CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
3550 N. Central Ave, 2nd floor
Phoenix, AZ, 85012
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

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NICOR MINERAL VENTURES

One of the NICOR basic energy companies

MEMORANDUM

To: Clancy Wendt

From: Gary Parkison

Date: April 16, 1986

Subject: Bill Yarter Submittal - Little Harquahala Mtns.

INTRODUCTION

Bill Yarter, a self-employed geologist, submitted his HV and Yuma claims to us in late February for joint venture consideration. The two claim blocks are separated by about 10 miles and are located south of the town of Salome in La Paz County, Arizona (Figure 1). The principal commodity pursued is gold. The HV group is located in T5N, R12W, Secs 27, 33, 34, 35 and T4NR12W Secs 3, 4, 5 and consists of approximately 85 claims located on BLM ground. The Yuma claims are located in T4NR13W Secs 28, 29, 30, 31, 32, 33 and T4NR14W Sec. 25 and consists of approximately 175 claims located on BLM ground. the claims were located in January-February, 1984 (Figure 2).

Texasgulf leased the ground from Bill Yarter shortly after they were located and subsequently terminated the lease in Fall, 1985 after drilling a total of 8,645 feet in 22 holes. Texasgulf took relatively few surface geochem samples but did geologically map the area in addition to performing gravity and magnetic surveys. Information supplied to NICOR was Texasgulf's drill results geologic maps, drill cross-sections and the geophysical surveys. Clancy Wendt and myself made a brief visit to both properties in February accompanied by Bill Yarter.

GEOLOGY

The geology of the Little Harquahala Mtns. is very complicated and involves a large number of diverse rock types which have been subjected to multiple deformational episodes. The Arizona Bureau of Mines and Geology has put out several publications and open-file reports discussing the geology of the general area of the HV and Yuma claims.

Precambrian rock types represented in the area are undifferentiated metamorphic rocks, predominantly gneisses and schists, equigranular leucocratic granite and the Socorro

