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REPORT ON
THE MAGMA CHIEF AREA
NEAR SUPERIOR, ARIZONA

E.N. PENNEBAKER Feb. 11, 1954.

E. N. PENNEBAKER
CONSULTING GEOLOGIST
SCOTTSDALE, ARIZONA

February 10, 1954

Mr. Russell A. Wright
Wright Associates
614 Heard Building
Phoenix, Arizona

Dear Mr. Wright:

Enclosed are two copies of my report on the Magma Chief area near Superior, Arizona.

I am also enclosing my statement in duplicate.

With kind regards,

Yours sincerely

E. N. Pennebaker

ENP:mc
encl.

To Do At Magma TAKE LAMP

① See if "Main Fault" turns north along Troy-Mescal contact to serve as a "roof structure" on the west (and as a feeding N-S shear). Note that the Mescal basalt is missing along this contact here & might have been cut out by a strike fault. Flt should dip steeply W. & show some mineralization.

② Look for an East-dipping bedding fault in the Troy (mineralized)

Shaft "A"

In Db on far W.

±24" Bleached Db with Mn Spots & flubby limonite patches at surface about 6' wide in shaft, which is ±40' deep.

Strike ± E-W

Speck of Cpy Bwk ✓

Minor drusy qtz

To W. enters qtzb & shows 10'-12' broken rk with some FeO & MnO

#4 Corner
Magnet 3778

#3 Corner
New East/Kornsilver
3778
on Mesal-Tray contact
at "B"

June 4, 1956

Mr. Russell A. Wright
c/o Wright Associates
384 No. Second Avenue
Phoenix, Arizona

Dear Mr. Wright:

I expected to hear from you around May 15 with regard to assessment drilling near Superior, but apparently we have missed connections.

I have been unexpectedly called upon to make a hurried trip to Australia, leaving Phoenix on June 5, and I sincerely regret that I shall be unable to help you in choosing a drill hole site for the current year's assessment work.

With kindest regards, I remain

Yours very truly

E. N. Pennebaker

ENP:mc

ALPINE
2-8614

NEW YORK ARIZONA DEVELOPMENT CORP.

HEARD
BUILDING

PHOENIX, ARIZONA

February 12, 1954

Mr. E. N. Pennebaker
Consulting Geologist
P. O. Box 817
Scottsdale, Arizona

Dear Mr. Pennebaker:

This will acknowledge receipt of your report on the Magma Chief area, and needless to say, I was very pleased with the thorough manner in which you covered the subject and expressed your thoughts on its unfavorable, as well as favorable, aspects.

Enclosed is our check in the amount of $200.00 to cover your fee, as billed.

I will, as a matter of interest, keep you informed on our activities in this area.

