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Tucson, Arizona 85701
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inquiries@azgs.az.gov

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To JDS

Date 2/1 Time 9:00 AM PM

WHILE YOU WERE OUT

M Bill Sorsen

of Globe

Phone (602) 425 4096

Area Code Number Extension

TELEPHONED		PLEASE CALL	
CALLED TO SEE YOU		WILL CALL AGAIN	
WANTS TO SEE YOU		URGENT	

RETURNED YOUR CALL

Message Re call in Pardint for Mining Properties Gold-silica Flats.

Operator

AMPAD EFFICIENCY®

REORDER #23-000

Strumway mill 20 tons @ .16 opt Au from stockpiled zone.

Jack Eastlick cut vein samples 0.86 – 6½' gtz vein.

Near Diamond Butte Quad, W of Young.

Hoodon Mine Ellison Mine (proposed

~~(AZ Hydrocarb~~ Gold Guilds Comm.

12 claims 2 veins 1) included 6' @ 30° NW 30 stub intrusive 2) metal min, 5–50' wide, clean gtz,

JDS

ASARCO

Southwestern Exploration Division

February 1, 1991

FILE NOTE

Houden
~~Hoodoo~~ - Ellison Mine
Sections 1 & 12, T9N, R12E
Diamond Butte 7½ Topo
W. of Young, Arizona
Gila County

A Mr. Bill Sorsen
Globe, Arizona
Phone: 602/425-4096

7:30

has a gold-silica flux prospect,
2 veins a) inclined 30°, N30W strike
intersecting b) vertical vein 5'-50' wide.

Has sent dump material to the Shumway mill at Young, Arizona;
30 tons averaged 0.16 opt gold.

Jack Eastlick (retired Inspiration CuCo Chief Geologist), cut
sample on 6½' average 0.86 opt gold.

As described the "Hoodoo" prospect is the prospect symbol in
Section 1, north of the Ellison Mine in Section 12 (above Gold Gulch).

Jeep trail road into property.

Wants drilling to determine width/grade.

Review: Saw in PayDirt.

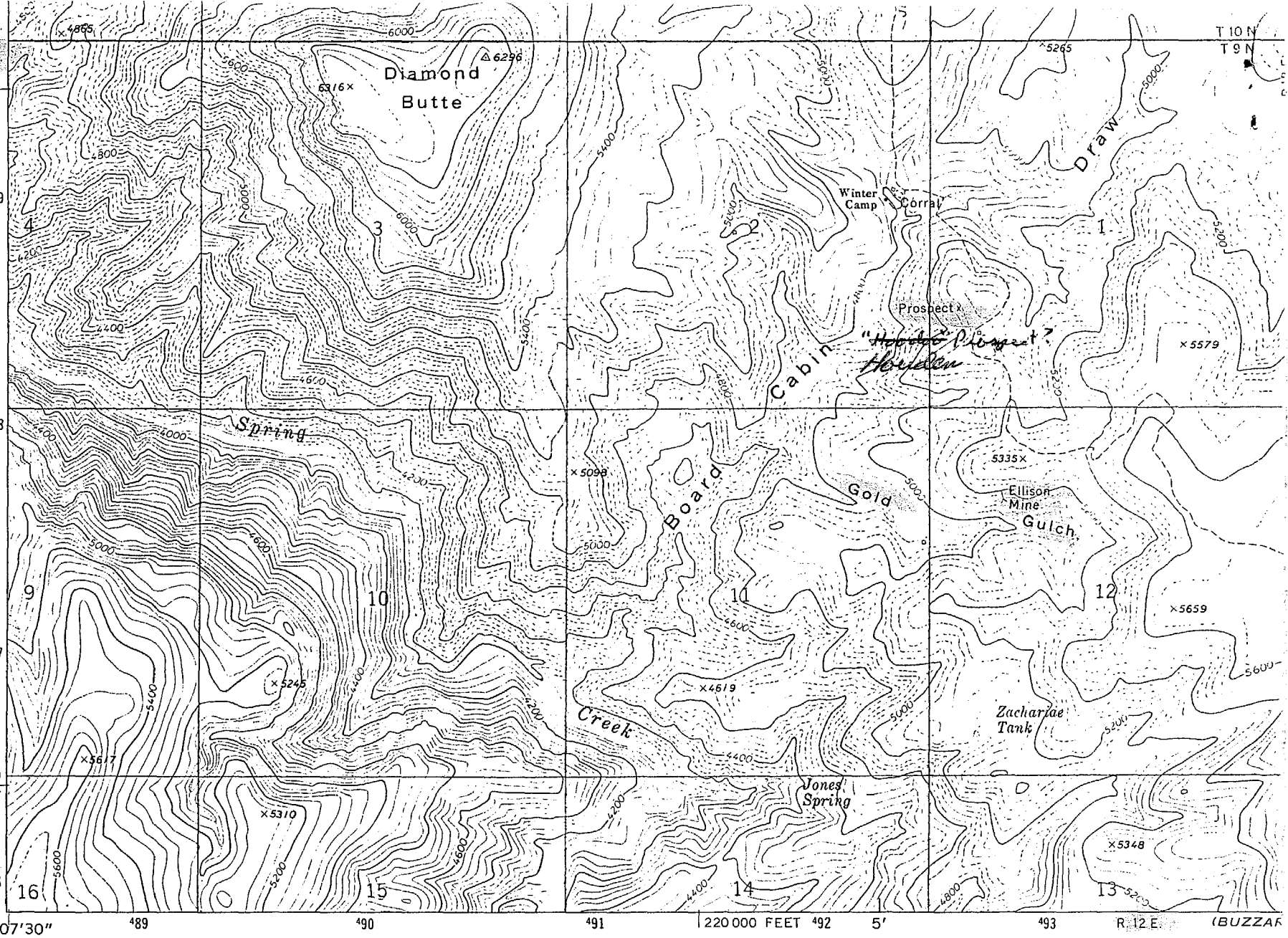
James D. Sell

James D. Sell

JDS:mek
Att.

cc: W.L. Kurtz
J.J. Malusa

Diamond Butte 7½' quad.



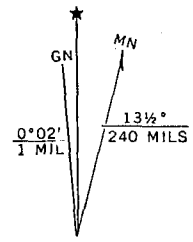
(SHEEP BASIN MTN.) 3752 II SW

Mapped by the U. S. Forest Service
Edited and published by the Geological Survey

Control by USGS, NOS/NOAA, and USFS

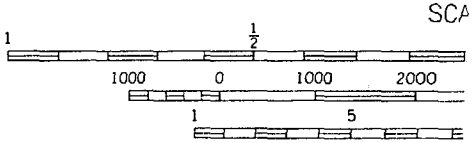
Topography by photogrammetric methods from aerial photographs taken 1965. Field checked by USGS 1973

Projection and 10,000-foot grid ticks: Arizona coordinate system, east zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue. 1927 North American datum



UTM GRID AND 1973 MAGNETIC NORTH

SCA



CONTOUR
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To _____

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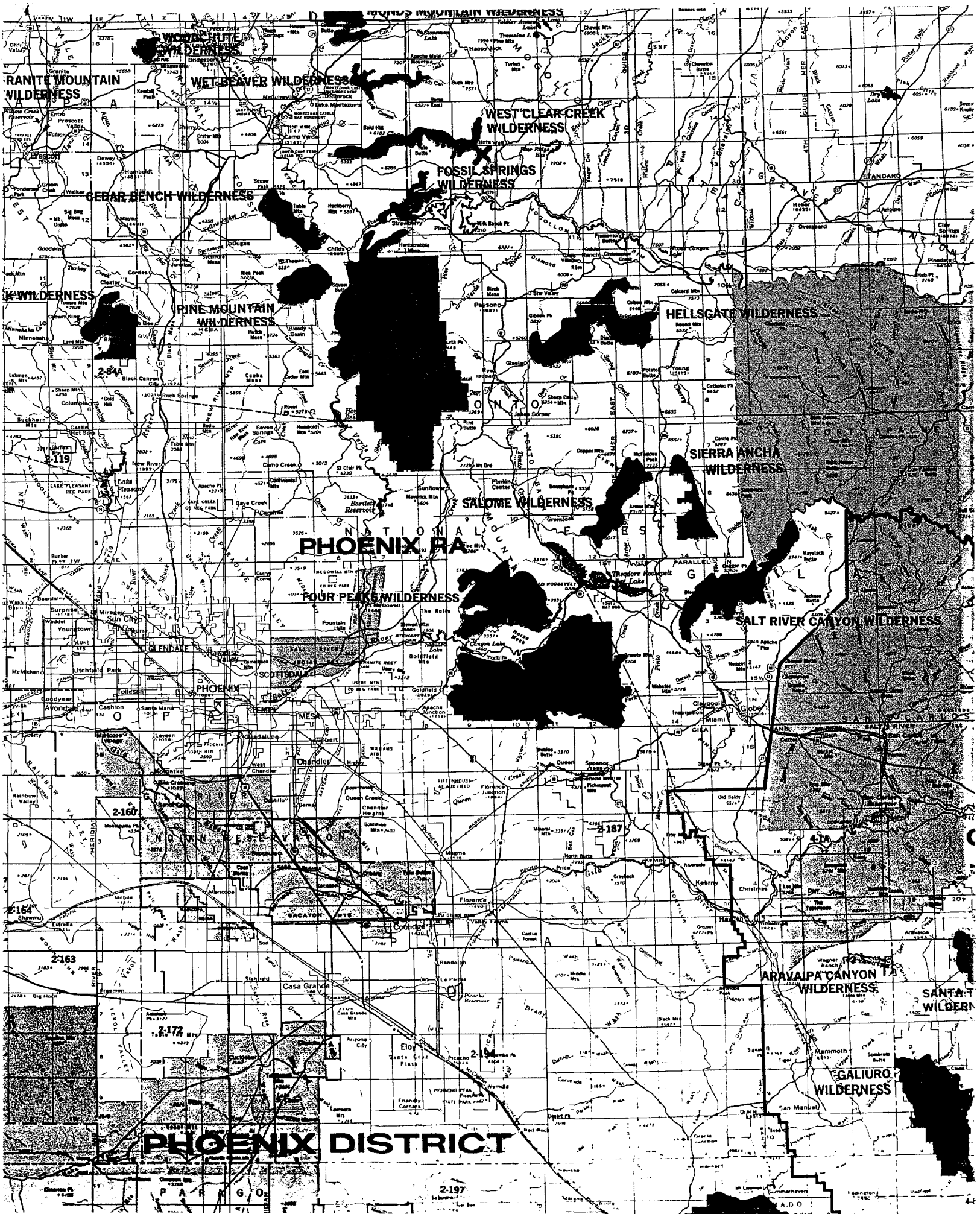
MOUNTAIN WILDERNESS
WOODCHUTER WILDERNESS
RANITE MOUNTAIN WILDERNESS
WET BEAVER WILDERNESS
WEST CLEAR CREEK WILDERNESS
FOSSIL SPRINGS WILDERNESS
CEDAR BENCH WILDERNESS
K WILDERNESS
PINE MOUNTAIN WILDERNESS
HELLSGATE WILDERNESS
SIERRA ANCHA WILDERNESS
SALOME WILDERNESS
PHOENIX RA
FOUR PEAKS WILDERNESS
SALT RIVER CANYON WILDERNESS
ARAVAIPA CANYON WILDERNESS
GALIURO WILDERNESS
PHOENIX DISTRICT
Prescott
Phoenix
Tempe
Mesa
Chandler
Casa Grande
Coolidge
Globe
Miami
Superior
Eloy
Sacaton
Lake Pleasant
Bartlett Reservoir
Roosevelt Lake
Apache Junction
Florence
Kearny
Mammoth
San Manuel
2-84A
2-119
2-160
2-164
2-163
2-172
2-187
2-194
2-197
4-1A

UNITED STATES DEPARTMENT OF THE INTERIOR
(BUREAU OF MINES)

MINERAL INVESTIGATION OF THE HELLS GATE ROADLESS AREA, GILA COUNTY, ARIZONA

SPRING CREEK MINING DIST.
GILA COUNTY

By
Robert A. McColly

MLA 139-82
1982

This open file report summarizes the results of a Bureau of Mines wilderness study and will be incorporated in a joint report with the U.S. Geological Survey. The report is preliminary and has not been edited or reviewed for conformity with the U.S. Bureau of Mines editorial standards. Work on this study was conducted by personnel from Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, CO 80225.

FOREWORD

The U.S. Bureau of Mines and U.S. Geological Survey jointly conduct mineral surveys of land which in the U.S. Forest Service Second Roadless Area Review and Evaluation (RARE II) program have been designated for further planning. These evaluations are used in the RARE II program which conforms with the Multiple-Use Sustained-Yield Act of 1960 (74 Stat. 215; 16 U.S.C. 528-531), the Forest and Rangeland Renewable Resources Planning Act of 1974 (88 Stat. 476, as amended; 16 U.S.C. 1601 note), and the National Forest Management Act of 1976 (90 Stat. 2949; 16 U.S.C. 1600 note). Reports on these surveys provide the President, Congress, the U.S. Forest Service, and the general public with information essential for determining the suitability of land for inclusion in the National Wilderness Preservation System.

This report is on the Hells Gate Roadless Area (3-021), Gila County, Arizona.