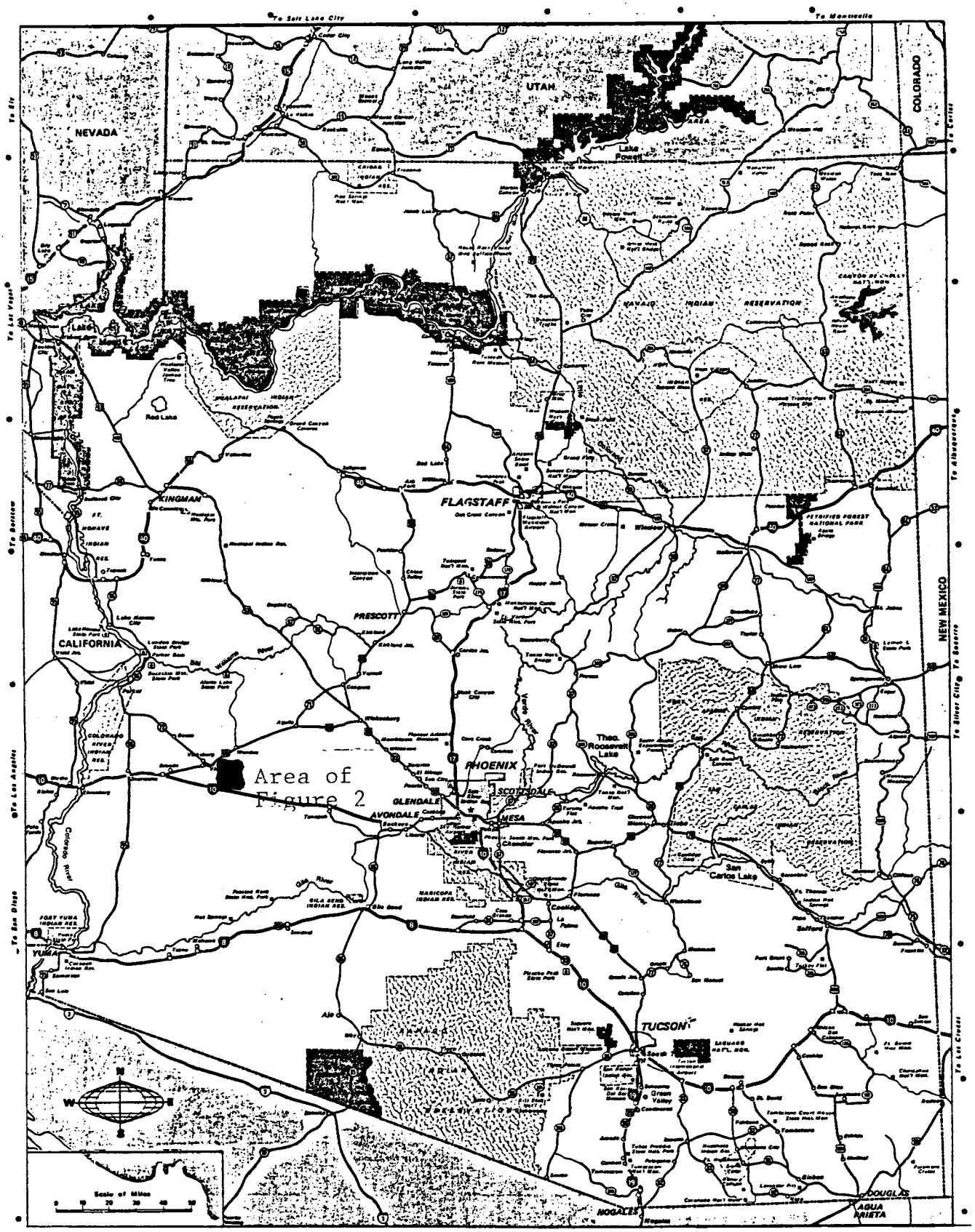


Figure 1. Location map for Salome area.

