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

**Kaaterskill Exploration** *Geochemistry • Petrology • Structural Analysis*

691 ROBINSON DRIVE • PRESCOTT, ARIZONA 86303 • 602/778-5321

October 24, 1988

Mr. Hugo Dummet
Westmont Mineral Ventures
2341 South Friebus Ave., Suite 12
Tucson, AZ 85713

Dear Hugo:

Enclosed is a submittal on the Alabama property (ALA claims) in Mohave County Arizona. The property consists of sixteen unpatented claims surrounding the Alabama patented claims. The ALA claims are owned by four partners, namely; G. Ryberg, Jim Loghry, R. Lundin and myself. Surrounding the ALA claims are a series of unpatented claims controlled by Marsh et. al. There is some overlap in the southernmost ALA claims with Marsh.

Stratabound mineralization exists on the property in four target areas. The sampling and shallow drilling completed by Santa Fe Mining Inc. demonstrates broad gold halos (> det. lt.) along these zones. The reports prepared for Santa Fe by Dr. P. Anderson are included in the appendices of this submittal report. The drill intercepts demonstrate that most of the better mineralization is located on our ground.

We feel that core drilling is required to better understand the nature of mineralization and therefore, would prefer to lease the property to a company which would have the expertise to evaluate the several targets available.

I do not have our copy of the MT plat at the present time. When G. Ryberg returns from the field he will forward a copy to you.

Feel free to visit and sample the property at your convenience. We request that a copy of any hard data (ex. assays) including sample location map be forwarded to us if you decide that you are no longer interested in our submittal.

Sincerely:

Pat O'Hara

Pat O'Hara

**Kaaterskill Exploration** *Geochemistry • Petrology • Structural Analysis*

691 ROBINSON DRIVE • PRESCOTT, ARIZONA 86303 • 602/778-5321

PROPERTY EXAMINATION REPORT - May 18, 1987 (updated; October 22, 1988)

PROPERTY NAME: Alabama - Walkover (ALA Claims)

PRIORITY/COMMODITY: High/Au-Ag

EXAMINED BY/SUBMITTED BY: P. O'Hara
G. Ryberg
J. Loghry
R. Lundin

AMS SHEET/TOPOGRAPHIC MAP: Williams/Valentine SE

DISTRICT/COUNTY/STATE: Cottonwood/Mohave/AZ

TOWNSHIP/RANGE/SECTION: T23N, R12W, S30 and 31

SUMMARY OF CONCLUSIONS:

1. Remobilized stratabound mineralization exists at several targets on the claim block
2. Large volumes of detectable and anomalous gold are present at each target
3. A core drilling program is required to test these targets at depth.

ACCESSIBILITY:

From Kingman, AZ, take Route 66 to Hackberry mile post 80.5. Continue on Rt. 66 to mile post 82.5 and turn right on Hackberry Rd. Go .4 miles and cross railroad tracks to dirt road. Turn left and go .1 mile, cross the cattle guard and turn right. Go through gate 6.2 miles to Walkover mine. This is a 4 X 4 road.

PROPERTY SIZE:

16 unpatented claims encompassing 330 acres, surrounding the Alabama patented claims.

LEGAL STATUS:

As far as is known, clear title to mineral rights exists on both the patented and unpatented claims.

OWNERSHIP:

Unpatented ALA - 1 to 16 owned by P. O'Hara, G. Ryberg, J. Loghry and R. Lundin. Patented claim owned by Bruno & Ilse Tesori (figure 1)
12234 Everglade
Los Angeles, CA 90066

GEOGRAPHIC SETTING:

The property is located at an elevation of 5000 feet just south of the Colorado Plateau in northwest Arizona. Low rolling hills covered with juniper and pinyon trees characterize the area. Dry washes are present and access by road requires four wheel drive vehicles.

DEVELOPMENT:

Many prospect pits and several shafts are found at Alabama and Walkover mineralized areas. Prospect pits are scattered locally within the claim block.

HISTORY AND PRODUCTION:

The mineral deposits of the district consist of gold-bearing quartz veins in the granitic gneiss and schist. The district was not discovered until around 1907 and little detailed information about the deposits is known. The Walkover mine which has been the major producer of the district has been described by Wilson and others (1967). Their description of the mine indicates that a mineralized vein occurs within moderately foliated, dark-colored schist. No mention is made as to whether the vein cuts, or is enclosed by, the schist. This consideration is important as the mineralization is described as consisting of abundant banded sulphides (mainly pyrite, arsenopyrite and chalcopyrite) below the water table. This description allows the following inference to be made; namely, that the Walkover Mine might be a remobilized gold rich polymetalic stratabound occurrence (massive sulfide). The ore contained high gold concentrations (several carloads in 1934 ran between 1.00 to 1.29 opt Au), which makes the mine and surrounding area worthy of additional investigation. (Modified after Rehrig, 1984?: unpublished report.)

Hewett and others (1936) described the district production to that date as amounting to some $70,000 in combined metals. Keith and others (1983a) credited the district with some 13,500 tons of ore containing 3000 oz Au, 6,000 oz Ag, 457,000 lbs Cu and 500 lbs. Pb.

Walkover Mine: (Sec 30, T23N, R12W.) The mineralized zone (vein?) strikes N25 E and dips 75 W in amphibolitic Precambrian schist. Ore is oxidized to the 100-ft level and is accompanied by much iron oxide and some copper stain. Below the water level, ores consist of abundant banded sulfides consisting mainly of pyrite, arsenopyrite and chalcopyrite. Gangue is brecciated, glassy, gray quartz and altered fragments of schist. The vein is cut by several southwest striking faults and is developed to a depth of 365 ft. and for a maximum length of 200 ft. south of main shaft. The vein has been largely stoped from

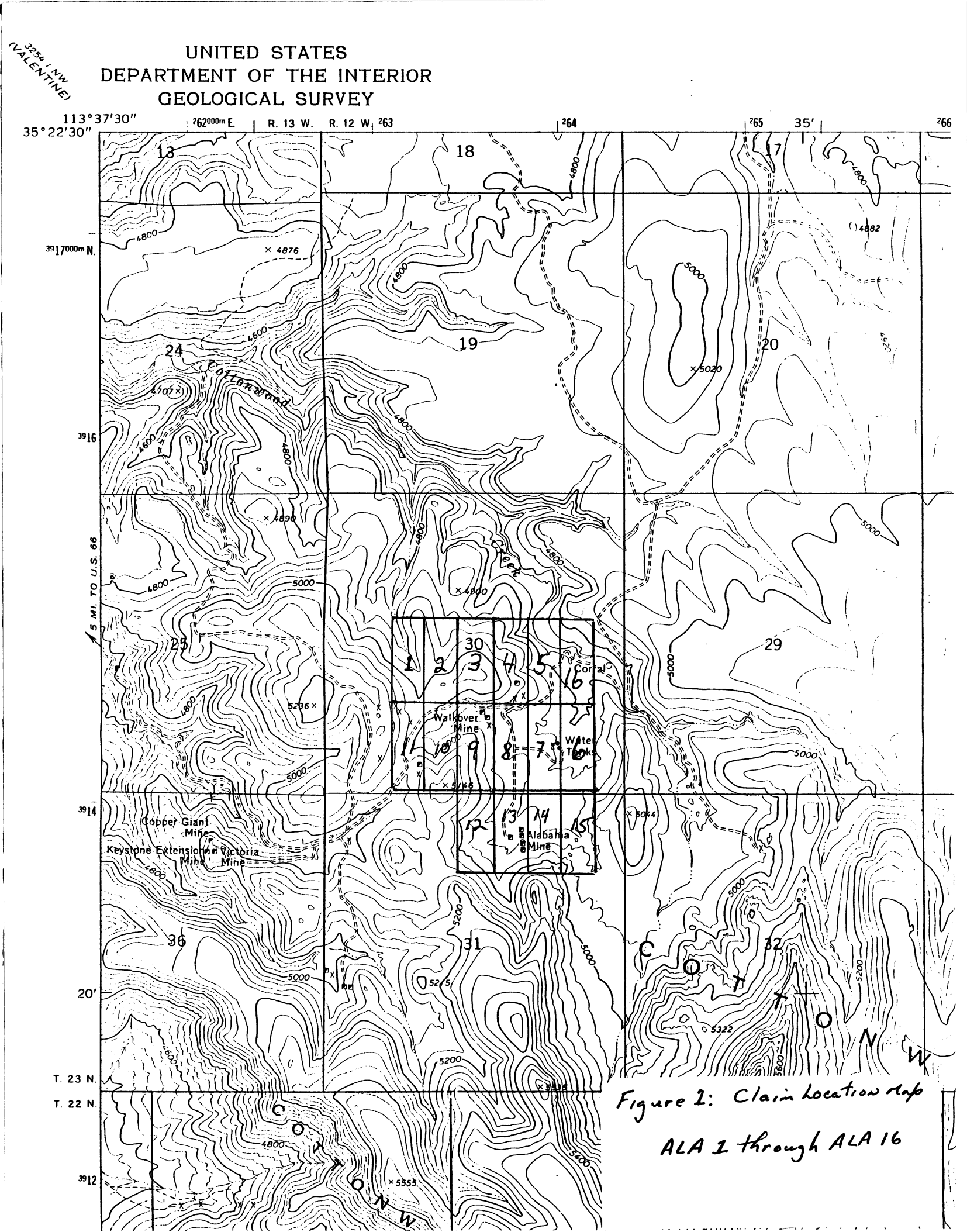



Figure 1: Claim location map

ALA 1 through ALA 16

the surface to the 100 foot level. Wilson and others (1967) indicated the width of the ore shoot ranged from 8 inches to 5 ft. and averaged about 2 ft.

REGIONAL GEOLOGY:

The district lies along the northern portion of the Cottonwood Cliffs which are a continuation of the Grand Wash Cliffs and mark the western margin of the Colorado Plateau. In this region, the plateau is floored by Precambrian dark colored schists and gneisses that are intruded in the northwest part of the district by Precambrian and Laramide granitoid rocks. The Precambrian rocks are overlain by lower Paleozoic sedimentary rocks to the southeast of the district and by nearly horizontal Tertiary volcanic rocks within the district.

PROSPECT GEOLOGY:

Near vertically dipping Precambrian metavolcanic and metasedimentary rocks crop out within the claim block. Top of the section is interpreted to lie to the east. The western part of the claim block, including the Walkover Mine area is underlain by mafic to dacitic volcanics now metamorphosed to amphibolites. The mafic volcanic rocks are overlain by a schistose fine-grained metasediment probably derived from the erosion of the mafic rocks. Interlayered rhyodocitic tuffs, pyroclastic sandstone and fine-grained metasediments overlie the sedimentary horizon. This unit hosts the ore zone at the Alabama Mine. Within this same rock unit an altered quartz porphry, which is silicified and gossanous, crops out north of the windmill. Andalusite bearing pelitic rocks overlie the felsic rocks and are in turn overlain by conglomerate which appears similar to the Texas Gulch Fm. of central Arizona.

The Walkover mine area contains vein mineralization within shear zones. Reference to banded massive sulfides at depth suggests that the veins may be remobilized from a stratabound system. At present, however, no alteration associated with the massive sulfide deposits has been observed on the surface.

Mineralization at the Alabama mine area appears to be concentrated within late fractures in the felsic unit. Again the possibility of a stratabound system may be hypothesized to exist at depth and that the mineralization observed at the surface is remobilized. Mineralization and alteration associated with the quartz porphyry in the creek bed north of the windmill is the best indication of a potential stratabound system. Geochemical samples with detectable gold collected from silicified felsic rock also suggests that a stratabound gold system may be present.

The excess aluminum within the andalusite bearing pelites may have been derived from argillic alteration associated with the stratabound system or alternatively been derived from the metamorphism of mineral assemblages created by alkali leaching of the sediment. The second possibility could occur if the hydrothermal system was subvolcanic and did not vent exhalative material at the seawater-sediment interface.

Mineralized target zones are located on figure 2.

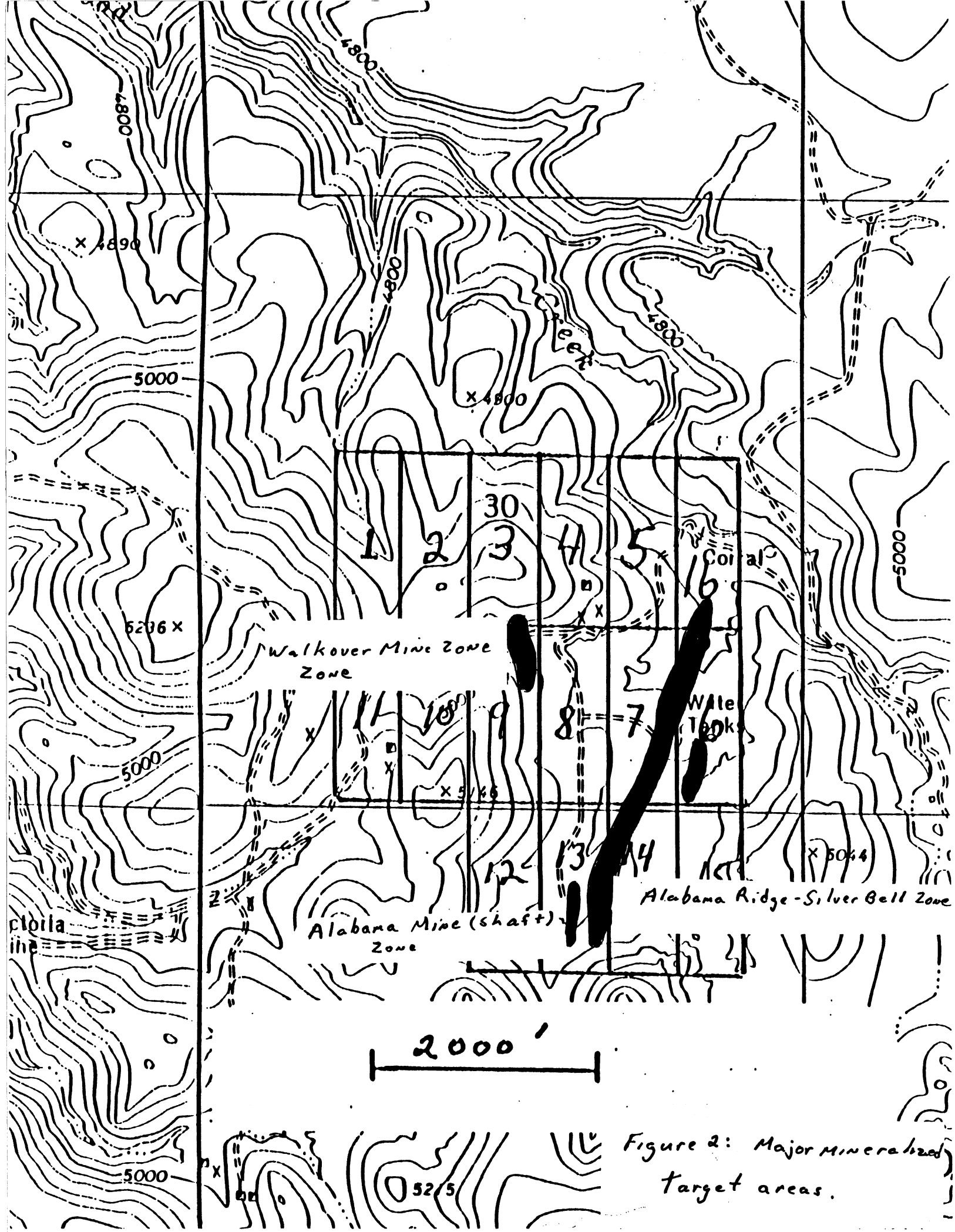



Figure 2: Major Mineralized target areas.

GEOCHEMISTRY:

G. Ryberg and P. O'Hara collected eleven lithogeochemical samples from the property during March, 1987. The location and results are summarized in Appendix 1. This data confirmed the presence of gold on the property.

A summary of Santa Fe Pacific Mining's geochemical data is presented in Appendices 2a and 2b.

GEOPHYSICS: None available to us. (unknown)

RESERVES: Unknown

POWER AND WATER SUPPLY: Hackberry, AZ

RAILHEAD AND SUPPLY POINTS: Hackberry, AZ/Kingman, AZ

ACTION TAKEN: Submitted to various companies

REFERENCES:
1. ADMR file on the Alabama - Walkover property
2. AZ Geological Survey Bull 137
3. S. Beard Thesis Map
4. Unpublished reports by P. Anderson Ph. D. for Santa Fe Pacific Mining Inc.

APPENDICES:

APPENDIX 1. Lithogeochemical data and sample location map for samples collected by G. Ryberg and P. O'Hara; March, 1987.

APPENDIX 2. Santa Fe Mining evaluation
- a. Geology
- b. Lithogeochemistry and soil geochemistry
- c. Drill results

Sincerely;

Pat O'Hara

Pat O'Hara

APPENDIX 1. Lithogeochemical data and sample location map for samples collected by G. Ryberg and P. O'Hara; March, 1987.

# IRON KING ASSAY INC.

08-Apr-87

LAB JOB #: MSC01444

Client name: Kaaterskill Exploration

Billing address: 691 Robinson Dr.
Prescott, AZ 86303

Phone number: 778-5321

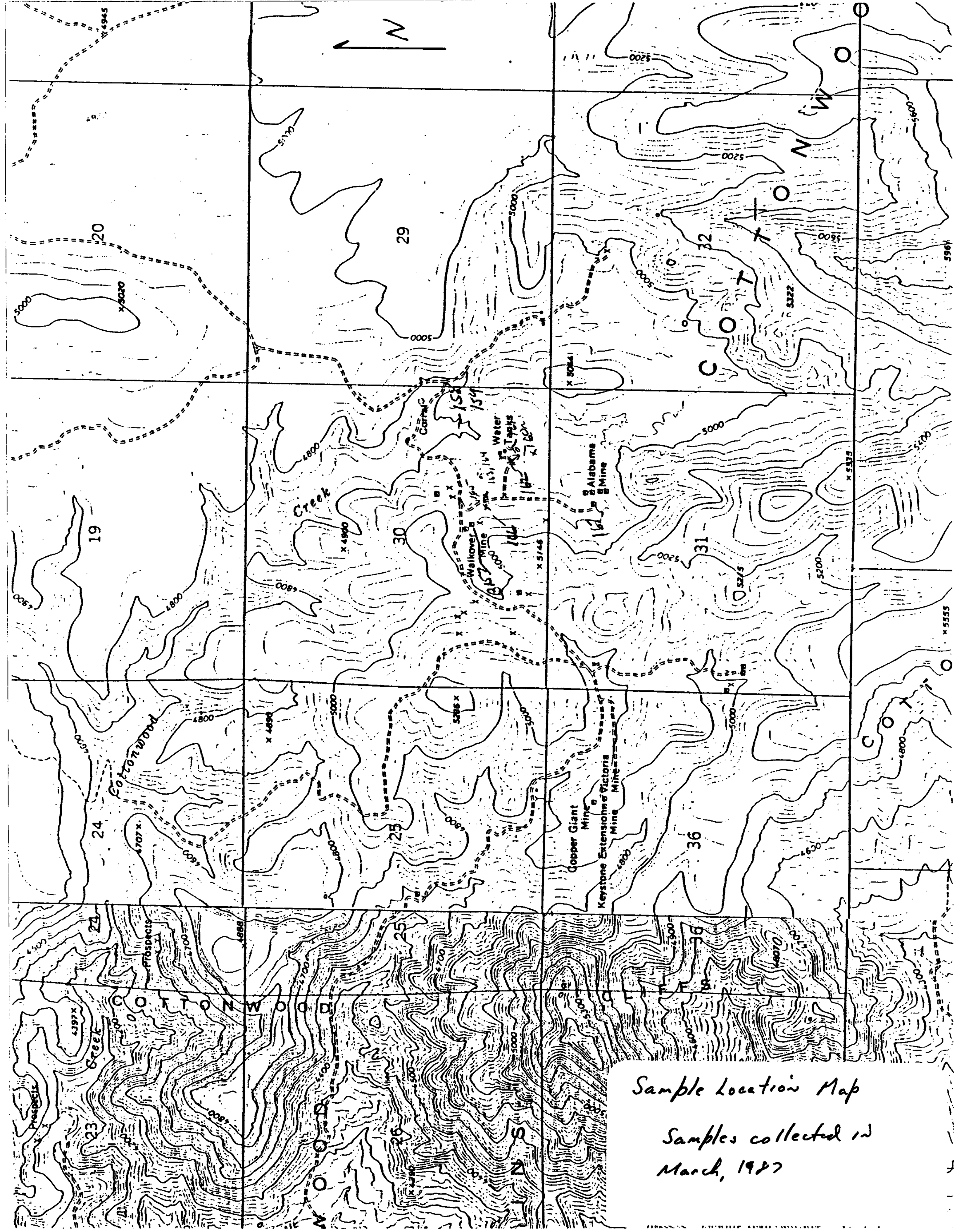
No. Samples: 11
Date Received: 04-01-87
Submitted by: Pat O'Hara

INVOICE ATTACHED

## ANALYTICAL REPORT

| Client ID MSC01444 | Lab ID | FA/AA Au ppb | AA Ag ppm |
|---|---|---|---|
| "KAAT - ALA - 1" | | | |
| B-157 | 1444- 1 | 2230 | 0.7 |
| B-158 | 1444- 2 | 70 | 5.1 |
| B-159 | 1444- 3 | 80 | 7.5 |
| B-160 | 1444- 4 | 90 | 0.6 |
| B-161 | 1444- 5 | 290 | 7.7 |
| B-162 | 1444- 6 | 2020 | 3.1 |
| B-163 | 1444- 7 | 700 | 1.5 |
| B-164 | 1444- 8 | 40 | <.2 |
| B-165 | 1444- 9 | 230 | 6.0 |
| B-166 | 1444- 10 | 210 | 3.7 |
| B-167 | 1444- 11 | 7890 | 4.5 |

REGISTERED ASSAYER
CERTIFICATE NO. 14315
ROBERT G. CROOK
Date Signed 4-8-87
ARIZONA, U.S.A.



