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Surface Map (Vulcan Mine)
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Photographs- Panoramic view looking East.
Vulcan Mine Vertical Shaft Headframe.

INTRODUCTION

As part of an initial program to establish Rayrock Mines Limited in Arizona, it was suggested by the author that the Vulcan Mine property, Pima Mining District, Pima County, Arizona be examined and reported upon. This suggestion was approved in writing in a September 7, 1960 letter; Mr. Walter E. Clarke to Richard E. Mieritz.

This property was suggested for three reasons, (1)-its past history as a small producer of high grade copper ores, either oxide or sulphides, (2)-the very excellent geologic conditions in which the claims lie and (3)-the favorable two exploration potentials- - a low grade disseminated deposit, or, high grade average width underground ore shoots.

The actual examination required four days field and travel time (September 19 thru 22nd) and included a plane table survey of surface geologic conditions, underground survey and geologic mapping where it was possible to examine same without hazardly taking chances where caving had occurred or timbers taking much weight. Succeeding pages contains the writers report on the Vulcan Mine Property.

CONCLUSIONS

RICHARD E. MIERITZ
CONSULTING MINING ENGINEER

PHOENIX, ARIZONA

As a result of the field examination completed by the writer, a study of the general structural and mineralization features of the district and a study of the Vulcan property itself, the following conclusions have been drawn:

- (1)- Structural, mineral and rock type geologic conditions enhanced within the Vulcan property are similar to prevailing conditions at other nearby mine operations (Banner, San Xavier, Pima)
- (2)- Development of property to date has been solely limited to a small area on a "minor" NE trending structure whereas the "major" structures in the district trend E-W.
- (3)- The Vulcan property exhibits E-W trending mineralized structures which warrant exploring.
- (4)- Because of similar geologic conditions present here as in the Pima operations, a favorable horizon may exist which could lend itself to low grade disseminated mineralization, and

- (5)- That expenditure of \$50,000 would be necessary to complete the recommended exploration program and initial property purchase payment.

PROPERTY and LOCATION

Owner of the Vulcan Mine property is Mr. Sherwood B. Owens, P. O. Box 769, Tucson, Arizona. Four patented claims, Vulcan Nos. 1 to 4 inclusive, total 73.40 acres and lie in the west half of section 2, T. 17 S., R. 12 E., Gila and Salt River Base and Meridian (G.S.R.B.M.) in the Pima Mining District, Pima County, Arizona.

Three claims lie N. 30° E. and one lies N. 84°-30' W. as shown on the included District Claim Map and Surface Map. The Vulcan claims are completely surrounded by the Banner property and the San Xavier property (now A. S. and R.). The Banner Mining Company is and has been for many years operating on the east-west mineralized zone near the Mineral Hill Shaft and the Daisy Shaft. San Xavier Mining Co. operated for many years on the east-west zone near the San Xavier Shaft (see District Geology Map). It is believed that Banner has located the ground west of the Vulcan group in as much as several claim corners had been found--overlapping into Vulcan ground to be sure of no fractions.

The Vulcan claims, located in 1897 to 1901, are all patented and carry mineral survey 1573. All patented claims overlapping or in conflict carry higher survey numbers and therefor the outline of the Vulcan claims remain full and as originally located and surveyed.

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ACCESSIBILITY and FACILITIES

PHOENIX, ARIZONA

Access to the property by car from Tucson, Arizona is over paved County Highway. From the center of Tucson (Congress and Stone Avenues), west on Congress (one way street) towards "A" Mountain, a well known land mark, to the North-South Freeway, after the underpass, left (south) on the Freeway 1.7 miles to South 12th Avenue; and easy right on So. 12th Ave. 1.3 miles to Ajo Road; right (west) on Ajo Road 1.6 miles to Mission Road and left (south) on Mission Road 16 miles to property. The property is on the west side of the road and identified by the single wood headframe on the Vertical Shaft. (see picture). Mill, Office and miscellaneous buildings as well as a water tank clearly mark the Banner operations east of the road.

As noted on the Surface Map, an electric power line to the Duval Sulphur Esperanza Pit operation passes over the southwest corner of the claims. The power supply of this transmission line no doubt is a three phase, 4400 volt system. Water could be a problem were much required for an operation, that is, mills, etc. The lowest level of the underground workings is dry, however, there was an air of dampness noted on this level, perhaps indicating the water table is not too distant in depth. Water can be found in the nearby valley fills or gravels.

Three mills will be operating in the area--Banner, Pima and A. S. & R.--with a total combined mill capacity of approximately 20,000 tons daily. Thus, any production from the Vulcan could be utilized by either of the three.

Natural gas is not available in the immediate vicinity but could be brought in if found necessary.

A very great majority of the employees of the three operating units live in Tucson or the surrounding smaller communities.

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HISTORY of PROPERTY

Location of Vulcan # 3 dates back to 1897 whereas the last of the group Vulcan # 2 was located in 1901. Patent was applied for, obtained and assigned Mineral Survey number 1573, an early number compared to Banners adjoining claims, 1649 and 3727.

The advent of World War I created increased activity. An early report states 6-7% copper ore was produced prior to 1917. American Smelting and Refining Company confirmed receiving at their smelter 3,554 tons of 4-5% copper ore during 1916-17. Records of Phelps-Dodge show that the following shipments were made to their Copper Queen Smelter at Douglas, Arizona.

