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GEOLOGY AND RECOMMENDATIONS FOR EXPLORATION AT THE MADRONE QUICKSILVER MINE SAN LUIS OBISPO COUNTY, CALIFORNIA

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GEOLOGY AND RECOMMENDATIONS

FOR EXPLORATION

AT THE

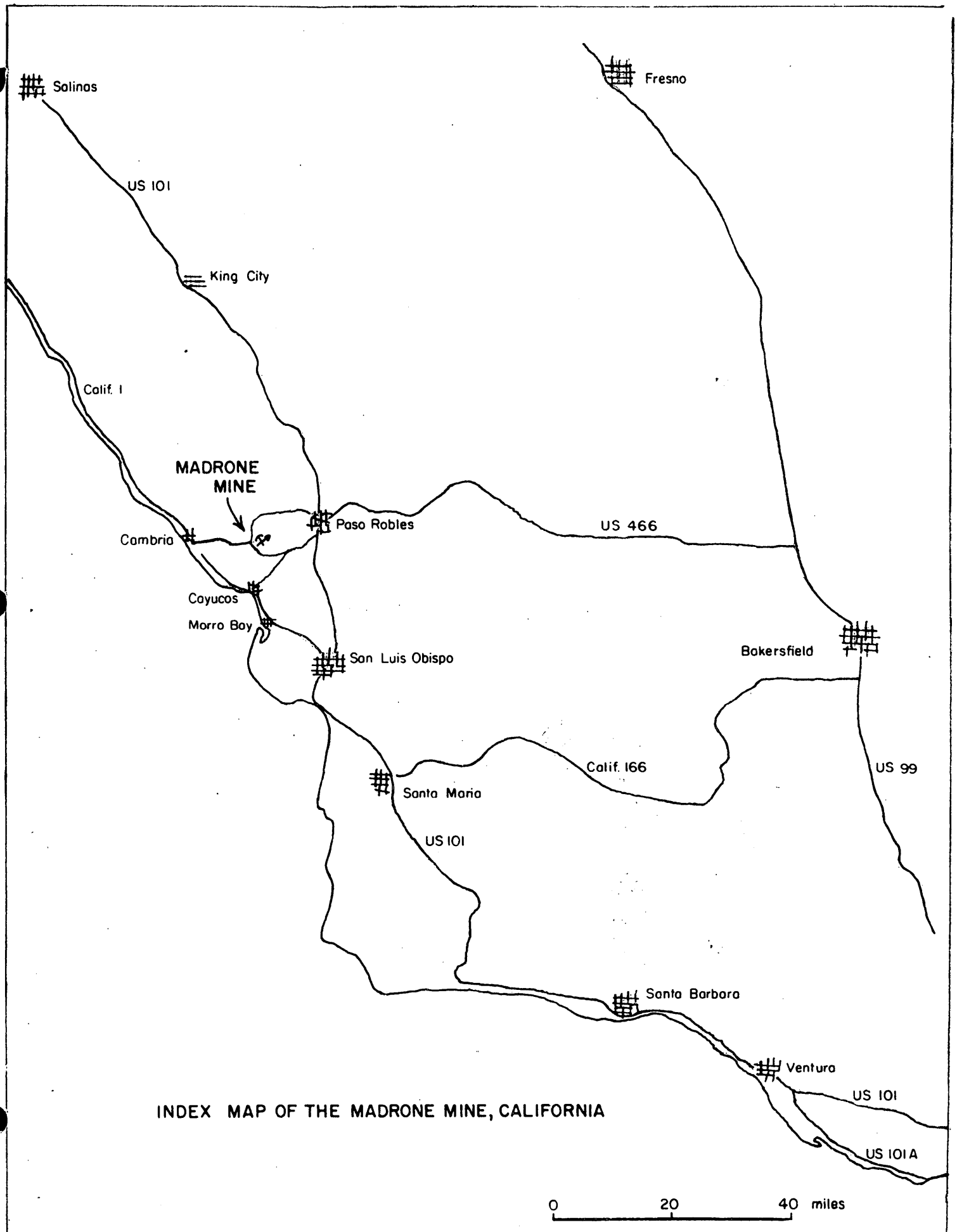
MADRONE QUICKSILVER MINE
SAN LUIS OBISPO COUNTY, CALIFORNIA

by

Victor V. Botts, Jr.