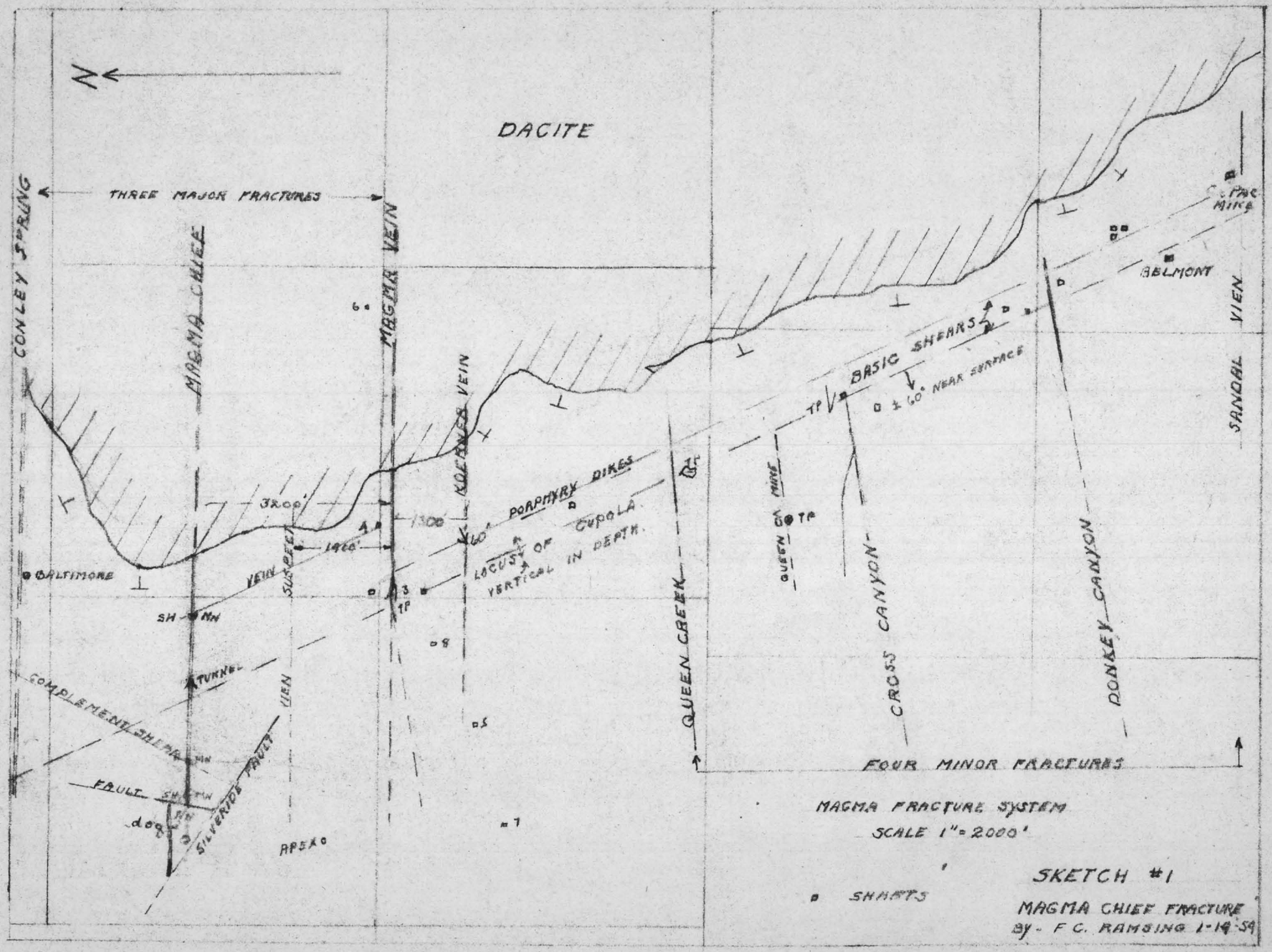
Very truly yours,

Russell Wright

Russell A. Wright

RAW:mb
Encl.