	Tons	Ag	Cu	SiO	Al ₂ O ₃	Fe	CaO	S
1916 9 mos.	5,167	1.12	6.24	34.0	7.4	11.4	16.8	5.8
1917 11 mos.	3,262	1.56	7.80	31.4	6.8	13.3	16.1	7.2
1918 2 mos.	88	1.35	7.92	34.8	7.5	12.8	14.2	3.7
1916-17 A.S.R.	<u>3,554</u>		6-7%					
Total	12,071							

Stopping to close to No. 2 Shaft resulted in closing of the mine by the State Mine Inspector. In 1920 a 2-compartment vertical shaft was sunk 210 feet. No doubt some leaser work was done as a result of this sinking. The latter half of 1957 a Texas group expended funds to re-

pair timbers in vertical shaft to the bottom (210 feet), sank 2-compartments to 325 feet (305 Lv.), timbered to 325 feet and sank a one compartment (untimbered) to a 362 foot depth. The 305 Level was driven to the west and north to pass near the 285 foot level. A short raise at the end of the 68 foot advance broke through to the desired level. The target of this work was a presumed unmined ore shoot--according to rumors--which proved false. No additional work has occurred since. The vertical shaft is in excellent condition.

RICHARD E. MIERITZ
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PHOENIX, ARIZONA

DEVELOPMENT

The underground development consists of what is shown on the Underground Map. Except for the 305 Lv., credit for surveying of the workings must be given T. N. Stevens, Surveyor, Tucson, retired, who had revised this map in 1951 and brought it to date. Apparently some "leaser" work had been done prior to and after 1951. After 1951 is assumed because the revised map indicated stope "A" was only mined above the 220 level.

During the field work period, the writer personally examined the 180 Lv., the 175 Lv. to within 20 feet of # 2 Shaft, the 305 Lv., the 285 Lv. and up the raise towards the 220 Lv. (on a rope) to a point where the indicated stope begins.

Previous reports indicate there are five stopes above the 220 Lv. and one below. At this time the writer has not been able to locate such information on any available maps. Comparing dump volume and mined volume--the five stopes are highly possible.

Underground development of the mine followed no specific program as indicated by the various random directions of the drifts and crosscuts--more likely probing.

Surface-wise development is quite meager and widely spaced although mineralization, iron, copper or both, were visible in all such openings, cuts, trenches and shallow shafts.

DISTRICT HISTORY

The two major underground operations in the district prior to 1951 were the Banner and San Xavier Mines, producing copper ore from east-west structures. (see District Geology Map.

In 1951, United Geophysical Inc. prospected the Mineral Hill (Banner) Structure eastward using geophysics. Magnetic and electromagnetic anomalies coincided and further work disclosed a narrow zone of high grade sulphide copper ore with an oxide capping dipping about 45° south with the limestone bedding. Further work proved a halo of low grade chalcopyrite ore in the hanging wall. A. S. & R. followed suit and has since developed the Mission ore body as indicated. A "continuous ore deposit exists between the two present pits, or at least mineralization does. Their respective cutoffs would determine whether it is ore.

To date, only the northeast (minor) structures on the Vulcan have been slightly developed.

RICHARD E. MIERITZ
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GEOLOGY

Broadly, mineralization occurs in the Paleozoic (Cambrian to Permian) sedimentaries resting on an unconformable Pre-Cambrian granite and overlain initially by the Cretaceous Sedimentary-Volcanic complex with an unconformity between them.

A recent academic study and report advanced by the U. S. G. S. for the complex structural features of the entire Pima District has indicated an expansive low angle Thrust Fault (San Xavier) which had moved the Vulcan, Banner, Pima, San Xavier and A. S. & R. area to its present position from its original position some five and a half miles south. The same report indicates the thrust takes a trough like shape striking NNE and plunging the same direction. Thus, the full section of Paleozoic sediments may be present in the Vulcan-Banner-San Xavier area and which could rest on Pre-Cambrian granite or possibly granodiorite, an upper Cretaceous, lower Tertiary formation.

A. S. & R. has indicated intersecting granodiorite and quartz monzonite porphyry in their deep drilling at the Mission project, but invariably these formations are not strongly mineralized--relatively fresh.

The Banner, San Xavier and Vulcan area is structurally complex with several major and minor faults, which I am sure has controlled mineralization in the area. Much detailed geologic work would have to be completed in this respect. The preliminary examination of the geologic conditions however, definitely inspire and warrant a desire of exploration.

MINERALIZATION

The Banner and San Xavier Mines are both on east-west trending structures and were recognizable on the surface only by small or "blossom" like iron discoloration--brown to tan. Such staining is not common for the entire strike length of the mine, thus much mineralization is hidden in surface areas void of such staining.

Copper as oxides; malachite, chrysocolla and some azurite and sulphide as the primary mineral chalcopyrite occurs as lenticular bodies--almost pipe like--with the greater dimension along dip. Gangue minerals in the fissure zones--usually along the bedding--are quartz, calcite and iron oxide.

At the Vulcan Mine only two parallel closely spaced N. 30° E. zones (one of which outcropped as iron) have been explored by mining. Other parallel zones exist as exposed in the other cuts and shafts. Some east-west zones also exist by similar exposure but have not been explored, thus, potentials lie in these directions.