June, 1961

Conclusions and Recommendations: It is the opinion of the writer that widespread occurrences of cinnabar in conjunction with favorable structural conditions in the Madrone Mine property warrant a drilling program of moderate size.



INDEX MAP OF THE MADRONE MINE, CALIFORNIA

retort was erected, and a small amount of quicksilver was produced, probably under a hundred flasks (76 pounds per flask).

In 1955, the writer leased the property from Mr. Nicholas A. Marquart, the previous owner's son. Intensive prospecting revealed a new ore discovery at the eastern edge of the mine. A series of very narrow, high grade veins were explored by shallow trenches and two flasks of quicksilver were produced. Convinced that the major potential of the mine could only be proven by fairly extensive drilling, the writer relinquished the lease in 1956.

Several lessees followed this period. Most of their efforts were confined to further trenching on the ore zone discovered by the writer. Three more flasks were produced from the same zone. The last exploration conducted on the property consisted of some shallow drill holes. These holes were drilled without regard for existing structures and evidently without any geological planning as to their location. The drilling method used was also rather unsatisfactory since no coring was done at all. Cinnabar (HgS), a very friable mineral, is very likely to be ground up by a conventional drilling bit. As a consequence, it is possible to drill through an ore body without detecting its presence unless the zone is cored or careful examination of the cuttings is accomplished.

GEOLOGY

The general geology of the Sierra Santa Lucia Mountains including the Madrone Mine area, has been described rather extensively in several publications (U. S. G. S. Bulletin 922-R and A. A. P. G. Bulletin, Vol. 28, No. 4). Hence, the geological section of this report will be limited to the immediate area of the Madrone Mine.

The principal geologic feature of the Madrone Mine area is a northwest trending thrust fault zone with probable steep northeastward dip. The zone disects strongly folded Jurassic (?) Franciscan sediments. Within the general mine area, the zone is offset by two northeasterly trending faults. The workings of the mine lie wholly within the fault zone, as is the case with most mines in the district. The zone averages 500' wide and extends over 1500' in a general easterly direction. However, as the zone strikes the eastern border of the area, there is an appreciable narrowing. (Refer to Plate I and II.)

Although the borders of the fault zone are not exposed within the mine area, their position may be inferred from the general outcrop of unaltered Franciscan sediments on both sides of the zone.

The major rock type within the fault zone is silica-carbonate rock.. This rock, as indicated by the name, is largely composed of chalcedony, quartz, and granular carbonate. It weathers to dull shades of brown or tan and occasionally dark reddish-brown and generally forms prominent outcrops compared to other rocks within the fault zone. The shape of the main topographic feature of the mine area, a northwest trending ridge, has largely been determined by the extent of large bodies of silica-carbonate rock, and indicates that a portion of the rock was derived from Franciscan sediments.

Shear zones separate one block of silica-carbonate from another. These zones contain strongly sheared sandstone and shale, usually light to dark gray in color. The sandstones have been extensively kaolinized. In the adit on the north slope of the mine, over thirty feet of shear is exposed. The shear is principally composed of deformed shale with occasional fragments of sandstone and highly altered serpentine. In addition to the aforementioned rock types there are several scattered bodies of unaltered or only slightly altered serpentine also lying within the main fault area.

Outside the borders of the main fault zone lie numerous rock types. The main groups are unaltered serpentine and Franciscan sandstones, shales, and bedded cherts. While the Franciscan rocks are somewhat deformed, they are not, for the most part, altered as is the case within the fault zone. Numerous scattered bodies of silica-carbonate rock also occur outside the main fault zone. However, it is probable that many of these bodies are pipe-like structures connecting with the fault zone at depth or with other smaller faults lying outside the main zone.