Sample Location Map

Samples collected in
March, 1987

APPENDIX 2. Santa Fe Mining evaluation

a. Geology
b. Lithogeochemistry and soil geochemistry
c. Drill results

Appendix 2a:

## Stratigraphic Setting

The March progress report explained that the geologic setting of the Alabama mine is in a broad package of felsic tuffaceous metasedimentary rocks that was deposited after basalt-dacite-rhyolite volcanism of the Copper Giant mine area, but prior to a thick sequence of conglomerates and wackes that are probable stratigraphic equivalents of the Texas Gulch Formation in the Prescott area. Thus, the stratigraphic sequence in the Cottonwood Cliffs is as follows:

~ 1720 Ma younger Texas Gulch-type conglomeratic metasediments

~~~~~~~~~~~ Unconformity ~~~~~~~~~~~

~ 1740 Ma felsic tuffaceous metasediments of Alabama mine
[gold-bearing Alabama Mine Horizon]

felsic volcanics and tuffs (northwest of Alabama)

Dacitic flows, breccias and tuffs of Walkover mine

Basalt-andesite-dacite flows, breccias and tuffs of
Copper Giant mine area.

Although rocks in the Alabama mine area are at lower amphibolite metamorphic grades and moderately sheared, the above stratigraphic sequence is remarkably persistent over several miles of strike from northeast of the Walkover mine to section 1 in the south (see fig. 1). The mineralization at the Alabama Mine occurs in a narrow stratigraphic horizon within tuffaceous metasediments that lie between felsic tuffs to the west and the conglomeratic sediments to the east. The mineralization appears to be equally persistent along strike, since it is also found in section 1 in precisely the same stratigraphic position as at the Alabama mine. Its persistence along strike is vital to successful exploration of the entire horizon for covered gold settings.
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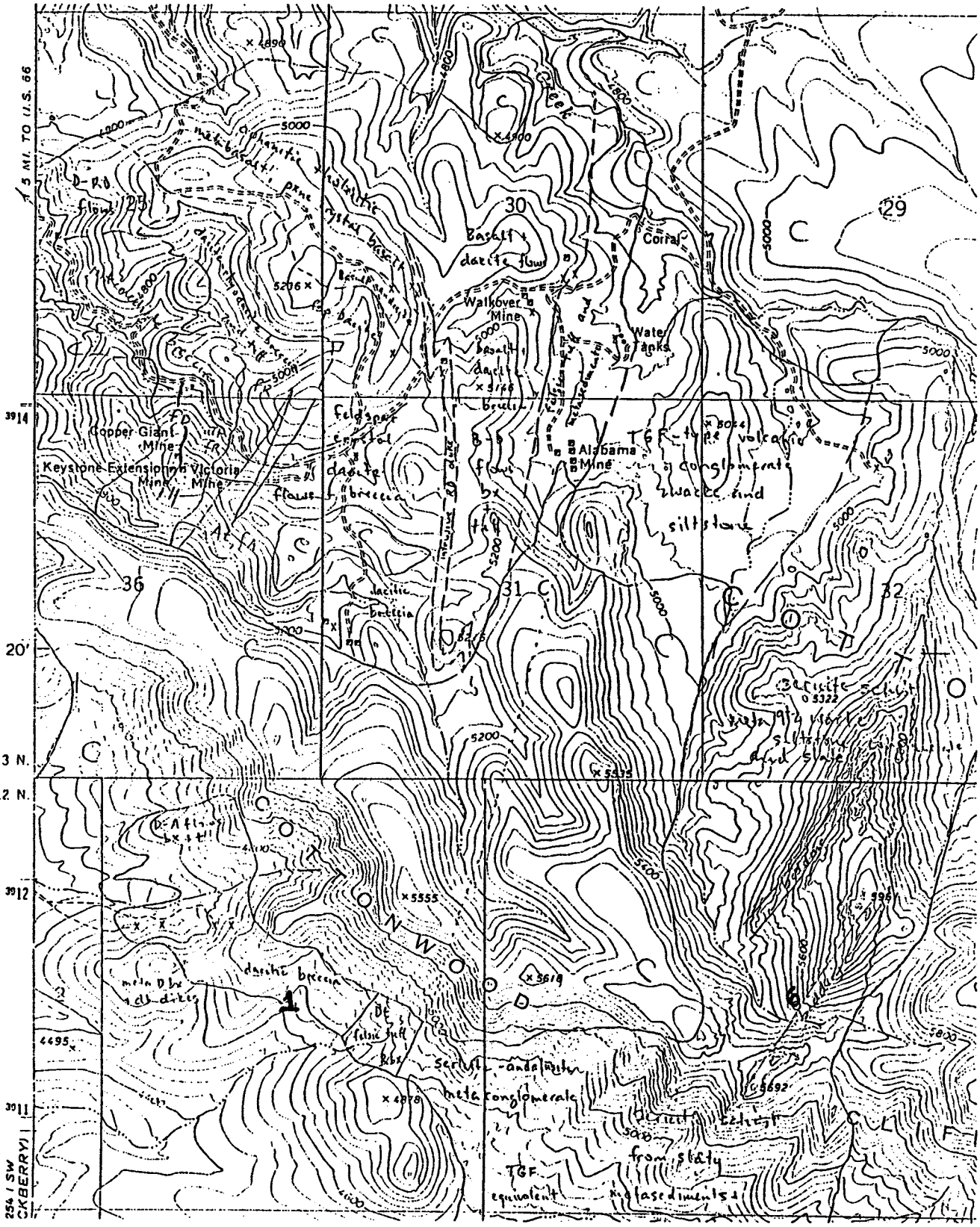


Figure 1: Revised geology of Copper Giant-Walkover-Alabama district

## General Geologic Setting

Figure 2, a geologic map of the Walkover-Alabama mine areas enlarged from 7.5' topographic base maps to 1" = 100' scale, shows the detailed geologic setting and land position of the Alabama mine area. The Walkover mine occurs in feldspar-crystal basalt and dacitic flows, breccias and tuffs that represent the eastern edge of the mafic-intermediate volcanics of the region. Mafic and intermediate metavolcanics extend southwest and west of the Walkover mine, but not to the east. Thus, the change from mafic-intermediate volcanics to felsic tuffs and sediments is a major stratigraphic break in the region.

This major stratigraphic break involves a sharp break into tuffaceous felsic volcanism east of the Walkover, then gradual evolution of the felsic deposits to less volcanic and more sedimentary with time and up-section to the east. The geologic section east of the small shaft between the Walkover and Alabama, sampled KH 25, is typical of the change. First, basalt flows, breccia and dacitic agglomerate give way to mafic (basalt-dacite) tuff and several carbonate-oxide facies iron formations to the east. The mafic tuffs are in turn overlain by meta-rhyodacite-rhyolite flows and tuffs with large quartz blebs, then by aphanitic felsic tuff and tuffaceous sediments, with carbonate-oxide cherts and intermediate tuffs locally interspersed.

Just east of the Alabama road is the beginning of a more massive sequence of very fine-grained felsic flows, tuffs or metasediments with tiny quartz crystals, but little else to aid in discerning the origin of the rocks at the high metamorphic grades exhibited in the area. In places the massive silicic rocks resemble rhyolite flows (e.g. to the north near the Silver Bell (?) shafts), elsewhere they seem to be fine grained felsic tuffs and tuffaceous metasediments, and still elsewhere (e.g. to the south near the Alabama mine) they resemble fine-grained metapelites (meta-mudstones and meta-siltstones) with little felsic tuff component. The locally non-volcanic appearance of the metasediments notwithstanding, even in the Alabama mine area, the metapelitic units are closely interbedded with tuffaceous metasediments that have obvious felsic volcanic components, so nowhere is the tuffaceous-sedimentary sequence without some felsic volcanic component. The high metamorphic grades, however, make distinction between felsic tuffs, tuffaceous sediments and non-volcanic metapelites difficult if not locally impossible without microscopic work.

## Alabama Mine Geologic Setting

The Alabama mine area itself has an interesting geologic setting for gold concentration. The area is made up of two distinct parts:

(1) is the western part where the main Alabama mine shaft itself lies;

(2) is the long N-trending ridge of outcrop about 400' to the east, named hereafter the Alabama ridge, as opposed to the Alabama mine (shaft) site.

There is a drastic difference between present geologic understanding of the two sites, since there is virtually no outcrop around the Alabama mine shaft, but there is relatively good outcrop over much of the Alabama ridge (see fig. 2).

There appears to be beds of felsic and intermediate tuff just west of the Alabama mine shaft, but dominantly non-volcanic metapelites (especially well bedded meta-mudstones and graded-bedded meta-siltstones) are at the shaft site, to the north, and just to the east. Graded bedding in the meta-mudstones north of the shaft clearly show that stratigraphic tops are to the east, and major stratigraphic repeats are absent. In the shaft itself is what seems to be a quartz vein cutting such pelitic metasediments. However, close inspection of the "vein" reveals an extremely fine-grained texture more like recrystallized chert than introduced quartz. In fact, the region is full of such chert-quartz bodies that appear to be the result of metamorphism and local remobilization of original chert beds. All parallel stratigraphy and foliation and are discordant to them only locally. There is no evidence that they are part of a later set of introduced quartz veins. However, some shear zones may be later structures.

The Alabama ridge appears to be a local domal felsic volcanic center that formed within a sea of felsic tuffaceous metasediments. The recessive area between the shaft and ridge is occupied by pelitic metasediments, and on the west side of the ridge is a resistant coarse-grained, foliated biotite-hornblende-feldspar rock that at first appeared to be a pre-tectonic mafic dike intruding the metasediments. However, bedding and textural-compositional layering in the unit implies that it is a mafic tuff rather than flow, sill or dike. Overlying the mafic tuff to the east is the main Alabama Gold Horizon, which consists of very fine-grained, well-bedded chlorite-biotite tuffaceous metasediments of felsic composition, but with a chloritic exhalative component. The Alabama gold horizon varies from 50 to 60 feet wide, as presently exposed, and extends for at least 600 feet along strike (see fig. 2).

The Alabama Gold Horizon contains at least three distinct mineral or metal facies on the Alabama ridge. The central zone is a high sulfide facies, where up to 20% sulfides, originally pyrite and chalcopyrite, but now mainly hematite-goethite-limonite gossan and oxide boxworks after Fe-Cu-As-Zn sulfides exist in thin chert bodies, in sheared parts of the tuffaceous stratigraphy, in narrow clayey shear zones, and as disseminations throughout host metasediments. Gold values are not confined to any one of the above, but occur in all of them.

North of the central sulfide-rich facies is a manganese-rich facies that represents a distinct gold cut-off on a local scale, compared to the two facies farther south. This local gold cut-off however, does not preclude another favorable environment occurring still farther north, because the Mn-facies appears to occupy only about 200' of strike. Rocks in the manganese facies are relatively silicic fine-grained rhyodacite-dacite metatuffs and metasediments that appear to wane in chlorite, sulfides and iron stain to the north, although outcrop to the north disappears at the limit of silicification.

The high sulfide facies of the Alabama gold horizon grades southward into what is the highest gold zone found in the surface sampling. In this zone the sulfide content is typically 10% or less, and the widespread hematite stain or hematite semi-gossan in the highest gold zones appears to be derived from pyrite and arsenic compounds rather than the pyrite-chalcopyrite to the north. The high-gold facies may grade south into another facies that was not detected in the preliminary survey due to poor rock exposures close to Tertiary cover.

Immediately in contact with the gold zone to the east is an original massive but now vertically foliated felsic rock with what appear to be small feldspar crystals disseminated throughout. The most likely protolith is a feldspar-crystal rhyodacite flow making up the core of the felsic dome, but other protoliths including sedimentary ones cannot be ruled out without thin sections. In the high sulfide facies of the Alabama gold horizon, the highest grade gold and sulfide mineralization appears to occur in a series of pits and trenches right at the contact of the massive rhyodacite and partly within the northern nose of the rhyodacite. Several small chert bodies and lenses lie along the contact, and these are enriched in gold relative to the surrounding felsic rocks. Several small shear zones also occur in the metasediments and tuffs but do not extend into the massive body, suggesting they are syngenetic.

The massive rhyodacite dome or flow is immediately overlain to the east by consanguineous feldspar-crystal rhyodacite breccia and tuff developed as a breccia cap to the flow or dome. Interestingly, this breccia exists only east of the most highly mineralized zone, and its coarse-grained facies is not present to the north. Instead, fine-grained felsic tuffs overlying the breccia facies appear to envelope both breccia and flow facies, to be indistinguishable with the tuffs underlying the felsic dome and breccia to the west. Overlying the breccia to the east, the same fine-grained felsic tuffs are much higher in chlorite and biotite (metamorphic from chlorite) component than to the north, implying a general waning of exhalative activity to the immediate north.

The mineralized package of rocks described above are sharply overlain and apparently locally truncated by a sheared assemblage of conglomerates and wackes that represent a sharp gold cut-off to the east. Although there is no direct evidence that this assemblage is time-equivalent to the Texas Gulch Formation in the Prescott area, its distinctive conglomeratic lithology, well-reworked non-volcanic matrix, and younger unconformable stratigraphic relation with underlying volcanic strata make it an almost certain candidate to be the time-stratigraphic equivalent of Texas Gulch Formation in northwest Arizona. Vast exposures of the sheared conglomerates and wackes exist to the east and southeast and all are devoid of significant mineralization, especially gold values. Thus, the conglomeratic sequence is of little exploration interest.

Examination of the Alabama mine area in March (see March 87 progress report) indicated that its geologic setting fitted the sedimentary-exhalative gold model earlier proposed for northwest Arizona exactly. Gold mineralization was disseminated throughout tuffaceous metasediments on the flank of a major metallically productive volcanic pile, and a local although small center for exhalative activity existed at the site. The initial reconnaissance sampling in March uncovered ore-grade gold values at the Alabama shaft, as well as at several places on the Alabama ridge, with values exceeding 1 oz/t Au suggesting the presence of high-grade gold-rich structures. Also, the blood red character of hematite stain in several semi-gossanous oxide zones on the ridge implied high arsenic contents of the system in the absence of high Cu-Zn base metals.

Thus, the Alabama ridge and mine area necessitated further detailed rock sampling, and was an ideal place to conduct a soil sampling grid survey, with analysis of the samples for gold, arsenic, and mercury. The location of the chain-and-compass flagged grid survey is shown on figure 3 in relation to prospects on the ridge and soil sample sites. The origination point of the survey is on the Alabama mine dump, and it extends up to 550' east to take in the conglomerate contact (fig. 2), and up to 100' west to take in the Alabama mine zone. The grid is thus 800' long N-S and 600' wide E-W. Soil samples were taken 50' apart on 100' line spacings, to a total of 98 soil samples.

Figure 4 shows the location of all rock samples taken at the Alabama shaft and Alabama ridge in relation to the many prospects on the ridge. The $30^{o}$ trend of prospects on the ridge accurately maps the trend of the highest grade mineralization on the ridge, and a comparison of figs. 4 and 2 show that this trend is $10\text{-}20^{o}$ more easterly than bedding in the same area. This does not mean that all mineralization was introduced epigenetically, but that lower-grade syngenetic gold mineralization was later reconcentrated in shear zones.

The 35 rock samples shown on figure 4 represent all that could be reasonably taken with the present surface exposures. Many small shafts are inaccessible without ladders, and only questionable chip samples could be taken beside the shafts at surface that probably do not accurately reflect the true gold grades of mineralization extracted at depth. Additional surface sampling can do no more than duplicate the existing sets of samples. Thus, to further and more effectively sample the property, additional exposures must be created, since the existing exposures on the ridge and especially at the main shaft are inadequate to properly evaluate the extent and grade of gold mineralization.

## Rock Sample Results

Figure 4 shows in red the gold results of the first rock samples from the Alabama mine area taken in March. In black are the results of additional rock samples taken in April. There is remarkably good agreement between the two different sample sets taken, but at high gold values (KH 20 and KH 23), the agreement is much poorer. This demonstrates that high-grade mineralization in the 1 oz/t range lies in relatively narrow units or structures that may or may not be duplicated by later sampling. In the case of KH 20, gold in excess of 1 oz/t probably lies in narrow chert lenses of the deep southern shaft, resampled as AR 5 and 7. In sample KH 23, the main Alabama mine chert or "quartz vein" contains more than 1 oz/t Au, adjacent wall rocks have mostly less than 1 ppm Au, and southern extensions of the structure have between 1 and 4 ppm Au.

It is clear from figure 4 that the northern part of the Alabama ridge north of the KH 18 prospect pit contains gold values lower than 0.2 ppm, and appears to be of lesser interest than the southern parts. This northern group of samples corresponds to the manganese facies of the Alabama gold horizon shown on figure 2, and represents a depositional facies unfavorable to gold concentration. Samples AR 8-12 and KH 18-19 represent the high sulfide facies of the ore horizon on figure 2. This high-sulfide facies appears to contain less than 1 ppm Au, but the significance of the prospects sampled is deceiving.

Samples AR 8-9, KH 18-19 and AR 12-16 were all from the most iron-stained, highest sulfide zones and are less than 0.5 ppm Au. Sample AR 10 was from a recessive chert unit with little sulfides, but it has a markedly higher 2 ppm gold value. Thus, gold does not seem to be most highly concentrated in the high-sulfide zones where it might be expected to lie, but rather in the siliceous units with only minor sulfides. This is true of all the highest Au samples KH 20, 23, AR 7, 10 and 28, since they all contain siliceous cherty beds, lenses or pods. Since the old prospectors preferred mining the highest sulfide zones on the Alabama ridge to many smaller cherty units, sampling of their prospects cannot be relied upon as an accurate representation of the highest grade gold mineralization on the ridge, nor even as a representative sample of the gold grades across the bulk of the 50'-wide gold-bearing zone.