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MINERAL INVESTIGATION OF THE HELLS GATE ROADLESS AREA, GILA COUNTY, ARIZONA

By Robert A. McColly, U.S. Bureau of Mines

INTRODUCTION

Field examinations of known mineral deposits near the Hells Gate Roadless Area were conducted by the U.S. Bureau of Mines during March and April, 1981 and 1982 (fig. 1). These studies, which included reconnaissance of all mines, prospects, and mineralized areas inside, or within a mile, of the roadless area boundary, were part of a joint mineral resource appraisal made in cooperation with the U.S. Geological Survey. In addition, several properties 2 to 5 mi from the area were visited to obtain information useful in identifying similar occurrences inside the area.

During the investigation, a total of 38 samples were taken for analysis. Selected samples were analyzed spectrographically for 42 elements, and all samples were fire-assayed for gold and silver. Additional analyses were made when other metals or barite were seen or suspected. The results of all analyses are available for public inspection at the Bureau of Mines, Intermountain Field Operations Center, Denver Federal Center, Denver, Colorado 80225.

Location, size, and geographic setting

The Hells Gate Roadless Area lies near Payson in northwestern Gila County Arizona, about 95 mi northeast of Phoenix. The 30,400-acre area is south of the Mogollon Rim in the Tonto National Forest, forming an irregular 3 to 5 mi wide strip along Tonto Creek from Forest Road 405 to Gisela, a distance of about 15 mi.

Topography is rough and mountainous. Tonto Creek canyon and the side-canyons joining it are lined with steep cliffs. Elevations range from 6,000 ft near the Mogollon Rim to 3,000 ft along Tonto Creek near Gisela.

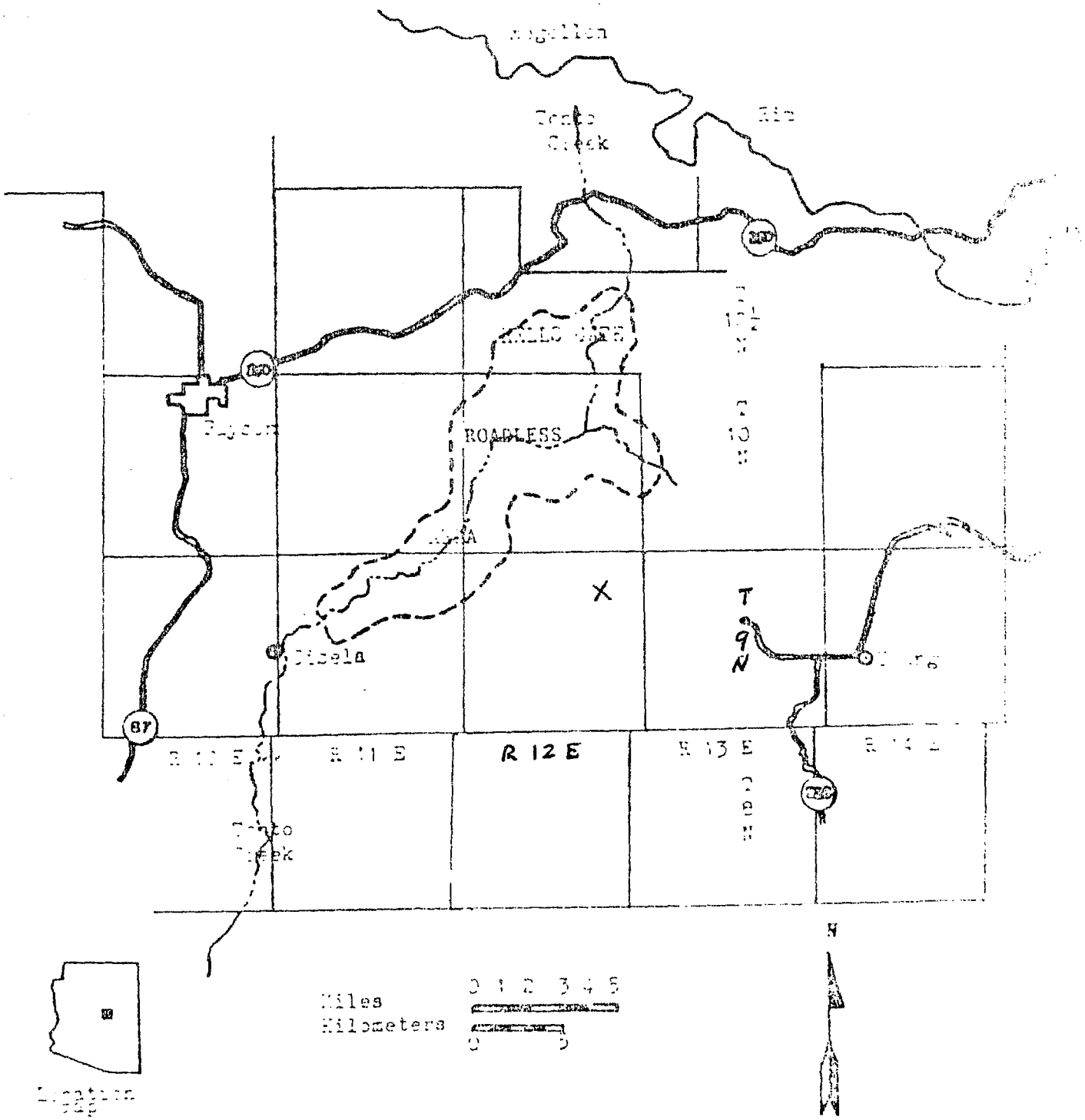


Figure 1.--Index map of Hells Gate Roadless Area, Gila County, Arizona.

From Payson, Gisela, and Young, jeep trails and Forest Service roads provide access to numerous points along the area perimeter. A few jeep trails extend short distances into the area, but generally access within the area is only by foot, horse, or helicopter.

Mining activity

The roadless area has no history of mining or mineral production, and no active claims, mines, or prospects were found inside the area boundaries. Some prospecting is indicated, based upon a review of mining claim records in the Gila County courthouse. Approximately 50 mining claims were found with descriptions that could place them within the area, but many descriptions are vague or even contradictory. Most of these claims were filed before the early 1930's, and none more recently than the 1950's. Bureau of Land Management records show no mineral leases, permits, or mining claims active in the area as of September 1982.

MINING DISTRICTS AND MINERALIZED AREAS

Parts of the Green Valley (Payson), and the Spring Creek (Young), mining districts extend into the Hells Gate Roadless Area, but none of the recorded mineral production from either district can be attributed to the area. Mine workings at the Gisela (Spook) barite deposit, and in Bearhide Canyon provide the only evidence of mining within 2 mi of the area. Several properties within a 5-mi radius include occurrences of agate, amethyst, barite, beryllium, copper, gold, iron, the rare-earth mineral xenotime (yttrium phosphate), silver, and uranium. The known deposits of iron, uranium, and yttrium, however, are related to geologic units not found in the area; and though favorable host rocks for the remaining minerals occur within the area, evidence to support the actual existence of such occurrences is tentative or lacking.

Gisela (Spook) barite deposit

A barite vein, 2 to 4 ft wide in granite, was exposed for over 10[illegible] along a ridge-top in the NW1/4, sec. 7, T. 9 N., R. 11 E., 2 mi west of [illegible] area (pl 1). The deposit is well known, production has occured as recent as 1981, and is described by Stewart and Pfister (1960, p. 15-16) who [illegible] values of 93.6 percent $BaSO_4$, 3.7 percent SiO_2, and 0.5 percent Fe_2O_3, with [illegible] specific gravity of 4.29. When visited in April 1982, the vein had been [illegible] covered with earth and dump material, and the site rehabilitated and seeded. Only small pieces of barite float could be found where the mine had been. [illegible] of these were collected for assay (table 2, sample 34). Stewart and Pfister (1960, p. 12) considered this vein as one of a system of sub-parallel fractures containing barite that extends south of Payson for about 15 mi. As mapped by Conway (1976), the structure containing barite at the Spook deposit continues southeastward for at least 2 mi, extending into the area. No barite was found along the projection of this structure, however, within a half-mile of the pit.

Bearhide Canyon prospects

Two water-filled shafts and a few shallow surface workings occur in sec. 24, T. 10-1/2 N., R. 12 E., along a 1/2-mi stretch of Bearhide Canyon [illegible] north of the area. None of the workings appeared to have been active recently. Fourteen Bureau of Mines samples (table 2, samples 3-16) gave assay values up to 0.117 ounce gold and 1.9 ounce silver per ton. Minor amounts of [illegible] and malachite were found on some of the dumps, but neither was observed in place. Mineralization is associated with quartz veins and masses occurring in granite. There is no record of production from mines in this vicinity, and based on observation, production, if any, was small. Though irregular, the veins appear to be near vertical, with an average strike of about N [illegible]

Therefore, the veins do not project into the roadless area either along strike or down dip.

Iron, uranium, and yttrium prospects

A review of the literature disclosed that iron, uranium, and yttrium prospects near the Hells Gate Roadless Area are found in host-rocks which are absent within the area. In this category are the Christopher Mountain hematite deposit in sec. 36, T. 11 N., R. 12 E., (Harrer, 1964, p. 30); the Promontory Butte uranium prospect in sec. 24, T. 11 N., R. 12 E., (Scarborough, 1981, p. 184); and the Diamond Butte xenotime (yttrium phosphate) occurrence in sec. 3, T. 9 N., R. 12 E., (Gastil, 1954, p. 280).

Other prospects

Several other prospects outside of the area were found and examined, most with scant development work, and generally providing little pertinent information on potential mineral deposits in the area. Included in this group are the Agate Mountain agate - amethyst occurrence in sec. 20, T. 10 N., R. 11 E., (Phillips, 1973, p. 1); the Baronite barite prospect in sec. 15, T. 10 N., R. 11 E., (Stewart and Pfister, 1960, p. 18-19); the Bread Pan Canyon beryllium prospect in sec. 23, T. 9 N., R. 12 E., (Smith, 1962, p. 1); the Royal Flush (Biship's Knoll) copper prospect in sec. 36, T. 10 N., R. 10 E., (Lausen and Wilson, 1925, p. 41); the Soldier Camp Creek copper prospects in secs. 25 and 36 T. 9 N., R. 11 E., and sec. 6, T. 8 N., R. 12 E.; placer and vein gold deposits in Gold Gulch and Board Cabin Draw in secs. 2, 11, and 12, T. 9 N., R. 12 E.; and a silver prospect near Mud Springs in sec. 36, T. 11 N., R. 11 E., (tables 1 and 2). None of these extend into the roadless area; neither are any similar deposits known to occur within the roadless area.

CONCLUSIONS

U.S. Bureau of Mines studies of the Hells Gate Roadless Area identified no mineral occurrences within the area.

REFERENCES

Conway, C. M., 1976, Petrology, structure, and evolution of a Precambrian volcanic and plutonic complex, Tonto Basin, Gila County, Arizona (Ph. D dissertation): California Institute of Technology, Pasadena, 460p.

Gastil, G. R., 1954, An occurrence of authigenic xenotime: Journal of Sedimentary Petrology v. 24, no. 4, p. 280-81.

Harrer, C. M., 1964, Reconnaissance of iron resources in Arizona: U.S. Bureau of Mines IC 8236, 204p.

Lausen, C., and Wilson, E. D., 1925, Gold and copper deposits near Payson, Arizona: University of Arizona, Arizona Bureau of Mines Bulletin 120, 44 p.

Phillips, K. A., 1973, Mine report-Beauty 1-7 claims group; Unpublished open-file report, Arizona Department of Mineral Resources, 1 p.

Scarborough, R. B., 1981, Radioactive occurrences and uranium production in Arizona: University of Arizona, Arizona Bureau of Geology and Mineral Technology, 297p.

Smith, L. A., 1962, Mine report-Scorpion beryllium mine: Unpublished open-file report, Arizona Department of Mineral Resources, 2p.

Stewart, L. A., and Pfister, A. J., 1960, Barite deposits of Arizona: U.S. Bureau of Mines RI 5651, 89p.