Three principal structural features lie within the fault zone. The first is a series of narrow shears striking east-west in the shaft area. These shears dip very steeply to the north, probably fluctuating between the vertical and 70°. The second structure, a large shear zone, lies several hundred feet to the north of the shaft area and also strikes roughly east-west. But, this shear has a pronounced southerly dip. The dip is 40° as exposed in the north slope adit. The third set of shears is located at the eastern end of the mine ridge and strikes N 20° W. These shears dip from 30° to 50° to the northeast. All of the foregoing structures either terminate against the hanging wall of the main zone or against other shears that terminate against the hanging wall.

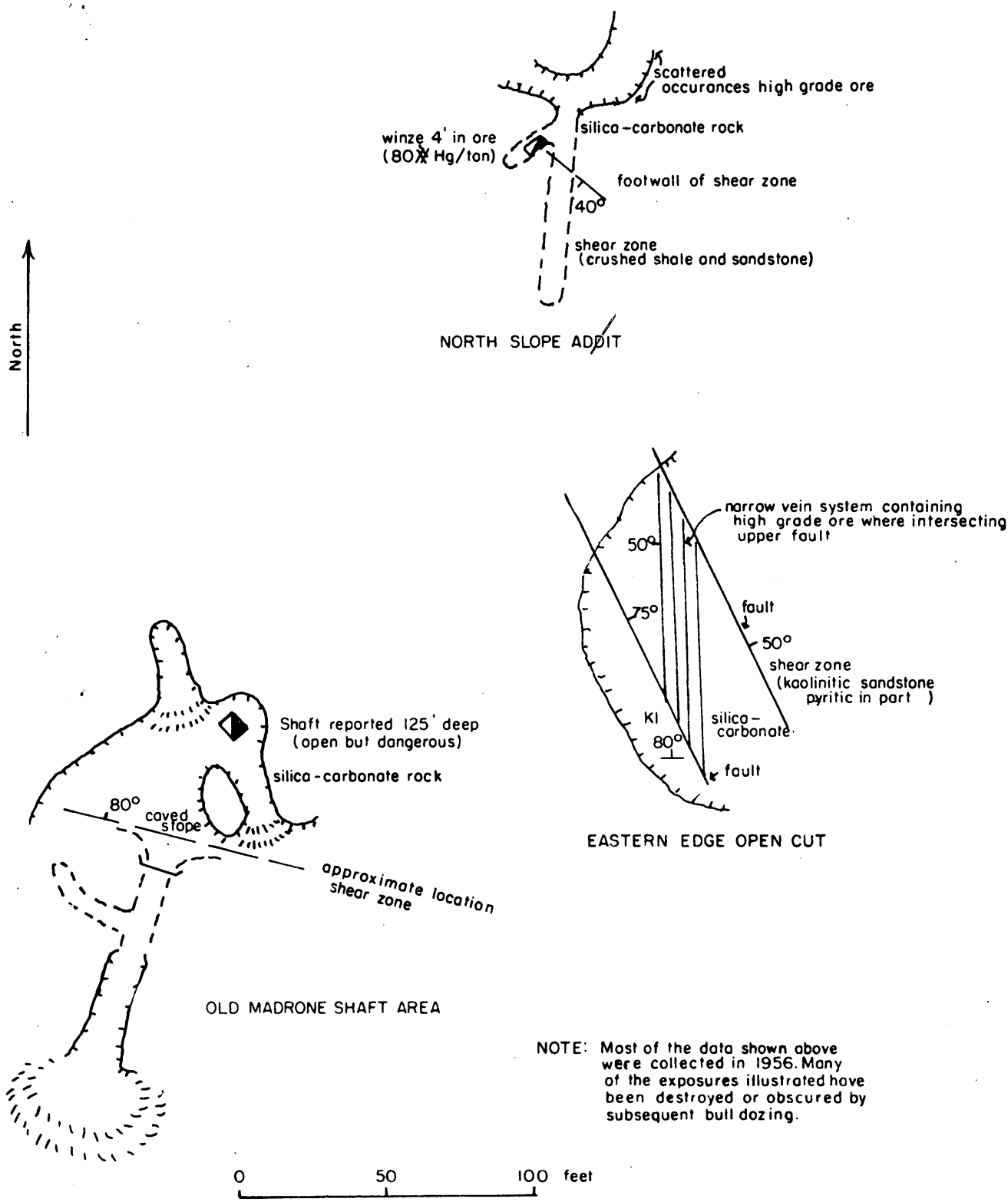
ORE BODIES

The presence and extent of ore bodies in the district have been largely determined by three major factors, (1) channelways for the ascending solutions, (2) porosity or fracturing for the deposition of ore, (3) structural

GEOLOGIC SKETCH MAP OF THE WORKINGS OF THE MADRONE MINE

by Victor V. Botts, Jr , 1961

PLATE III



NOTE: Most of the data shown above were collected in 1956. Many of the exposures illustrated have been destroyed or obscured by subsequent bull dozing.

features trapping the ascending solutions forcing their cooling and resulting in the deposition of ore.

At the two known ore bodies within the Madrone property, all the foregoing conditions are present. It may be readily inferred that subsequent discoveries will be based on the careful application of geologic techniques to the search for these conditions.

Little is known of the main Madrone ore body. One of the unmined portions of the ore body discovered by the writer in 1956 was very rich (over 300# Hg/ton). Fragments of ore found within the old dump would also indicate that the ore body was quite rich. California Division of Mines Bulletin #27 (1908) Quicksilver Resources of California states "These surface works show very good ore and in one place a well-defined vein, running nearly east and west and dipping very steep northward". A second ore body is exposed in the adit on the north slope of the mine. Samples collected by the writer ranged from 80# Hg/ton to 100# Hg/ton. Since only the uppermost edge of the ore body is exposed within the working, little else