The only way to obtain such a representative sample is to have continuous exposure across the ridge as trenches (or drill holes), and take continuous channel samples across the mineralized zone. The rock sampling to date, however, does indicate that there appears to be near ore-grade gold grades across significant widths (e.g. AR 5, AR 27, 28, KH 20, 23, and AR 10), and this seems to be adequate cause to justify a more detailed trenching and rock sampling program of both the Alabama shaft zone and the Alabama ridge.

Tables 1 and 2 show other geochemical results of the rock samples. The general element profile of the Alabama mine area is of high gold, arsenic and mercury, and low silver and base metals. The low silver and lead values implies that the metal system is an original syngenetic one, and the generally low copper and zinc values plus the total non-correlation between Au and Cu-Zn implies that the syngenetic system was on a trend of maximum gold enrichment independent of base metals. Some epigenetic remobilization of syngenetic gold may be indicated in the few samples with high silver values (KH 20, 23), but the enrichment could also be due to Au-Ag-As concentration during metamorphism. Thus, the geochemistry of the Alabama metal system is exactly what would be expected from a syngenetic sedimentary-exhalative gold deposit where gold underwent maximum enrichment over all other metallic constituents. The system therefore had the potential to reach the highest gold concentrations possible.

## Soil Sample Results

Figure 5 shows the gold results of soil samples taken on the Alabama grid as both plotted values and contours in ppb. The two very high Au values over the Alabama shaft are explicable as a dump sample and its natural down-slope expression, but even without these two values, the soil grid picked up the gold mineralization of the Alabama shaft area. On the Alabama ridge, the highest 6200 ppb value is at the southern open cut where the highest gold-value rock sample was found. Apart from this expected spike, the highest gold values in soils to the north all lie east of the line of oxide prospects. Although east is also downhill on this part of the ridge, the soil anomaly is unlikely to be due to down-slope transport, since several soil samples were taken right from the oxide dumps or at outcrop. Instead. the soil results tend to confirm the rock sample results that the highest gold values do not occur in the high-sulfide zone that was heavily pitted, but rather in silicic units farther east. This is another reason to open up the ridge with a series of trenches.

The soil sampling program appears to have closed off the gold anomaly north of line 600 N, although this is at the point where alluvial cover takes over from outcrop and sub-outcrop. It also may appear to have closed off the gold anomaly to the south at line 200 S, but in reality it did not, because the base line at 250 E involves Tertiary volcanic cover, whereas the 100 ppb gold anomalies either side are near outcrop. The anomalous zone therefore is open to the south. The results of the soil sampling were very successful both in locating anomalies under thin alluvial cover, and in defining an anomalous gold trend similar to that deduced from geologic mapping. Consequently, it is worth extending the soil sample grid northward to test for occurrences of other gold anomalies along the same geologic trend toward the Silver Bell(?) mine. Figure 2 shows that the Silver Bell(?) mine area may involve another gold-rich system like the Alabama, but may be separated from it by a gold-poor Mn-rich facies.

The arsenic results of soil samples are shown in figure 6, which is designed to be an overlay to the fig. 5 gold results. The position and trend of the main arsenic anomaly, as well as individual high-As samples, coincide closely if not exactly with the main gold anomalies and high arsenic samples. This indicates a close correlation between arsenic and gold in the Alabama metal system, as is nearly always the case in a low Cu-Zn-Pb high-As Au system. Thus, arsenic is an excellent gold tracer in the Alabama gold horizon, but not necessarily in other gold horizons of the district. For example, the prospect on the ridge between the Alabama and Walkover mines (fig. 2, table 2) is not anomalous in gold but contains 25% arsenic!

Mobile or low-T extractable mercury ( < 189$^{o}$C extraction) values were determined by Exploration Technologies Inc. for all the Alabama soil samples. Whereas the rock samples showed anomalous mercury values but no particular spikes with an AA extractable determination, the mobile mercury values showed much greater variability, as evident on figure 7. Comparing this figure to fig. 5, it is clear that mobile mercury outlines the same anomalies, both generally and in detail, as the gold results. The Hg anomalies also coincide with the As anomalies (figs 6 & 7), confirming the close interdependence of Au, Ag and As. Interestingly, there is an As and Hg anomaly at the southern limit of the soil survey where Au values are depleted by Tertiary volcanic cover. Perhaps this means that mobile Hg and As anomalies reflect through cover where Au does not.

Although Cu, Pb and Zn are generally low in soil samples (table 3) as in rock samples (table 1), there is a reasonably close correspondence between high Au and high Cu-Pb-Zn in several high Au samples (AS 54, 64, 65, 70) but not in others (AS 18, 28, 30, 55). The close gold-base metal correspondence occurs right over the Alabama ore horizon and the Alabama shaft, as expected.

Both As and mobile Hg are valuable adjuncts to Au in further soil sampling of more northerly extensions of the Alabama horizon. The existing soil sample grid was not large enough to get out of the mobile mercury anomaly that surrounds the gold mineralization. All samples, including those off the main gold and sulfide zones, exceed mobile mercury background levels of 3-5 ppb Hg. Probably the same is true for arsenic, and it is almost certain that on a broader regional scale, the entire Alabama mine stratigraphic package would show up as a huge anomaly in mobile mercury, arsenic and gold.

TABLE I:

RESULTS OF ROCK SAMPLES, ALABAMA RIDGE AND ALABAMA MINE AREAS

| Sample | Location and Rock Type | Au (ppb) |
|---|---|---|
| **Alabama Ridge Area** | | |
| AR 1 | 4' chip across southernmost pit on main S shear zone | 340 |
| AR 2 | 4' channel of gossan, S end deep pit (incl. in KH 20) | 200 |
| AR 3 | chip along west wall of southern deep pit (cf. KH 20) | 190 |
| AR 4 | 2' channel across N end of deep pit (incl. in KH 20) | 6000 |
| AR 5 | 4' chip across edge of southern shaft (in KH 20) | 3800 |
| AR 6 | 5' chip of clay-hematite-altered rhyolite in E trench | 880 |
| AR 6E | 5' chip as above, but eastern part of same trench | 25 |
| AR 7 | High-grade hematite goethite gossan, south shaft dump | 14500 |
| AR 8 | Dump of central deep shaft (previous sample KH 19) | 220 |
| AR 9 | 5' chip across edge of central deep shaft, hem. rhy. | 220 |
| AR 10 | 7' channel, hem. rhyolite on S strike with north zone | 2000 |
| AR 11 | 6' chip of hem-pyr chert beside rhyolite, N-central zone | 41 |
| AR 12 | 5' chip across gossanous rhyolite of N pit (cf. KH 18) | 330 |
| AR 13 | 5' chip of hematitic rhyolite, west wall N-central pit | 1540 |
| AR 14 | 5' chip of hematitic rhyolite, south wall N-central pit | 44 |
| AR 15 | 5' chip of hematitic rhyolite, east wall N-central pit | 22 |
| AR 16 | dump of hematitic semigossanous rhyolite, N-central pit | 143 |
| AR 17 | 8' chip of felsic tuffaceous metasediments (cf. KH 17) | 8 |
| AR 18 | 4' chip of manganese-rich rhyolite, small pit in NE | 12 |
| AR 19 | dump sample of Mn-rich rhyolite breccia from above pit | 169 |
| AR 20 | Manganese-rich rhyolite on edge of Mn-rich zone to N | 11 |
| AR 21 | 7' chip of hem. rhyolite, west wall of large N pit | 25 |
| AR 22 | 3' channel of hem.-clay zone in large N pit (cf. KH 16) | 76 |
| AR 23 | 4' channel of hem. rhyolite and clay, large N pit | 16 |
| AR 24 | 4' chip, coarse gr. bi-chl metaseds, N pit (cf. KH 25) | 12 |
| AR 25 | 3' chip of clay-lim rhyolite, farthest N otcp on ridge | 36 |
| **Alabama Mine Area** | | |
| AR 26 | 3' chip of silicic rhyolite, S trench of Alabama zone | 56 |
| AR 27 | 4' channel of lim. gossan, S end Alabama cut (cf. KH 21) | 2300 |
| AR 28 | 3' chip of hem. felsic tuff, in southern Alabama cut | 4200 |
| AR 29 | 3' chip across southern extent of Alabama chert (missing) | 340 |
| AR 30 | 3' chip, west wall of main Alabama cut (incl. in KH 22) | 72 |
| AR 31 | 4' chip, west wall of main Alabama cut (incl. in KH 22) | 930 |
| AR 32 | 5' chip, west wall of main Alabama cut (incl. in KH 22) | 540 |
| AR 33 | 3' chip, west wall of main Alabama cut (incl. in KH 22) | 460 |
| AR 34 | Dump sample of main Alabama dump (cf. KH 23) | 3100 |
| AR 35 | Bulk sample of main Alabama mine dump | 112 |

RESULTS OF ROCK SAMPLES, ALABAMA RIDGE AND ALABAMA MINE AREAS

| SAMPLE | AU (ppm) | AG (ppm) | CU (ppm) | PB (ppm) | ZN (ppm) | AS (ppm) | *HG (ppb) |
|---|---|---|---|---|---|---|---|
| **Alabama Ridge Area** | | | | | | | |
| AR 1 | .340 | 0.6 | 136.0 | 14.0 | 47.0 | 640.0 | 24.0 |
| AR 2 | .200 | 0.4 | 168.0 | 8.0 | 58.0 | 67.0 | 24.0 |
| AR 3 | .190 | 0.4 | 132.0 | 9.0 | 55.0 | 53.0 | 24.0 |
| AR 4 | 6.000 | 3.2 | 291.0 | 30.0 | 47.0 | 587.0 | 24.0 |
| AR 5 | 3.800 | 1.8 | 85.0 | 16.0 | 17.0 | 5547.0 | 16.0 |
| AR 6 | .880 | 1.4 | 96.0 | 35.0 | 80.0 | 253.0 | 24.0 |
| AR 6E | .025 | <0.2 | 41.0 | 7.0 | 38.0 | 88.0 | 16.0 |
| AR 7 | 14.500 | 5.2 | 189.0 | 19.0 | 11.0 | 18560.0 | 24.0 |
| AR 8 | .220 | 3.4 | 840.0 | 8.0 | 64.0 | 443.0 | 24.0 |
| AR 9 | .220 | 2.0 | 900.0 | 24.0 | 38.0 | 32.0 | 32.0 |
| AR 10 | 2.000 | 4.2 | 41.0 | 410.0 | 174.0 | 240.0 | 16.0 |
| AR 11 | .041 | 0.6 | 23.0 | 15.0 | 36.0 | 99.0 | 32.0 |
| AR 12 | .330 | 0.8 | 145.0 | 20.0 | 82.0 | 192.0 | 24.0 |
| AR 13 | 1.540 | 0.6 | 55.0 | 73.0 | 75.0 | 341.0 | 24.0 |
| AR 14 | .044 | 0.4 | 94.0 | 6.0 | 24.0 | 189.0 | 40.0 |
| AR 15 | .022 | 0.6 | 119.0 | 9.0 | 88.0 | 496.0 | 16.0 |
| AR 16 | .143 | 0.8 | 165.0 | 13.0 | 54.0 | 315.0 | 32.0 |
| AR 17 | .008 | 1.0 | 173.0 | 9.0 | 12.0 | 13.0 | 16.0 |
| AR 18 | .012 | 0.4 | 47.0 | 13.0 | 54.0 | 123.0 | 16.0 |
| AR 19 | .169 | 1.0 | 49.0 | 15.0 | 46.0 | 205.0 | 32.0 |
| AR 20 | .011 | 0.4 | 11.0 | 11.0 | 52.0 | 27.0 | 32.0 |
| AR 21 | .025 | 1.4 | 121.0 | 55.0 | 206.0 | 237.0 | 32.0 |
| AR 22 | .076 | 1.4 | 153.0 | 87.0 | 116.0 | 181.0 | 48.0 |
| AR 23 | .016 | <0.2 | 129.0 | 25.0 | 45.0 | 165.0 | 32.0 |
| AR 24 | .012 | <0.2 | 69.0 | 13.0 | 27.0 | 29.0 | 24.0 |
| AR 25 | .036 | 0.6 | 41.0 | 5.0 | 18.0 | 85.0 | 16.0 |
| **Alabama Mine Area** | | | | | | | |
| AR 26 | .056 | 0.4 | 63.0 | 55.0 | 125.0 | 8.0 | 16.0 |
| AR 27 | 2.300 | 0.8 | 183.0 | 47.0 | 80.0 | 384.0 | 16.0 |
| AR 28 | 4.200 | 0.8 | 242.0 | 118.0 | 120.0 | 131.0 | 40.0 |
| AR 29 | .340 | 0.6 | 540.0 | 376.0 | 580.0 | 272.0 | 32.0 |
| AR 30 | .072 | 0.2 | 63.0 | 235.0 | 345.0 | 88.0 | 32.0 |
| AR 31 | .930 | 0.4 | 45.0 | 339.0 | 510.0 | 203.0 | 32.0 |
| AR 32 | .540 | 0.4 | 201.0 | 480.0 | 940.0 | 427.0 | 56.0 |
| AR 33 | .460 | 0.6 | 257.0 | 117.0 | 152.0 | 133.0 | 40.0 |
| AR 34 | 3.100 | 1.0 | 290.0 | 150.0 | 390.0 | 469.0 | 135.0 |
| AR 35 | .112 | <0.2 | 193.0 | 11.0 | 104.0 | 96.0 | 40.0 |

*HG = Total AA-assay Mercury reported by Barringer Labs

TABLE 1A:

## Rock Sample Results - Alabama Mine Area

| SAMPLE | AU (ppm) | AG (ppm) | CU (ppm) | PB (ppm) | ZN (ppm) | AS (ppm) | *HG (ppb) |
|---|---|---|---|---|---|---|---|
| AR 1 | .340 | 0.6 | 136.0 | 14.0 | 47.0 | 640.0 | 24.0 |
| AR 2 | .200 | 0.4 | 168.0 | 8.0 | 58.0 | 67.0 | 24.0 |
| AR 3 | .190 | 0.4 | 132.0 | 9.0 | 55.0 | 53.0 | 24.0 |
| AR 4 | 6.000 | 3.2 | 291.0 | 30.0 | 47.0 | 587.0 | 24.0 |
| AR 5 | 3.800 | 1.8 | 85.0 | 16.0 | 17.0 | 5547.0 | 16.0 |
| AR 6 | .880 | 1.4 | 96.0 | 35.0 | 80.0 | 253.0 | 24.0 |
| AR 6E | .025 | <0.2 | 41.0 | 7.0 | 38.0 | 88.0 | 16.0 |
| AR 7 | 14.500 | 5.2 | 189.0 | 19.0 | 11.0 | 18560.0 | 24.0 |
| AR 8 | .220 | 3.4 | 840.0 | 8.0 | 64.0 | 443.0 | 24.0 |
| AR 9 | .220 | 2.0 | 900.0 | 24.0 | 38.0 | 32.0 | 32.0 |
| AR 10 | 2.000 | 4.2 | 41.0 | 410.0 | 174.0 | 240.0 | 16.0 |
| AR 11 | .041 | 0.6 | 23.0 | 15.0 | 36.0 | 99.0 | 32.0 |
| AR 12 | .330 | 0.8 | 145.0 | 20.0 | 82.0 | 192.0 | 24.0 |
| AR 13 | 1.540 | 0.6 | 55.0 | 73.0 | 75.0 | 341.0 | 24.0 |
| AR 14 | .044 | 0.4 | 94.0 | 6.0 | 24.0 | 189.0 | 40.0 |
| AR 15 | .022 | 0.6 | 119.0 | 9.0 | 88.0 | 496.0 | 16.0 |
| AR 16 | .143 | 0.8 | 165.0 | 13.0 | 54.0 | 315.0 | 32.0 |
| AR 17 | .008 | 1.0 | 173.0 | 9.0 | 12.0 | 13.0 | 16.0 |
| AR 18 | .012 | 0.4 | 47.0 | 13.0 | 54.0 | 123.0 | 16.0 |
| AR 19 | .169 | 1.0 | 49.0 | 15.0 | 46.0 | 205.0 | 32.0 |
| AR 20 | .011 | 0.4 | 11.0 | 11.0 | 52.0 | 27.0 | 32.0 |
| AR 21 | .025 | 1.4 | 121.0 | 55.0 | 206.0 | 237.0 | 32.0 |
| AR 22 | .076 | 1.4 | 153.0 | 87.0 | 116.0 | 181.0 | 48.0 |
| AR 23 | .016 | <0.2 | 129.0 | 25.0 | 45.0 | 165.0 | 32.0 |
| AR 24 | .012 | <0.2 | 69.0 | 13.0 | 27.0 | 29.0 | 24.0 |
| AR 25 | .036 | 0.6 | 41.0 | 6.0 | 18.0 | 85.0 | 16.0 |
| AR 26 | .056 | 0.4 | 63.0 | 55.0 | 125.0 | 8.0 | 16.0 |
| AR 27 | 2.300 | 0.8 | 183.0 | 47.0 | 80.0 | 384.0 | 16.0 |
| AR 28 | 4.200 | 0.8 | 242.0 | 118.0 | 120.0 | 131.0 | 40.0 |
| AR 29 | .340 | 0.6 | 540.0 | 376.0 | 580.0 | 272.0 | 32.0 |
| AR 30 | .072 | 0.2 | 63.0 | 235.0 | 345.0 | 88.0 | 32.0 |
| AR 31 | .930 | 0.4 | 45.0 | 339.0 | 510.0 | 203.0 | 32.0 |
| AR 32 | .540 | 0.4 | 201.0 | 480.0 | 940.0 | 427.0 | 56.0 |
| AR 33 | .460 | 0.6 | 257.0 | 117.0 | 152.0 | 133.0 | 40.0 |
| AR 34 | 3.100 | 1.0 | 290.0 | 150.0 | 390.0 | 469.0 | 135.0 |
| AR 35 | .112 | <0.2 | 193.0 | 11.0 | 104.0 | 96.0 | 40.0 |

*HG = Total AA-assay Mercury reported by Barringer Labs

TABLE 2:

RESULTS OF COTTONWOOD CLIFFS RECONNAISSANCE SAMPLES, KINGMAN AREA

| Sample | Location and Rock Type | Au (ppb) | Au (oz/t) |
|---|---|---|---|
| **Walkover Mine:** | | | |
| KH 24 | 10' chip of hematite stringers, cut S of Walkover | 21,000 | .613 |
| KH 34 | Magnetite-pyrite chert of main Walkover mine shaft | 15,100 | |
| KH 35 | West 3' hematite gossan in metadacite} southern | 4,000 | |
| KH 36 | Central 7' brecciated clay gouge zone} Walkover | 880 | |
| KH 37 | East 4' of gossanous dacite and gouge} shaft | 4 | |
| KH 38 | Sulfidic lean chert on S dump near loading chute | 3,900 | |
| **Prospects between Alabama and Walkover** | | | |
| KH 25 | Arsenopyrite-rich tuff + cif on dump NW of Alabama | <2 | |
| KH 26 | Pyritic quartz vein or chert on Silver Bell dump | 4,500 | |
| KH 27 | Hematite-clay-malachite rhyolite on dump near KH 26 | 1,300 | |
| KH 28 | Vuggy cellular hem-goeth-lim gossan, pits to north | 370 | |
| **Alabama Mine Ridge:** | | | |
| KH 15 | red-brown oxide after pyr+aspy, northernmost dump | 15 | |
| KH 16 | 5' channel of clay-rich limonite gossan, 2nd N pit | 35 | |
| KH 17 | chip of felsic tuffaceous metasediments, 3rd N pit | 7 | |
| KH 18 | 5' chip of hematite gossan zone, 50' to south of 17 | 360 | |
| KH 19 | high-grade goethite-hem-silica gossan, main dump | 430 | |
| KH 20 | aggregate chip of gossan in southern pits and cut | 49,000 | 1.601 |
| **Alabama Mine:** | | | |
| KH 21 | 4' channel, south clay gouge extent of main vein | 600 | |
| KH 22 | 4' chip, hem-silicic mseds + felsic tuff, main cut | 340 | |
| KH 23 | hematite gossan and quartz vein, main Alabama dump | 43,000 | 1.230 |

RESULTS OF COTTONWOOD CLIFFS RECONNAISSANCE SAMPLES, KINGMAN AREA

| SAMPLE | AU (ppm) | AG (ppm) | CU (ppm) | PB (ppm) | ZN (ppm) | AS (ppm) | *HG (ppb) |
|---|---|---|---|---|---|---|---|
| **Walkover Mine:** | | | | | | | |
| KH 24 | 21.000 | 2.6 | 1650.0 | 8.0 | 69.0 | 23467.0 | <10.0 |
| KH 34 | 15.100 | 8.0 | 6600.0 | 32.0 | 47.0 | 16000.0 | <10.0 |
| KH 35 | 4.000 | 1.2 | 1410.0 | 16.0 | 69.0 | 195.0 | <10.0 |
| KH 36 | .880 | 0.2 | 810.0 | 42.0 | 60.0 | 7573.0 | 16.0 |
| KH 37 | .004 | <0.2 | 82.0 | 20.0 | 42.0 | 43.0 | 24.0 |
| KH 38 | 3.900 | 0.8 | 1020.0 | 38.0 | 17.0 | 485.0 | <10.0 |
| **Prospects between Alabama and Walkover** | | | | | | | |
| KH 25 | <.002 | 442.0 | 2720.0 | 4500.0 | 14.0 | 250667.0 | 16.0 |
| KH 26 | 4.500 | 6.8 | 6100.0 | 54.0 | 51.0 | 405.0 | <10.0 |
| KH 27 | 1.300 | 27.8 | 3300.0 | 49.0 | 160.0 | 293.0 | 40.0 |
| KH 28 | .370 | 6.2 | 321.0 | 14.0 | 32.0 | 832.0 | 1663.0 |
| **Alabama Mine Ridge:** | | | | | | | |
| KH 15 | .015 | 1.6 | 690.0 | 10.0 | 217.0 | 293.0 | <10.0 |
| KH 16 | .035 | 1.0 | 225.0 | 40.0 | 114.0 | 229.0 | 13.0 |