Table 1.-Mineral deposits near the Hells Gate Roadless Area, Gila County, Arizona

[Sample numbers correspond with sample localities shown on pl. 1]

Sample number(s) table 2	Mine or prospect name and location	Mineral or commodity and grade	Host rock and other geologic features controlling mineralization	Development and production	Reference
-	Agate Mountain prospect SE1/4, sec. 20, (unsurveyed) T. 10 N., R. 11 E.	Agate, amethyst.	Quartz vein, strike N 50-60° W, dip 70-80° N, exposed over 3,000-4,000 ft.	Shallow cut and trenches, production small, if any.	Phillips, 1973, p. 1.
-	Baronite prospect NW1/4, sec. 15 and NE1/4, sec. 16, (unsurveyed) T. 10 N., R. 11 E.	Barite, grade unknown.	Granite, NW striking fractures up to 1 ft wide.	None, none	Stewart and Pfister, 1960, p. 18-19.
3-16	Bearhide Canyon prospects NW1/4, sec. 24, (unsurveyed) T. 10-1/2 N., R. 12 E.	Copper, 0-0.8 pct; gold, 0-0.117 oz/ton; silver, 0-1.9 oz/ton.	Quartz veins, fractures in granite, strike N 35° W, dip 90°.	Two water-filled shafts, other small pits and cuts, production small, if any.	None

Table 1.-Mineral deposits near the Hells Gate Roadless Area, Gila County, Arizona-Continued

Sample number(s) table 2	Mine or prospect name and location	Mineral or commodity and grade	Host rock and other geologic features controlling mineralization	Development and production	Reference
-	Board Cabin Draw-Gold Gulch prospects secs. 2, 11, 12, T. 9 N., R. 12 E.	Gold, grade unknown.	Quartz veins in metamorphic rocks, gold placer deposits.	Numerous small pits and cuts. Production unknown, probably small.	None
-	Bread Pan Canyon prospect secs. 13, 14, 26-28, 33, 34, T. 9 N., R. 12 E.	Beryllium, 0.14-0.25 BeO, ave. 0.19.	40-50 ft wide, NW trending shear zone in schist, 7,000-8,000 ft long.	Surface sampling, four 500-ft, diamond-drill holes. No production.	Smith, 1962, p. 1.
-	Christopher Mountain hematite deposit SE1/4, sec. 36, (unsurveyed) T. 11 N., R. 12 E.	Iron, grade unknown.	Limestone, contact zone with diabase.	None, none.	Harrer, 1964, p. 30.
-	Diamond Butte rare-earth occurrence SE1/4, sec. 3, (unsurveyed) T. 9 N., R. 12 E.	Xenotime (yttrium phosphate), grade unknown.	Quartzite, other geologic controls unknown.	None, none.	Gastil, 1954, p. 280.

Table 1. Mineral deposits near the Bulls Gate Roadless Area, Gila County, Arizona-Continued

Sample number(s) table 2	Mine or prospect name and location	Mineral or commodity and grade	Host rock and other geologic features controlling mineralization	Development and production	Reference
34	Gisela (Spook) deposit NW1/4, sec. 7, (unsurveyed) T. 9 N., R. 11 E.	Barite, 46.5-93.6 pct $BaSO_4$; 3.7 pct SiO_2; 0.5 pct FeO_3.	NW striking vein in granite, exposed over 2,000 ft.	Open pit, or cut along vein for over 100 ft. Site now buried and reclaimed. Production unknown.	Stewart and Pfister, 1960, p. 12.
17-20	Mud Springs (Hidden Valley) prospect NW1/2, sec. 36, (unsurveyed) T. 11 N., R. 12 E.	Silver, 0.5-2.9 oz/ton.	Shear zone in granite along contact with aplite(?) dike.	Open cut with flooded pit or small shaft. Production unknown.	None
-	Promontory Butte prospect N1/2, sec. 24, T. 11 N., R. 12 E.	Uranium, grade unknown.	Shale, red beds, conglomerate.	Two open-cuts, several thousand feet of diamond drilling. Under 500 tons of ore produced.	Scarborough, 1981, p. 184.

Table 1.--Mineral deposits near the Hells Gate Roadless Area, Gila County, Arizona--Continued

Sample number(s) table 2	Mine or prospect name and location	Mineral or commodity and grade	Host rock and other geologic features controlling mineralization	Development and production	Reference
-	Royal Flush (Bishop Knoll) prospect NE1/4, sec. 36, T. 10 N., R. 10 E., and NW1/4, sec. 31, T. 10 N., R. 11 E.	Copper, grade unknown.	Fracture zones and contacts in schist and diorite where cut by basic dikes.	One shaft, several adits, minor surface workings. Production unknown.	Lausen and Wilson, 1925, p. 41.
36-38	Soldier-Camp Creek prospect, secs. 25, 36, (unsurveyed) T. 9 N., R. 11 E., sec. 6, T. 8 N., R. 12 E.	Copper, 0-6.4 pct silver, 0-1.6 oz/ton.	Schist and conglomerate, other geologic controls unknown.	Three separate sites, four shafts, three adits, one open cut, other minor workings. Production unknown.	None

Table 2.-Sample information and assay data summary

[Pan. con., panned concentrate; St. sed., stream sediment; NA, not applicable; -, not detected (detection limits, gold-0.005 oz/ton, silver-0.2 oz/ton)]

Sample No.	Sample Type	Sample Width	Location	Gold oz/ton	Silver oz/ton	Other percent
1	Pan. con.	NA	St. sed.	-	-	-
2	Pan. con.	NA	St. sed.	-	-	-
3	Grab	NA	Dump	0.117	0.9	-
4	Chip	1.0 ft	Shaft collar	0.006	0.3	-
5	Chip	8.0 ft	Outcrop	-	-	-
6	Grid	NA	Dump	-	-	-
7	Grab	NA	Stock pile	0.024	-	-
8	Grid	NA	Dump	0.018	-	-
9	Chip	6.0 ft	Open cut	-	-	-
10	Chip	1.5 ft	Shaft collar	-	-	-
11	Chip	5.0 ft	Shaft collar	0.006	0.6	-
12	Chip	8.5 ft	Quartz outcrop	-	-	-
13	Pan. con.	NA	St. sed.	-	-	-
14	Pan. con.	NA	St. sed.	-	-	-
15	Chip	NA	Quartz outcrop	-	0.3	-
16	Grab	NA	Dump	-	1.9	0.8 copper
17	Chip	1.0 ft	Pit	-	2.9	-
18	Chip	0.7 ft	Pit	-	0.7	-
19	Chip	3.0 ft	Pit	-	1.1	-
20	Chip	6.0 ft	Pit	-	0.5	-
21	Pan. con.	NA	St. sed.	-	-	-
22	Pan. con.	NA	St. sed.	-	-	-

Table 2.-Sample information and assay data summary-Continued

Sample No.	Sample Type	Sample Width	Location	Gold oz/ton	Silver oz/ton	Other percent
23	Pan. con.	NA	St. sed.	-	-	-
24	Pan. con.	NA	St. sed.	-	-	-
25	Pan. con.	NA	St. sed.	-	-	-
26	Pan. con.	NA	St. sed.	-	-	-
27	Pan. con.	NA	St. sed.	-	-	-
28	Pan. con.	NA	St. sed.	-	-	-
29	Pan. con.	NA	St. sed.	-	-	-
30	Pan. con.	NA	St. sed.	-	-	-
31	Pan. con.	NA	St. sed.	-	-	-
32	Pan. con.	NA	St. sed.	-	-	-
33	Pan. con.	NA	St. sed.	-	-	-
34	Grab	NA	Float	-	-	46.9 $BaSO_4$
35	Pan. con.	NA	St. sed.	-	-	-
36	Grab	NA	Dump	-	0.3	0.1 copper
37	Chip	NA	Outcrop	-	-	-
38	Grab	NA	Stock pile	-	1.6	6.4 copper

EXPLANATION OF SYMBOLS FOR MINE AND PROSPECT MAP

APPROXIMATE BOUNDARY OF THE HELLS GATE ROADLESS AREA

APPROXIMATE BOUNDARY OF MINING DISTRICT

UNPATENTED MINING CLAIMS

○ 12 LOCALITY OF SAMPLED OUTCROP--Showing sample number

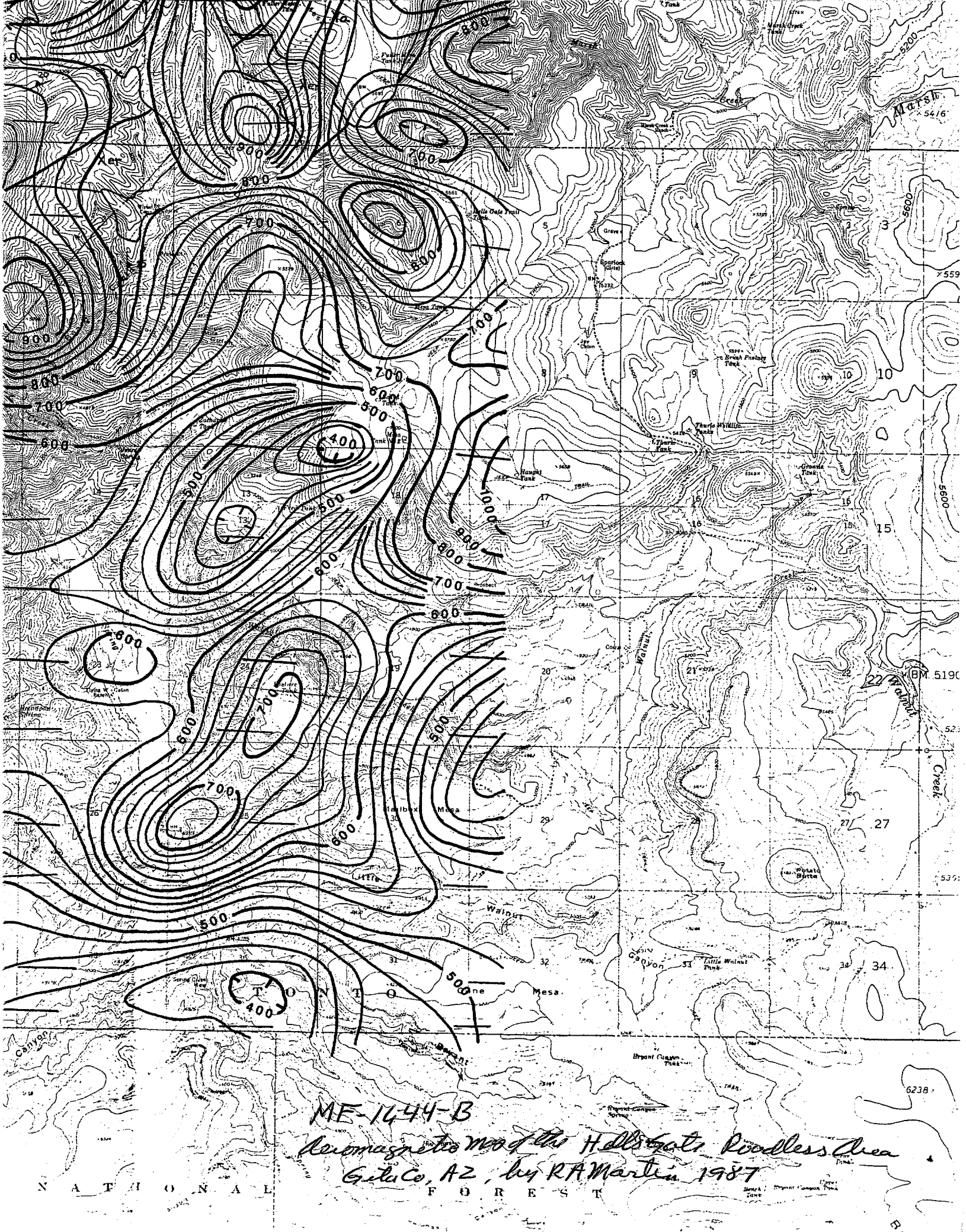
◎ 1, 2 LOCALITY OF PAN CONCENTRATE SAMPLE--Showing sample number

SURFACE OPENINGS--Showing sample locality number; symbols may represent more than one working

℞ 34 Mine

× 9 Prospect pit or trench

⊡ 38 Shaft


ME-144-B
Aeromagnetic map of the Hellsgate Roadless Area
Gila Co, AZ, by R A Martin 1987
Marsh Creek
Walnut Creek
Little Walnut
Mesa
Canyon
Bryant
Potato Butte
Grave
Spurlock (Site)
Hellsgate Trail Tank
Haught Tank
Granite Tank
Bryant Canyon Tank
Little Walnut Tank
Tonto
NATIONAL FOREST
800
700
600
500
400
1000
900

MINERAL RESOURCE POTENTIAL OF THE HELLS GATE ROADLESS AREA, GILA COUNTY, ARIZONA

SUMMARY REPORT

By

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STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and related acts, the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Hells Gate Roadless Area (3-021), Tonto National Forest, Gila County, Arizona. The area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

Tin-bearing alkali granite, granophyre, and rhyolite of Early Proterozoic age underlie most of the Hells Gate Roadless Area. On the basis of geologic and geochemical evidence, a low to moderate resource potential exists for tin along the north and west margins of the area in the upper part of a granite body and in structurally overlying granophyre. A low resource potential for tin exists in central to southern parts of the area in intrusive and extrusive rhyolite. The resource potential for barite in veins along Tertiary faults is low. Except for geochemical data, there is no evidence of resource potential for gold, silver, copper, and lead in the area.

INTRODUCTION

GEOGRAPHIC SETTING

The Hells Gate Roadless Area comprises approximately 31,200 acres in the northern part of the Tonto National Forest in Gila County, Ariz. (fig. 1). The area is roughly a 4- by 15-mi strip along a deeply incised segment of upper Tonto Creek. Elevations range from 3,000 ft in the lower gorge to 6,000 ft in hills above the upper gorge; local relief in the canyon is commonly greater than 1,000 ft. The roadless area lies in the central part of Tonto Basin which consists of Tonto Creek and its tributaries draining the Mogollon Rim and the northern Sierra Ancha between Payson and Young.