Low grade disseminated mineralization in the area (Pima and A.S.& R.) is found in the calcareous rocks, tactite and hornfels of the Paleozoic formations. Pimas high grade ore has made in a brown garnetized limestone with quartz stringers. This zone is overlain by a marblized limestone, altered (marble to clay) and underlain by a chloritic limestone. Similar conditions are exposed in the present limited workings of the Vulcan, particularly on the 175 level.(see Underground Map) Thus, possible low grade disseminated copper mineralization may exist within the confines of the Vulcan claims. Stratigraphically, the writer cannot at this time identify the position or particular beds within the Vulcan claims, however, a suspicion is held that the surface exposed beds are quite high in the series. It remains to be seen whether the underlying Pre-Cambrian granite is present in some higher position than considered normal thus, eliminating the lower portion of the Paleozoic sediments- or possibly productive beds. It is the writers thoughts that such does not exist--that is, the normal sequence and position is present--however, only future drilling will answer the question.

Banner Mining has carried on an extensive drilling program the past year and a half which has outlined disseminated ore bodies. Where these ore bodies are, I do not know. One I suspect is near the New Banner Shaft--an enlargement of the Mission ore body. The writer has

seen diamond drills in that area. Another may be south of the Mineral Hill Shaft since much drilling has occurred there also. It is not possible that an extension of the Pima pit westward might be the second ore body because mineralization in the Pima pit ends abruptly in this direction. Faulted? Perhaps, at least there is some structural feature controlling it.

Banner is presently drilling approximately 200 feet east of the east side line of Vulcan # 4 and approximately 140 feet north of the north side line of Vulcan # 2.

ORE RESERVES

Frankly, there are no ore reserves that can be considered as such. Some ore may be available around the existing stopes but it is of little consequence and would not warrant purchase of the property on that strength.

No samples were taken in the stopes or elsewhere because their results would mean little--previous shipments indicate the type and grade of ore that may exist.

EXPLORATION POSSIBILITIES

RICHARD E. MIERITZ
CONSULTING MINING ENGINEER

PHOENIX, ARIZONA

The value of the property lies in two directions, (1) the development of lowgrade disseminated copper ore body in some favorable zone within the Paleozoic sediments and (2) the development of high grade lenticular ore shoots confined to the NE and EW trending structural features known to exist and those which may possibly be hidden but may be recognized by some minute tell tale feature resulting from a more detailed surface mapping project.

It is the opinion of the writer that exploration in these two directions can best be done by surface churn or diamond drilling. Since the initial drilling is strictly exploratory, diamond drilling would be preferred because structural features are more discernable from the core and type of drilling and samples are less cumbersome to handle. Sludge samples need not be taken except in an ore zone or where core recovery has dropped below 60%. Rayrock may have their own standards in this respect.

EXPLORATION PROGRAM

To test target (1)-disseminated mineralization--three vertical holes are recommended. (see Surface Map). These holes are spaced 800 feet apart and designed to

intersect the greatest column of the Paleozoic sediments as possible near "major" east-west structures. Each hole, (Red Circles 1, 2, and 3) must be drilled to a depth of 600 feet, less only if granite has been penetrated for at least 70 feet. If results are encouraging, intermediate and westward located holes must be drilled. If holes 1 and 2 are not encouraging, hole 3 may or may not be drilled, optional. Unsatisfactory results would then require the program directed towards the second target--exploring for high grade lenticular NE and E-W ore shoots. Angle drill holes 4, 5, 6, 7, 8 and 9 should be drilled in that order to intersect structures at depth which are known to exist by exposure in cuts or pits on the surface. These holes should be drilled normal to the strike of the structures and at angles to penetrate the structures at a 250-275 foot depth. Sulphides appear to come in at a 200 foot depth. Hole depths would approximate 350 feet.

Actual location of holes would vary dependent on field conditions.

RICHARD E. MIERITZ
CONSULTING MINING ENGINEER

EXPLORATION COSTS

PHOENIX, ARIZONA

Depths of holes indicated may be on the "heavy" side. The nine holes would require approximately 3,900 feet of drilling. Drilling to the indicated depths and in these type formations--for better core recovery and less troublesome holes--I would recommend a BX and AX combination. For the deeper holes, perhaps 400 BX and 200 AX and a 150 and 200 foot combination for the shallower holes.

An established contractors price for drilling in this area is as follows:

	<u>BX</u>	<u>AX</u>
0 to 500 feet	\$5.20	\$4.90
500 to 750 feet	\$5.70	\$5.40

Extras, such as cementing, casing, etc can be estimated at \$2.00 per foot of drilling. Supervision, sampling, assaying, etc will perhaps average \$2.00 per foot drilled. For miscellaneous such as core boxes, construction of small office (core storage, etc) supervision travel expenses, about \$0.60 per foot.

Assuming an average of \$5.40 for actual drilling, plus the other extras, brings the estimated cost for drilling to \$10.00 per foot for the projected footage of 3,900, or \$40,000 for the complete exploration project as suggested.

A time element of approximately five months may be necessary for the complete project as outlined. During

the drilling of the first hole, a more comprehensive, detailed geologic mapping of the accessible underground workings should be completed. For safety reasons, three men would be required for a couple of days, two mapping and the third as a lookout. Some of the workings not mapped by the writer appeared a little "wild" to venture in by himself, during the preliminary examination.