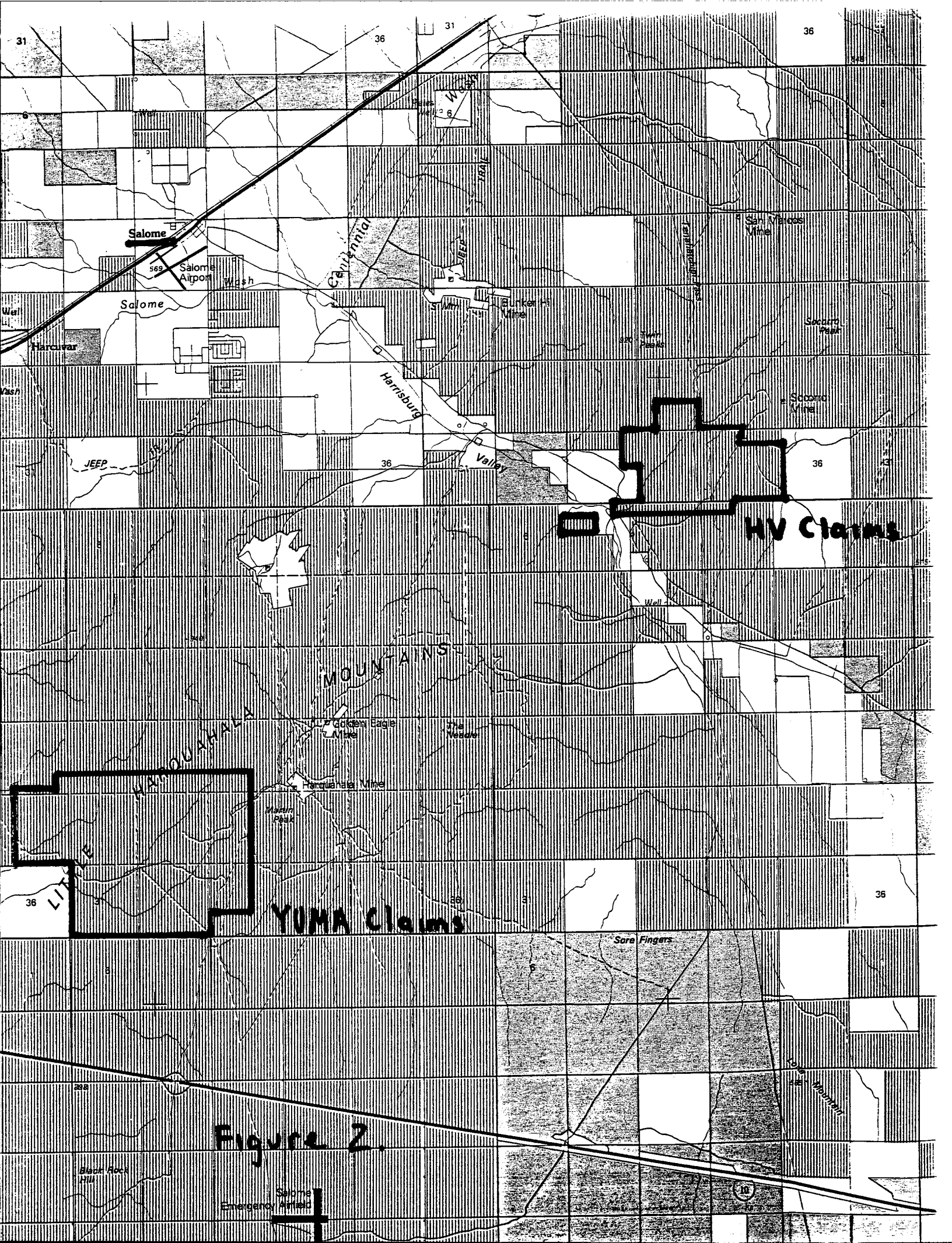

Salome
Salome Airport
Wash
Salome
Harquahala
Centennial
Harrisburg
Valley
JEEP
TRAIL
Bunker Hill Mine
San Marcos Mine
Socorro Peak
Twin Peaks
Socorro Mine
HV Claims
MOUNTAINS
HARQUAHALA
LITTLE
Golden Eagle Mine
The Vesuvio
Harquahala Mine
Makum Peak
YUMA Claims
Sore Fingers
Long Thorman
Black Rock Hill
Salome Emergency Airfield

Figure 2.

megacrystic granite. The Socorro granite is commonly altered to a chlorite, sericite rich rock and reportedly contains anomalous (50-100 ppb) amounts of gold. A dismembered section of Paleozoic rocks is represented by the Cambrian Bolsa Quartzite, the Devonian Martin Limestone and the Permian Supai Formation. In the area of the Yuma claims, Jurassic-Cretaceous porphyritic dacite intrusive rocks and undifferentiated sedimentary strata are present. A diverse assemblage of Tertiary volcanic rocks from rhyolite to basalt in composition, are intercalated with great thicknesses of tuffaceous sedimentary rocks. Quaternary alluvium is widespread and covers most of the area of both claimblocks.

The structure of the area is very complex. The Little Harquahala Mtns are on the southwest flank of the Mid to Early Tertiary(?) Harquahala metamorphic core complex. Several thrust faults, including the regional Hercules thrust, are exposed in the area and probably are Laramide in age. Mid to Late Tertiary detachment faulting has affected nearly all rock types and has locally reactivated some earlier thrust faults. The detachment faults have been offset by contemporaneous and later wrench faulting along west-northwest trends which has generated pull-apart basins and grabens which have been filled largely with Tertiary and Quaternary sediments and alluvium.

In the area of the claim blocks the detachment faults separate upper plate Tertiary rocks from lower plate Precambrian rocks. The Socorro granite often is in a middle plate position bounded by detachment faults. The detachment fault surfaces are often broadly warped to form a series of antiforms and synforms or graves with generally southerly or easterly dips from 0 to 45° with fold axes trending generally in a northeast-southwest direction.

GEOCHEMISTRY

Neither Bill Yarter nor Texasgulf have done extensive geochemical sampling over the claim blocks. Samples taken at specific sites such as prospect pits for gold, copper, etc. commonly contain from .01 to .10 opt gold. Samples taken away from known mineralized areas have background gold values below 10 ppb. As mentioned earlier, the Socorro granite appears to be consistently anomalous in gold content often containing from 50 to 100 ppb gold. The samples were also assayed for Ag, Cu and Pb but the concentrations of those elements did not obviously correlate with Au. The samples were not run for other "pathfinder" elements such as namely As, Sb, Hg, Tl, etc.

The geochemical analyses from the drilling should be considered somewhat suspect, particularly those for year 1984. Gold values were reported only to a .003 opt detection limit whereas silver values seem much too high and contradict surface geochem values and results from 1985 drilling.

MINERALIZATION

The HV and Yuma claim blocks were originally located on the basis of their geologic similarity to a conceptual model of gold mineralization devised by Bill Yarter. As such, the importance of site specific geology and geochemistry is downplayed. This simplified conceptual model is developed below:

1) The Socorro granite is regionally altered through deep burial or other means and becomes enriched in gold.