| KH 17 | .007 | 1.0 | 171.0 | 9.0 | 19.0 | 32.0 | <10.0 |
| KH 18 | .360 | 1.6 | 114.0 | 81.0 | 107.0 | 379.0 | <10.0 |
| KH 19 | .430 | 6.2 | 750.0 | 23.0 | 103.0 | 357.0 | <10.0 |
| KH 20 | 49.000 | 20.0 | 387.0 | 37.0 | 58.0 | 19200.0 | <10.0 |
| **Alabama Mine:** | | | | | | | |
| KH 21 | .600 | 1.0 | 193.0 | 57.0 | 120.0 | 133.0 | <10.0 |
| KH 22 | .340 | 0.8 | 329.0 | 217.0 | 470.0 | 587.0 | <10.0 |
| KH 23 | 43.000 | 18.4 | 510.0 | 229.0 | 349.0 | 597.0 | 27.0 |

TABLE 3:

## Soil Sample Results - Alabama Mine Area

| SAMPLE | AU (ppb) | AG (ppm) | CU (ppm) | PB (ppm) | ZN (ppm) | AS (ppm) | *HG (ppb) |
|---|---|---|---|---|---|---|---|
| AS 1 | <2.0 | <0.2 | 10.0 | 11.0 | 41.0 | 19.0 | 4.4 |
| AS 2 | <2.0 | <0.2 | 26.0 | 20.0 | 75.0 | 40.0 | 7.5 |
| AS 3 | <2.0 | <0.2 | 19.0 | 11.0 | 81.0 | 59.0 | 6.7 |
| AS 4 | <2.0 | <0.2 | 23.0 | 8.0 | 87.0 | 72.0 | 4.8 |
| AS 5 | <2.0 | <0.2 | 21.0 | 9.0 | 64.0 | 35.0 | 6.3 |
| AS 6 | <2.0 | <0.2 | 28.0 | 7.0 | 52.0 | 8.0 | 5.6 |
| AS 7 | <2.0 | <0.2 | 40.0 | 8.0 | 55.0 | 27.0 | 5.2 |
| AS 8 | <2.0 | <0.2 | 18.0 | 15.0 | 88.0 | 101.0 | 7.1 |
| AS 9 | <2.0 | <0.2 | 16.0 | 14.0 | 96.0 | 104.0 | 13.1 |
| AS 10 | <2.0 | <0.2 | 9.0 | 6.0 | 51.0 | 40.0 | 7.1 |
| AS 11 | 52.0 | <0.2 | 17.0 | 6.0 | 65.0 | 35.0 | 6.0 |
| AS 12 | 36.0 | <0.2 | 12.0 | 5.0 | 68.0 | 29.0 | 4.8 |
| AS 13 | <2.0 | <0.2 | 18.0 | 6.0 | 83.0 | 56.0 | 4.4 |
| AS 14 | <2.0 | <0.2 | 27.0 | 10.0 | 127.0 | 64.0 | 10.7 |
| AS 15 | <2.0 | <0.2 | 28.0 | 11.0 | 68.0 | 16.0 | 4.8 |
| AS 16 | 10.0 | <0.2 | 23.0 | 20.0 | 100.0 | 176.0 | 9.9 |
| AS 17 | 6.0 | <0.2 | 17.0 | 8.0 | 73.0 | 157.0 | 7.1 |
| AS 18 | 164.0 | <0.2 | 19.0 | 7.0 | 69.0 | 93.0 | 6.3 |
| AS 19 | <2.0 | <0.2 | 14.0 | 6.0 | 58.0 | 40.0 | 3.6 |
| AS 20 | <2.0 | <0.2 | 20.0 | 11.0 | 63.0 | 64.0 | 9.1 |
| AS 21 | <2.0 | <0.2 | 30.0 | 14.0 | 69.0 | 13.0 | 11.9 |
| AS 22 | <2.0 | <0.2 | 18.0 | 7.0 | 67.0 | 32.0 | 5.6 |
| AS 23 | <2.0 | <0.2 | 21.0 | 11.0 | 84.0 | 37.0 | 6.3 |
| AS 24 | 6.0 | <0.2 | 29.0 | 19.0 | 74.0 | 48.0 | 9.1 |
| AS 25 | 44.0 | <0.2 | 36.0 | 15.0 | 79.0 | 120.0 | 11.9 |
| AS 26 | 60.0 | <0.2 | 19.0 | 29.0 | 72.0 | 91.0 | 11.1 |
| AS 27 | 48.0 | <0.2 | 15.0 | 31.0 | 62.0 | 216.0 | 7.9 |
| AS 28 | 380.0 | <0.2 | 23.0 | 77.0 | 76.0 | 224.0 | 9.1 |
| AS 29 | 20.0 | <0.2 | 25.0 | 23.0 | 53.0 | 85.0 | 11.9 |
| AS 30 | 64.0 | 0.8 | 290.0 | 48.0 | 149.0 | 157.0 | 17.1 |
| AS 31 | 108.0 | <0.2 | 33.0 | 15.0 | 76.0 | 144.0 | 10.3 |
| AS 32 | 68.0 | <0.2 | 44.0 | 21.0 | 78.0 | 99.0 | 10.7 |
| AS 33 | 74.0 | <0.2 | 24.0 | 26.0 | 74.0 | 101.0 | 6.0 |
| AS 34 | 26.0 | <0.2 | 26.0 | 14.0 | 64.0 | 29.0 | 9.9 |
| AS 35 | 52.0 | <0.2 | 19.0 | 12.0 | 55.0 | 11.0 | 4.0 |
| AS 36 | <2.0 | <0.2 | 54.0 | 18.0 | 60.0 | 11.0 | 7.9 |
| AS 37 | 48.0 | <0.2 | 20.0 | 15.0 | 89.0 | 11.0 | 8.3 |
| AS 38 | 88.0 | <0.2 | 42.0 | 9.0 | 44.0 | 45.0 | 7.9 |
| AS 39 | 8.0 | <0.2 | 55.0 | 15.0 | 61.0 | 5.0 | 9.1 |
| AS 40 | 10.0 | <0.2 | 21.0 | 11.0 | 56.0 | <3.0 | 5.6 |
| AS 41 | 8.0 | <0.2 | 20.0 | 9.0 | 54.0 | 11.0 | 9.5 |
| AS 42 | 16.0 | <0.2 | 22.0 | 10.0 | 61.0 | 13.0 | 5.6 |
| AS 43 | 48.0 | <0.2 | 20.0 | 5.0 | 72.0 | 29.0 | 5.6 |
| AS 44 | 46.0 | <0.2 | 23.0 | 4.0 | 65.0 | 27.0 | 6.7 |
| AS 45 | 42.0 | <0.2 | 44.0 | 7.0 | 59.0 | 27.0 | 9.1 |
| AS 46 | 24.0 | <0.2 | 27.0 | 10.0 | 70.0 | 35.0 | 6.7 |
| AS 47 | 14.0 | 0.4 | 23.0 | 4.0 | 97.0 | 147.0 | 8.3 |
| AS 48 | 10.0 | <0.2 | 18.0 | 7.0 | 79.0 | 112.0 | 6.7 |
| AS 49 | <2.0 | <0.2 | 21.0 | 8.0 | 81.0 | 61.0 | 7.5 |

Alabama Soil Sample Results (Cont'd) TABLE 3

| SAMPLE | AU (ppb) | AG (ppm) | CU (ppm) | PB (ppm) | ZN (ppm) | AS (ppm) | *HG (ppb) |
|---|---|---|---|---|---|---|---|
| AS 50 | 192.0 | <0.2 | 76.0 | 7.0 | 69.0 | 53.0 | 7.1 |
| AS 51 | 32.0 | <0.2 | 32.0 | 5.0 | 54.0 | 11.0 | 11.1 |
| AS 52 | 44.0 | <0.2 | 22.0 | 10.0 | 75.0 | 120.0 | 7.5 |
| AS 53 | 420.0 | <0.2 | 19.0 | 15.0 | 87.0 | 181.0 | 8.7 |
| AS 54 | 220.0 | 1.4 | 66.0 | 306.0 | 490.0 | 4427.0 | 277.8 |
| AS 55 | <2.0 | <0.2 | 150.0 | 3.0 | 132.0 | 19.0 | 111.1 |
| AS 56 | 30.0 | <0.2 | 11.0 | 6.0 | 46.0 | 45.0 | 13.5 |
| AS 57 | 92.0 | <0.2 | 17.0 | 11.0 | 71.0 | 45.0 | 6.7 |
| AS 58 | 6.0 | <0.2 | 29.0 | 8.0 | 66.0 | 11.0 | 10.7 |
| AS 59 | <2.0 | <0.2 | 19.0 | 7.0 | 55.0 | <3.0 | 6.3 |
| AS 60 | 108.0 | <0.2 | 21.0 | 9.0 | 61.0 | 3.0 | 5.2 |
| AS 61 | 90.0 | <0.2 | 60.0 | 14.0 | 68.0 | 11.0 | 7.9 |
| AS 62 | 16.0 | <0.2 | 65.0 | 12.0 | 63.0 | <3.0 | 5.6 |
| AS 63 | 164.0 | <0.2 | 31.0 | 10.0 | 65.0 | 216.0 | 7.9 |
| AS 64 | 2340.0 | 0.6 | 302.0 | 69.0 | 124.0 | 597.0 | 269.8 |
| AS 65 | 2980.0 | 0.8 | 199.0 | 143.0 | 233.0 | 181.0 | 357.1 |
| AS 66 | 68.0 | <0.2 | 21.0 | 17.0 | 58.0 | <3.0 | 6.3 |
| AS 67 | 34.0 | <0.2 | 25.0 | 10.0 | 62.0 | <3.0 | 17.1 |
| AS 68 | <2.0 | <0.2 | 12.0 | 6.0 | 82.0 | 8.0 | 5.2 |
| AS 69 | 46.0 | <0.2 | 11.0 | 6.0 | 57.0 | 24.0 | 5.2 |
| AS 70 | 6200.0 | 1.6 | 259.0 | 16.0 | 98.0 | 928.0 | 174.6 |
| AS 71 | 120.0 | <0.2 | 25.0 | 10.0 | 62.0 | 147.0 | 7.9 |
| AS 72 | 146.0 | <0.2 | 23.0 | 11.0 | 71.0 | 139.0 | 7.9 |
| AS 73 | 70.0 | <0.2 | 16.0 | 16.0 | 59.0 | 104.0 | 6.0 |
| AS 74 | 94.0 | <0.2 | 17.0 | 11.0 | 47.0 | 112.0 | 7.5 |
| AS 75 | 168.0 | <0.2 | 27.0 | 7.0 | 56.0 | 357.0 | 6.7 |
| AS 76 | 122.0 | <0.2 | 19.0 | 8.0 | 44.0 | 77.0 | 5.6 |
| AS 77 | 130.0 | <0.2 | 19.0 | 12.0 | 42.0 | 96.0 | 6.0 |
| AS 78 | 40.0 | <0.2 | 15.0 | 19.0 | 49.0 | 117.0 | 9.9 |
| AS 79 | 16.0 | <0.2 | 13.0 | 11.0 | 56.0 | 120.0 | 6.3 |
| AS 80 | 128.0 | <0.2 | 15.0 | 9.0 | 49.0 | 37.0 | 7.5 |
| AS 81 | 42.0 | <0.2 | 15.0 | 8.0 | 34.0 | 48.0 | 5.2 |
| AS 82 | 6.0 | <0.2 | 24.0 | 16.0 | 47.0 | 96.0 | 6.7 |
| AS 83 | <2.0 | <0.2 | 29.0 | 15.0 | 39.0 | <3.0 | 4.4 |
| AS 84 | 10.0 | <0.2 | 18.0 | 8.0 | 35.0 | <3.0 | 4.4 |
| AS 85 | 60.0 | <0.2 | 20.0 | 15.0 | 46.0 | <3.0 | 11.5 |
| AS 86 | 6.0 | <0.2 | 19.0 | 14.0 | 32.0 | <3.0 | 4.8 |
| AS 87 | 50.0 | <0.2 | 23.0 | 11.0 | 53.0 | 227.0 | 6.3 |
| AS 88 | 8.0 | <0.2 | 24.0 | 9.0 | 35.0 | <3.0 | 6.7 |
| AS 89 | <2.0 | <0.2 | 15.0 | 5.0 | 49.0 | <3.0 | 5.6 |
| AS 90 | <2.0 | <0.2 | 17.0 | 7.0 | 39.0 | 8.0 | 6.0 |
| AS 91 | 8.0 | <0.2 | 18.0 | 9.0 | 40.0 | <3.0 | 9.5 |
| AS 92 | 10.0 | <0.2 | 26.0 | 6.0 | 51.0 | 48.0 | 6.7 |
| AS 93 | 30.0 | <0.2 | 37.0 | 16.0 | 67.0 | 107.0 | 7.5 |
| AS 94 | 100.0 | <0.2 | 31.0 | 9.0 | 52.0 | 192.0 | 5.2 |
| AS 95 | 62.0 | <0.2 | 20.0 | 9.0 | 46.0 | 29.0 | 13.9 |
| AS 96 | 126.0 | <0.2 | 41.0 | 13.0 | 79.0 | 341.0 | 6.7 |
| AS 97 | 6.0 | <0.2 | 17.0 | 4.0 | 31.0 | <3.0 | 6.0 |
| AS 98 | 8.0 | <0.2 | 6.0 | 3.0 | 27.0 | <3.0 | 5.2 |

*HG = Mobile Mercury only (< 189°C)

TABLE 4:

**Mobile Mercury Results - Alabama Mine Area Soil Samples**

| SAMPLE | MOBILE HG (ppb) | SAMPLE | MOBILE HG (ppb) |
|---|---|---|---|
| AS 1 | 4.4 | AS 50 | 7.1 |
| AS 2 | 7.5 | AS 51 | 11.1 |
| AS 3 | 6.7 | AS 52 | 7.5 |
| AS 4 | 4.8 | AS 53 | 8.7 |
| AS 5 | 6.3 | AS 54 | 277.8 |
| AS 6 | 5.6 | AS 55 | 111.1 |
| AS 7 | 5.2 | AS 56 | 13.5 |
| AS 8 | 7.1 | AS 57 | 6.7 |
| AS 9 | 13.1 | AS 58 | 10.7 |
| AS 10 | 7.1 | AS 59 | 6.3 |
| AS 11 | 6.0 | AS 60 | 5.2 |
| AS 12 | 4.8 | AS 61 | 7.9 |
| AS 13 | 4.4 | AS 62 | 5.6 |
| AS 14 | 10.7 | AS 63 | 7.9 |
| AS 15 | 4.8 | AS 64 | 269.8 |
| AS 16 | 9.9 | AS 65 | 357.1 |
| AS 17 | 7.1 | AS 66 | 6.3 |
| AS 18 | 6.3 | AS 67 | 17.1 |
| AS 19 | 3.6 | AS 68 | 5.2 |
| AS 20 | 9.1 | AS 69 | 5.2 |
| AS 21 | 11.9 | AS 70 | 174.6 |
| AS 22 | 5.6 | AS 71 | 7.9 |
| AS 23 | 6.3 | AS 72 | 7.9 |
| AS 24 | 9.1 | AS 73 | 6.0 |
| AS 25 | 11.9 | AS 74 | 7.5 |
| AS 26 | 11.1 | AS 75 | 6.7 |
| AS 27 | 7.9 | AS 76 | 5.6 |
| AS 28 | 9.1 | AS 77 | 6.0 |
| AS 29 | 11.9 | AS 78 | 9.9 |
| AS 30 | 17.1 | AS 79 | 6.3 |
| AS 31 | 10.3 | AS 80 | 7.5 |
| AS 32 | 10.7 | AS 81 | 5.2 |
| AS 33 | 6.0 | AS 82 | 6.7 |
| AS 34 | 9.9 | AS 83 | 4.4 |
| AS 35 | 4.0 | AS 84 | 4.4 |
| AS 36 | 7.9 | AS 85 | 11.5 |
| AS 37 | 8.3 | AS 86 | 4.8 |
| AS 38 | 7.9 | AS 87 | 6.3 |
| AS 39 | 9.1 | AS 88 | 6.7 |
| AS 40 | 5.6 | AS 89 | 5.6 |
| AS 41 | 9.5 | AS 90 | 6.0 |
| AS 42 | 5.6 | AS 91 | 9.5 |
| AS 43 | 5.6 | AS 92 | 6.7 |
| AS 44 | 6.7 | AS 93 | 7.5 |
| AS 45 | 9.1 | AS 94 | 5.2 |
| AS 46 | 6.7 | AS 95 | 13.9 |
| AS 47 | 8.3 | AS 96 | 6.7 |
| AS 48 | 6.7 | AS 97 | 6.0 |
| AS 49 | 7.5 | AS 98 | 5.2 |

Mobile Mercury extracted by Exploration Technologies Inc. at 189°C

Appendix 2c.

# FINAL REPORT

# ON

# 1987 DRILLING RESULTS

# AND GOLD POTENTIAL

# OF THE

# ALABAMA MINE AREA

# COTTONWOOD CLIFFS, ARIZONA

FOR

SANTA FE PACIFIC MINING INC.

BY

PHILLIP ANDERSON, PH.D.

PRECAMBRIAN RESEARCH AND EXPLORATION INC.

31 JANUARY, 1988

10,451

## SUMMARY

The Alabama and related mine areas are part of a large gold-arsenic-mercury system that formed syngenetically in felsic tuffaceous metasediments after the close of major Proterozoic basalt-dacite volcanism in the Cottonwood Cliffs, east of Kingman, Arizona. Previous surface sampling earlier in 1987 indicated that the Alabama mine and ridge workings were a key part, perhaps the domal center, of a gold system that is known to extend intermittently for 2.5 miles south of the Alabama and for at least 0.5 miles north to the Silver Bell. The Walkover mine, a nearby small gold mine, formed at the interface between the mafic and felsic volcanic sequences, and also warranted further evaluation.

The 1987 rotary drilling program first tested the Walkover, then the Alabama shaft and ridge systems, and finally the Silver Bell mine area, to see if the gold systems were large enough to interest Santa Fe. It was also a test of whether the entire felsic tuffaceous syngenetic gold system was sufficiently productive to warrant exploration farther along strike. It had been determined that syngenetic protore was too low in gold in many places to be economic, but metamorphic reconcentration and later shearing had enriched gold grades up to 1 oz/t in 3 of the 4 mine areas drilled. The hope of the drill program was thus to find the right combination of enriching factors to make a viable gold deposit.

The Walkover mine proved to be a complex area of low-angle faults and steep shears at the mafic-felsic contact, structures that cut off the Au-rich Walkover chert and host strata at shallow 50-100' depths. Not even the stratigraphic position of the gold horizon could be traced to the south. Drilling at the Walkover showed that its gold system is too small, has too little depth extent, and is much too fragmented to be an important gold target for Santa Fe.

Drilling in the main Alabama mine shaft area showed that the 2'-wide quartz-chert body with up to 1 oz/t Au does not persist to depth as a tabular body, but as lensoidal, rod-shaped pods randomly dispersed throughout a broader rock package of anomalous but subeconomic gold grades. One of the two drill holes hit such a pod, bringing a 5' intercept up to a still-subeconomic 2 ppm gold value. Thus the Alabama shaft is too small a package to be of interest.

The Alabama ridge gold system, which from previous surface sampling appeared to be the largest, was systematically shortened by drilling to less than 300 feet along the ridge crest, the right structures existing north and south along strike, but without anomalous gold values. The sulfide facies on the ridge crest showed up to 2 ppm Au over 5' at surface, and these grades were confirmed at depth, but not enlarged at all. Finally, the richest workings for gold to the south were traced to a 40' depth with 2-3 ppm over 5', but below this, a series of synvolcanic dikes completely cut off all trace of the zone. Hence, the drilling limited both the strike and depth extent of the Alabama ridge gold system to such a small area as to be of little interest to Santa Fe.

In contrast, the Silver Bell mine area proved to be the widest gold target of the four, with disseminated gold mineralization intermittently spread over a 90'-wide section of stratigraphy. It was the only area drilled where pyrite-arsenopyrite and up to 4.2 ppm Au is also disseminated throughout felsic metasediments, instead of just in quartz-chert semi-gossan zones. Although the Silver Bell mine area has the earmarks of a much larger gold system, its strike length (but not its depth extent) was limited by the drilling, so further work may show the Silver Bell to be no larger than the Alabama ridge system.

# INTRODUCTION

Previous reconnaissance by Santa Fe Pacific Mining and Precambrian Research and Exploration in the Kingman region outlined the Alabama mine area, lying 30 miles east of Kingman in the Cottonwood Cliffs, as a major center of anomalous gold mineralization in Precambrian metavolcanic and tuffaceous metasedimentary rocks. The gold-bearing volcanic stratigraphy represented at the Alabama mine is of vast regional extent throughout the Cottonwood Cliffs and Hualapai Mountains east and south of Kingman, stratigraphy that has never been fully evaluated for its gold potential by any mineral exploration company.

The previous May 1987 progress report of Santa Fe on the Cottonwood Cliffs area revealed that gold mineralization of the Alabama Mine horizon was known to extend for a strike length of more than 2 miles, from the Silver Bell mine (Water Tanks) area in the north, through the Alabama mine and ridge area, and under Tertiary cover to the south, reappearing only as a small window in section 1 more than a mile south of the Alabama mine (figure 1). Since the Alabama mine horizon carries highly anomalous ( > 2.5 ppm ) gold mineralization in many places along this 2-mile strike extent, the entire horizon constitutes an enticing regional Precambrian gold exploration target.

Moreover, until Santa Fe's 1987 evaluation, the Alabama mine area had never been systematically drilled, despite better-than-ore-grade gold values up to 1 oz/t on the Alabama mine dump and in numerous prospect pits on the ridge immediately to the east (figure 2). Systematic geologic mapping and surface soil and rock sampling of the Alabama mine vicinity in March and April outlined a 40' wide zone in Precambrian felsic metavolcanic-tuffaceous metasedimentary rocks with ore-grade gold values that had the potential to be a gold-ore zone.

Since the gold zone was situated in tuffaceous rocks stratigraphically above a thick fractionated mafic-felsic volcanic pile, it represents an ideal setting for a Precambrian stratabound sedimentary-exhalative gold deposit. All points considered, the Alabama Mine area made a very high-priority gold target well suited to a systematic drilling evaluation program. Santa Fe optioned the ground and decided to proceed with the drilling program. This report describes the results of that work, and the gold potential of the Alabama Mine area.

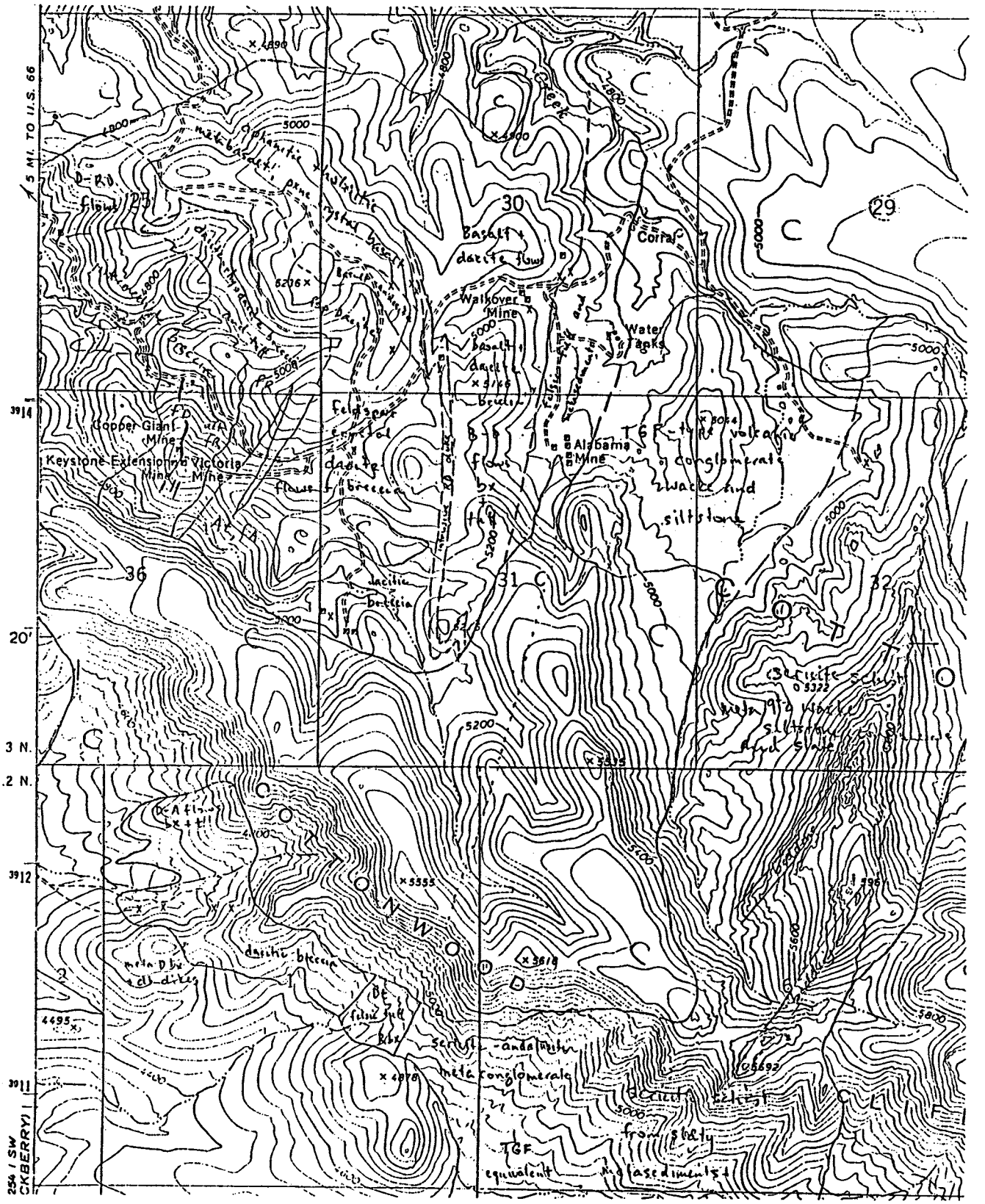


Figure 1: Revised geology of Copper Giant-Walkover-Alabama district

## DRILLING PROGRAM AND METHODS

From the 16th to the 24th of November, 1987, Santa Fe Pacific Mining Inc. completed the final stage of its 1987 evaluation of the gold potential of the Alabama Mine Area, Cottonwood Cliffs, Arizona. This final stage involved pattern drilling of all sites in the Alabama Mine area where previous geologic and geochemical evaluations had shown gold mineralization to be concentrated.

The drilling program was outlined and conducted by Phillip Anderson of Precambrian Research and Exploration Inc. and supervised by Fred Jenkins of Santa Fe. Drilling was undertaken by Dateline Drilling Inc. using their usual track-mounted reverse-circulation rotary rig. The drill cuttings were logged and pseudo-3D plots made of the logs during the drilling program to guide the pattern of drill holes. Since Santa Fe's previous geologic-geochemical program had already approximately located of the main gold zones, the drilling program involved no vertical exploratory holes, but rather all $45^{o}$ angle holes, 100 to 150 feet deep typically, across the main mineralized stratigraphic packages.

Samples of the drill cuttings were taken at 5 foot intervals and sent to Barringer Labs in Denver for gold analysis by fire-assay finish on AA beads. No check analyses were made in the program because three assay labs, including Barringer's Denver lab, had been checked with known USGS gold standards just prior to the Alabama program. Little water was encountered in the holes and essentially all samples were split dry. Collars and wipers were used on all holes so that recovery would be as uniform as possible throughout the hole. Grade depletion, if any, would be highest in the first 15 feet of each hole. With generally good rock for drilling and a new compressor, recovery was ideal.