can be determined at the present time. A third area, the eastern end of the ridge, has an interesting series of narrow high-grade veins. While not of enough extent to be properly called an ore body, nevertheless produced several flasks of quicksilver from ore averaging over 200# Hg/ton. (See Plate III.) U. S. G. S. Bulletin 922-R (1940) makes the following statements regarding the grade of ore in the two neighboring mines: La Libertad Mines - "The grade of the ore that has been produced is not known, but some of it is reported to have been very rich and little of it seems to have contained less than 5 pounds of quicksilver to the ton". Little Bonanza Mine - "Most of the ore taken from the mine was in high-grade pockets....."

The size of ore bodies in the San Luis Obispo mining district varies a good deal. The largest ore body encountered in the district was 40' wide, 500' long, and 700' high and yielded from 2 - 5 lbs. Hg/ton at the Oceanic Mine. A single ore shoot in the Cambria Mine was 40' wide, 180' long, and 100' high yielding an estimated 48,000 tons of ore averaging 7.6 lbs. Hg/ton. While information is very scarce about early operations of any of the mines in the general Madrone Mine area, California Division of Mines Bulletin No. 78 lists the Klau Mine with a production of 1590 flasks in the year 1876. This production was accomplished with a daily furnace capacity of 15 tons. Calculations with these figures indicate around 10,500 tons of ore were burnt with an average grade of over 50 lbs. Hg/ton recovered. Considering the low efficiency of the furnaces of that era, the ore body must have been of remarkable richness. Total production for the Klau Mine up to 1940 was 17,800+ flasks.

Maps of the old stopes in the neighboring Little Bonanza Mine indicate a probable 30,000 tons of material was removed from two stopes. No information is available as to the actual size of the La Libertad stopes, however, it is known that most of the ore produced was developed from a single ore shoot which extended over 210' on the pitch with most of the workings bottoming in good ore (U. S. G. S. Bulletin 922-R). The most recent discovery within the area, was at the Buena Vista Mine, 4-1/2 miles from the Madrone Mine. The single ore body has been worked by open cut methods for over three years with a good portion of the ore running over 40 lbs. Hg/ton.