2) Regional detachment faulting generates numerous fault bounded slivers or tectonic slices along subparallel shallowly-dipping fault surfaces which are gently warped or folded then refolded to an "egg-carton" geometry, producing many "grooves".

3) Contemporaneous with the detachment faulting is west-northwest trending large-scale wrench faulting which generates numerous pull-apart basins or grabens. Detachment-related tectonic slices slide into evolving grabens and are intensely brecciated.

4) The high heat flow associated with the detachment environment stimulates geothermal circulation through the brecciated and broken detached rocks within the graben. The grove in the detachment fault is preserved in the graben and aids in focusing fluid flow. Gold is mobilized from elsewhere in the geothermal cell and fixed and concentrated where local reducing conditions are present.

5) In regards to part 4, the Socorro granite is a very favorable host and source rock for gold, as it would brecciate well and the abundant chlorite and FeOx would provide reducing sites for gold deposition. In summary, the gold mineralization model employs the Socorro granite being both a favorable source rock as well as a favorable host rock where it has been brecciated within a graben. The groove within the detachment fault as well as the graben itself aid in localizing hydrothermal circulation to aid in the generation of a bulk-mineable gold deposit.

Surface geochemistry would generally only detect peripheral mineralization associated with this model as the best target areas are within alluvium filled and covered structural depressions, grabens and grooves. Hence, drilling is the only way to evaluate the merits of the mineralization model and of the property.

DRILLING RESULTS

Texasgulf's drilling results are summarized in Tables 1 (HV claims) and 2 (Yuma claims). Inspection of Table 1 shows that the highest grade intercepts (LHN 84-2, 10' of .032 opt Au) was associated a with high angle quartz vein. The second highest grade intercept (LHN 85-4, 5' of .027 opt Au) was not associated with the detachment fault zone as was the next highest grade interval (LHN 84-1, 10' of .015 opt Au). No other intercepts exceeded .010 opt Au. (Figure 3).

Inspection of Table 2 shows somewhat better results. Hole LHS 84-4 intercepted an upper zone of 15' of .020 opt Au and a lower zone of 15' of .020 opt gold. Both intercepts are within granite but do not appear to be related to the detachment fault zone. An adjoining hole about 550 feet to the south, LHS 85-5, intercepted a 40' thick zone grading .030 opt Au within metamorphic rocks below the detachment. All other intevals were less than .012 opt Au. (Figure 4).

The drill holes were generally spotted to test the mineralization model and were generally widely spaced. Several holes failed to intercept the target horizon because of excessive depth.

DISCUSSION

The results of the drilling to date does not appear to support the mineralization model as proposed by Bill Yarter, although additional drilling may yet demonstrate that it is valid. The model may indeed work well on a regional basis resulting in low level gold enrichment but might not be capable of generating economic higher-grade gold deposits which were the target of Texasgulf's drilling.

Anomalous gold zones in drill holes to date typically are <u>not</u> associated with brecciation, hematite, silificication, etc. as discerned from drill cuttings. Furthermore, most intercepts are at some distance from detachment fault as interpreted by