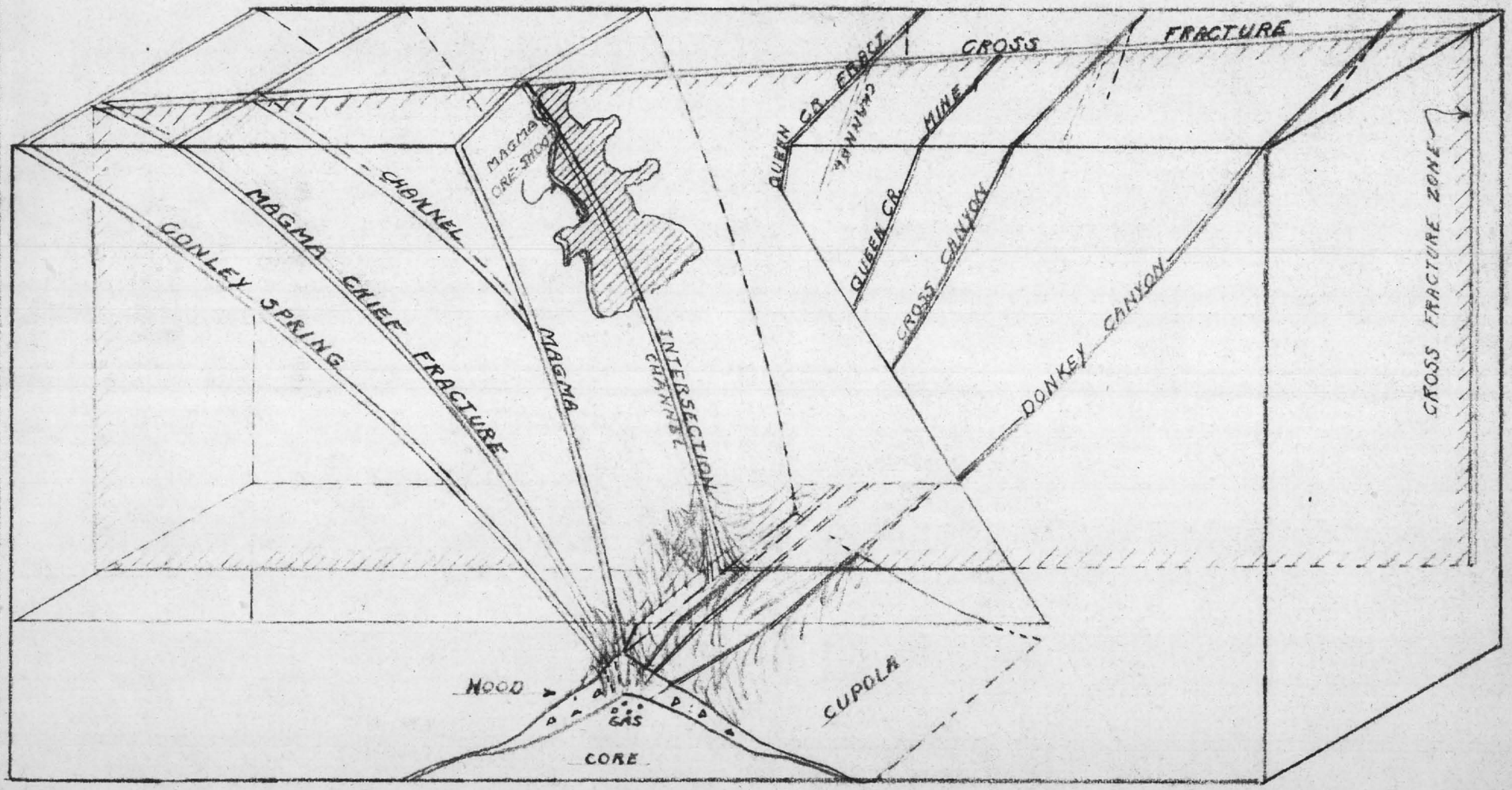
RECEIVED
FEB 13 1954
E. N. PENNEBAKER


N
DACITE
THREE MAJOR FRACTURES
CONLEY SPRING
MAGMA CHIEF
MAGMA VEIN
KOEHLER VEIN
3200'
1300
1460'
60' PORPHYRY DIKES
LOCUS OF CUPOLA VERTICAL IN DEPTH.
BASIC SHEARS
± 60° NEAR SURFACE
TP
BALTIMORE
SH
MN
VEIN SURFACE
TUNNEL
COMPLEMENT SHEAR
FAULT
SILVERIDE FAULT
VEIN
APEX
QUEEN CREEK
QUEEN CA
MINE
CROSS CANYON
DONKEY CANYON
ABLMONT
SANDAL VIEN
FAC MINE
FOUR MINOR FRACTURES
SHAFTS
MAGMA FRACTURE SYSTEM
SCALE 1" = 2000'
SKETCH #1
MAGMA CHIEF FRACTURE
BY - F.C. RAMSING 1-14-59

SKETCH #2

IDEAL CUPOLA

SHOWING PARALLEL FRACTURE SYSTEM INTERSECTED BY A CROSS-FRACTURE ZONE FORMING CHANNELS FOR PORPHYRY AND ORE SOLUTIONS. MAGMA ORE SHOOT SHOWN.



BLOCK PATTERN

MAGMA CHIEF FRACTURE
BY F.C. RAMSING 1-19-54.

REPORT ON
THE MAGMA CHIEF AREA
NEAR SUPERIOR, ARIZONA

INTRODUCTION

On February 2, 1954, the writer examined the Magma Chief fracture and its westerly extension in company with Mr. Russell A. Wright. The area of interest is situated about 3,500 feet northerly from the surface outcrop of the productive Magma fault fissure in the Pioneer mining district near Superior, Pinal County, Arizona.

The purpose of the examination was to evaluate the ore-bearing possibilities at depth of the Magma Chief fault. It is well-known that the Magma fault has been richly productive of copper, silver, and zinc at moderate depth beneath croppings that were of rather mediocre quality. Because of certain similarities, the Magma Chief fault, which is lightly mineralized at the surface, has attracted attention, and it is the purpose of this memorandum to point out the similarities and differences of these two pre-mineral fissures in order to arrive at the possibilities of the Magma Chief.