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PROPERTY ACQUISITION

PHOENIX, ARIZONA

The terms of the property as dictated to Mr. Kostolnik and myself by the owner Mr. Sherwood B. Owens is as follows: Clear title to the property can be delivered upon payment of the end price of \$265,000.00.

Payment of the full end price are broken down and spread over an eighteen (18) year basis, most of which can be paid out of production at a 10% rate of the net smelter return. The amounts to be paid and the time element are as follows:

- (1)- A \$10,000 cash payment at the time of negotiation to purchase property and prior to exploration of the property.
- (2)- Payment of the next \$100,000 is due on or before December 15, 1963. Payable from production, monthly or yearly or on any terms agreeable between the parties.
- (3)- Payment of the next \$100,000 is due on or before December 15, 1973. Payable on terms similar to (2).
- (4)- Payment of the next \$55,000 on or before December 15, 1978. Payable on terms similar to item (2).
- (5)- Payments from production will not be less than 10% of the net smelter return.
- (6)- A \$50.00 per month ground rental must be paid unless \$500.00 per month is expended on the property.

The purchase price per claim may appear high, however it is analogous to a lot on a busy street and a similar lot on a back road. The potential of the property expressed in geologic terms is there. A mere million tons of 1% ore or two stopes of 5,000 tons each more than warrants the purchase price, the terms.

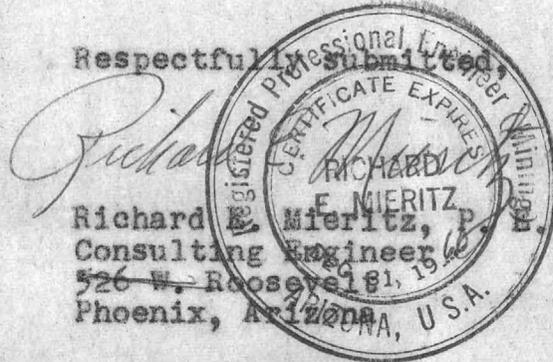
Ideal operating underground conditions exist for a

moderate size operation. An excellent shaft in excellent condition, excellent centralized location for future ore shoots within the property, excellent location accessibility-wise for surface ore haulage, etc. Certainly one of the three mills would accept the ore produced regardless it be 1% or 6-7% since it would have the same characteristics as their own--thus not a customized proposition.

It is the opinion of the writer that the end price so dictated and the terms of payment are of just and reasonable thinking.

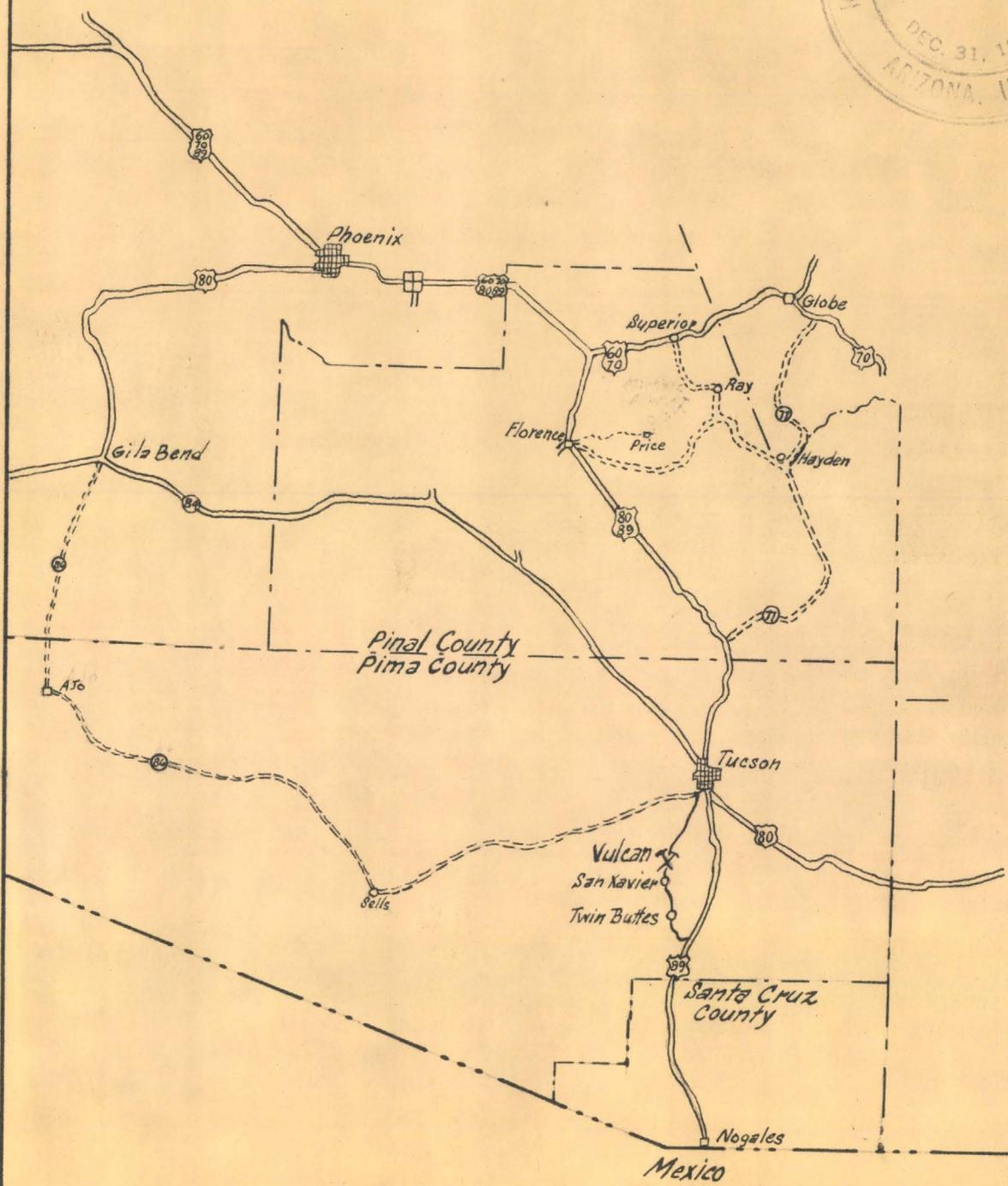
The property justly satisfies the three factors I considered and advanced to Rayrock Limited in July of this year, namely (1) greatest potential of successful exploration for a reasonable balance of financial expenditures suitable to your corporation; (2) potential economic profit for minimum capital expenditures to help establish your corporation in Arizona and (3) the availability of the property at a "deal" which is "in line" and would not scare a corporation before it even set foot on the property.