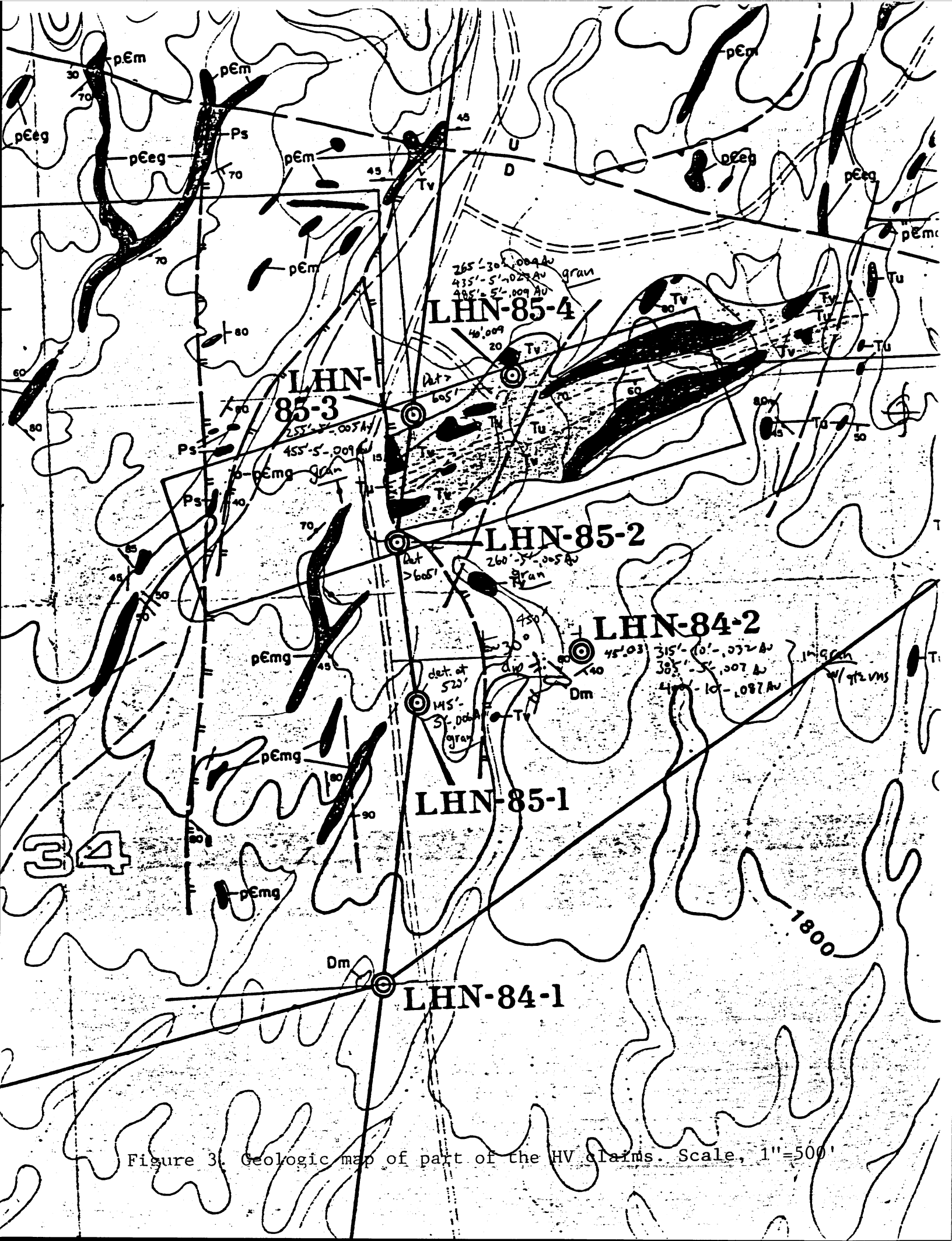


Figure 3. Geologic map of part of the HV claims. Scale, 1"=500'