It will be assumed that the reader is familiar with the general geology of the Superior area and has before him a copy of the geologic map (Plate I) from the Arizona Bureau of Mines Geological Series No. 16, Bulletin No. 151 (1943) and a copy of the longitudinal section of the Magma vein as

portrayed on Plate II from the same publication.

During the course of the examination the Magma-Apex portion of the property was not studied, and this area is not discussed here.

PATTERN OF GEOLOGY AND MINERALIZATION AT THE MAGMA MINE

The ore shoots of the Magma mine occur along and near portions of the Magma fault, which was a fissure already in existence when the ore-forming solutions were active. The Magma fault strikes about due east and has vigorously and substantially moved the beds of Martin limestone and other formations where it cuts them near the mine. Into this fault has been injected a dike of igneous rock (the so-called "porphyry").

Referring to Plate II, which gives a longitudinal picture of the vein and the ore shoots arranged along its north wall, it will be seen that most of the ore bodies are deeply buried and that very little of the ore reached the surface. In fact, most of the ore occurs beneath a structural "roof" whose ridge runs north-south near the outcropping west edge of the Martin limestone. The east slope of the "roof" is not far below the base of the Martin limestone and in part appears to be influenced by a bedding fault in the Troy quartzite. The steep west slope of the "roof" is approximately the path of the Main fault system, but is more closely defined by parallel members called "A", "B", "C", and "D" faults. A limited amount of ore is found above and outside of the "roof",

but the great bulk is confined beneath it.

If the idea of a "roof structure" is correct, then we have a possible explanation for weak outcrops above and a strong ore zone below, with the "roof" having served to impound most but not all of the ore-forming solutions beneath it. A somewhat dubious point is the actual age of the Main fault. It is commonly held to be a young, post-mineral fault that cuts the ore, which implies that it was not in existence early enough to have served as a "roof structure". On the other hand, the authors of Bulletin 151 hint that the Main fault and parallel faults "A", "B", "C", and "D" may actually be pre-mineral in age, and Plate II strongly suggests this possibility. It is the writer's experience that such controversial faults were generally formed prior to mineralization, but later, post-mineral movement has also followed along them.

Diabase constitutes the wall rock along the most productive parts of the vein. Some ore also follows beds of Martin limestone in the eastern part of the Magma mine.

The porphyry injected along the Magma fault near the surface may be interpreted as a favorable indication because of the common association of abundant copper mineralization with similar porphyries in the Miami-Inspiration ore zone about 13 miles to the northeast. Here the trend followed by such porphyries is east-northeast.

What the writer believes to be the significant associates of the Magma ore zone are summarized as follows:

1. East-west fault fissure with substantial throw (which implies that it may knife down deeply to receive mineralizing solutions.

2. Porphyry injected in the fissure, which demonstrates a connection with an igneous source.
3. A "roof structure" provided by bedding and premineral faults to confine the ore-forming solutions.
4. Diabase injected at a high stratigraphic horizon (that of the Troy quartzite), which gives an extensive distribution to the favored wall rock <u>within</u> the productive "roof structure".
5. Leakage of mineralization exposed by erosion along the east-west fault fissure which proves the activity of mineralizing solutions.

PATTERN OF GEOLOGY AND MINERALIZATION IN THE MAGMA CHIEF AREA

The east-west Magma Chief fault substantially offsets the Mescal limestone, but a short distance to the east it has apparently died out and there is no offset of the overlying Martin limestone. Along the westerly extension of the fault, bedrock is partly obscured by soil and slide-rock; however, intermittent exposures reveal steep east-striking fractures in diabase and quartzite that may be the extension of the Magma Chief fault. These exposures give a possible known strike length of about 3,000 feet, and in places the broken zone is of substantial width. It is a reasonable assumption that the so-called "Magnet vein" forms the westerly extension of the Magma Chief vein, but it would require very detailed mapping and considerable trenching to prove this point.

There is no evidence of any porphyry injected into the Magma Chief fault.

