5 NE/NE 30
-889 fng
-1064 ls fng, increase ls skarn w/depth, some qte & clastics
979-994 skarn frgs Cu_2S, Cu_2O, Cu
-1125 EOH 2/21/72 red gng
mnz: 981-1004 .69% Cu

1259 650' all fng 358-650 wk to loc fair CuOx E side sec 20 near ¼ cor

1308 631' SE/SW 21
4-197 gry ls, some change
-500 md to dk gry fossil ls, lower 116' cherty
-594 dk to lt gry fossil ls , some sandy
-631 EOH ss to qte