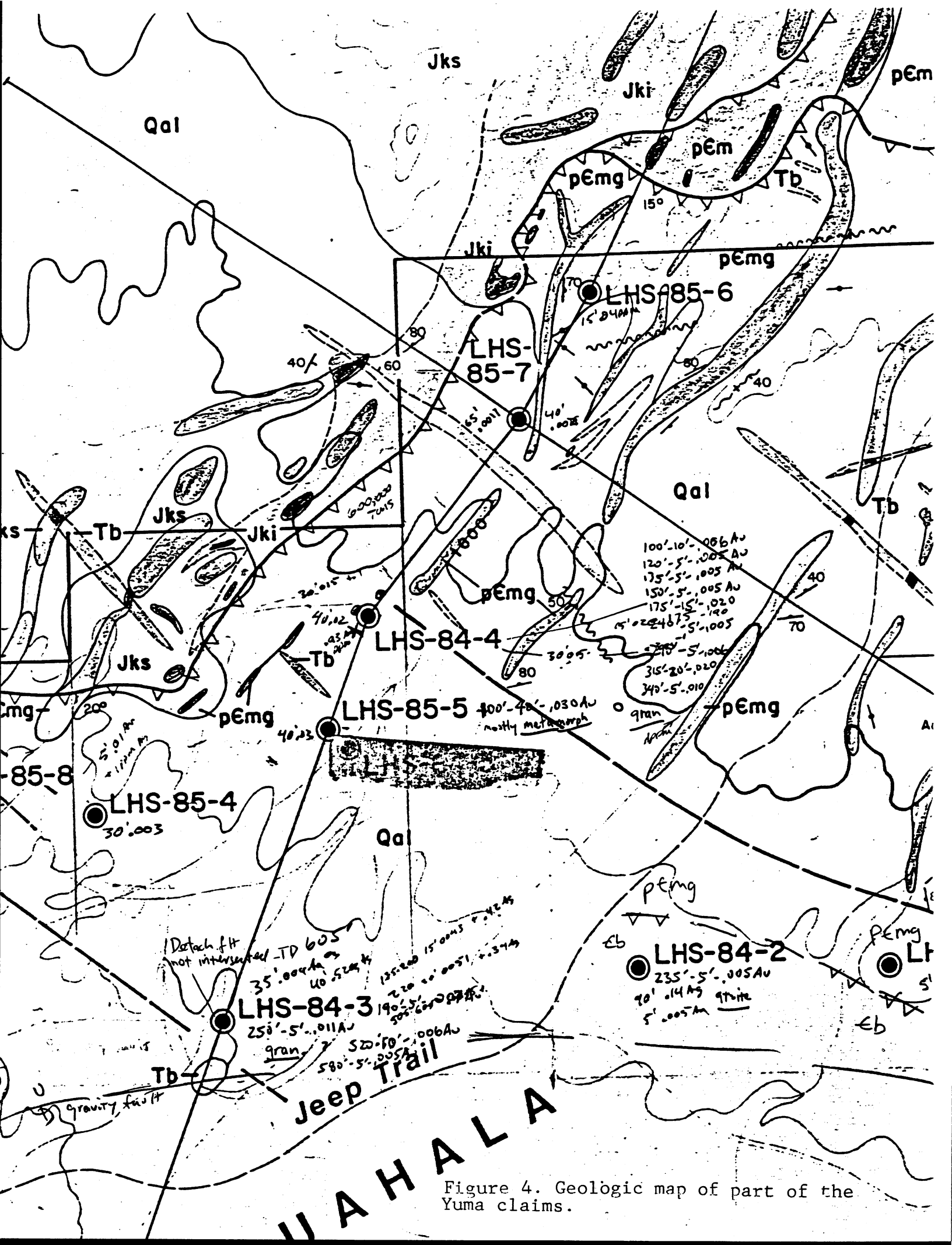


Figure 4. Geologic map of part of the Yuma claims.

Texasgulf. While most intercepts are within granite the holes were sited to preferentially sample granite. Indeed, the better intercepts are within quartz veins, metamorphic rocks or quartzite. Other mineralized intercepts do not appear to be associated with discrete horizons or associated with alteration or mineralogic features which could be used in a predictive manner to spot additional drill holes.