Respectfully Submitted,



Richard E. Mieritz,
Consulting Engineer
526 W. Roosevelt
Phoenix, Arizona, U.S.A.

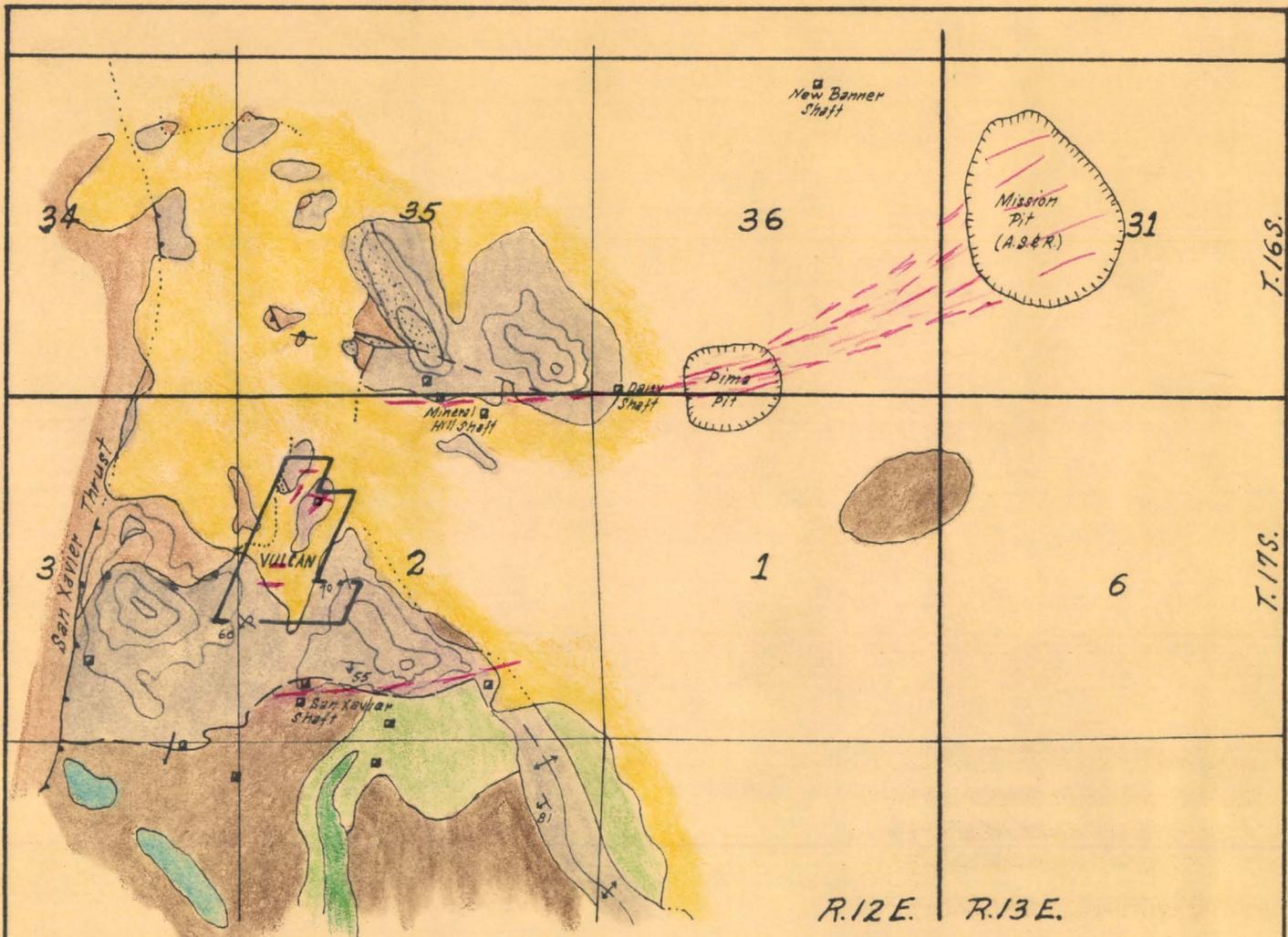
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INDEX MAP
PIMA COUNTY, ARIZ
OCT., 1960
R.E.M.