## PURPOSE OF THE DRILLING PROGRAM

Geologic study of the region earlier in the year found that the large metamorphosed, deformed Precambrian volcanic pile in the Cottonwood Cliffs was a productive center both for base-metal and gold mineralization: it produced the base-metal-rich Copper Giant, Victoria and Keystone Extension mines in the upper parts of the fractionated volcanic sequence, the gold- and copper-rich

Walkover mine in a chert horizon along the upper surface of the last mafic flow unit, and the gold-rich Alabama and Silver Bell mines (water tanks, figure 1) in tuffaceous metasedimentary sequences overlying the last mafic volcanic cycle.

The drilling program did not test any base-metal-rich settings within the volcanic pile itself, but was designed to test those gold-rich environments in tuffaceous metasediments that immediately followed the main volcanic events. These settings included the Walkover, Alabama and Silver Bell mine areas. The Walkover was thus tested to determine whether the chert horizon at the end of the main mafic volcanic cycle was productive for gold mineralization, and the Alabama and Silver Bell mine areas were tested to determine extent and grade of gold mineralization in the major Alabama tuffaceous-sedimentary gold horizon.

Limitations of the current drilling program permitted testing of only the known mineralized areas, and precluded more extensive blind testing of the Alabama horizon along strike, either far to the north or south. Thus, the purpose of drilling the Alabama and Silver Bell mine sites in 1987 was to determine the strike length and width of gold mineralization in the immediate mine areas. The logic was that if these proved to be sufficiently big targets, a later program that more extensively tested the full potential of the entire Alabama mine horizon along its 2.5 + miles of strike would be justified.

Another reason for drilling the Alabama mine horizon was to determine the true nature of gold mineralization in the system. Was gold localized in narrow high-grade structures or beds within the broader 40'-wide belt of gold-rich stratigraphy, or was it more uniformly disseminated across the entire 40 foot zone? This difference could be crucial to minability of the gold system. Although the previous program of surface rock and soil sampling was highly successful in outlining the anomalous region and extent of high gold grades, it could not possibly answer that important question: by necessity surface sampling was limited to sparse rock exposure at surface or in pits and dumps, and these samples represented only fragments of the total mineralized gold system.

Only complete trenching across the zone and meticulous sampling, or else drilling, could accurately determine gold distribution in the system. The decision was made to drill the zones, which while providing less exact geologic data, was ultimately a more accurate test of the gold potential in the system.

## Alabama Mine Geologic Setting

The Alabama mine area itself has an interesting geologic setting for gold concentration. Basically, gold is concentrated in dominantly tuffaceous-sedimentary strata and not in proximal felsic volcanics. Even in places where felsic volcanics predominate, gold is richest in the tuffaceous-sedimentary strata. The Alabama mine area is made up of two distinct parts:

(1) the western part where the main Alabama mine shaft itself lies;

(2) the long N-trending ridge of outcrop 400' to the east, named here the Alabama ridge, in contrast to the Alabama mine (shaft) site noted above.

There is a significant difference in geologic setting between the two sites: gold-bearing strata at the Alabama mine are enveloped by finer grained, distal turbiditic metapelites, whereas strata on the Alabama ridge involve a proximal felsic volcanic center with local breccia facies and flanking tuffs.

At and west of the Alabama mine shaft, felsic and intermediate tuffs predominate, but mainly non-volcanic metapelites (well bedded meta-mudstone and graded-bedded meta-siltstone) lie just east and north at the shaft. Graded beds in meta-mudstones north of the shaft have stratigraphic tops to the east, and stratigraphic repeats seem to be absent. The shaft stratigraphy is dominated by what appears to be a large 2'-wide quartz vein and smaller lensoidal veins cutting tuffaceous metasediments. However, close inspection shows the "veins" to have an extremely fine-grained texture typical of recrystallized chert, not hydrothermal vein material. Siliceous strata of the Alabama shaft site is full of such chert-quartz bodies, which may result from metamorphism of original chert beds, or from metamorphic remobilization of excess silica. The quartz bodies parallel stratigraphy and foliation and are discordant to them only locally. There is no evidence that they are a set of later introduced quartz veins. However, shear zones on the ridge to the east may be later structures.

The Alabama ridge 400' east is a local felsic volcanic domal center enveloped by felsic tuffaceous metasediments. Recessive, partly covered strata between the shaft and ridge are pelitic metasediments, whereas the west side of the ridge is held up by a resistant coarse-grained, foliated biotite-hornblende-feldspar rock that at first appeared to be a pre-tectonic mafic dike intruding the metasediments. However, bedding and textural-compositional layering in the unit suggests that it may be a mafic tuff rather than flow, sill or dike.

Overlying this mafic unit to the east is the **Alabama Gold Horizon**, which consists of very fine-grained, well-bedded chlorite-biotite tuffaceous metasediments of felsic composition, but with a chloritic exhalative component. The Alabama gold horizon appears to be from 40 to 60 feet wide, as indicated by surface gold results, and extends for at least 600 feet along strike (fig. 2). The horizon consists of at least three distinct mineral or metal facies on the Alabama ridge. The central zone is a high sulfide facies, where up to 20% sulfides, originally pyrite and chalcopyrite, but now mainly hematite-goethite-limonite gossan and oxide boxworks after Fe-Cu-As-Zn sulfides, exist in thin chert bodies, in sheared parts of the tuffaceous stratigraphy, in narrow clayey shear zones, and as disseminations throughout host metasediments. Gold values are not confined to any one of the above, but occur in all of them.

North of the central sulfide-rich facies is a manganese-rich facies that represents a distinct gold cut-off on a local scale, compared to the two facies farther south. This local gold cut-off however, does not preclude another favorable environment occurring still farther north, because the Mn-facies appears to occupy only about 200' of strike. Rocks in the manganese facies are relatively silicic fine-grained rhyodacite-dacite metatuffs and metasediments that appear to wane in chlorite, sulfides and iron stain to the north, although outcrop to the north disappears at the limit of silicification.

The high sulfide facies of the Alabama gold horizon grades southward into what is the highest gold zone found in the surface sampling. In this high-gold zone, sulfides typically amount to 10% or less, and widespread hematite stain or hematite semi-gossan appears to be derived from pyrite and arsenic compounds, in contrast to the pyrite-chalcopyrite to the north. The high-gold facies may grade south into another facies that was not detected in the surface sampling, due to poor rock exposures close to Tertiary cover.

Immediately in contact with the gold zone to the east is an original massive but now vertically foliated felsic rock with what appear to be small feldspar crystals disseminated throughout. The most likely protolith is a feldspar-crystal rhyodacite flow making up the core of the felsic dome, but other protoliths including sedimentary ones cannot be ruled out without thin sections. In the high sulfide facies of the Alabama gold horizon, the highest grade gold and sulfide mineralization appears to occur in a series of pits and

trenches right at the contact of the massive rhyodacite and partly within the northern nose of the rhyodacite. Several small chert bodies and lenses lie along the contact and are enriched in gold relative to the surrounding felsic rocks. Several small shear zones occur in the metasediments and tuffs, but do not extend into the massive body, suggesting that such shears may be syngenetic.

The massive rhyodacite dome or flow is immediately overlain to the east by consanguineous feldspar-crystal rhyodacite breccia and tuff developed as a breccia cap to the flow or dome. Interestingly, this breccia exists only east of the most highly mineralized zone, and its coarse-grained facies is not present to the north. Instead, fine-grained felsic tuffs overlying the breccia facies seem to envelope both breccia and flow facies, and are indistinguishable from fine-grained tuffs interfacing with felsic flows and breccia to the north. Overlying the breccia to the east, the fine-grained felsic tuffs are higher in chlorite and biotite (metamorphic from chlorite) component than to the north, implying a general waning of exhalative activity to the immediate north.

The mineralized package of rocks described above are sharply overlain and apparently locally truncated by a sheared assemblage of conglomerates and wackes that represent a total cut-off in gold to the east. Although there is no direct evidence that this assemblage is time-equivalent to the Texas Gulch Formation in the Prescott area, its distinctive conglomeratic lithology, well-reworked non-volcanic matrix, and younger unconformable stratigraphic relation with underlying volcanic strata make it an almost certain candidate to be the time-stratigraphic equivalent of Texas Gulch Formation in northwest Arizona. Vast exposures of the sheared conglomerates and wackes exist to the east and southeast and are devoid of any mineralization but minor copper showings.

## Silver Bell Mine Geologic Setting

Two shafts on the Silver Bell patented claim have a geologic setting that is a direct northerly extension of the Alabama Ridge geology, with facies changes expected from being 1500 feet north along strike. Although there seems to be no local felsic volcanic dome at the Silver Bell Mine site, abundant rhyolitic flows and tuffs carrying substantial widths of sulfide and gold mineralization exist in the stratigraphic package, interbedded with tuffaceous metasediments and non-volcanic pelites, to comprise an important gold center.

## SUMMARY OF RESULTS OF SURFACE SAMPLING PROGRAM

### Walkover Mine Area

Gold mineralization at the Walkover mine lies in chert and related mafic-intermediate volcanics extruded near the top of the volcanic pile. High surface gold values of 15.1 ppm Au were found in a very silicic recrystallized chert in the northern (main) shaft, at the contact between chloritic tuff and rhyodacitic tuffs (fig. 2). Similarly high 21.0 ppm Au values were recovered from the side of the southern caved shaft in sheared hematite-goethite gossan, sericite-clay gouge and basalt. Averaged mined chert at the loading chute has 3.9 ppm Au, chert which greatly resembles quart-chert material at the Alabama, except for its more obvious stratigraphic confinement at the Walkover. Gold results at the Walkover are surprisingly high for a mafic-intermediate volcanic setting, implying Au enrichment at the top of the volcanic pile. The surface sampling warranted a series of shallow drill holes across the main mineralized structures to test the immediate depth potential of the gold mineralization.

### Alabama Mine Area

Gold mineralization in the Alabama mine area is concentrated in small quartz-chert bodies, in Fe-oxide gossans and shear zones, and is disseminated throughout tuffaceous metasediments in and on the flanks of a small felsic dome within a broader assemblage of felsic tuffaceous metasediments and metapelites. Initial sampling uncovered ore-grade gold values locally exceeding 1 oz/t at the Alabama shaft and at several places on the Alabama ridge. The blood red character of hematite in semi-gossan zones on the ridge suggested that the gold system is higher in arsenic that Cu-Zn base metals.

Additional rock sampling and a detailed soil sample grid confirmed the highest gold anomalies at the Alabama shaft site and at three shafts on the Alabama ridge, as well as outlining the whole Alabama mine area as an extremely high arsenic and mercury geochemical anomaly. Figures 3 to 7 and tables 1 to 4 show the results of this surface sampling work, as more fully explained in the May 1987 progress report. From the surface results, it appeared that the main 40'-wide gold-bearing zone trends about 10-20$^{o}$ discordant to bedding, thus implying enrichment of gold in post-syngenetic structures such as shear zones.

The highest grade gold values in the 1 oz/t range reproduced poorly in repeated surface sampling, especially where high gold values were recovered from sheared hematite gossans with small quartz-chert bodies. The southern shaft on the Alabama ridge had the highest gold value of all (1.5 oz/t) even though it was an aggregate channel + chip sample across 4 feet. Later samples had less than 0.2 oz/t, but more than 0.5 oz/t from the adjacent shaft. This confirmed that the highest-grade mineralization probably occurs in shear zones. Likewise, the main Alabama mine quartz-chert "vein" contains more than 1 oz/t Au, adjacent wall rocks have mostly less than 1 ppm Au, and southern extensions of the structure have between 1 and 4 ppm Au.

Surface sampling also showed that the central high-sulfide facies of the main Alabama gold horizon on the ridge contains somewhat lower gold values in the 1-5 ppm Au range, values that are still economically interesting. In contrast, the northern Mn facies of the ore zone seemed to have much lower gold values than the central and southern parts, in the 0.2 ppm Au range. However, in the absence of outcrop or workings farther north, it was impossible to say from surface sampling whether the northern decline in gold grades persisted or was a local phenomenon of the Mn facies. Abundant semi-gossanous float in the recessive area north of the Mn facies suggested that grades may increase again. Similarly, it was virtually impossible to evaluate the southern extent of the Alabama gold horizon south of the highest Au prospect on the ridge with surface sampling, because of ubiquitous Tertiary volcanic float and cover to the south.

The surface sampling program also found that gold is not everywhere highest in the high-sulfide or gossan zones, where it might be expected. In several places on the ridge, siliceous or chert units with only minor sulfides were found to have higher gold values than nearby high-sulfide-oxide zones. Thus, it was concluded that surface sampling of prospects on the ridge, while indicating the presence of a wide gold-rich zone of possible economic interest, could not be taken as an accurate measure of the gold grades and widths, nor even as a representative sample of the gold grades across the bulk of the 40'-wide gold-bearing zone. More detailed and continuous sampling of the zone was required, such as could be obtained from drilling.

The element profile of the Alabama mine area is of high gold, arsenic and mercury, and low silver and base metals. Low silver-lead values imply an

original syngenetic metal system, generally low copper-zinc values and non-correlation of Au to Cu+Zn indicates a system on a trend of high-Au enrichment over base metals. Epigenetic remobilization or metamorphic reconcentration is implied in some samples with high silver values. Geochemistry of the Alabama system is just as expected in a syngenetic sedimentary-exhalative gold deposit.

Soil sampling confirmed the locations and magnitude of gold anomalies in rocks on the Alabama ridge and shaft area with remarkable accuracy. It also showed a close correlation of arsenic and mercury to gold in the Alabama system, as is typical of high-As, low Cu-Zn-Pb gold systems. A close coincidence of high gold and high base metal values in soils occurs right over the Alabama ore horizon and the Alabama shaft.