The roadless area may be reached by four-wheel-drive trails from Little Green Valley on the north and from Pleasant Valley on the southeast. These roads are connected by a pack trail that crosses the area at Hells Gate (the confluence of Tonto and Haigler Creeks); descent into the Tonto Creek gorge is difficult elsewhere. A good dirt road from the Chamberlain Trail extends to the Ellinwood Ranch on Gordon Creek, 1.5 mi east of the roadless area. A four-wheel-drive track extends from there westward nearly to Hells Gate. The southwestern part of the area can be reached by a four-wheel-drive road from Arizona Highway 260 a few miles east of Star Valley to Houston Pocket near Tonto Creek.

Vegetation is light to moderately dense. Intermediate to higher elevations are forested with pinion pine, alligator juniper, several varieties of oak, and stands of ponderosa pine above 5,000 ft. Succulents, cactus, and chapparal are common at lower elevations. Soil cover is light and bedrock exposure is excellent.

MINING ACTIVITY

Little mineral exploitation has occurred in the Tonto Basin. There was a short period of moderately successful small-scale gold mining in the late 1800's in Proterozoic diorite south and west of Payson. A few small base- and precious-metal mines have operated intermittently in Proterozoic volcanic and clastic strata south and east of the roadless area. A small barite vein a few miles west of the roadless area was mined in the 1970's. There are no active claims in the roadless area and only a few small prospect pits.

CURRENT INVESTIGATION

From 1980 through 1982 the U.S. Geological Survey and the U.S. Bureau of Mines conducted geologic mapping, a geochemical survey of rocks and drainage sediments, gravity and aeromagnetic surveys, and investigations of mines, prospects, and mining history. This report summarizes the findings of these surveys as they pertain to the mineral resource potential of the Hells Gate Roadless Area.

GEOLOGY, GEOCHEMISTRY, AND GEOPHYSICS PERTAINING TO MINERAL RESOURCE ASSESSMENT

GEOLOGY

The Hells Gate Roadless Area is underlain entirely by rocks of Early Proterozoic age (1.7 b.y.) and small local deposits of unconsolidated Tertiary and Quaternary gravel and sand (see simplified geologic base of resource potential map). The Middle Proterozoic Apache Group (1.2 b.y.) and

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Paleozoic sedimentary rocks are widely exposed within a few miles of the roadless area. The Apache Group rests unconformably on the Early Proterozoic basement, and the Paleozoic rocks rest unconformably on both the Apache Group and the Early Proterozoic rocks. Following late Tertiary normal faulting and the consequent development of the Mogollon Rim and the central Arizona mountain and valley terrane, both the Apache Group and the Paleozoic strata were eroded from the Hells Gate area. Some sand and gravel deposits in the roadless area rest upon Tertiary faults and were probably deposited by ancestral streams of the Tonto Creek drainage system. However, some deposits, especially the thicker deposits at higher elevations, may be equivalent to extensive upper Miocene deposits west of Payson which predate the Tertiary faulting.

Early Proterozoic rocks in the vicinity of the roadless area were briefly discussed by Darton (1925), Lausen and Wilson (1925), Wilson (1922, 1939), and Putman and Burnham (1963). The first detailed study of the Proterozoic rocks in the area was by Gastil (1958), who mapped eastern parts of the Hells Gate Roadless Area. He found that extrusive rhyolite which is widely exposed in the area is one of the uppermost units in a stratigraphic succession which is exposed mostly southeast of the area. He postulated that this rhyolite and the extensive intrusive rhyolite, granophyre, and granite of the Tonto Basin area were genetically and temporally related. Conway (1976) mapped all except a small southern part of the Hells Gate area and found that a quartzite in the area rests depositionally on the extrusive rhyolite. He refined and documented the stratigraphy and structure of the area and described the physical and petrogenetic evolution of the deeply eroded volcanic complex composed of rhyolite, granophyre, and granite. This work supports Gastil's suggested cogenetic relation for the felsic igneous rocks.

Early Proterozoic stratified rocks and sheets of intrusive rocks exposed in the Hells Gate Roadless Area occupy the axis of a broad northeast-trending synclinorium. Quartzite (Xq) and underlying alkalic extrusive rhyolite (Xer) constitute the upper third of a 20,000-ft-thick stratified sequence exposed in the axis and southeast limb of the synclinorium. Sedimentary, volcaniclastic, and volcanic rocks (Xsv) of the lower two-thirds of the sequence lie outside the Hells Gate Roadless Area. Intrusive alkalic rhyolite (Xir), granophyre (Xgp), and granite (Xg) occupy the axis and northwestern limb of the synclinorium and were intruded beneath and into the extrusive rhyolite and quartzite.

The extrusive rhyolite and associated hypabyssal felsic rocks constitute a volcanic complex which evolved at a basin margin whose constructs were largely emergent, and most of the extrusive rhyolite is terrestrial ash-flow tuff. Quartz arenite was deposited in high-energy fluvial or marine environments both before and after the major eruptive episode.

A diorite-gabbro complex (Xd) with pendants of volcanic and volcaniclastic rocks is exposed a few miles west of the Hells Gate Roadless Area. These rocks are older than the granite and granophyre and are possibly older than the stratified sequence described above.

Folds of the synclinorium and thrust faults in Tonto Basin developed in a Proterozoic compressional event (Mazatzal orogeny, Wilson, 1939). Stratified rocks are openly to isoclinally folded and weakly to intensely foliated. Massive igneous and quartzite bodies are weakly to imperceptibly foliated. During this orogenic event the Proterozoic rocks of the region were metamorphosed in the greenschist facies. Northeast- to north-trending faults, possibly representing a late stage of the Mazatzal orogeny (Conway and others, 1982) have normal to left-lateral components of offset.

The northeast- to north-trending faults are locally occupied by veins of white quartz or quartz-healed fault breccia as much as 12 ft wide. Locally, the country rocks are extensively altered (apparently hematitized and sericitized) near the quartz veins. No prospects were found in the veins or altered rock. Samples from several quartz veins and nearby altered rocks within the roadless area yielded no anomalous metal values; however, quartz veins at Bearhide Canyon, 1 mi north of the roadless area, are mineralized. Thrust faults both within and west of the Hells Gate Roadless Area contain local extensive breccia zones which are healed with silica and hematite. Agate is abundant in the fault breccia at Agate Mountain 1 mi west of the roadless area. Analyses of these rocks yielded no anomalous metal values.

Both primary (magmatic) and secondary (hydrothermal) characteristics of the felsic igneous rocks, particularly the granite, suggest potentially ore-forming conditions. Ubiquitous fluorite, disseminated tourmaline in some units, and miarolitic cavities in many units indicate the magma was volatile rich (Conway, 1976). Paucity of pegmatites in the granite may be explained by the high-level of intrusion where fluids readily migrated upward under low lithostatic pressure. One of the oldest extrusive rhyolites (southeast of the Hells Gate Roadless Area) contains topaz. Fluorite, tourmaline, and topaz are minerals commonly formed from volatile-rich highly differentiated magmas which may accompany enrichments in lithophile elements (Taylor, 1979; Burt and others, 1982).

The extrusive rhyolite and associated hypabyssal rocks are extensively altered. Primary ferromagnesian minerals have been almost universally converted to hematite and either muscovite or sericite. The hematite is finely divided and disseminated, particularly in feldspar equilibrated at very low temperatures. In the upper parts of the granite, rare massive tourmalinization indicates flooding by hydrothermal fluids. These alterations probably accompanied hydrothermal activity during the active history of the volcanic complex.

DRAINAGE-SEDIMENT GEOCHEMISTRY

Sediment samples were taken at 85 sites chosen to allow reconnaissance analysis of detritus representing all small drainage systems (0.2-1 mi^2) in the roadless area. In the field, loose sediments were screened to pass 9 mesh. From these samples, the minus-80-mesh fraction was separated in the laboratory for semiquantitative spectrographic analysis; these analyses are referred to in this report as bulk-sediment analyses. A heavy-mineral sample was also collected at each site by hand panning. In the laboratory, magnetic minerals were removed from these samples with a hand magnet, and a further separation of heavy minerals was made with the heavy liquid bromoform (specific gravity 2.86). Ferromagnesian silicate minerals were then removed from the samples with the Frantz isodynamic separator at a setting of 0.6 amperes. This high-density fraction was then fused in a tetra-borate flux in preparation for semiquantitative spectrographic analysis. Dilution by the flux results in an approximately two-fold increase in detection level over that for the bulk-sediment analyses (see tables 1 and 2). Analyses of the heavy-mineral concentrates are referred to in this report as concentrate analyses. All bulk-sediment samples and 79 panned-concentrate samples (insufficient material for 6 samples) were analyzed for thirty-one elements. In the following sections and in the explanation on the accompanying mineral resource potential map, analyses for certain elements in certain areas are referred to as being "high" or "anomalous." Levels for given elements considered to be "high" or "anomalous" for the purpose of this report are indicated in tables 1 and 2.

The tin suite

Heavy-mineral concentrates in most of the roadless area are characterized by high values of tin, beryllium, niobium, lanthanum, and yttrium (the tin suite). Boron is locally high in both bulk sediments and concentrates. The distribution of these elements clearly indicates their source as the silicic igneous units, granite, granophyre, and intrusive and extrusive rhyolite, which underlie most of the area. The highest concentrations are from drainages underlain by the upper part of the granite pluton and by granophyre.

Cassiterite, identified in the panned concentrates, is probably the source of the tin. Beryllium, niobium, lanthanum, and yttrium may reside in the cassiterite or in other nonmagnetic heavy minerals such as zircon, xenotime, or monazite. The source of the cassiterite is unknown; it may be sparsely disseminated in the igneous rocks. However, some drainages contain unusually high amounts of tin and

other elements, which suggests that greisen zones may be present.

Areas of low to moderate (Sn_1) and low (Sn_2) resource potential for tin and criteria for their classification are shown on the accompanying mineral resource potential map. Area Sn_1 has, in addition to higher tin, beryllium, niobium, and yttrium in panned concentrates (fig. 2), local high values of niobium, lanthanum, yttrium, lead, and tin in bulk sediments. High copper and bismuth values were measured in a few panned concentrates. Area Sn_2 is characterized by generally lower concentrations of tin, beryllium, niobium, and yttrium and higher concentrations of lanthanum in concentrates (fig. 2).

Five localities (areas 1-5, accompanying map sheet and fig. 3) are characterized by unusually high concentrations of the tin suite and of other metals in panned concentrates and (or) bulk-sediment samples. Four are outside the roadless area but within area Sn_1 and one is within the roadless area in area Sn_2.

North of Gisela two adjacent sampled drainages (area 1, drainages outlined on map) have anomalous values of a remarkably large suite of elements. There are high contents of tin, beryllium, niobium, lanthanum, yttrium, arsenic, thorium, molybdenum, bismuth, and barium in the panned concentrates, and high contents of niobium, lanthanum, yttrium, lead, molybdenum, thorium, tin, and iron in the bulk sediments. A quartz vein along the north-northeast-trending fault which crosses the northern of the two drainage areas is not a likely source of these anomalies because it does not have high metal contents.

Two to three miles west of the roadless area near the Baronite barite prospect, several adjoining drainage systems (within area 2) contain high values of lanthanum, niobium, silver, copper, lead, arsenic, and barium in panned concentrates. Bulk sediments yielded high amounts of silver, copper, lead, niobium, and yttrium. The high copper contents are the only anomalous bulk-sediment copper values in the entire study area. The sediments are from a large area in the granite which is extensively oxidized and possibly brecciated. The widespread iron oxide minerals may have formed from alteration of sulfides. Original mineralization may be related to the nearby Agate Mountain thrust fault, but samples of fault breccia containing silica and hematite cement from the thrust fault at Agate Mountain, 2 1/2 mi to the southwest, have no anomalous metal values.

The mineralized area at Mud Spring (area 3) is defined on the basis of prospect pits and indications of mineralization and alteration. No stream sediments were collected from drainages in this area.

Panned-concentrate samples from two drainages in the vicinity of the Bearhide Canyon copper-gold-silver prospects (area 4) have high values of tin, beryllium, yttrium, tungsten, boron, and thorium. Bulk-sediment samples have high values of thorium, lead, tin, boron, and silver. Most high values including those for silver are not from the Bearhide Canyon drainage, however, which suggests that the metal content of the sediment samples may be related to mineralization in the late Miocene fault that passes through both drainages rather than to the mineralization at the Bearhide Canyon prospects.

North and south of Tonto Creek a few miles west of Hells Gate, panned concentrates from a number of drainages (area 5) yielded slightly anomalous contents of tin, beryllium, lanthanum, yttrium, niobium, silver, thorium, and boron. Bulk-sediment samples from the same area have high contents of lead, silver, bismuth, manganese, and titanium. Dump material from a shallow shaft in area 5 along Tonto Creek has been washed away. The nature of the presumed mineralization was not determined.

Barite, tungsten, and lead

Three zones of high barium values in concentrates are shown on the mineral resource potential map. These zones coincide closely with east-west Miocene faults. The Gisela (Spook) barite mine and Baronite barite prospect lie on or near Miocene faults in these zones. The northern two zones are well defined and correspond closely with the Star Valley fault and with a southwestward extrapolation of the Mud Spring fault. Faults (not shown on the map) in the vicinity of Hells Gate may be part of a fault system connected to the Mud Spring fault. The broad, less well-defined southern barium zone contains the Willow Spring fault on which the Gisela (Spook) barite deposit occurs. Several samples from drainages eastward on this fault are low in barite.