A-29

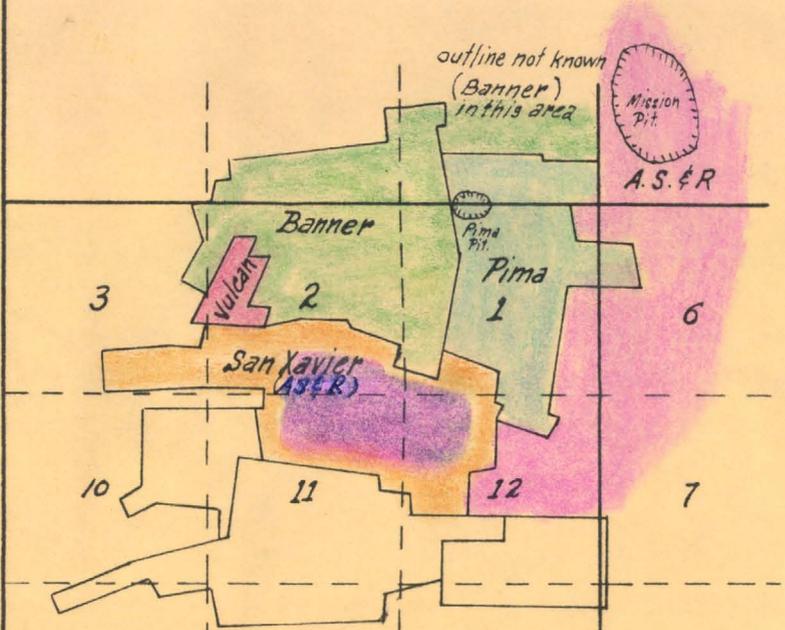
PLATE: 1



DISTRICT GEOLOGY
Scale: 2"=1 mile

R.12E. R.13E.
LEGEND

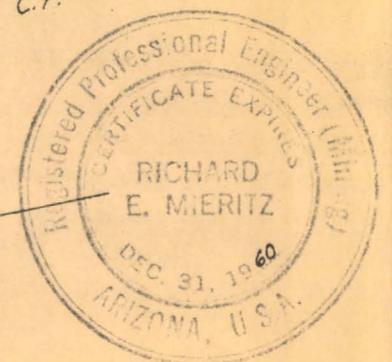
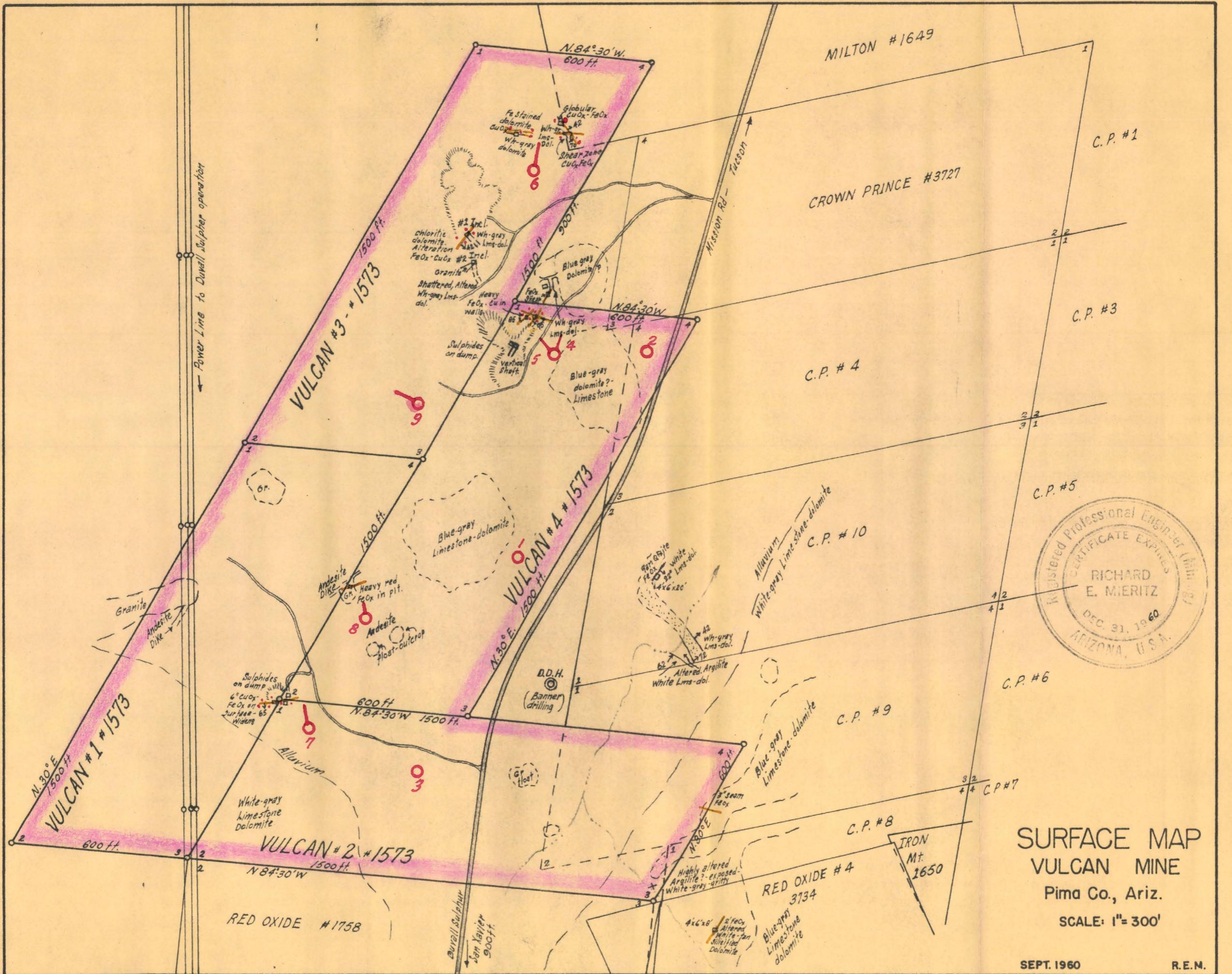
- Alluvium -
- Granodiorite - Tertiary
- Kar } Sedimentary-Volcanic Complex.
- Kas } See text of report.
- Krs } Cretaceous
- Paleozoic Sedimentaries. Basal unit.
- Bolsa Qtzite-stippled
- Pre-Cambrian Granite.
- Thrust Fault.
- Mineralized Zones
- Faults