## Silver Bell Mine Area

The two shafts at the Silver Bell mine (water tanks) site represent a greater amount of work than was done at the Alabama, including drifting between shafts at depth. Lying directly on strike with the Alabama gold horizon, the Silver Bell mine area may represent another gold-rich system like the Alabama, a continuation of the same horizon beyond the northern Mn-rich Au-poor facies of the Alabama, and separated from it by this gold-poor Mn-rich facies.

The thin but uniform blanket of alluvium in the shaft area makes the geologic setting of the gold system difficult to decipher from surface exposures. Host rocks are fine-grained quartz-feldspar metarhyolites and felsic tuffs with locally strong iron stain after sulfides, and metasediments with much less iron stain and more barren appearance. Silicic pyritic quartz-chert dump material carries 4.5 ppm Au, whereas adjacent hematitic metatuff carries 1.3 ppm Au. The zone of mineralization is much wider than the 10'-wide shaft.

The fact that the Silver Bell shafts lie directly on strike with the Alabama zone, contain the same type of ore-grade gold mineralization in silicic cherty units and adjacent pyritic tuffs over substantial widths, and may be a direct continuation of the same metal system as the Alabama, tagged the mine area as of great interest for further evaluation by drilling. Shallow alluvial cover in the Silver Bell mine area could conceal a large gold zone possibly exceeding the size of the main gold-rich facies of the Alabama gold horizon.

## RESULTS OF 1987 DRILLING PROGRAM

The results of 1987 drilling of the Alabama-Walkover-Silver Bell mine areas are shown on figures 8 to 14 to follow, and as table 5 (summary of drill results), table 6 (gold results of drill samples) and table 7 (geologic logs of drill holes). Barringer's original assay sheets are reproduced as an appendix to the report. The areas will be described in the same order in which they were drill, namely Walkover, Alabama mine and ridge, and Silver Bell area.

The drill results, both geologic and assay, are graphically portrayed in figs 10, 12, 13 and 14 as a series of pseudo-3 dimensional cross sections of the drill holes, looking generally north along strike of the mineralized zones. The cross sections are not strictly 3-D, since each drill hole X-section is an entity unto itself, true to scale and dip with respect to the ideal horizontal line that depicts the surface (to show true topography would have distorted the 3-D effect). However, stacking of the drill holes in series on a single graph provides a 3-D illusion which permits easy visual tracking of the geology, gold grades and structures as they change along strike of the zones. In each case, the E-W position of each drill hole collar to the other is as exact as possible: in the Alabama mine area where a grid existed, it is true; in the Walkover and Silver Bell mine areas it was measured as close as possible. In contrast, the N-S position of each drill cross-section to the next is purposely not drawn to scale, since many drill holes were spaced closer on the ground than could be plotted on the cross-sections. The position of each X-section line is labeled and one must refer to the geologic maps to determine their true locations.

Two other aspects of the drill hole cross sections should be noted: (1) Contacts are projected to surface where there is reasonably good agreement between surface geology and that in the drill hole; however, where contacts do not reach surface, there is either no surface evidence of the geology, or else rocks encountered in the drill hole positively do not match those at surface. (2) The uniformly steep-dipping aspect of all contacts in the cross sections is only an assumption based on pervasive near-vertical foliation seen at surface: in many places it accurately reflects present bedding dips, but in others it does not, especially where surface geology does not correlate to that in the drill holes. Dikes are typically the units that cut most divergent to steep bedding dips, but differences in dips cannot be measured in rotary drill holes.

TABLE 5: **ALABAMA MINE AREA 1987 DRILL HOLE SUMMARIES**

| DRILL HOLE | LOCATION | DEPTH | GOLD INTERCEPTS |
|---|---|---|---|
| AL 1 | Walkover Mine | 155 | Two 5' sections of 0.2 ppm Au |
| AL 2 | " | 95 | 5' of 0.10 ppm Au |
| AL 3 | " | 175 | 15' of 0.57 ppm Au |
| AL 4 | " | 135 | 15' of 0.35 ppm Au |
| AL 5 | " | 105 | 15' of 0.04 ppm Au |
| AL 6 | Alabama Mine | 165 | 15' of 1.17 ppm Au incl. 5' of 2.4 ppm |
| AL 7 | " | 145 | 20' intermittent of 0.25 ppm Au |
| AL 8 | Alabama Ridge | | on patent |
| AL 9 | " | | " |
| AL 10 | " | | " |
| AL 11 | " | | " |
| AL 12 | " | | " |
| AL 13 | " | 135 | 5' of 0.10 ppm Au |
| AL 14 | " | | on patent |
| AL 15 | " | 125 | 35' of 0.85 ppm Au |
| AL 16 | " | 115 | 40' intermittent of 0.1+ ppm Au |

## Walkover Mine Drill Results

Fig. 8 shows the locations at 1"=100' of all rotary holes drilled in the Alabama region in 1987. Fig. 9 is an enlargement of geology and drill hole locations just for Walkover mine area. At surface, the Walkover mine geology is quite clear: a sequence of felsic flows, tuffs and tuffaceous metasediments lies on the east side of the mine workings, whereas mafic to intermediate flows and tuffs (feldspar-crystal basalt-dacite and basaltic-andesite tuffs) lie to the west. The $73^{0}$ W-dipping chert exposed in the main Walkover shaft north of the creek demarcates the boundary between the two different rock sequences.

Workings at the caved shaft south of the creek appear to be mainly in the basalt-dacite flow sequence, but felsic tuffs lie only a short distance to the east, so it is reasonable to assume that the main chert unit was originally once there, but was later attenuated by shearing. The very high gold values obtained from the hematite gossan and shear zone in the southern caved shaft walls would have quite reasonably been from the chert's original stratigraphic position, but signify epigenetic enrichment of that gold. The other workings on the hill, including a shaft possibly connecting with an old portal at the creek level (fig. 9), seem to follow a shear zone in the basalt-dacite sequence that is filled with Fe-oxide gossan and locally a dike of possible Tertiary age.

Two of the 5 holes drilled at the Walkover totally disrupted this clear surface geologic picture. Drill hole AL-1 was successful in intersecting and testing the gold grade of the main Walkover chert at depth beneath the old workings. Drill hole AL-2 was also successful in testing a semi-gossanous zone in dacite tuff exposed on the creek's south bank. However hole AL-3, drilled east in the creek to test continuity of the chert or its stratigraphic position from the north shaft across to the south shaft, not only missed the chert and its stratigraphic position, but continued through the basalt-dacite sequence for more than 75' past where the felsic tuff sequence should have been intersected (see figs 9 and 10). To make matters worse, hole AL-4, collared in felsic rock, should have intersected mafic rock at about 50', based on surface exposure; but at its 135' end the hole was still in the felsic sequence. This means that at depth under the creek, mafic rocks extend much too far east, and at depth under the southern hill, felsic rocks extend much too far west, than can be accounted for by any reasonable geologic projections based on the surface geology.

Considering that many Walkover drill holes did not intersect the same units at depth as exposed at surface, it is not surprising that the holes had much lower gold values than were expected from surface testing. However, hole AL-1 did intersect the main Walkover chert at 85-105' and found it lacking in anomalous gold values. Instead, the underlying sericite zone at 105-110 ' had mildly anomalous gold values (0.2 ppm). Interestingly, tuffaceous metasediments at the top of the hole were equally anomalous in gold. Similarly, the highest gold value in hole AL-2, 0.1 ppm, was also at the top of the hole (possible surface contamination); the main alteration zone from 43-75' was low in gold.

Despite the fact that the geology of hole AL-3 was unexpected, it had the highest gold values of the 5 Walkover holes, averaging 0.57 ppm from 40-55' and up to 1 ppm Au in the same interval. This gold anomaly occurs in a cherty Fe-oxide-stained rhyodacitic tuff at about the right position for the chert unit, but immediately east of it is massive metabasalt. It is possible that this Au-bearing felsic tuff is the remains of the Walkover chert horizon at depth, either intruded by a basalt dike to the east or faulted into contact with a fault-repeat of the mafic sequence to the east. In either case, AL-3 effectively wrote off any continuity in strike of the Walkover gold horizon between the northern and southern shafts, at least in its immediate depth extent from 0 to 100 feet. The fault geometry could easily allow widening of the mineralized rock package at greater depth, a possibility not worth pursuing without much higher gold grades in the main chert-altered felsic tuff package.

The absence of rock units and gold grades in hole AL-4 comparable to those at surface implies that surface values near 1 oz/t Au at the southern shaft are only a local phenomenon. Considering that the last 15' of the hole had the highest gold value (0.35 ppm), it is possible that the Walkover chert horizon was only being approached at this depth, far west of where it should have been intersected. IF this is true, then it means that the structure of the Walkover mine area involves shallow-dipping faults of large horizontal displacements, a structure that is not at all evident from the surface. If so, diamond drilling may be necessary to effectively evaluate the Walkover mine.

Drill hole Al-5, higher on the hill south of the main southern shaft, was drilled to test a series of workings on a shear zone or fault that cuts up hill from the southern shaft into the basalt-dacite sequence. The 34' of solid

goethite-hematite gossan encountered in the hole was unexpected, and may in part be caused by a decomposed younger (Tertiary?) dike, although there is no compelling reason in the drill cuttings or at surface to suggest a later dike. In either case, the low gold values in this gossan (0.04 ppm) suggests that it is probably not worth pursuing farther south up the hill, unless it should widen into a different type of gold-rich structure at greater depth.

In summary, no rotary drill holes in the Walkover mine area recovered ore-grade gold values over 5' sample intervals, despite the presence of 0.2 to 1.0 oz/t Au values in rock units and structures at surface. Complex faulting is probably the cause, an aspect that the present program did not evaluate.

## Alabama Mine Shaft Drill Results

Unlike the Walkover, drilling results of the Alabama mine shaft area matched well what is observable at surface, especially the geologic aspects. As noted previously, the Alabama mine shaft itself is dominated by a 1-3 foot-wide quartz chert body and several smaller sheared quartz bodies paralleling foliation in weakly schistose felsic tuffaceous metasediments. South of the shaft, open cuts show that the quartz body narrows and lenses out within about 50 feet of strike, where altered, Fe-oxide-rich schist and gossan dominates at the same stratigraphic position. Results of surface samples suggested that gold values decrease to the south, from highest in the quartz material (0.3 to 1.0 oz/t Au) to lower in the gossanous material (0.4-0.6 ppm Au). However, drill results were just the opposite: the best gold values were recovered from under the southern extent of the ore zone, whereas to the north under the main Alabama dump, gold values were lower and more widely disseminated.

Hole AL-6 was drilled under the gossanous zone at the south end of Alabama mine open cut, designed to test it's grade at 60-70' depth. The semi-gossanous zone intersected from 80-95' contained much higher gold values than at surface: 15 feet of 1.17 ppm, including a 5' interval of 2.4 ppm Au. These results are effectively the same as those obtained from the main Alabama mine dump -- narrow bodies of hematitic gossanous quartz material from sulfide and As-Au-bearing chert carries Au values in the range 0.3 to 1 oz/t, which upon inclusion in a 5' interval, dilutes the grade down to the 2-3 ppm Au range.

In contrast, hole AL-7 drilled under the northern end of the main Alabama dump, missed any significant concentration of gold-bearing quartz-chert and gossan, so instead of gold values being concentrated in a single zone, they were spread out over three 5- to 15'-wide zones of 0.2 to 0.3 ppm Au. In all cases the gold-bearing intervals were the gossanous to semi-gossanous Fe-oxide-rich tuffaceous metasediments with siliceous veinlets or pods, as anticipated from logging the drill cuttings. The adjacent, apparently unmineralized rock generally was found to have trace gold values.

The favorable results of AL-6 were balanced by lower gold values from AL-7, to produce a gold picture of the main Alabama shaft area comparable to that of the surface picture, even if the distribution is different. However, it is unlikely that the gold results from surface and at depth can reasonably be used to predict a moderately south-plunging structure for highest the gold grades in the Alabama mine system. Instead, it is almost certain that the disposition of high gold values is directly controlled by the distribution of gossanous quartz-chert bodies in the mineralized rock package: wherever a large quartz body or concentration of smaller bodies is found, that is where the gold grades will be the highest, notwithstanding, of course, equally high gold values in some gossanous felsic tuff horizons without remobilized silica.

Additional drilling south of AL-6 and north of AL-7 was planned at the end of the program to test the Alabama mine system farther along strike, but it was not carried out because it was felt that the two main holes in the system already indicated that the gold distribution in the Alabama mine area was too spotty to develop a large tonnage system of interest to Santa Fe. Moreover, surface rock samples from trenches to the south and soil samples to the north indicated that gold values in the mineralized zone dropped to near background levels less than 200' south of Al-6 and north of AL-7. Thus it was already known that the gold system at surface was limited to less than 400 feet of strike length, and high gold values to only about 100 feet of strike.

It is entirely possible that more extensive drilling along strike or at greater depth could recover much higher gold values, but the results at hand are considered to be reasonable and representative of the size of the gold system and its potential at the Alabama mine site. That size and potential is limited to a narrow zone of small and steeply plunging, lensoidal ore shoots.

## Drilling Results of the Main Alabama Gold Horizon on the Alabama Ridge

The primary target for drill evaluation in 1987 was the much larger and apparently more continuous gold system, described as the main Alabama gold horizon, and partly exposed on the ridge 400' east of the Alabama shaft site. Previous surface sampling indicated a 40'-wide and 600'-long minimum size to the gold anomaly on the ridge, but could not successfully evaluate exactly how much of the rock package had anomalous gold values, nor over what intervals, if any, ore-grade gold values were sustained. The 1987 rotary drill program was successful in quickly and effectively doing exactly this evaluation.

Although gold grades decrease in the Mn facies on the northern edge of the Alabama ridge, a broad recessive area still farther north at the north end of the Alabama grid has abundant gossan float but no surface exposure to sample.

Drill holes Al-8 thru 12
Al-14

and hole #'s above Al-16 are removed from report because they are located on the patented ground

Hole AL-13 should have contained the richest gold intercept on the Alabama ridge, since it was drilled directly under the workings that gave the highest surface gold values on the ridge -- namely the southern open cut (caved shaft collar) and nearby small deep shaft on the southern part of the ridge, just north of a fence line. A 5'-wide aggregate chip sample of gossanous metatuff from the southern open cut carried more than 1 oz/t (43 ppm) gold (KH-20, fig. 4), and a sample of dump material from the nearby shaft carried 14.5 ppm Au (AR-7). Clearly, high-grade gold ore exists in a zone explored by these relatively deep (50'+) workings. Below the workings, however, hole AL-13 transected, for most of its length, a silicic mafic (dike?) rock that is not exposed at surface; the hole never intersected the ore zone, even though it went past where the ore zone should have projected at depth.