Tungsten and lead contents in panned concentrates also tend to be higher in the vicinity of the Miocene faults although the anomalies are not as pronounced as are the barium anomalies. The tungsten content in most samples is below the detection level (100 ppm). Of the 13 samples in which tungsten was measured (100 to 500 ppm), 10 are in the high barium zones and 11 are from drainages crossed by Miocene faults (including one sample on the Diamond Rim fault).

Chromium, nickel, and vanadium

In two localities (areas 6 and 7), each with two drainage samples, bulk sediments contain anomalously high values of chromium, nickel, and vanadium. In area 6 cobalt is also high. In both areas bulk sediments also have high values of iron and manganese and in area 7 they contain high values of calcium and magnesium. The absence in the panned concentrates of anomalies for these elements, except for calcium and magnesium, indicates that the metals are in a magnetic iron-rich phase. Numerous bulk samples with comparable iron levels collected elsewhere in the area do not have the anomalous suite of chromium, nickel, vanadium, and cobalt. These samples contain only a few scattered high values, usually of only one of these elements.

Concentrations of chromium, nickel, cobalt, and vanadium are commonly associated with iron- and magnesium-rich mafic and ultramafic rocks. Area 6 is underlain mostly by Tertiary and Quaternary gravel and sand, with minor felsic igneous rocks, and area 7 is underlain by felsic igneous rocks. Numerous other drainages underlain by the same geologic units have no such anomalies. The sources of the ferro-alloy metals are not known, but are surely small.

Gold

A number of old claims along Tonto Creek may have been worked for placer gold. Gold was not detected (detection limit 0.15 ppm) in 16 samples of panned heavy-mineral concentrates taken along the length of Tonto Creek in the roadless area.

Yttrium

Authigenic xenotime (yttrium phosphate) occurs in the Apache Group capping Diamond Butte one mile east of the roadless area (Gastil, 1954). Drainage-sediment samples from the southeast slope of Diamond Butte, apparently beneath the xenotime occurrence, do not contain anomalous yttrium.

GEOPHYSICS

A complete Bouguer gravity map and an aeromagnetic map (flight level 1,000-ft terrain clearance) were constructed for the Tonto Basin area. For the most part, the maps systematically reflect mapped rock types and generally confirm the interpretive projections of these rock types to depths of 10,000 ft (structural cross sections, Conway, 1976). The major geophysical features trend northeastward, reflecting the Proterozoic structural grain.

The major features of the Hells Gate gravity map are gravity lows in the northern two-thirds of the area, a response to low-density granite, granophyre, and rhyolite. An increase in gravity values southward reflects the more dense sedimentary and volcanic rocks stratigraphically beneath the rhyolite. The lowest gravity values define a crude gravity trough trending northeastward over the Tonto Basin syncline which is underlain by several thousand feet of low-density quartzite and rhyolite. Northwestward-trending gradients southeast of the roadless area probably reflect stratigraphic and structural complexities.

The aeromagnetic map has more resolution, relative to

geologic features, than the gravity map. A series of northeasterly alined magnetic lows conform with thick quartzite and rhyolite and mark the axis of the Tonto Basin syncline. A parallel magnetic ridge immediately southeast of the roadless area coincides with a thick section of mafic volcanic rocks in an anticline. A parallel magnetic trough lying farther to the southeast and across a major northeast-trending Proterozoic fault overlies rhyolite.

Magnetic highs in the Green Valley Hills in the northwestern part of the roadless area coincide closely with a subunit of the intrusive rhyolite which contains mafic xenoliths. The broad magnetic high is presumably due to the xenoliths, but sharp internal magnetic peaks may indicate mafic bodies, possibly the source of the xenoliths, in the subsurface. In granite, west of the Hells Gate Roadless Area, some local magnetic highs are due to small Tertiary basaltic plugs (not shown on accompanying map); others are unexplained. The northwest-trending intrusive contact between the granite and the diorite-gabbro body to the southwest is marked by a strong gradient between a magnetic trough to the northeast and a magnetic ridge to the southwest. Field relations indicate the granite and diorite-gabbro contact dips gently southward. Anomalies with strong gradients over this contact are also conspicuous features on regional gravity (West and Sumner, 1973) and aeromagnetic (Sauck and Sumner, 1970) maps.

Geophysical features show no apparent relation to potentially mineralized zones in the Hells Gate area except that locally they weakly reflect the Miocene faults. West of the Hells Gate Roadless Area there is a pronounced embayment into the east margin of the magnetic high over the diorite-gabbro body. This magnetic low coincides with the Royal Flush mine area and may be due to alteration associated with mineralization and (or) faulting, or, alternatively, to the presence of pendants (incompletely mapped just southward) low in magnetic minerals.

MINING DISTRICTS AND MINERALIZATION

A search was made of all public mining and claim records and of literature pertaining to mineralization in the Hells Gate Roadless Area and vicinity (McColly, 1982). All known mines, prospects, and mineralized areas inside or within a mile of the roadless-area boundary were examined and sampled. In addition, several mines and prospects 2 to 5 mi from the area were visited and sampled to obtain comparative data.

The Hells Gate Roadless Area has no history of mining or mineral production, and no active mines, claims, or prospects were found. Some prospecting is indicated from a review of mining-claim records in the Gila County courthouse. Approximately 50 mining claims were found with descriptions that could place them within the roadless area, but descriptions are often vague or even contradictory. Most of these claims were filed before the early 1930's, and none more recently than the 1950's. U.S. Bureau of Land Management records show no mineral leases, permits, or mining claims active in the area as of September 1982.

MINING DISTRICTS AND MINERALIZED AREAS

Parts of the Green Valley (Payson) and the Spring Creek (Young) mining districts extend into the Hells Gate Roadless Area, but none of the recorded mineral production from either district can be attributed to the roadless area. Mine workings at the Gisela (Spook) barite mine and in Bearhide Canyon constitute the only mining within 2 mi of the area. Several mineral occurrences within a 5-mi radius include agate, amethyst, barite, beryllium, copper, gold, iron, yttrium, silver, and uranium. These occurrences, locations, and host rocks are given in the list of mines and prospects on the accompanying map sheet and are briefly described below.

Gisela (Spook) barite mine

A 2- to 4-ft-wide barite vein occurs along a fault between granite and diorite at the Gisela (Spook) barite mine 2 mi west of the roadless area. Production occurred as recently as 1981. Stewart and Pfister (1960, p. 15-16) cite values for the ore of 93.6 percent $BaSO_4$, 3.7 percent SiO_2, and 0.5 percent Fe_2O_3, with a specific gravity of 4.29. The vein was originally exposed for over 100 ft along a ridge top, but in April 1982 it was totally covered with earth and dump material and the site was rehabilitated and seeded. Small pieces of barite float were found where the mine had been. Stewart and Pfister (1960, p. 12) considered this vein to be part of a system of subparallel fractures containing barite that extends south of Payson for about 15 mi. As mapped by Conway (1976), the Willow Spring fault, which contains the barite at the Spook deposit, continues southeastward for at least 2 mi extending into the Hells Gate Roadless Area. No barite was found along the projection of this fault within one-half mile of the pit.

Bearhide Canyon prospect

Two water-filled shafts and a few shallow surface workings occur along a 1/2-mi stretch of Bearhide Canyon just north of the roadless area. None appear to have been worked recently. Samples of mineralized dump material contain as much as 4 ppm gold and 60 ppm silver. Minor amounts of azurite and malachite were found on some of the dumps, but neither was observed in place. Mineralization is associated with quartz veins and pods occurring in granite. There is no recorded production and if any production occurred it was probably minor.

Mud Spring prospect

A prospect pit on a small quartz vein in altered granite occurs at Mud Spring (area 3) one mile west of the roadless area. Samples of mineralized rock contain as much as 500 ppm silver, 1.7 percent lead, 1 percent arsenic, 300 ppm zinc, 50 ppm antimony, 0.5 ppm tellurium, and 140 ppm bismuth. This occurrence is the only mineralized greisen-like zone found in the felsic igneous rocks in the study area. It is in the area of low resource potential for tin (Sn_1), as defined by drainage-sediment geochemistry, but the drainage in which it occurs was not sampled. The mineralized samples at the prospect are not enriched in the tin-suite elements. A tourmaline-bearing phase of the granite is exposed about 300 ft west of the prospect. Near the prospect, mostly southward, granite and granophyre are locally sericitized or, rarely, tourmalinized. Small heavily oxidized areas containing iron oxide minerals replacing pyrite also are exposed in the granite.

Other mines and mineral occurrences

Mines and prospects of the Spring Creek mining district south and east of the roadless area are in Early Proterozoic stratified rocks that are not exposed within the roadless area. Most prospects are in small precious- and base-metal occurrences in fault-associated quartz veins or in highly foliated and sheared fine-grained incompetent rocks (see list of mines and prospects, accompanying map sheet). Exceptions are the Fred Pranty mine which may be in a base-metal massive sulfide deposit (M. E. Donnelly, oral commun. 1981) and the Breadpan Canyon beryllium prospect, which is associated with shearing near a major northeast-trending Proterozoic fault, but which has no base- or precious-metal enrichment.

Mineralized samples from most of these occurrences were analyzed; the analyses indicate that the base- and precious-metal occurrences were explored primarily for gold, silver, and copper, or combinations thereof. Lead and zinc are moderately enriched at a mine near Ernie Tank. These deposits are also commonly enriched in arsenic, boron, tellurium, antimony, and mercury.

The Royal Flush mine west of the roadless area was not examined. Metals sought in this area were copper and possibly gold (Lausen and Wilson, 1925). Mineralization is probably similar to that in the diorite west and south of Payson where metal-bearing quartz veins are localized on Miocene faults and, to a lesser degree, along Proterozoic faults (C. M. Conway, unpub. data, 1980).

Mineral occurrences (list of mines and prospects) found in Late Proterozoic or Paleozoic strata near the Hells Gate Roadless Area were not examined.

ANALYSIS OF THE MINERALIZATION

THE PROTEROZOIC MAGMATIC SYSTEM

The distributions of the lithophile elements tin, beryllium, lanthanum, niobium, and yttrium in the panned concentrates from the Hells Gate Roadless Area clearly indicate that the silicic alkalic rocks are enriched in these metals and that the greatest enrichments are in the upper parts of the granite body and possibly in the granophyre. All the silicic units in the area are similar in composition and appear to have formed from highly evolved, volatile-rich magmas, but the granite and granophyre appear to be exceptional in this regard. The large granite body likely differentiated in place as indicated by compositional gradation in major oxides and evidence for upward accumulation of volatiles (Conway, 1976). Ubiquitous miarolitic cavities are evidence of exsolution of volatiles in the granophyre. There can be little doubt that the anomalous metal content of these rocks is the result of magmatic processes, either extreme differentiation or very limited partial melting or a combination thereof. However, evidence for ultimate concentration of the tin by the magmatic (or magmatic-hydrothermal) system into greisen zones has not yet been found.

The question arises whether the Mud Spring greisen(?), which is not enriched in the tin suite, is related to the emplacement and cooling of the felsic igneous rocks. Given the well-known phenomenon of metal zonation in ore deposits, it is possible that the metals found at Mud Spring might belong to an outer mineralized zone with tin concentrated in an inner or lower zone. This may be unrelated to the apparent concentration of tin (area Sn_1) in the immediate vicinity of Mud Spring, but would require a complex history of multiple episodes of granite magma-related mineralization. Likewise, the mineral occurrences south of the Hells Gate Roadless Area may also be high-level products of a tin-mineralizing system, again genetically related to granite. Enrichments of major and trace metals (Ag, Pb, As, Sb, and Te) in these occurrences are similar to the Mud Spring metal suite and support a common origin. Concentration of beryllium, one of the tin-suite elements, in Breadpan Canyon may also support this model.

Other lines of evidence suggest that the mineralization south of the Hells Gate Roadless Area, and possibly that at Mud Spring, is not related to emplacement and cooling of granite. Heterogeneity among the southern deposits favors multiple causes of origin. As stated above the deposit at the Fred Pranty mine may be volcanogenic. Most of the occurrences are many miles from exposures of the alkali granite and are hundreds of feet down section and laterally far removed from the known site of granite intrusion (Conway, 1976). Mineralization at Mud Spring and also at Bearhide Canyon is possibly related to the system of northeast-trending Proterozoic faults in the area. Mineralization clearly related to this fault system was not found within the Hells Gate Roadless Area, but the Deadman fault, interpreted to belong to this fault system (Conway and others, 1982), is mineralized in the Mazatzal Wilderness 20 mi to the west (Wrucke and others, 1983). These faults formed after the folding and thrust faulting in the region and must therefore considerably postdate the intrusion and consolidation of the regional alkali granite complex. Therefore, any mineralization on these faults must be unrelated to alkali magmatism and related processes.

The silicic volcanic and hypabyssal complex exposed in Tonto Basin extends westward into the northern Mazatzal Mountains where panned concentrates also yielded anomalously high amounts of tin-suite elements (Wrucke and others, 1983). Base- and precious-metal mineralization also occurs both in alkali granite and in volcanic and volcaniclastic rocks to the south. Some mineralization in these stratified rocks is clearly volcanogenic (Conway, 1983). The types and distributions of mineralization in the Mazatzal Mountains are analogous to those in the Tonto Basin. Wrucke and others (1983) suggested that the tin and the base- and precious-metal mineralization in the granite, and in some cases in the stratified rocks, may be attributed to the granite.