As regards the presence of a favorable "roof structure" in this area, it is quite possible that there might be an east-dipping bedding fault near or below the base of the Martin limestone that is concealed from view. With respect to the west side of the "roof", the behavior of the Main fault going north is of critical importance. As mapped on Plate I, it is shown swinging to the northwest and dying out about where it meets the Mescal limestone. An alternative interpretation would be that this fault bends somewhat to the east and defines the east contact of the Mescal, thereby continuing into the Magma Chief area. This important possibility was checked in the field, but no evidence of such behavior could be ascertained. On the contrary, the Main fault appears to turn to the northwest, as mapped, with its northwesterly extension marked by fractures that strike northwest but carry little or no movement.

If there is a fault structure that might serve as the west slope of a "roof", then it would have to be concealed in the Troy quartzite or beneath the Martin limestone. It is possible that structures defining the east and west slopes of such a "roof" might be found in the Magma Chief area, but there is no actual evidence of them and the possible existence of a favorable "roof structure" is entirely speculative.

Mineralization along and near the Magma Chief fault and its possible extensions consists of manganese oxides and small

and erratic amounts of precious metals. No bright-colored copper stains were noted, although the writer did identify a minute amount of so-called "chalcopyrite boxwork" (an oxidation product after the copper-iron sulphide, chalcopyrite). Manganese and the precious metals are commonly found in the outer fringes of copper-bearing zones, and the above-noted occurrences are somewhat favorable.

COMPARISON OF MAGMA AND MAGMA CHIEF AREAS

Of the five significant geological associates of the Magma ore zone, only two are known to exist in the Magma chief area. One of these (east-west faulting) is apparently somewhat weaker in the Magma Chief area. The leakage of mineralization also appears weaker. Furthermore, there is no evidence of an impounding "roof structure", although it is granted that such could exist.

All of these points do not necessarily deny the possibility of an ore body at depth, but they do make the search for it a very speculative undertaking.

PROPERTY-LINE SITUATION

I am advised that the area of interest consists of 54 unpatented mining claims and that this block of ground is rather closely flanked by claims belonging to Magma Copper Company.

As regards the Magma Chief tunnel area, Magma Copper

ground covers the Magma Chief tunnel and to the east in an area that would constitute the peak and east slope of the "roof" if such a "roof structure" did exist. Consequently the ground that we are now evaluating occupies an inferior position, because deeper prospecting would be required on the west flank to pierce any possible "roof".

CONCLUSIONS

There is a definite fissure in the Magma Chief area that exhibits light mineralization, and there is a reasonable assumption that this fault fissure is fairly continuous in strike for several thousand feet. The real problem is whether there will be a radical increase in mineralization to form commercial ore at depths that can be effectively and conclusively explored for a reasonable expenditure.

For such an improvement to occur, there must be a beneficial change in the geological environment with added depth. What might such a change be? In a foregoing section it was proposed that such a change at the Magma mine took place where exploration reached beneath a structural "roof". Unfortunately there is no evidence pointing to the existence of such a favorable feature in the Magma Chief area. In fact, if the Main fault swings northwesterly, as it is judged to do, the present erosion surface that we now see is actually below the "roof" and the weak mineralization already exposed is the average to be expected.

On the other hand, as previously pointed out, a favor-

able "roof" might be buried with little or no evidence of its existence. Unfortunately, if we wish to test this possibility the property line forces us to the west where deep drilling (over 1,000 feet) would be required.

It might well be argued that the Main fault is simply a post-mineral break and did not exist to function as a steep, impounding roof. In this case we might visualize the Magma ore zone as controlled by a broad set of pre-mineral fractures dipping west whose "outcrop" is buried beneath the Martin limestone, through which only a little mineralization leaked.

A repetition of the foregoing structural pattern (which is really only stating the "roof structure" idea in a somewhat different way) in the Magma Chief area would add to the promise of this ground, but its possibilities, as pointed out before, lie deep.

If another ore zone similar in form to the Magma zone does exist in the Magma Chief area, it appears that its shallower two-thirds would be in claims owned by Magma Copper Company.

It is concluded that exploration of the western part of the Magma Chief area would be very speculative, deep, and expensive, and favorable results would probably prove the shallower and more desirable ore, if such exists, to be to the east on Magma's side of the property line.