In fact the log of AL-13 (table 7) bears little resemblance to the units at surface, particularly the alternation of coarse-grained hornblende-feldspar rock with a fine-grained silicic quartz-biotite metatuff or dike east of the workings -- at surface the coarse-grained rock is seen only to the west. These dikes appear to dissect mineralization on the ridge into pod-like bodies with little lateral or depth extent. No significantly anomalous gold values were recovered from any part of hole AL-13, in an area rich in gold at surface.

Hole Al-15 was collared on the west side of the southern workings near the fence line, and was drilled east across the workings to intersect the mineralized rock package that AL-13 missed. It was reasonably successful in that it did encounter a 10-15 foot-wide goethite-limonite gossan after sulfides in the upper part of the hole. A 15' section with some gossan averaged 0.9 ppm Au, including a 5' section of 2.2 ppm Au, but interestingly, the coarse-grained hornblende dike rock in contact with the gossan to the west was richer in gold -- 3.1 ppm -- than the gossan itself. Part of the problem could have been that the edge of the old workings was intersected for 2 feet in the drill hole, and possibly some high-grade rock was lost. These high-Au results notwithstanding, the fact that gold zone cut at 40' depth in AL-15 does not exist at 100' depth in hole AL-13 immediately below it, shows that the gold zone is much too small and erratic to make a viable gold target for Santa Fe.

The last hole drilled on the Alabama ridge tested a 126 ppb gold soil anomaly at the south end of the grid. Since the Alabama gold horizon was under Tertiary volcanic cover at this point, the hole was vital in assessing the gold values in the system as it projected south of the main ridge. Prior rock and soil sample surveys left the gold system open to the south and ripe for testing. The 30 foot-wide red hematite gossan that AL-16 intersected was unexpected, and seemed a favorable sign that the system continued west. However, only 5' of gossan had 0.35 ppm Au and other parts carried 0.1 ppm Au. A prospect higher on the ridge on strike with the AL-16 gossan zone was sampled and found to have comparable 0.1 ppm Au values, except for a thin seam on hand-picked high-grade malachite-hematite ore carrying 20 ppm -- a value reminiscent of the first dump samples on the Alabama that later drilling proved to be narrow zones. The low gold values in otherwise favorable gossan to the south shows that mineralization persists to the south, but gold values quickly drop to background levels away from the prominent Alabama ridge, just as they do to the north of the ridge.

## CONCLUSIONS AND RECOMMENDATIONS

The Alabama mine region is a partly exposed segment of a major gold-bearing horizon in tuffaceous metasediments that extends across the Cottonwood Cliffs for two miles or more south of the Alabama, where high gold values recur in section 1, and for an unknown distance to the north. Precambrian volcanism in the Copper Giant and Walkover mine areas was enriched in gold, but the best depositional environment for fixing gold were in felsic tuff horizons related to exhalative centers that evolved in a broad expanse of tuffaceous sediments after the major volcanism. Such horizons include the Alabama mine, Alabama ridge, and Silver Bell mine areas. Despite the present epigenetic appearance of gold mineralization at these sites, such as in quartz "veins" (chert bodies) and in sheared zones, the confinement of gold deposits to felsic tuff horizons on a wide regional scale indicates that gold first accumulated in a syngenetic setting, then was reconcentrated during diking and later regional metamorphism.

The major break from mafic volcanism of the Copper Giant mine to the younger felsic volcanism and tuffaceous sedimentation containing the syngenetic gold occurs at the Walkover mine, where a chert horizon lies at the boundary. The chert and adjacent strata carry locally high gold values at surface, but both the chert and high gold values are lensoidal and absent at depth, being either cut off by later shearing and faulting, or simply no present. The 1987 rotary drill program was decisive, at least in a preliminary evaluation, in confining gold values in the Walkover system to too small and too fragmented a rock package to be of interest to Santa Fe Mining. Other companies looking for small high-grade gold targets, however, could find the Walkover gold system interesting, as it is geologically favorable for syngenetic gold localization and later concentration in high-grade structures.

The Walkover will require diamond drilling in the future to properly evaluate its geology and gold distribution, as its structure is too complex and obscure at surface to accurately evaluate with a rotary drilling program. As is the case for all areas drilled in the 1987 program, the gold potential of the Walkover mine was not evaluated below a 200 foot depth. Considering that low-angle fault structures may exist in the Walkover mine area, it is possible that at greater depth the gold system could change and become either more or less favorable for economic gold mineralization.

The Alabama mine area, including workings at the main shaft and on the Alabama ridge to the east, plus the stratigraphic equivalent of the ridge geology to the north at the Silver Bell mine shafts, constitute the main gold target in the district. All three components of this target were evaluated by the 1987 rotary drill program. Drilling of the Alabama mine shaft site closely confirmed the grade and character of gold mineralization evident at surface: narrow gossanous quartz "veins" after original sulfide-bearing chert pods have high-grade gold values up to 1 oz/t, but when these 6" to 2'-wide structures are included in a 5' drill sample interval, the grade is diluted down to the 2-4 ppm range. The relatively narrow 10' width of the Alabama shaft zone and short strike length ( < 300 feet) makes it a very small-tonnage gold target. This, coupled with erratically distributed, podiform, high-Au lenses, makes it of little interest to Santa Fe, but of possible interest to a small operation.

The main Alabama gold horizon on the Alabama ridge goes through metal-mineral facies changes that limit the strike extent of high gold values just to the central-southern part of the ridge itself. Surface sampling showed that the old workings contain locally high gold values up to 1 oz/t. However, these workings and their high values are not representative of the distribution and grade of gold in the entire Alabama ridge system. Three drill holes on the north end of the ridge, and one hole south of the ridge where the system goes under Tertiary cover, located the right mineralized structures and alteration zones at both ends of the system, but found them lacking in significant gold values. This cut the maximum strike length of interesting gold values in the system to less than 300 feet on the ridge.

Three drill holes into the central sulfide-rich facies of the Alabama ridge system confirmed the 0.4 to 2 ppm gold values found at surface in narrow 5-10' structures; but limiting marginal gold values to such small widths also excluded this area from serious economic interest. This left a small Au-rich center at two shafts on the south end of the ridge. A drill hole into these workings at 40' depth confirmed the presence of up to 3 ppm Au values, but not the spot 1 oz/t Au values at surface. However, a hole under the same workings at 100' depth intersected a series of synvolcanic dikes instead of the Au-rich zone, dikes which appear to cut off any depth extent of the zone. This left the Alabama ridge with potential for ore-grade gold values only at spot sites near surface, and no potential for ore-grade gold intercepts at 100' depth.

Thus it is concluded that a series of intersecting or anastomosing felsic dikes in part underlie the Alabama ridge, dikes that are integral to the original volcanic structure of the felsic center, but which intruded just after deposition of the mineralized sediments so as to redistribute gold and sulfides in those sediments. The dikes effectively wreak havoc with the syndepositional structure of the gold system, causing both sulfides and gold to be haphazardly distributed in thin lenses within the sediment matrix between the dikes.

Consequently, down to the 200' depth range that the rotary drilling program evaluated, the Alabama ridge area has no potential for an economic gold deposit large enough to be of interest to Santa Fe Mining. Although the felsic center was productive for gold mineralization, gold permeated too little of the system and its adjacent strata to make a large economic deposit. This is especially evident in mineralized altered units 200' along strike from the main center that have no anomalous gold values. It is possible that some unusual combination of circumstances could allow the Alabama ridge gold system to blossom below the 200' depth evaluated by the 1987 drill program, but this is considered unlikely due to the lensoidal, not tabular, shape of felsic domes.

In contrast to the narrow gold intercepts found at the Alabama ridge, drilling of the Silver Bell mine area 1500 feet north along strike discovered a remarkably wide zone of gold mineralization in rhyolitic tuffs and tuffaceous metasediments that is not exposed at surface. Although anomalous gold values do not persist over the full 90' width of the zone, nevertheless, it is made up of several 5'- to 40'-foot wide units that carry 4.2 to 0.5 ppm Au values. The mineralized rocks are permeated in the drill holes by red hematite and Fe-oxide in semi-gossan zones, which translates to arsenopyrite, pyrite, minor sphalerite and chalcopyrite disseminated in felsic tuffs below the water table at 120 feet.

Although drilling of the Silver Bell mine has not yet shown that a major gold orebody exists, several important factors must be considered:

1. The geologic setting is of distal tuffs and sediments, not proximal domes.
2. The 90' width of the mineralized system indicates that the Silver Bell mine is closest to a truly disseminated Au setting of all drilled in the program.
3. Unlike the other areas, drilling did not close off the widths and grades of mineralization at depth -- they were the same or better than at surface.

4. Of all 5' drill-sample intervals assayed in the program, the highest value (4.2 ppm Au) was found under the Silver Bell mine shaft.
5. This highest gold value was not in a quartz-chert-rich gossan zone, as was the case everywhere else in the program, but in an altered metasediment on the edge of a semi-gossanous zone.

The last point is possibly the most important of all, because it is one of the earmarks of a potentially larger gold system than at the Walkover and Alabama. The main negative factor in the drilling was that only 150' to the north, gold values in the main oxide zone had decreased to 0.25 ppm Au, so it could be inferred from this that the system is just as restricted in strike extent as the Alabama ridge system, even though it is a bedded setting, not a domal one.

Taking all the above points into account, one could optimistically view the Silver Bell mine area as the "tip of an iceberg" where the intensity of gold mineralization and persistence of economic grades gradually increased to depth into a major gold orebody. Pessimistically, it could be viewed as a system no larger than the Alabama ridge, with a lensoidal geometry in 3-D and little lateral and vertical persistence. The lack of any obvious strike extent to the north and south at surface supports the lensoidal shape, although it is not always possible to find traces of the zones at surface. In all likelihood, the Silver Bell Mine area will eventually be shown to be no larger than the Alabama ridge system, and therefore not of interest to Santa Fe. But with the present results at hand, key earmarks that the Silver Bell mine system could be larger, and the fact that drilling did not close off the zone to depth, it is not possible to rule out the Silver Bell mine area from economic consideration.

Probably the easiest way to test the depth potential of the Silver Bell mine area would be with a series of deep, steeply inclined holes across the main zone. Before such a program is considered however, it should be kept in mind that the only truly ore-grade intercept found to date in the 5' of 4.2 ppm. Even if a large zone of gold mineralization is found at the Silver Bell mine, present data favors the prediction that its grade will be subeconomic.

Finally, it is recommended that Santa Fe discontinue its interest in the Walkover mine, Alabama shaft area and Alabama ridge area, because of the above considerations. Optionally the Silver Bell may be worthy of more work.

* * * * * * *

TABLE 6 : GOLD RESULTS OF ALABAMA MINE AREA DRILL HOLES

Walkover Mine Area

| DRILL HOLE SAMPLE | AU (ppb) | | TOTAL |
|---|---|---|---|
| AL-1 5'- 10' | 57.0 | | Two 5' sections of 0.2 ppm Au |
| AL-1 10'- 15' | 153.0 | } 5'of 0.2 ppm | |
| AL-1 15'- 20' | 8.0 | | |
| AL-1 20'- 25' | 10.0 | | |
| AL-1 25'- 30' | 8.0 | | |
| AL-1 30'- 35' | 11.0 | | |
| AL-1 35'- 40' | 7.0 | | |
| AL-1 40'- 45' | 14.0 | | |
| AL-1 45'- 50' | 36.0 | | |
| AL-1 50'- 55' | 52.0 | | |
| AL-1 55'- 60' | 54.0 | | |
| AL-1 60'- 65' | 30.0 | | |
| AL-1 65'- 70' | 28.0 | | |
| AL-1 70'- 75' | 20.0 | | |
| AL-1 75'- 80' | 25.0 | | |
| AL-1 80'- 85' | 13.0 | | |
| AL-1 85'- 90' | 8.0 | | |
| AL-1 90'- 95' | 6.0 | | |
| AL-1 95'- 100' | 16.0 | | |
| AL-1 100'- 105' | 59.0 | | |
| AL-1 105'- 110' | 190.0 | } 5 feet of 0.2 ppm | |
| AL-1 110'- 115' | 54.0 | | |
| AL-1 115'- 120' | 31.0 | | |
| AL-1 120'- 125' | 63.0 | | |
| AL-1 125'- 130' | 27.0 | | |
| AL-1 130'- 135' | 15.0 | | |
| AL-1 135'- 140' | 8.0 | | |
| AL-1 140'- 145' | 8.0 | | |
| AL-1 145'- 150' | 8.0 | | |
| AL-1 150'- 155' | 10.0 | | |
| AL-2 0'- 5' | 112.0 | | 5' of 0.1 ppm Au |
| AL-2 5'- 10' | 19.0 | | |
| AL-2 10'- 15' | 21.0 | | |
| AL-2 15'- 20' | 10.0 | | |
| AL-2 20'- 25' | 9.0 | | |
| AL-2 25'- 30' | 7.0 | | |
| AL-2 30'- 35' | 4.0 | | |
| AL-2 35'- 40' | 9.0 | | |
| AL-2 40'- 45' | 13.0 | | |
| AL-2 45'- 50' | 15.0 | | |
| AL-2 50'- 55' | 13.0 | | |
| AL-2 55'- 60' | 33.0 | | |
| AL-2 60'- 65' | 79.0 | | |
| AL-2 65'- 70' | 62.0 | | |
| AL-2 70'- 75' | 26.0 | | |
| AL-2 75'- 80' | 8.0 | | |
| AL-2 80'- 85' | 6.0 | | |
| AL-2 85'- 90' | 6.0 | | |
| AL-2 90'- 95' | 5.0 | | |

| DRILL HOLE SAMPLE | AU (ppb) | | TOTAL |
|---|---|---|---|
| AL-3 5'- 10' | 19.0 | | 15' of 0.57 ppm Au |
| AL-3 10'- 15' | 16.0 | | |
| AL-3 15'- 20' | 19.0 | | |
| AL-3 20'- 25' | 9.0 | | |
| AL-3 25'- 30' | 12.0 | | |
| AL-3 30'- 35' | 8.0 | | |
| AL-3 35'- 40' | 37.0 | | |
| AL-3 40'- 45' | 1050.0 | } | |
| AL-3 45'- 50' | 290.0 | } 15' of 0.57 ppm | |
| AL-3 50'- 55' | 360.0 | } | |
| AL-3 55'- 60' | 17.0 | | |
| AL-3 60'- 65' | 9.0 | | |
| AL-3 65'- 70' | 10.0 | | |
| AL-3 70'- 75' | 7.0 | | |
| AL-3 75'- 80' | 6.0 | | |
| AL-3 80'- 85' | 7.0 | | |
| AL-3 85'- 90' | 6.0 | | |
| AL-3 90'- 95' | 7.0 | | |
| AL-3 95'- 100' | 6.0 | | |
| AL-3 100'- 105' | 10.0 | | |
| AL-3 105'- 110' | 8.0 | | |
| AL-3 110'- 115' | 10.0 | | |
| AL-3 115'- 120' | 6.0 | | |
| AL-3 120'- 125' | 6.0 | | |
| AL-3 125'- 130' | <2.0 | | |
| AL-3 130'- 135' | 6.0 | | |
| AL-3 135'- 140' | 3.0 | | |
| AL-3 140'- 145' | <2.0 | | |
| AL-3 145'- 150' | <2.0 | | |
| AL-3 150'- 155' | <2.0 | | |
| AL-3 155'- 160' | <2.0 | | |
| AL-3 160'- 165' | <2.0 | | |
| AL-3 165'- 170' | 4.0 | | |
| AL-3 170'- 175' | 4.0 | | |
| AL-4 5'- 10' | 18.0 | | 15' of 0.35 ppm Au |
| AL-4 10'- 15' | 7.0 | | |
| AL-4 15'- 20' | 6.0 | | |
| AL-4 20'- 25' | 4.0 | | |
| AL-4 25'- 30' | <2.0 | | |
| AL-4 30'- 35' | <2.0 | | |
| AL-4 35'- 40' | 10.0 | | |
| AL-4 40'- 45' | 5.0 | | |
| AL-4 45'- 50' | 15.0 | | |
| AL-4 50'- 55' | 6.0 | | |
| AL-4 55'- 60' | 5.0 | | |
| AL-4 60'- 65' | <2.0 | | |
| AL-4 65'- 70' | <2.0 | | |
| AL-4 70'- 75' | 7.0 | | |
| AL-4 75'- 80' | 6.0 | | |
| AL-4 80'- 85' | 12.0 | | |
| AL-4 85'- 90' | 13.0 | | |
| AL-4 90'- 95' | <2.0 | | |