Metal provinces or belts in which certain trace elements in sulfides are high regardless of age or type of mineralization occur in the southwestern U.S. and Mexico (Burnham, 1959). These belts apparently reflect deep crustal characteristics. The Tonto Basin-Mazatzal Mountains area lies on a northwest-trending regional belt defined by high amounts of tin in chalcopyrite. The highest value (8,000 ppm) of tin in chalcopyrite in the southwestern U.S. and Mexico comes from the northeastern Mazatzal Mountains (Burnham, 1959). These data may be important in evaluating the metallogenesis of the Tonto Basin-Mazatzal Mountains region. Similarities in major- and trace-metal contents of mineral occurrences in the granite and in the stratified rocks to the south may reflect a unique crustal metal chemistry underlying a "Burnham" mineral belt and do not necessarily support a common origin related to mineralizing action within and immediately above the high-level granitic rocks.

TERTIARY FAULTING AND MAGMATISM

The occurrence of barite veins along or in close proximity to late Miocene faults, and high barium values from panned concentrates in zones closely coincident with these faults, requires a mineralizing process controlled at least in part by the faults. The panned-concentrate data also suggest that tungsten and possibly lead were concentrated along these faults.

Metal-bearing solutions presumably rose along the porous fault zones and, upon cooling, precipitated barite and associated metals. In central Arizona, particularly west of Tonto Basin, there was extensive late Miocene volcanic activity. Although only a few basalt plugs are present in the vicinity west of Hells Gate Roadless Area, the magmatic episode may have provided enough heat to generate the late Miocene mineralization. Gold mineralization in the diorite-gabbro complex south and west of Payson was controlled in part by the same system of faults and likely was generated in the same episode. Possibly the barium, tungsten, and lead were dissolved by waters circulating through the granite, and the gold by waters circulating through the diorite. Tungsten is commonly associated with tin (Rose and others, 1979; Taylor, 1979) and, although it was not found to be anomalous in the drainage-sediment study, it may have been sufficiently enriched in the granite to allow ready extraction for a secondary enrichment.

Anomalous amounts of mercury were found in a few of the southern precious- and base-metal occurrences. Mercury deposits in roughly equivalent strata in the central Mazatzal Mountains were probably formed as a result of late Tertiary volcanic activity (Ransome, 1915; Faick, 1958; Wrucke and others, 1983). Possibly some of the base- and precious-metal mineralization south of the Hells Gate Roadless Area is also late Tertiary in age.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

There has been no mining and little prospecting and claim filing in the Hells Gate Roadless Area. Nevertheless, findings of this study indicate there is a low potential for several resources, notably tin, in the area (fig. 3).

The roadless area is largely underlain by a regionally extensive suite of silicic alkalic igneous rocks. The magmatically evolved compositions of these rocks, the widespread fluorite, the local occurrence of the volatile- and lithophile-rich minerals topaz and tourmaline, and the evidence for vapor exsolution and hydrothermal activity are common characteristics of tin-bearing granites in many parts of the world (Taylor, 1979; Evans, 1982). The presence of anomalous tin in the silicic alkalic rocks, both in the Hells Gate area and in the Mazatzal Wilderness, is demonstrated by analysis of drainage sediments. The resource potential for tin and associated metals is low. Upper parts of the granite and the overlying granophyre, which have the greatest potential for tin, crop out along the north and southwest margins of the roadless area and dip beneath it. This zone should be further

examined for the presence of greisen-type mineralization. In particular, small aplite selvages apparently derived from the granophyre (Conway, 1976) have potential because of presumed extreme differentiation.

Barite is present along Miocene faults near the roadless area, and barium anomalies from drainage sediments along faults within the area likely reflect barite mineralization. Tungsten and lead anomalies, also approximately coincident with the faults, suggest the possibility of concentrations of these elements. The likelihood of resources of these commodities is low.

A moderate resource potential exists for copper, silver, and gold in volcanic and volcaniclastic rocks near the south and east margins of the roadless area, but resource potential for these metals within the roadless area is low because the stratified rocks are not present.

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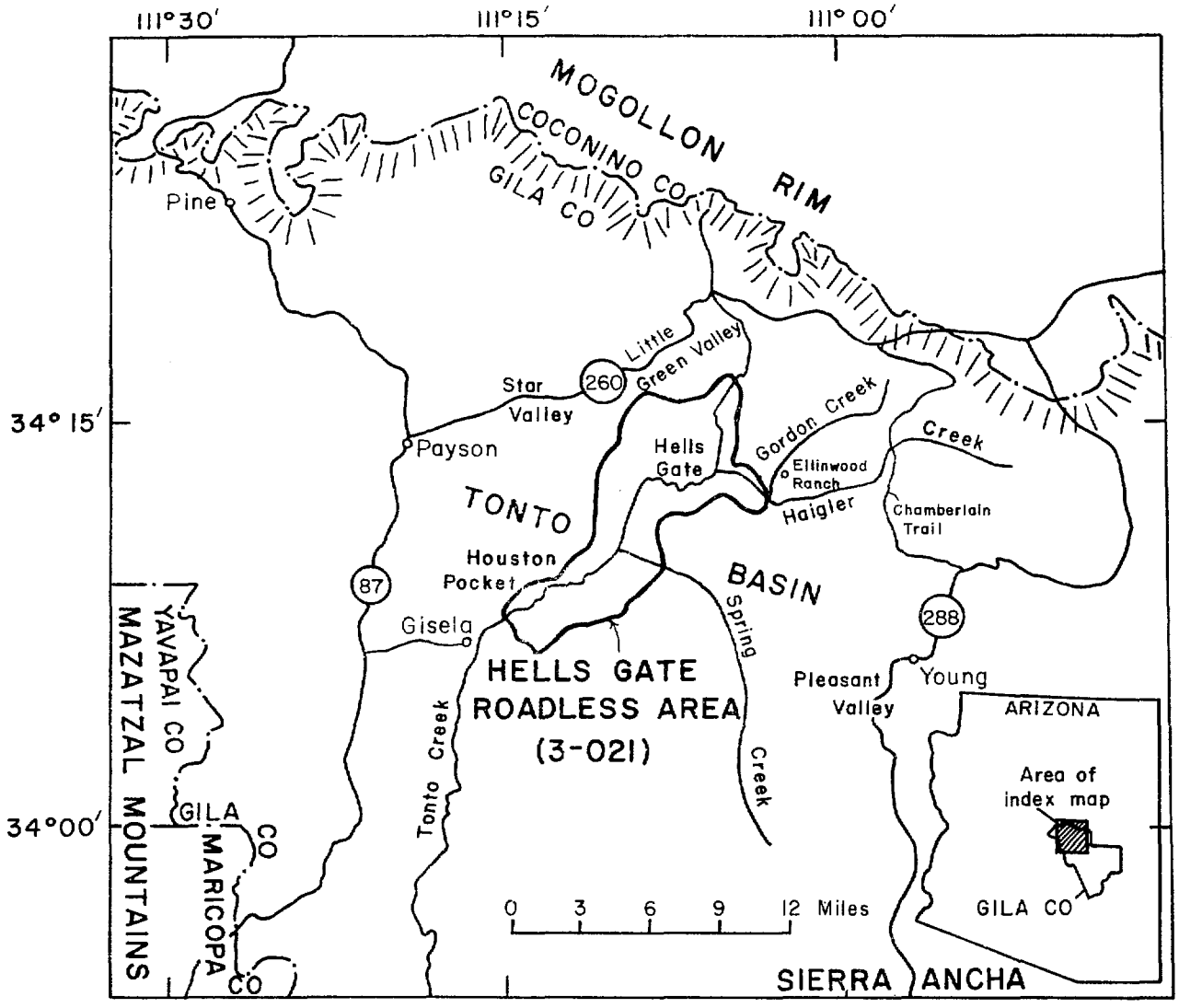


Figure 1.—Index map showing location of Hells Gate Roadless Area, northern Gila County, Ariz.

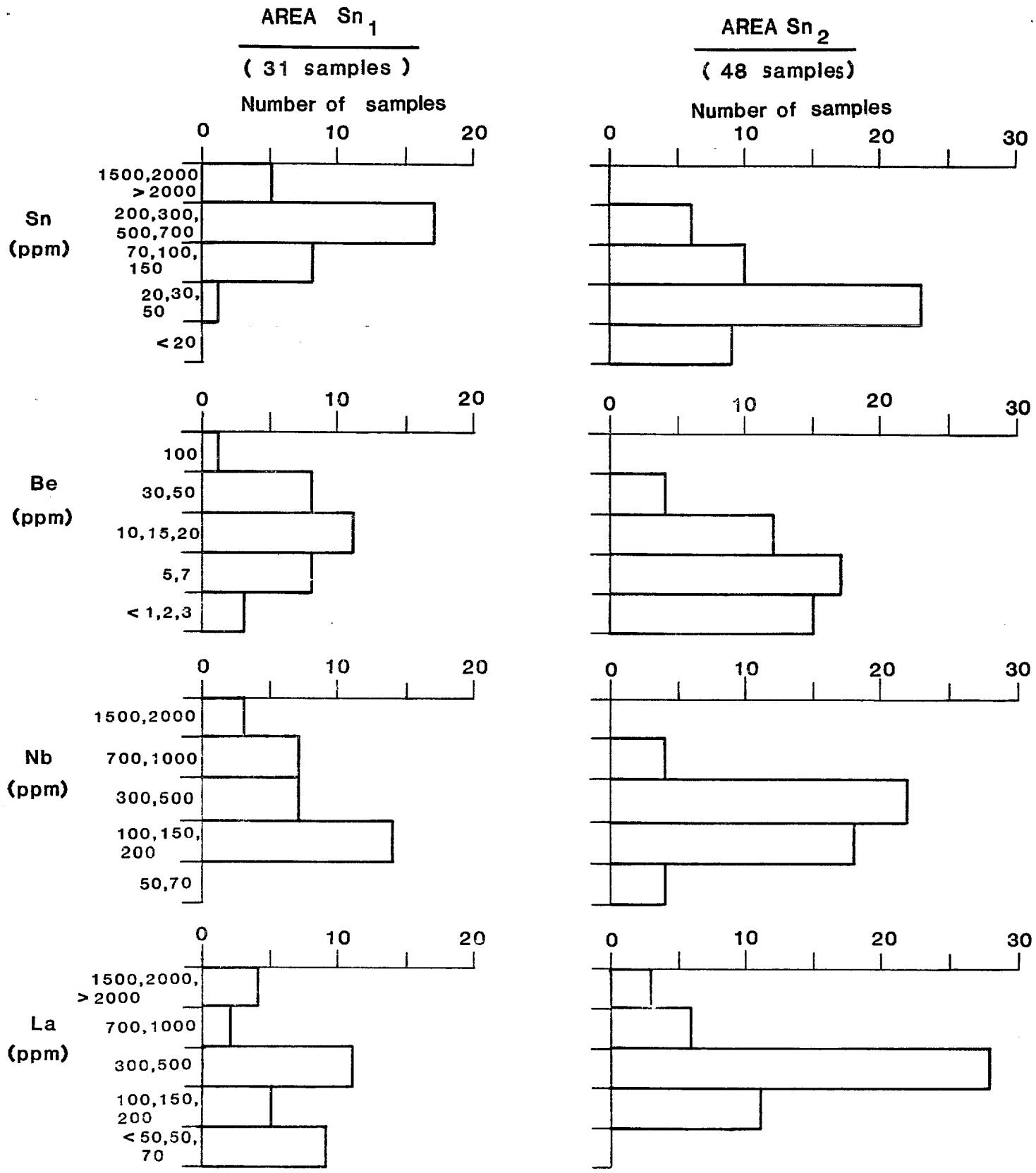


Figure 2.—Histograms showing comparative abundances of tin, beryllium, niobium, and lanthanum in panned-concentrate samples from areas of low to moderate (Sn_1) and low (Sn_2) resource potential for tin.