DISTRICT CLAIM MAP
Scale: 1"=1 mile.



SURFACE MAPS
PIMA MINING DIST.
Pima County, Arizona



**SURFACE MAP
VULCAN MINE**
Pima Co., Ariz.
SCALE: 1" = 300'

SECTION A-A
SCALE: 1"=30'

300

250

200

150

100

50

350

300

250

200

150

100

50

350

300

250

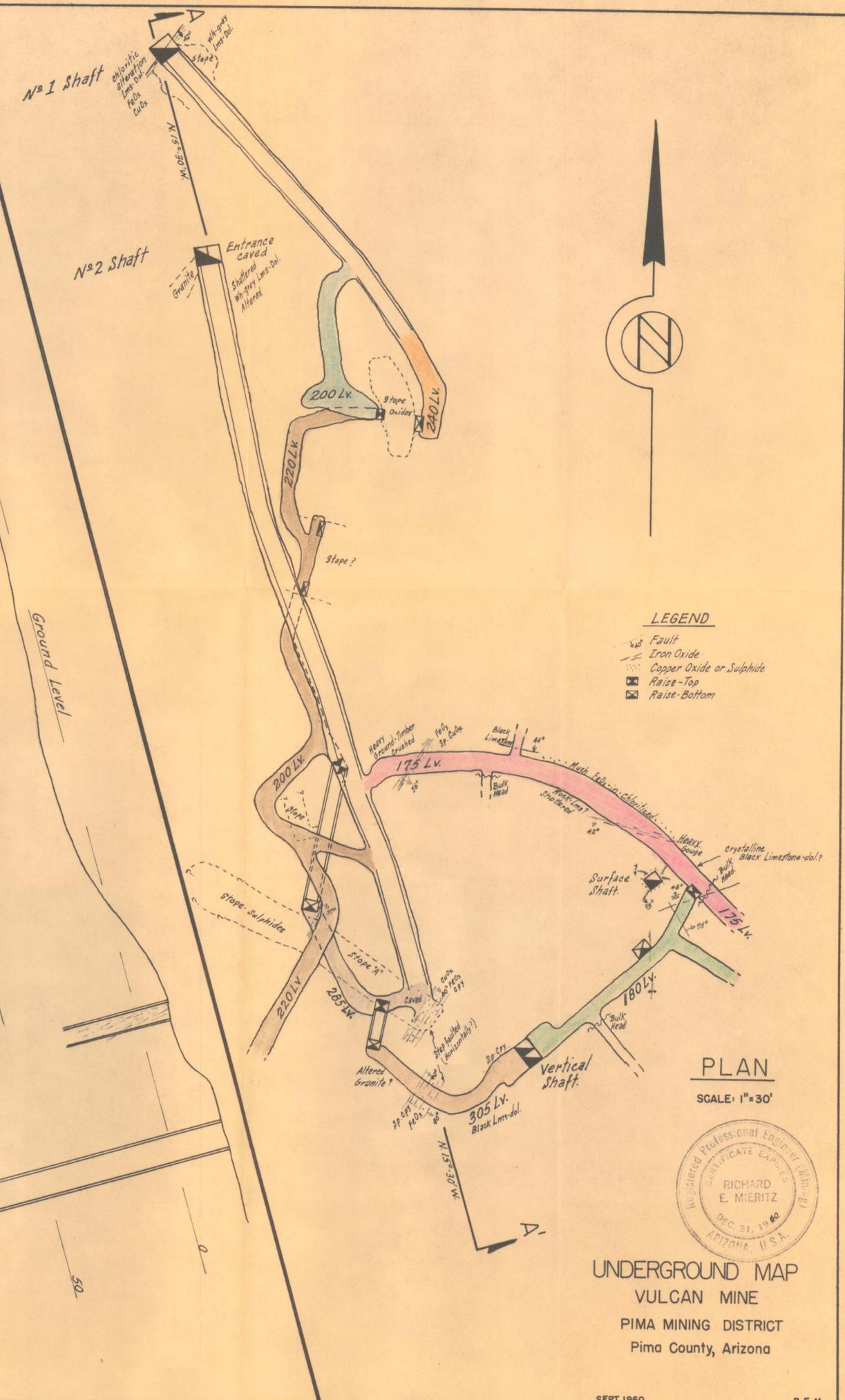
200

150

100

50

Ground Level



- LEGEND**
- Fault
 - Iron Oxide
 - Copper Oxide or Sulphide
 - ⊠ Raise-Top
 - ⊡ Raise-Bottom