| AL-4 95'- 100' | 4.0 | | |

| DRILL HOLE SAMPLE | AU (ppb) | | TOTAL |
|---|---|---|---|
| AL-4 100'- 105' | 22.0 | | |
| AL-4 105'- 110' | 9.0 | | |
| AL-4 110'- 115' | 4.0 | | |
| AL-4 115'- 120' | 37.0 | | |
| AL-4 120'- 125' | 620.0 | } | |
| AL-4 125'- 130' | 95.0 | } 15' of 0.35 ppm | |
| AL-4 130'- 135' | 350.0 | } | |
| AL-5 5'- 10' | 29.0 | | 15' of 0.04 ppm Au |
| AL-5 10'- 15' | 32.0 | | |
| AL-5 15'- 20' | 9.0 | | |
| AL-5 20'- 25' | 6.0 | | |
| AL-5 25'- 30' | 7.0 | | |
| AL-5 30'- 35' | 5.0 | | |
| AL-5 35'- 40' | 4.0 | | |
| AL-5 40'- 45' | 12.0 | | |
| AL-5 45'- 50' | 8.0 | | |
| AL-5 50'- 55' | 17.0 | } | |
| AL-5 55'- 60' | 18.0 | } 15' gossan of 0.04 ppm | |
| AL-5 60'- 65' | 89.0 | } | |
| AL-5 65'- 70' | 11.0 | | |
| AL-5 70'- 75' | 3.0 | | |
| AL-5 75'- 80' | 4.0 | | |
| AL-5 80'- 85' | <2.0 | | |
| AL-5 85'- 90' | 5.0 | | |
| AL-5 90'- 95' | 4.0 | | |
| AL-5 95'- 100' | 6.0 | | |
| AL-5 100'- 105' | 9.0 | | |

Main Alabama Mine Area

| | | | |
|---|---|---|---|
| AL 6 5'- 10' | 7.0 | | 15' of 1.17 ppm Au |
| AL 6 10'- 15' | 12.0 | | incl. 5' of 2.4 ppm |
| AL 6 15'- 20' | 13.0 | | |
| AL 6 20'- 25' | 11.0 | | |
| AL 6 25'- 30' | 7.0 | | |
| AL 6 30'- 35' | 10.0 | | |
| AL 6 35'- 40' | 6.0 | | |
| AL 6 40'- 45' | 15.0 | | |
| AL 6 45'- 50' | 17.0 | | |
| AL 6 50'- 55' | <2.0 | | |
| AL 6 55'- 60' | <2.0 | | |
| AL 6 60'- 65' | 3.0 | | |
| AL 6 65'- 70' | <2.0 | | |
| AL 6 70'- 75' | 6.0 | | |
| AL 6 75'- 80' | 10.0 | | |
| AL 6 80'- 85' | 2400.0 | } 15' of 1.17 ppm | |
| AL 6 85'- 90' | 141.0 | } incl. 5' of 2.4 ppm | |
| AL 6 90'- 95' | 960.0 | } | |
| AL 6 95'- 100' | 12.0 | | |
| AL 6 100'- 105' | <2.0 | | |
| AL 6 105'- 110' | 18.0 | | |
| AL 6 110'- 115' | 11.0 | | |

| DRILL HOLE SAMPLE | AU (ppb) | | TOTAL |
|---|---|---|---|
| AL 6 115'- 120' | 23.0 | | |
| AL 6 120'- 125' | 50.0 | | |
| AL 6 125'- 130' | 11.0 | | |
| AL 6 130'- 135' | 10.0 | | |
| AL 6 135'- 140' | 4.0 | | |
| AL 6 140'- 145' | 6.0 | | |
| AL 6 145'- 150' | 4.0 | | |
| AL 6 150'- 155' | 3.0 | | |
| AL 6 155'- 160' | 7.0 | | |
| AL 6 160'- 165' | 5.0 | | |
| AL 7 5'- 10' | 16.0 | | 20' of 0.25 ppm Au intermittent |
| AL 7 10'- 15' | 230.0 | } 5' of 0.2 ppm | |
| AL 7 15'- 20' | 54.0 | | |
| AL 7 20'- 25' | 12.0 | | |
| AL 7 25'- 30' | 60.0 | | |
| AL 7 30'- 35' | 9.0 | | |
| AL 7 35'- 40' | 51.0 | | |
| AL 7 40'- 45' | 26.0 | | |
| AL 7 45'- 50' | 300.0 | } | |
| AL 7 50'- 55' | 240.0 | } 10' of 0.27 ppm | |
| AL 7 55'- 60' | 48.0 | | |
| AL 7 60'- 65' | 7.0 | | |
| AL 7 65'- 70' | 10.0 | | |
| AL 7 70'- 75' | 13.0 | | |
| AL 7 75'- 80' | 7.0 | | |
| AL 7 80'- 85' | 14.0 | | |
| AL 7 85'- 90' | 23.0 | | |
| AL 7 90'- 95' | 45.0 | | |
| AL 7 95'- 100' | 20.0 | | |
| AL 7 100'- 105' | 5.0 | | |
| AL 7 105'- 110' | 5.0 | | |
| AL 7 110'- 115' | 6.0 | | |
| AL 7 115'- 120' | 21.0 | | |
| AL 7 120'- 125' | 15.0 | | |
| AL 7 125'- 130' | 41.0 | | |
| AL 7 130'- 135' | 58.0 | | |
| AL 7 135'- 140' | 39.0 | | |
| AL 7 140'- 145' | 300.0 | } 5' of 0.3 ppm | |

| DRILL HOLE SAMPLE | AU (ppb) | | TOTAL |
|---|---|---|---|
| AL 13 5'- 10' | 106.0 | } 5' of 0.1 ppm | 5' of 0.1 ppm Au |
| AL 13 10'- 15' | 32.0 | | |
| AL 13 15'- 20' | 32.0 | | |
| AL 13 20'- 25' | 25.0 | | |
| AL 13 25'- 30' | 18.0 | | |
| AL 13 30'- 35' | 14.0 | | |
| AL 13 35'- 40' | 9.0 | | |
| AL 13 40'- 45' | 16.0 | | |
| AL 13 45'- 50' | 7.0 | | |
| AL 13 50'- 55' | 35.0 | | |
| AL 13 55'- 60' | 14.0 | | |
| AL 13 60'- 65' | 13.0 | | |
| AL 13 65'- 70' | 7.0 | | |
| AL 13 70'- 75' | 6.0 | | |
| AL 13 75'- 80' | 11.0 | | |
| AL 13 80'- 85' | 25.0 | | |
| AL 13 85'- 90' | 77.0 | | |
| AL 13 90'- 95' | 36.0 | | |
| AL 13 95'- 100' | 31.0 | | |
| AL 13 100'- 105' | 8.0 | | |
| AL 13 105'- 110' | 34.0 | | |
| AL 13 110'- 115' | 33.0 | | |
| AL 13 115'- 120' | 36.0 | | |
| AL 13 120'- 125' | 68.0 | | |
| AL 13 125'- 130' | 32.0 | | |
| AL 13 130'- 135' | 38.0 | | |

| DRILL HOLE | SAMPLE | AU (ppb) | | TOTAL |
|---|---|---|---|---|
| AL 15 | 5'- 10' | 9.0 | | 35' of 0.85 ppm Au |
| AL 15 | 10'- 15' | 11.0 | | |
| AL 15 | 15'- 20' | 33.0 | | |
| AL 15 | 20'- 25' | 3100.0 | } 5' of 3.1 ppm | |
| AL 15 | 25'- 30' | 69.0 | | |
| AL 15 | 30'- 35' | 44.0 | | |
| AL 15 | 35'- 40' | 37.0 | | |
| AL 15 | 40'- 45' | 2200.0 | } | |
| AL 15 | 45'- 50' | 190.0 | } 15' of 0.9 ppm | |
| AL 15 | 50'- 55' | 300.0 | } incl. 5' of 2.2 ppm | |
| AL 15 | 55'- 60' | 17.0 | | |
| AL 15 | 60'- 65' | 36.0 | | |
| AL 15 | 65'- 70' | 49.0 | | |
| AL 15 | 70'- 75' | 21.0 | | |
| AL 15 | 75'- 80' | <2.0 | | |
| AL 15 | 80'- 85' | 13.0 | | |
| AL 15 | 85'- 90' | 153.0 | | |
| AL 15 | 90'- 95' | 6.0 | | |
| AL 15 | 95'- 100' | 38.0 | | |
| AL 15 | 100'- 105' | 15.0 | | |
| AL 15 | 105'- 110' | 35.0 | | |
| AL 15 | 110'- 115' | 27.0 | | |
| AL 15 | 115'- 120' | 55.0 | | |
| AL 15 | 120'- 125' | 113.0 | | |
| AL 16 | 5'- 10' | 103.0 | | 40' intermittent of over 0.1 ppm Au |
| AL 16 | 10'- 15' | 42.0 | | |
| AL 16 | 15'- 20' | 350.0 | } 5' of 0.35 ppm | |
| AL 16 | 20'- 25' | 120.0 | | |
| AL 16 | 25'- 30' | 141.0 | | |
| AL 16 | 30'- 35' | 53.0 | | |
| AL 16 | 35'- 40' | 66.0 | | |
| AL 16 | 40'- 45' | 50.0 | | |
| AL 16 | 45'- 50' | 113.0 | | |
| AL 16 | 50'- 55' | 16.0 | | |
| AL 16 | 55'- 60' | 13.0 | | |
| AL 16 | 60'- 65' | 139.0 | | |
| AL 16 | 65'- 70' | 130.0 | | |
| AL 16 | 70'- 75' | 17.0 | | |
| AL 16 | 75'- 80' | 78.0 | | |
| AL 16 | 80'- 85' | 49.0 | | |
| AL 16 | 85'- 90' | 74.0 | | |
| AL 16 | 90'- 95' | 71.0 | | |
| AL 16 | 95'- 100' | 36.0 | | |
| AL 16 | 100'- 105' | 174.0 | | |
| AL 16 | 105'- 110' | 44.0 | | |
| AL 16 | 110'- 115' | 53.0 | | |

ROCK CHIP samples, southernmost prospect on Alabama Ridge zone

| | | |
|---|---|---|
| AR | 36 | 114.0 |
| AR | 37 | 63.0 |
| AR | 38 | 164.0 |
| AR | 39 | 20200.0 |

TABLE 7: GEOLOGIC LOGS OF ALABAMA MINE AREA 1987 DRILL HOLES

WALKOVER MINE AREA ( No formal grid established)

HOLE AL-1 (-45°) at 245°, Loc. 50'E of main Walkover shaft (T.D. = 155')
Drilled across main Walkover shaft zone north of creek

| | | |
|---|---|---|
| 0'- 35' | Fine-grained biotite schist, Fe-oxide stained, local Fe oxide semi-gossan -- good looking rock -- metased or meta-rhyolite. | * |
| 35'- 45' | Less Fe-oxide stained fine-grained biotite schist -- limonite after pyrite. | |
| 45'- 55' | Mafic metavolcanic basalt-dacite, local chert. | |
| 55'- 60' | Highly siliceous cherty metadacite or biotite metadacite tuff. | |
| 60'- 65' | Fe oxide semi-gossan zone in biotitic tuffaceous metasediments or metarhyolite. | |
| 65'- 79' | Cherty silicic metarhyolite or rhyolitic tuff, white, little or no Fe oxide. | |
| 79'- 81' | Thin semigossan stringer in cherty rhyolitic tuff. | |
| 81'- 85' | Cherty silicic rhyolitic tuff, minor Fe oxides, lots of silica. | |
| 85'- 105' | Gray-brown chert, some biotite, minor Fe oxides. | |
| 105'- 112' | Green sericitic zone on down side of chert (west). | * |
| 112'- 125' | Silicic, locally cherty, biotite-bearing basalt-dacite tuff. | |
| 125'- 155' | Massive meta basalt-dacite, no alteration or fracturing. | |

HOLE AL-2 (-45°) at 090°, in creek 200'W 60'S of Walkover shaft (T.D. = 95')
Drilled across oxidized zone in creek west of Walkover shaft

| | | |
|---|---|---|
| 0'- 10' | Fill and oxidized semi-gossan and altered feldspar-crystal dacite -- looks good. | * |
| 10'- 20' | Fresh feldspar-crystal dacite, minor quartz, sericite, biotite alteration. | |
| 20'- 43' | Sericitically altered feldspar-crystal dacite, rhyodacite tuff and biotite schist, some altered rhyolite tuff, moderately strong Fe oxide stain, lots of sericite alteration. | |
| 43'- 75' | Strong yellow sericite alteration and Fe oxide gossan stringers in feldspar-crystal rhyodacite-dacite tuff - main alteration gossan zone in cuts. | |
| 75'- 95' | Massive, fresh, unaltered metabasalt -- barren. | |

HOLE AL-3 (-45°) at 080°, 100'W 65'S strike of Walkover shaft (T.D. = 175')
Drilled across southern Walkover extension in creek

| | | |
|---|---|---|
| 0'- 15' | Oxidized locally Fe-oxide and hematite-stained metabasalt. | |
| 15'- 30' | Fresh feldspar-crystal basalt-dacite, little Fe oxide stain. | |
| 30'- 45' | Strong Fe oxide stained semi-gossanous, sericite-altered feldspar-crystal dacite. | ** |
| 45'- 58' | Brown cherty feldspar-crystal rhyodacite -- almost chert, local Fe oxide. | * |
| 58'- 95' | Massive green fresh metabasalt. Little Fe oxide. | |
| 95'- 135' | Massive green metabasalt with minor to moderate Fe oxide and abundant biotite - could be partly tuffaceous metaseds. | |

| | |
|---|---|
| 135'- 140' | Minor-moderate malachite stain in biotite metabasaltic andesite tuff. |
| 140'- 175' | Same as above, more biotite rich, possibly tuff but more likely of basalt-andesite composition. |

HOLE AL-4 (-45°) at 265°, Loc. 70'E south Walkover open cut (T.D. = 135')
Drilled across main high-Au showing south of creek

| | |
|---|---|
| 0'- 30' | Felsic schistose metarhyodacite-rhyolite tuff, biotite-sericite, lots of Fe oxide stain. |
| 30'- 40' | Highly sericitic zone, powdery, almost no rock recovered. |
| 40'- 60' | Fe oxide-stained gray biotite rhyodacite tuff, moderate Fe oxide stain. |
| 60'- 70' | Sericitic zone in biotite rhyodacite tuff, little or no Fe oxide. |
| 70'- 82' | Gray silicic feldspar crystal rhyodacite-dacite flow, gray, no Fe stain. |
| 82'- 83' | Clear quartz vein or chert. |
| 83'- 95' | Biotite rich tuffaceous metaseds, high in feldspar, pale green from sericite. Lots of Fe oxide stain, minor quartz -- could be depth extent of ore zone. |
| 95'- 110' | Silicic biotite-rich tuffaceous metaseds, little or no Fe oxide stain. |
| 110'- 135' | Silicic biotite-rich tuffaceous metaseds, abundant quartz veinlets and green sericite. * |

HOLE AL-5 (-45°) at 265°, Loc. 60'E of pit on ridge to south (T.D. = 105')
Drilled across oxide zone on 220° trend from previous hole

| | |
|---|---|
| 5'- 48' | Relatively fresh metabasalt, local Fe oxide and sericite. |
| 48'- 72' | 34' of solid goethite-hematite gossan and quartz -- possibly a Tertiary dike or oxide gossan zone. * |
| 72'- 75' | Altered basalt edge to dike -- 30% Fe oxide. |
| 75'- 95' | Relatively massive metabasalt with local orange-brown Fe oxide stringers related to dike. |
| 95'- 105' | Brown biotite schist and felsic rhyodacite tuff - sericite and quartz. |

MAIN ALABAMA MINE AREA (Formal grid established)

HOLE AL-6 (-45°) at 130°, Loc. 50'W, 60'S (T.D. = 165')
Across S extension of main Alabama shaft zone

| | |
|---|---|
| 0'- 30' | Orange Fe oxide stained silicic feldspar rhyodacite or tuffaceous metasediment -- good. |
| 30'- 45' | Brown-gray fine-grained biotite metasediment - relatively barren. |
| 45'- 50' | Narrow hematite goethite gossan zone in biotitic metaseds - good. |
| 50'- 80' | Highly silicic biotitic metaseds, trace of Fe oxide stain. |
| 80'- 95' | Chert, Fe-oxide semigossan and Fe oxide-stained highly silicic rhyodacite tuff and tuffaceous meta sediments - this is the depth extent of the ore gossan zone. *** |
| 95'- 107' | Sericitic chert and highly silicic rhyodacite tuff. |
| 107'- 120' | Fine grained biotitic metaseds with minor Fe oxide stain. |

| | |
|---|---|
| 120'- 145' | Very barren dark gray biotite schist -- barren. |
| 145'- 155' | Good Fe oxide-stained zone in black biotite-schist - good. |
| 155'- 165' | Back into barren gray fine-grained biotite metased schist. |

HOLE AL-7 (-45°) at 130°, Loc. 75'W 50'N (T.D. = 145')
Across main Alabama shaft under north end of dump

| | | |
|---|---|---|
| 0'- 18' | Felsic rhyodacite tuff and tuffaceous sediments with lots of hematite stain and thin gossan stringers after polysulfides -- looks relatively good. | * |
| 18'- 37' | Green-brown fine-grained biotite schist with red hematite stringers after veinlet-type sulfides -- fracture disseminated mineralization. | |
| 37'- 58' | Major hematite-goethite semigossan zone after disseminated Au and As sulfides - orange rhyolitic tuff or alteration zone. | * |
| 58'- 95' | Disseminated and fracture controlled mineralization persisting throughout biotite rhyodacite or tuffaceous sediments -- lots of hematite fractures. | |
| 95'- 105' | Waning hematite-goethite alteration in sandy biotite schist. | |
| 105'- 130' | Fine-grained platy silicic biotite-rich metaseds, pyrite 125-130'. | |
| 130'- 135' | Local oxidized sulfide zone and silica in biotitic metaseds. | |
| 135'- 140' | (Repeat of 125-130)} in and out of pyritic metaseds and | |
| 140'- 145' | (Repeat of 130-135)} oxidized zones at water table. | * |

SUMMARY Good hole, intermittent mineralization from 0-95', with 25' of good hematitic semigossan.

HOLE AL-13 (-45°) at 285°, Loc. 00'N 321'E (T.D. = 135')
Under high-Au shaft of main ridge zone in southern area

| | |
|---|---|
| 5'- 15' | Yellow-brown clay and strong sericite alteration of rhyodacite tuff. * |
| 15'- 20' | Clear chert-quartz (vein?), yellow-orange clay and intense sericite alteration -- very little rock -- all soft sericite with hematite after pyrite. |
| 20'- 35' | Gray highly silicic sericite-altered rhyodacite tuff or tuffaceous metasediment, with quartz-chert, yellow-brown clay and hematite-goethite after pyrite on fractures. |
| 35'- 45' | Hematite-limonite-goethite-altered biotite metased tuff and chert. |
| 45'- 50' | Feldspar-hornblende mafic tuff or dike and biotite schist, with minor pyrite. |
| 50'- 55' | Biotite-feldspar schist, thin chert units, lots of Fe oxide stain. |
| 55'- 60' | Highly sericitic biotite-schist, lots of Fe oxide stain and pyrite. |
| 60'- 80' | Coarse-grained feldspar-hornblende mafic dike or tuff, minor Fe oxide and pyrite. |
| 80'- 100' | Fine grained black silicic biotite-quartz metatuff with moderate Fe oxide stain, clear chert lenses and local limonite zones. |
| 100'- 135' | Massive dark silicic mafic unit or dike with local Fe oxide stain, chert-quartz lenses and minor limonite zones. |

SUMMARY Mafic rock was intersected where ore zone should be.

HOLE AL-15 (-45°) at 095°, Loc. 202'E 12'S (T.D. = 125')
East under high-Au southern open cut missed by AL-13

| | |
|---|---|
| 5'- 20' | Fresh massive feldspar-hornblende dike rock, minor limonite stain. |
| 20'- 40' | Strongly oxidized locally semigossanous finer-grained feldspar- hornblende rock. **** |
| | (38-41' went through edge of shaft -- lost high grade). |
| 40'- 50' | Goethite-limonite gossan after sulfides in quartz + biotite schist.*** |
| 50'- 65' | Semigossanous biotite schist with minor quartz chert. ** |
| 65'- 75' | Strongly Fe oxide stain in biotite schist, decreasing with depth. |
| 75'- 83' | Fine-grained biotite-feldspar-hornblende dike + quartz-biotite schist. |
| 83'- 90' | Small hematite gossan and quartz zone in biotite schist -- good. |
| 90'- 110' | Sericite-biotite-rich schist, soft hematite-limonite after sulfides. |
| 110'- 125' | White silicic massive rhyolite with hematite after sulfides. Looks good and moderately mineralized. |

SUMMARY Good hole in opposite direction to AL 13 but incomparable to it.

HOLE AL-16 (-45°) at 270°, Loc. 330'E 152'S (T.D. = 115')
Under soil anomaly on southernmost part of ridge zone

| | |
|---|---|
| 0'- 15' | Orange limonite-stained biotite schist + hornblende-feldspar schist. |
| 15'- 45' | Good 30' zone of intensely blood-red hematitic gossan and semi- gossan in hematite-pervaded biotite schist. * |
| 45'- 65' | Strongly hematite-stained biotite-quartz-feldspar-sericite schist that was a metarhyolite tuff; minor chert and lots of Fe oxide. |
| 65'- 75' | Same rock as above but lower to minimal Fe oxide. |
| 75'- 80' | Red hematitic biotite schist and quartz feldspar metarhyolite tuff. |
| 80'- 100' | Dark biotite-rich siliceous rock with much finely disseminated pyrite and limonite-goethite stain after pyrite. |
| 100'- 115' | Black siliceous biotite-feldspar-quartz rock (rhyolite?) with abundant pyrite but no Fe oxide stain (now below water table). |

SUMMARY Surprisingly good hole for this far south - good mineralization for 100' (15'-115').

ROCK CHIP SAMPLES, prospect south of Al-16 hole

Hematitic rhyolite prospect south of AL-16 in main rhyolite body near feldspar hornblende dike at 350'S, 285'E sampled as follows:

| | |
|---|---|
| AR 36 | central high hematite zone over 2' width. |
| AR 37 | eastern schistose felsic rhyolitic tuff with moderate hematitic stain and local goethite gossan over 3'. |
| AR 38 | western 2'including feldspar-hornblende dike and local Fe-ox zones |
| AR 39 | malachite-rich dump ore. Looks like a rich setting. |