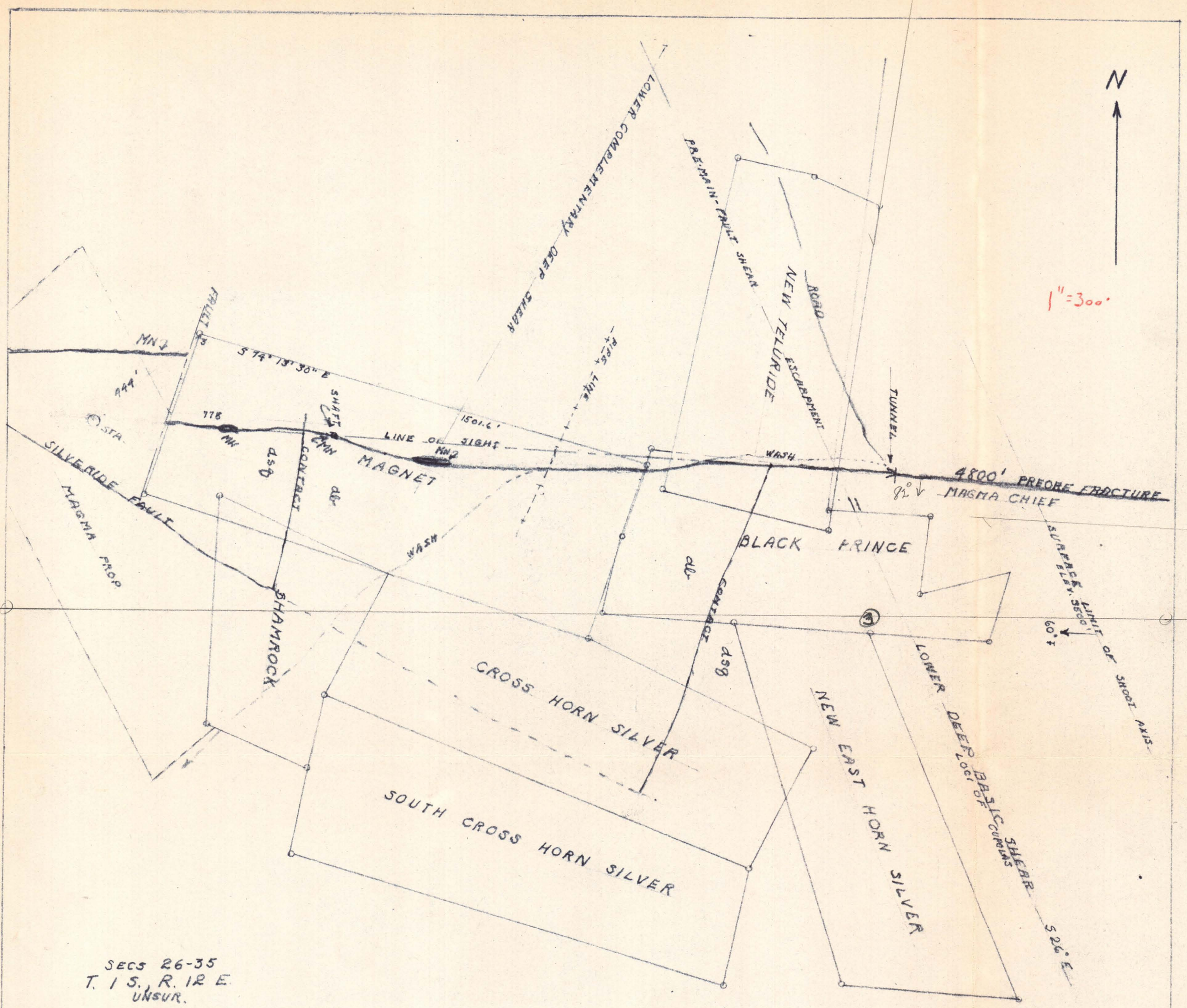
At this time, as regards the Magma Chief area, it would seem to be the more conservative policy to wait for Magma to explore first on its side of the line. Unfortunately this period

of waiting will be expensive because of the requirement for doing annual assessment work and the paying later on of minimum royalties. If this course is followed, the assessment work should be performed by diamond drilling, doing two years' work at a time over the end of the fiscal year and in carefully located deep holes.

E. N. Pennebaker

E. N. PENNEBAKER

Scottsdale, Arizona
February 11, 1954.



MAGMA APEX CO. CLAIMS ON MAGMA CHIEF FRACTURE