Ore deposits within the immediate area have a known vertical depth of over 200'. Both the Little Bonanza and La Libertad mines still have ore at this depth, but have not been explored below this point due to certain topographic features necessitating shaft sinking to get below this point. In no case has any mine in the San Luis Obispo area shown any indications of reaching a lower limit of ore mineralization. The entire district has a vertical range of ore over 3000'. Inidividual mines have explored as deep as 700' below the surface.

CONCLUSIONS AND RECOMMENDATIONS

It is the opinion of the writer, that widespread occurrences of cinnabar in conjunction with favorable structural conditions in the Madrone Mine property warrant a drilling program of moderate size.

There are two very favorable areas for exploration. The first is in the area between the old shaft and the north slope adit. A series of holes should be drilled in such a manner as to explore the underside of the large shear zone exposed in the adit. The intersection of this shear with the shear exposed in the area of the old shaft should provide a very favorable structure for the entrapment of ore. The presence of surface ore at the under edge of the north slope shear provides additional evidence that this may be the case. An additional hole should be placed just to the north of the adit to check the possibility that the now eroded intersection of the main hanging wall and the adit shear may have provided a structural trap for solutions ascending the main hanging wall. (See Plate VII and Table I.)

The second area for exploration is at the eastern end of the ridge where a change in both strike and dip occur, creating a probable northerly concavity in the main hanging wall of the fault zone, again providing favorable structural conditions for the deposition of ore. Throughout the general area are numerous surface occurrences of cinnabar.

TABLE I

Drill hole	Type	Diff.	Depth	Inclination	Remarks
1	A	x	100'	40°	- determines down dip extension of ore exposed in north slope adit
2	A	x	50'	Vert.	- explores possible width of north slope ore body
3	A	x	100'	40°	- explores eastern edge for both down dip and easterly extensions
4	B	x	70'	Vert.	- determines position of footwall of shear zone and down dip extension of north slope ore.
5	B	x	170'	Vert.	- determines position of footwall of shear zone and down dip extension of north slope ore.
6	B	x	80'	Vert.	- determines position of footwall of shear zone in easterly direction and explores for ore in favorable structural position.
7	A	x	100'	40° *	- explores underside of footwall for easterly extension of ore in north slope adit.
8	A	x	100'	40° *	- as above.
9	A	x	100'	40° *	- as above.
10	B	x	100'	Vert.	- determines position of footwall of shear zone in easterly direction and explores for ore in favorable structural position.
11	A	z	80'	50°	- explores for eastern extension of old shaft ore body.
12	A	z	80'	50°	- as above.
13	A	z	80'	50°	- as above.
14	A	x	120'	Vert.	- explores area with widespread cinnabar showings and area where previous drill hole encountered cinnabar at unknown depth.

TABLE I (Continued)

Drill hole	Type	Diff.	Depth	Inclination		Remarks
15	A	x	120'	Vert.	-	as above
16	B	x	100'	60°	-	explores for position of hanging wall of main fault zone and favorable area for ore.
17	B	x	150'	Vert.	-	general exploration of central fault block.
18	B	x	150'	Vert.	-	as above.
			1850' @			