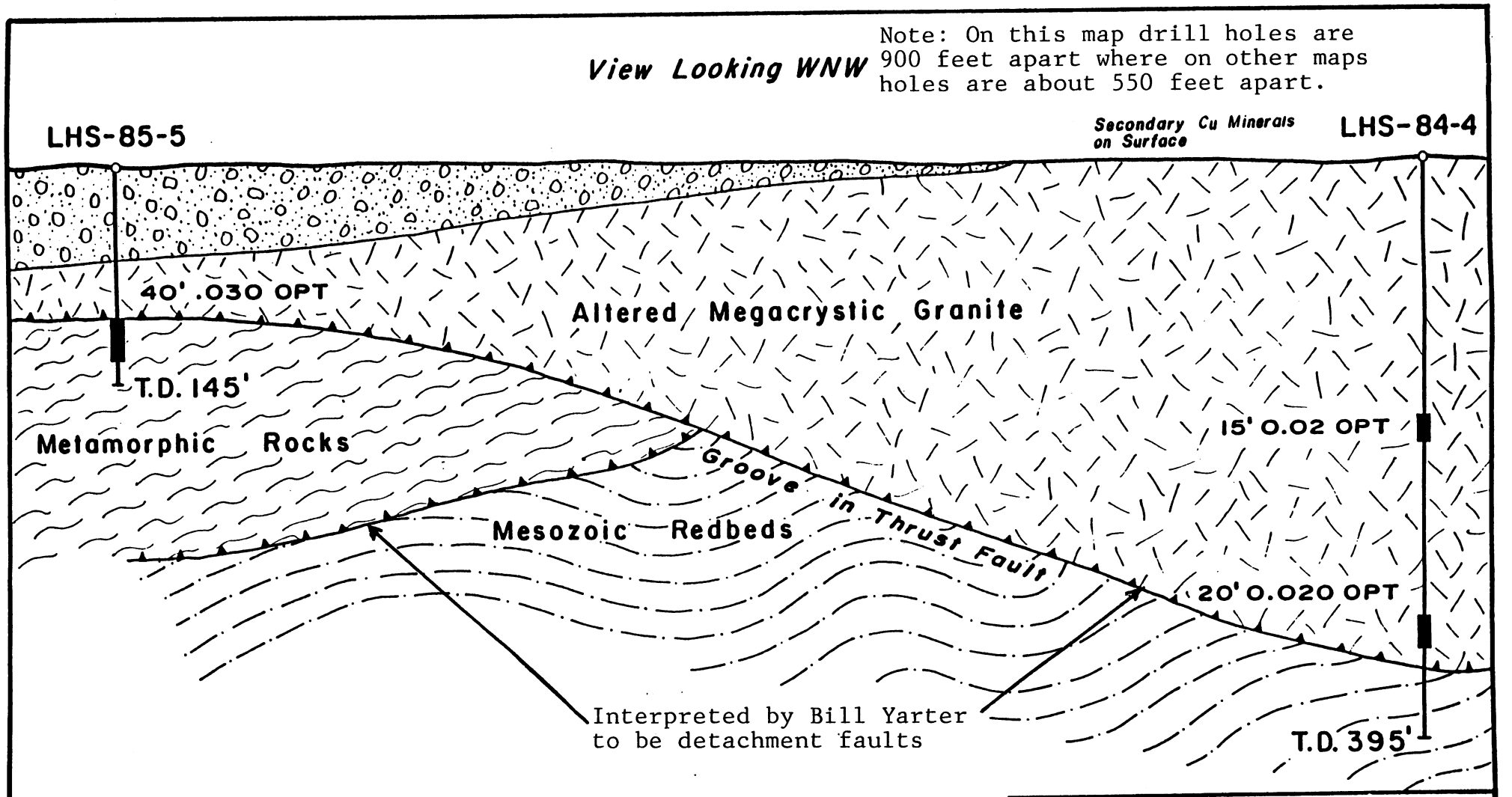
Based on surface mapping there is little to predict the erratic behavior of the detachment fault and associated rock types known to exist in the subsurface through drilling. Indeed, in hole LHS 85-5 the best intercept was within metamorphic rocks in an antiform whereas the target was brecciated granite within a tectonic synform or groove. (Figure 5).

Additional drilling to further test the model will be necessarily expensive owing to the common steep dip of the target detachment faults as well as the down-dropping of the target horizon through faulting. A gravity survey performed on the Yuma claim block suggests a large fault drops the target zone to in excess of 1000 feet a short distance south of hole LHS 85-5. Drilling in the HV claim block suggests dips of the target horizons at from 20 to in excess of 45 degrees.

SUMMARY AND CONCLUSIONS

Bill Yarter has located approximately 260 claims in two separate blocks about ten miles east and south of Salome in western Arizona. The claims lie in the Little Harquahala Mtns., an area of extremely complicated geology. Rock units ranging from Precambrian crystalline rocks through Quarternary alluvium occur in numerous fault-bounded blocks and slices owing to extensive Laramide thrust faulting, and mid- to late-Tertiary detachment and contemporaneous wrench faulting. This complex geologic setting forms the basis for a conceptual gold mineralization model wherein the Socorro granite is a preferential host rock where it is transported and brecciated as the evolving "groove" in the detachment fault intersects with a graben forming from contemporaneous wrench faulting. Hydrothermal circulation and related gold deposition would be localized within the brecciated granite where it is channelized by the graben and groove.

Texasgulf drilled a total of 8,645 feet in 22 holes testing this mineralization model. Analysis of the results of Texasgulf's drilling shows generally poor results with the best intercept



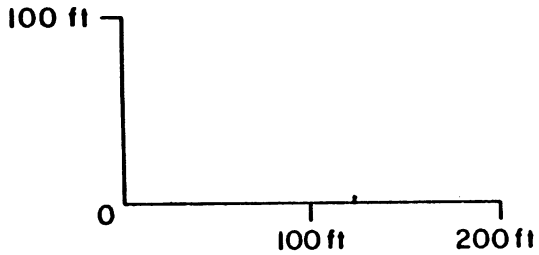


Figure 5.

Texasgulf Minerals and Metals, Inc.