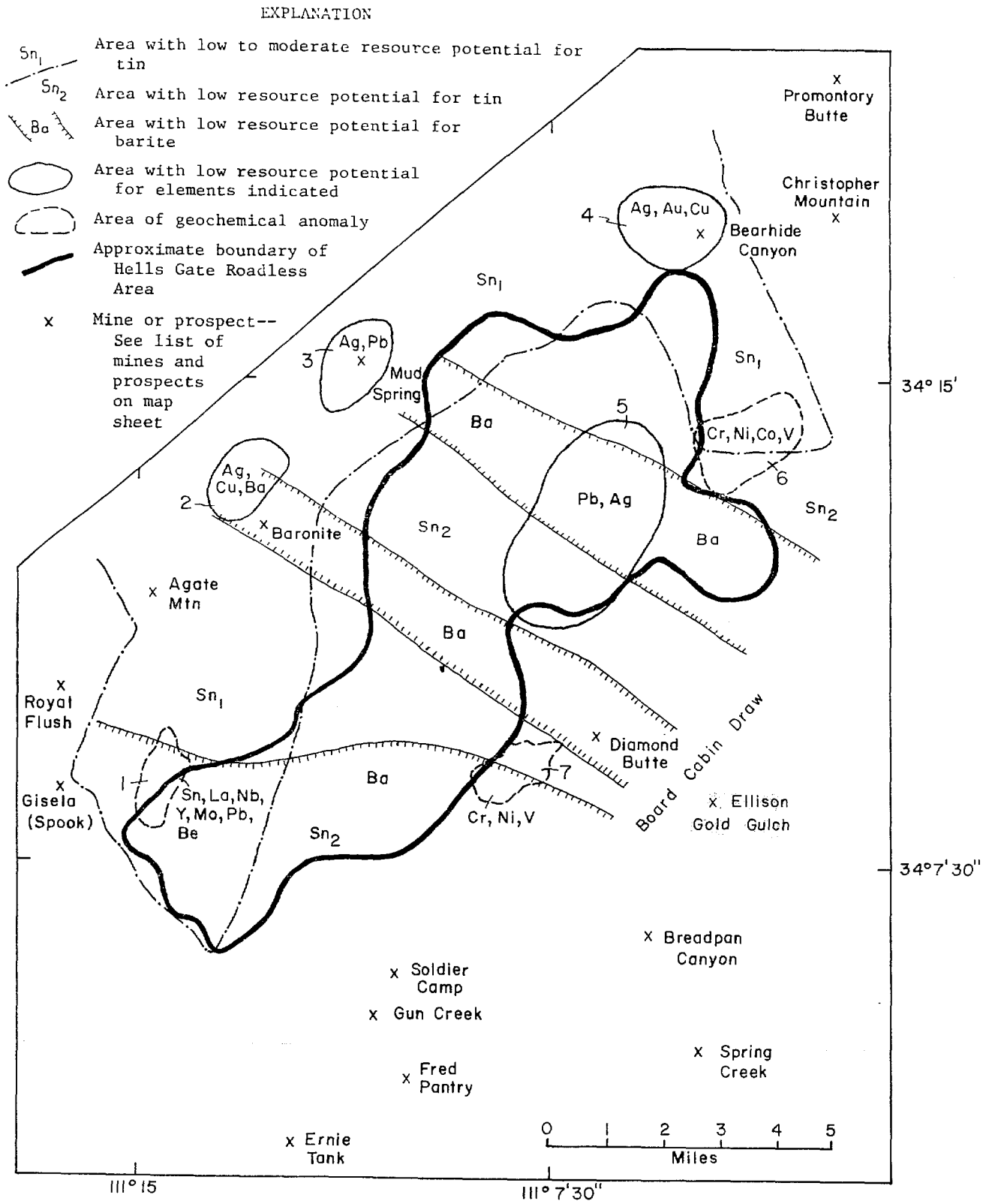


Figure 3.—Areas with mineral resource potential in and near the Hells Gate Roadless Area. Numbers 1-7 refer to explanation on map sheet.

TABLE 1. SUMMARY OF ANALYSES OF PANNED CONCENTRATES FOR ELEMENTS OF INTEREST

[Values above the bar in each column are considered "high" or "anomalous" as discussed in text and in explanation of accompanying map; numbers in parentheses are determination limits; % - percent; ppm - parts per million; no. - number of analyses; m - median; L - detected, but below limit of determination; N - not detected; G - greater than]

As (500)		B (20)		Ba (50)		Be (2)		Bi (20)		Ca (0.1)		Cu (10)		La (50)	
ppm	no.	ppm	no.	ppm	no.	ppm	no.	ppm	no.	%	no.	ppm	no.	ppm	no.
7,000	3	200	1	G10,000	13	100	1	500	1	20	1	2,000	1	G2,000	1
2,000	1	150	8	10,000	9	50	8	300	2	15	2	1,000	2	2,000	4
1,500	3	100	14	7,000	1	30	4	200	3	10	4	500	3	1,500	2
700	1	70m	24	5,000	7	20	4	100	1	5	3	300	1	1,000	4
Nm	71	50	18	3,000	4	15	7	70	1	3	10	200	2	700	4
		30	9	2,000	5	10	12	50	2	2	11	150	3	500	14
		20	5	1,500m	8	7m	11	30	5	1.5	8	100	5	300m	25
				1,000	13	5	16	20	3	1.0m	10	70	7	200	12
				700	9	3	9	L	11	0.7	1	50	9	150	1
				500	8	2	4	Nm	50	0.5	9	30m	14	100	3
				300	1	L	3			0.3	4	20	12	70	1
				200	1					0.2	7	15	10	50	1
										0.15	5	10	8	L	4
										0.1	3	L	2	N	3
										L	1				

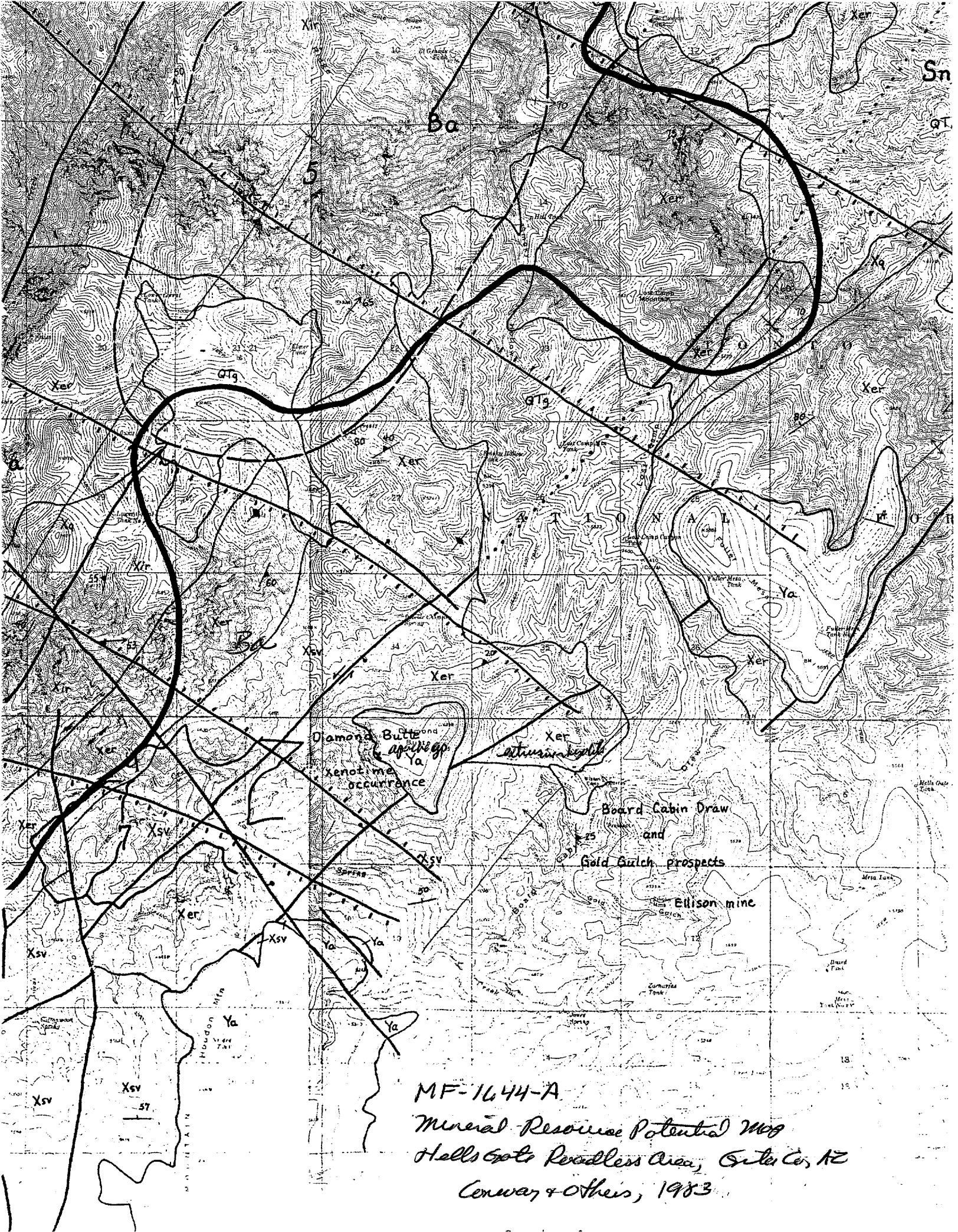
Mg (.05)		Mo (10)		Nb (50)		Pb (20)		Sn (20)		Th (200)		W (100)		Y (20)	
%	no.	ppm	no.	ppm	no.	ppm	no.	ppm	no.	ppm	no.	ppm	no.	ppm	no.
10	1	300	1	2,000	1	20,000	1	G2,000	2	2,000	1	500	1	G5,000	1
5	1	70	1	1,500	2	10,000	1	2,000	2	1,000	1	150	1	5 000	2
1	4	50	1	1,000	1	5,000	1	1,500	1	500	3	100	11	3 000	3
0.7	11	30	7	700	10	3,000	2	700	3	300	2	L	14	2 000	6
0.5	16	20	6	500	15	2,000	1	500	7	200	1	Nm	52	1,500	9
0.3m	21	15	6	300m	14	1,000	1	300	9	L	2			1,000	13
0.2	19	10	16	200	12	700	4	200	4	Nm	75			700	10
0.15	2	Lm	6	150	12	500	11	150	7					500	24
0.1	4	N	35	100	8	300	8	100m	5					300	6
				70	4	200m	13	70	6					200	4
						150	10	50	10					100	1
						100	12	30	8						
						70	8	20	6						
						50	4	L	3						
						30	1	N	6						
						20	1								

TABLE 2. SUMMARY OF ANALYSES OF BULK SEDIMENTS FOR ELEMENTS OF INTEREST

[Values above the bar in each column are considered "high" or "anomalous" as discussed in text and in explanation of accompanying map; numbers in parentheses are detection limits; % - percent; ppm - parts per million; no. - number of analyses; m - median; L - detected, but below limit of determination; N - not detected]

Ag (.5)		B (10)		Ba (20)		Ca (.05)		Cr (10)		Co (5)		Cu (5)		Fe (.05)		La (20)		Mg (.02)	
ppm	no.	ppm	no.	ppm	no.	%	no.	ppm	no.	ppm	no.	ppm	no.	%	no.	ppm	no.	%	no.
1.5	2	100	3	2,000	1	5	3	1,500	1	30	3	500	2	20	1	500	1	3	2
0.7	2	70	11	1,500	10	3	1	700	2	20	3	100	1	15	3	300	1	1.5	3
0.5	7	50m	36	1,000m	47	2	1	300	3	15	15	70	9	10	15	200	3	1.0	13
L	3	30	23	700	21	1	6	200	5	10m	26	50	25	7	16	150	16	0.7m	27
Nm	71	20	11	500	3	0.7	12	150	13	7	28	30m	21	5m	25	100m	27	0.5	34
		L	1	300	3	0.5m	19	100m	28	5	10	20	12	3	24	70	15	0.3	5
						0.3	9	70	18			[illegible]	9	2	1	50	15	0.2	1
						0.2	18	50	13			10	5	L	3				
						0.15	5	30	2			7	1	N	9				
						0.10	9												
						0.07	2												

Mn (10)		Mo (5)		Nb (20)		Ni (5)		Pb (10)		Sn (10)		Th (100)		V (10)		Y (10)	
ppm	no.	ppm	no.	ppm	no.	ppm	no.	ppm	no.	ppm	no.	ppm	no.	ppm	no.	ppm	no.
5,000	1	15	1	70	1	150	1	100	1	30	1	150	1	700	1	500	1
3,000	2	10	1	50	3	100	1	70	4	20	1	100	1	500	2	150	4
2,000	7	7	4	30	12	70	1	50	26	15	3	L	1	300	4	100	8
1,500	25	5	13	20m	36	50	6	30m	27	10	1	Nm	82	200	5	70m	31
1,000m	33	L	14	L	16	30	16	20	21	L	1			150	12	50	28
700	11	Nm	52	N	17	20m	29	15	9	Nm	78			100m	22	30	12
500	6					15	18	10	1					70	28	20	1
						10	[illegible]							50	9		
						[illegible]	2							30	2		
						[illegible]	[illegible]										