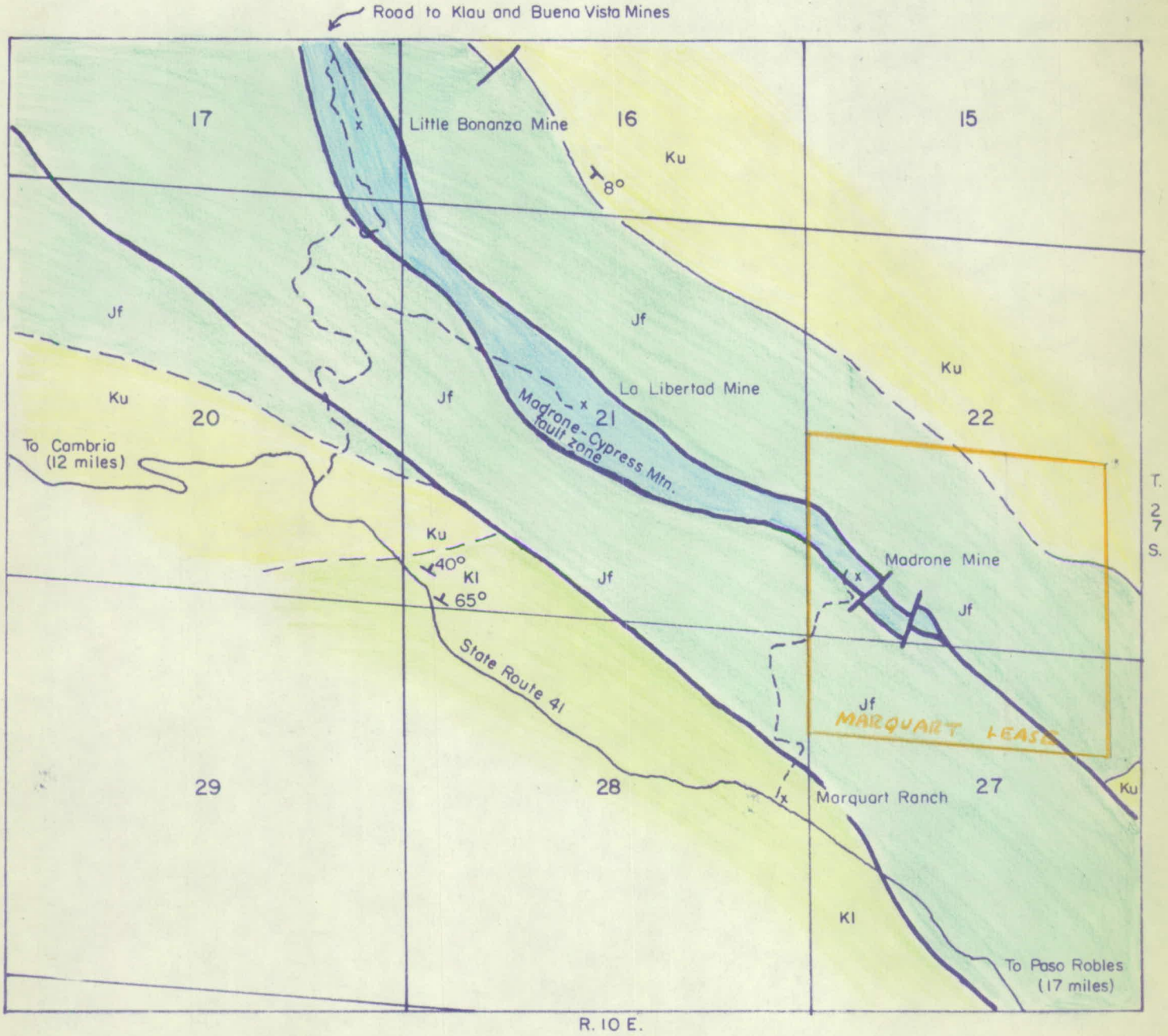
A indicates mostly coring
B indicates mostly full hole drilling
x indicates fairly easy drilling
z indicates drilling with some difficulty

@an additional 1000' of drilling should be provided for in order to fully explore any unknown structures or ore bodies encountered in 18 hole program above.

* angle to be determined from information obtained from DH No. 6

GEOLOGIC MAP OF A PORTION OF THE MADRONE-CYPRESS MTN. AREA
(Generalized and modified from U.S.G.S. Bulletin 922 R)

Plate I



0 1/2 1 mile

Madrone-Cypress Mountain Fault Zone (modified from U.S.G.S. Bulletin 922 R)

Fault

Contact

Jf Jurassic(?) Franciscan formation

Kl Lower Cretaceous (undifferentiated)

Ku Upper Cretaceous (undifferentiated)

40° Dip and strike of beds