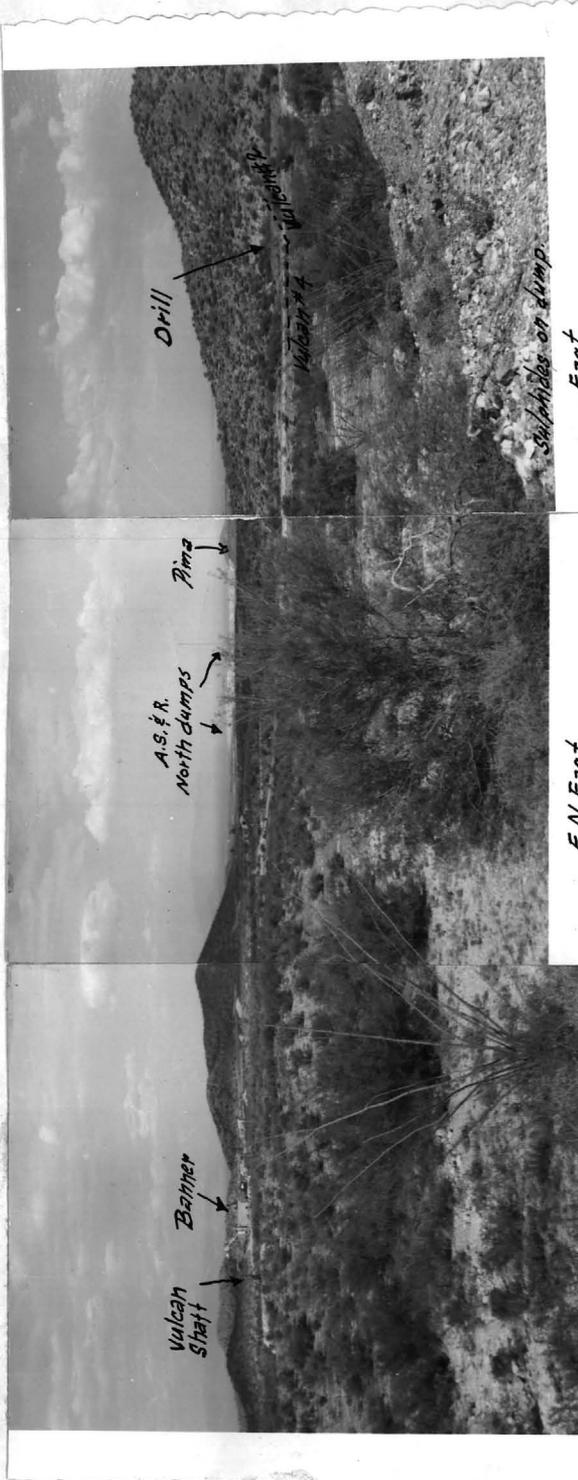
PLAN
SCALE: 1"=30'



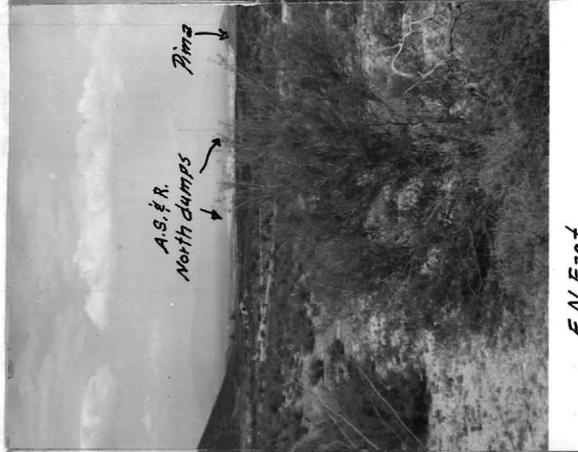
UNDERGROUND MAP
VULCAN MINE
PIMA MINING DISTRICT
Pima County, Arizona

SEPT. 1960

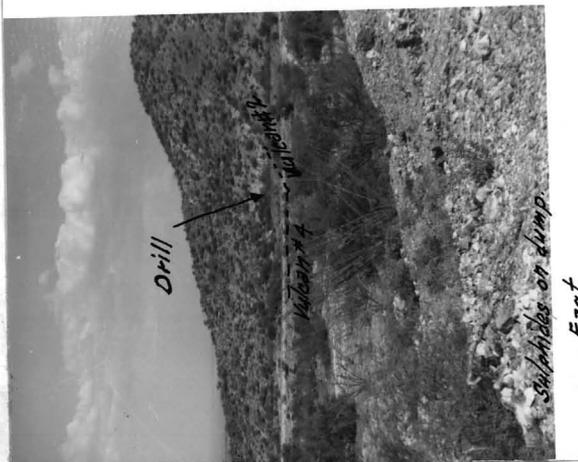
R. E. M.



Looking NE.



E.N. East



East



Vulcan Vertical Shaft Headframe