LITTLE HARQUAHALA SOUTH

CROSS SECTION SHOWING MINERALIZATION THROUGH LHS-85-5 AND LHS-84-4

Scale: 1 inch equals 100 feet	Data by: C. LANE
Drafted by: Asplund Oct. 15, 1985	

grading 40' of .030 opt gold. Most holes did not return any values exceeding .010 opt gold. Furthermore, the intercepts obtained do not readily relate to any features which would support the mineralization model, i.e., the intercepts are typically not associated with brecciated, silicified and altered rock. It is felt that further drilling is needed, however, to fully evaluate the merits of the model.

Additional exploration and drilling on both the HU and Yuma claim groups is not recommended. Besides the ambiguous results obtained to date, the target horizons are too deeply buried in most of the more prospective ground to be of potential interest. While the model is interesting, trying to validate it in these areas will be very costly and time consuming.

TABLE 1

Hole	Total Depth	Gold Mineral-ization (opt)	Host	Detach-ment Related	Comments
LHN 84-1	600'	165'-10'-.015	Qtzite	No	Min. zone Brecciated w/hem., qtz veinlets
LHN 84-2	505'	315'-10'-.032	Granite	No	Min. zone w/bull qtz vein
LHN 84-3	385'	None			All in upper plate Tert. rocks
LHN 84-4	435'	None			All in upper plate Paleo. seds.
LHN 84-5	305'	None			All in alluvium
LHN 85-1	605'	145'-5'-.006	Granite	No	Min. zone w/nothing special
LHN 85-2	605'	260'-5'-.005	Granite	No	Min. zone w/nothing special
LHN 85-3	605'	245'-5'-.004 255'-5'-.005	Granite	No	Min. zone w/nothing special
		445'-5'-.004 455'-5'-.009	Granite	No	Min. zone w/abund. sericite, hem., py pseudo.
LHN 85-4	605'	265'-30'-.009	Granite	No	Min. zone w/much clay
		435'-5'-.027	Granite	No	Min. zone w/abund. hem, clay
		485'-5'-.009	Granite	No	Min. zone w/nothing special
Total feet	4,650				

TABLE 2

Hole	Total Depth	Gold Mineral-ization (opt)	Host	Detach-ment Related	Comments
LHS-84-1	605'	280'-10'-.007	Granite	No	Min. zone w/nothing special
LHS-84-2	285'	235'-5'-.005	Qtzite	Maybe	Min. zone brec. w/spec. hem.
LHS-84-3	605'	190'-5'-.007	Granite	No	Min. zone w/nothing special
		250'-5'-.011	Granite	No	Min. zone weakly silicif. w/hem.
		520'-10'-.006	Granite	No	Min. zone w/nothing spcial
		580'-5'-.005	Granite	No	Min. zone w/abund sericite, tr. hem.
LHS-84-4	395'	100'-10'-.006	Granite	No	Min. zone w/nothing special
		120'-5'-.005	Granite	No	Min. zone w/abund sericite, mod. hem
		135'-5'-.005	Granite	No	Min. zone w/abund. hem
		150'-5'-.005	Granite	No	Min. zone w/bull qtz veins
		175'-15'-.020	Granite	No	Min. zone w/nothing special
		240'-5'-.005	Granite	No	Min. zone w/bull qtz veins
		295'-5'-.006	Granite	Maybe	Min. zone w/mod. hem, spec. hem., siderite
		315'-20'-.020	Granite	Maybe	Min. zone w/abund hem lim, mod. sericite
		340'-5'-.010	Granite	Yes	Min. zone breccia w/lim, spec. hem
LHS-84-5	45'	None			All in alluvium
LHS-85-1	485'	None			Penetrated detach.
LHS-85-2	345'	None			All in Tert. volcs., seds.
LHS-85-3	305'	None			Mostly in Mes. seds. below detach
LHS-85-4	205'	None			Penetrated detach.

TABLE 2 (Cont)

Hole	Total Depth	Gold Mineral-ization (opt)	Host	Detach-ment Related	Comments
LHS-85-5	145'	100'-40'-.030 (130'-5'-.127)	Pe meta.	Maybe	Min. zone w/no brecc. noted. Mod. hem.
LHS-85-6	125'	None			Penetrated upper detach., stopped in Pe meta
LHS-85-7	325'	None			Mostly in granite, cuts detach.
LHS-85-8	125'	90'-5'-.012	Granite	Maybe	Min. zone w/abund hem, w/silicif.
Total feet	3,995				