Diamond Butte
apitic gp.
Ya
Xenotime occurrence
Board Cabin Draw
and
Gold Gulch prospects
Ellison mine
Xer
Xsv
Ba
Sn
QTg
Xir
Ya
MF-1644-A
Mineral Resource Potential Map
Hells Gate Roadless Area, Gila Co, AZ
Conway & Others, 1983

				tain coal, pyrite, condary uranium minerals.		
Christopher Mountain hematite occurrence	Sec. 36, T. 11 N., R. 12 E.	Fe	n.a.	Proterozoic lateritic concentration in the Mescal Limestone of the Apache Group.	No known prospects or production.	Harrer (1964); Shride (1967, p. 38-39)
Spring Creek (Young) mining district						
Diamond Butte xenotime occurrence	Sec. 3, T. 9 N., R. 12 E.	Y	n.a.	Xenotime occurs in ironstone concretions from middle member of the Dripping Spring Quartzite of the Apache Group.	No known prospects or production.	Gastil (1954, p. 280)
Board Cabin Draw-Gold Gulch prospects	Secs. 1, 2, 11, and 12, T. 9 N., R. 12 E.	Au	n.a.	Quartz veins and associated placer deposits.	A few shafts, adits, and prospect pits. Small production likely, none recorded.	None
34°07'30'' Ellison mine (in Gold Gulch)	Sec. 12, T. 9 N., R. 12 E.	Au	Ag, B, Te, Cu	Quartz veins with minor sulfides in Proterozoic quartzite (Xq) and mafic volcanic rocks (Xsv).	Mine (adit) reopened recently and active in 1981. No production records.	None
Breadpan Canyon prospect	Sec. 23, T. 9 N., R. 12 E.	Be	B, As	Zone in Proterozoic shale (Xsv) near a major Proterozoic fault (Breadpan fault) with intense foliation and local parallel quartz veins. Sparse beryl in zone is mostly with quartz.	Few trenches and one large fenced pit. No recorded production.	Smith (1962, p. 1)
Soldier Camp and Gun Creek prospects	Secs. 25 and 36, T. 9 N. R. 11 E.	Ag, Au, Cu	As, B, Sb, Bi, Te, Hg	Zone in Proterozoic shale (Xsv) of intense foliation and probable distributed shear with abundant small quartz veins. Primary metallic-gray sulfides and abundant secondary copper minerals.	Shallow shafts and prospect pits. No production.	None
Fred Pranty mine	Sec. 6, R. 12 E., T. 8 N.	Cu	n.a.	Small massive sulfide lenses in Proterozoic shale and graywacke (Xsv). Possibly volcanogenic.	Several adits and shafts. Recent mapping and drilling by private exploration. No recorded production.	Donnelly, M. E. (oral comm., 1981)
Mine near Ernie Tank	Sec. 11, R. 11 E., T. 8 N.	Cu, Ag, Au	Pb, Zn, Cd, As, Sb, Hg	Veins of metallic gray sulfide-bearing quartz probably related to nearby east-west fault.	Several adits. No recorded production.	None

111°30' 111°15' 111°00'

JDS

GEOLOGY REPORT

ON

BRAHMA RESOURCES

GOLD GULCH PROPERTY

R. J. Dutka

H.B.Sc. Geology

February, 1988

CERTIFICATE OF QUALIFICATIONS

THIS IS TO CERTIFY THAT:

- I am a resident of Thunder Bay, province of Ontario, Canada (215 Clavet Street, Thunder Bay, Ontario, P7A 2M5).

- I have been engaged in base and precious metal exploration as a geologist since 1982.

- I am a graduate of Lakehead University, Thunder Bay, Ontario (H.B.Sc. Geology, 1982).

- I am a Fellow member of the Geological Association of Canada, a member of the Geological Society of America, Prospectors and Developers Association, and of the Canadian Institute of Mining and Metallurgy.

- I have not received, directly or indirectly, or expect to receive any interest in the company and its properties.

Rick Dutka

Rick Dutka,
H.B.Sc. Geology

Bondar-Clegg & Company Ltd.
5420 Canotek Rd
Ottawa, Ontario
Canada K1J 9N5
Phone (613) 749-2220
Telex 053-3233

BONDAR-CLEGG

Certificate of Analysis

REPORT: 417-6950 PROJECT: NONE

ELLISON MINE

SAMPLE NUMBER	ELEMENT UNITS Ag OPT	Au OPT
EM 1118		0.125
EM 1119		0.112
EM 1120		0.710
EM 1121	0.07	0.005
EM 1122	0.02	0.004
EM 1123		0.003
EM 1124		0.013
EM 1125		0.011
EM 1126		0.500
EM 1127		0.004
EM 1128		0.428

HOUDEN CLAIMS MAP #1

SAMPLE NUMBER	ELEMENT UNITS Ag OPT	Au OPT
GG 1076		0.001
GG 1077		0.002
GG 1078		0.001
GG 1079		<0.001
GG 1080		0.039
GG 1081		0.004
GG 1082		0.001
GG 1083		0.002
GG 1084		<0.001
GG 1085		0.001
GG 1086		0.001
GG 1087		0.004
GG 1088		0.001
GG 1089		<0.001
GG 1090		<0.001
GG 1091		0.013
GG 1092		0.012
GG 1093	0.17	0.027
GG 1094	0.15	0.009
GG 1095	0.06	0.383
GG 1096	0.27	0.038
GG 1097	0.12	0.006
GG 1098	0.13	0.007
GG 1099	0.13	2.340
GG 1101		0.019
GG 1102		0.004
GG 1103		0.010
GG 1104		0.008
GG 1105		<0.001

HOUDEN CLAIMS MAP #2

SAMPLE NUMBER	ELEMENT UNITS Ag OPT	Au OPT
GG 1106		0.002
GG 1107		0.002
GG 1108		0.003
GG 1109		0.004
GG 1110		0.007
GG 1111		<0.001
GG 1112		0.375
GG 1113		0.003
GG 1114		0.001
GG 1115		0.001
GG 1116		0.001
GG 1117		0.001

A P P E N D I X

Certificate of Assays

Property Location Map

Property Geology Maps

TABLE NUMBER 1

SAMPLE NUMBER	SAMPLE LOCATION	DESCRIPTION	ASSAY RESULT (ounces/ton)
GG 1076	Houden Claims Map No. 1	- 2 1/2' chip sample - chlorite-sericite-carbonate-clay schist - minor veining	Au 0.001
GG 1077	Houden Claims Map No. 1	- 5' chip sample - chlorite-sericite-carbonate-clay schist - several quartz stringers	Au 0.002
GG 1078	Houden Claims Map No. 1	- 5' chip sample - chlorite-sericite-carbonate-clay schist - several quartz stringers	Au 0.001
GG 1079	Houden Claims Map No. 1	- 3' chip sample - chlorite-sericite-carbonate-clay schist - quartz vein, minor pyrite, hematite	Au<0.001
GG 1080	Houden Claims Map No. 1	- 5' chip sample - chlorite-sericite-carbonate-clay schist - quartz stringers	Au 0.039
GG 1081	Houden Claims Map No. 1	- 5' chip sample - chlorite-sericite-carbonate-clay schist - minor quartz stringers	Au 0.004
GG 1082	Houden Claims Map No. 1	- 5' chip sample - chlorite-sericite-carbonate-clay schist - minor quartz stringers	Au 0.001
GG 1083	Houden Claims Map No. 1	- 5' chip sample - chlorite-sericite-carbonate-clay schist - minor quartz stringers	Au 0.002
GG 1084	Houden Claims Map No. 1	- 5' chip sample - chlorite-sericite-carbonate-clay schist - minor quartz stringers	Au<0/001

TABLE NUMBER 1

SAMPLE NUMBER	SAMPLE LOCATION	DESCRIPTION	ASSAY RESULT (ounces/ton)
GG 1085	Houden Claims Map No. 1	- 5′ chip sample - chlorite-sericite-carbonate-clay schist - quartz stringers	Au 0.001
GG 1086	Houden Claims Map No. 1	- 5′ chip sample - chlorite-sericite-carbonate-clay schist - quartz stringers	Au 0.001
GG 1087	Houden Claims Map No. 1	- 5′ chip sample - chlorite-sericite-carbonate-clay schist - quartz stringers	Au 0.004
GG 1088	Houden Claims Map No. 1	- 5′ chip sample - chlorite-sericite-carbonate-clay schist - quartz stringers	Au 0.001
GG 1089	Houden Claims Map No. 1	- 5′ chip sample - chlorite-sericite-carbonate-clay schist - quartz stringers	Au<0.001
GG 1090	Houden Claims Map No. 1	- 5′ chip sample - chlorite-sericite-carbonate-clay schist - quartz stringers	Au<0.001
GG 1091	Houden Claims Map No. 1	- 5′ chip sample - chlorite-sericite-carbonate-clay schist - quartz vein, minor sulphides	Au 0.013
GG 1092	Houden Claims Map No. 1	- 5′ chip sample - chlorite-sericite-carbonate-clay schist - quartz vein, minor sulphides	Au 0.012
GG 1093	Houden Claims Map No. 1 NW wall of adit	- 4′ chip sample across quartz vein	Au 0.027 Ag 0.17

TABLE NUMBER 1

SAMPLE NUMBER	SAMPLE LOCATION	DESCRIPTION	ASSAY RESULT (ounces/ton)
GG 1094	Houden Claims Map No. 1 NW wall of adit	- 4' chip sample across quartz vein	Au 0.009 Ag 0.15
GG 1095	Houden Claims Map No. 1 NW wall of adit	- 4' chip sample across quartz vein	Au 0.383 Ag 0.06
GG 1096	Houden Claims Map No. 1 NW wall of adit	- 4' chip sample across quartz vein	Au 0.038 Ag 0.27
GG 1097	Houden Claims Map No. 1 SE wall of adit	- 4' chip sample across quartz vein	Au 0.006 Ag 0.12
GG 1098	Houden Claims Map No. 1 Adit entrance	- 4' chip sample across quartz vein	Au 0.007 Ag 0.13
GG 1099	Houden Claims Map No. 1 Dump pile	- grab sample of quartz vein, disseminated pyrite, chalcopyrite, hematite	Au 2.340 Ag 0.13
GG 1101	Houden Claims Map No. 2	- 3' chip sample across quartz vein - minor hematite, pyrite	Au 0.019
GG 1102	Houden Claims Map No. 2	- 4' chip sample across quartz vein, chlorite schist - minor hematite, pyrite	Au 0.004
GG 1103	Houden Claims Map No. 2	- grab sample - alteration zone - gossan coated, silicified - fine-grained pyrite	Au 0.010
GG 1104	Houden Claims Map No. 2	- grab sample - quartz vein - specular hematite	Au 0.008

TABLE NUMBER 1

SAMPLE NUMBER	SAMPLE LOCATION	DESCRIPTION	ASSAY RESULT (ounces/ton)
GG 1105	Houden Claims Map No. 2	- 5' chip sample across quartz vein altered wallrock	Au<0.001
GG 1106	Houden Claims Map No. 2	- 7' chip sample across quartz vein altered wallrock	Au 0.002
GG 1107	Houden Claims Map No. 2	- 5' chip sample across quartz vein altered wallrock	Au 0.002
GG 1108	Houden Claims Map No. 2	- 5' chip sample across quartz vein altered wallrock	Au 0.003
GG 1109	Houden Claims Map No. 2	- 5' chip sample across quartz vein altered wallrock	Au 0.004
GG 1110	Houden Claims Map No. 2	- 4' chip sample across quartz vein altered wallrock	Au 0.007
GG 1111	Houden Claims Map No. 2	- 5' chip sample - quartz stringers, sericite-chlorite-carbonate schist	Au<0.001
GG 1112	Houden Claims Map No. 2	- grab sample from dump pile - gossan stained quartz with specular hematite, pyrite, minor sericite-chlorite schist	Au 0.375
GG 1113	Houden Claims Map No. 2	- 5' chip sample - quartz stringers, sericite-chlorite-carbonate schist	Au 0.003
GG 1114	Houden Claims Map No. 2	- 7' chip sample - quartz stringers, sericite-chlorite-carbonate schist	Au 0.001

TABLE NUMBER 1

SAMPLE NUMBER	SAMPLE LOCATION	DESCRIPTION	ASSAY RESULT (ounces/ton)
GG 1115	Houden Claims Map No. 2	- 5' chip sample - quartz vein/stringers - sericite-chlorite-carbonate schist	Au 0.001
GG 1116	Houden Claims Map No. 2	- 5' chip sample - quartz vein/stringers - sericite-chlorite-carbonate schist	Au 0.001
GG 1117	Houden Claims Map No. 2	- 5' chip sample - quartz vein/stringers - sericite-chlorite-carbonate schist	Au 0.001
EM 1118	Ellison Mine Map No. 3 Bulldozer trench	- composite grab sample - 1" quartz vein, chlorite-schist	Au 0.125
EM 1119	Ellison Mine Map No. 3 Bulldozer trench	- composite grab sample - 1/2" quartz vein, minor specular hematite	Au 0.112
EM 1120	Ellison Mine Map No. 3 Saddle Vein	- composite grab sample - 1" quartz vein, specular hematite, pyrite	Au 0.710
EM 1121	Ellison Mine Map No. 3 Chigger Hole	- 3' chip sample at back of adit - quartz vein, specular hematite, pyrite	Au 0.005 Ag 0.07
EM 1122	Ellison Mine Map No. 3 Chigger Hole	- grab sample at adit entrance - quartz vein, hematite, pyrite	Au 0.004 Ag 0.02
EM 1123	Ellison Mine Map No. 3 Pearly Hole	- 1' chip sample across quartz vein	Au 0.003
EM 1124	Ellison Mine Map No. 3 Shovel Hole	- composite grab sample - 1/2" quartz vein, specular hematite	Au 0.013

TABLE NUMBER 1

SAMPLE NUMBER	SAMPLE LOCATION	DESCRIPTION	ASSAY RESULT (ounces/ton)
EM 1125	Ellison Mine Map No. 3 Shovel Hole	- composite grab sample - 1/2" quartz vein, specular hematite, pyrite - visible gold	Au 0.011
EM 1126	Ellison Mine Map No. 3 Shovel Hole	- 3' chip sample across shear zone, minor quartz vein	Au 0.500
EM 1127	Ellison Mine Map No. 3 Levis Grantham Hole	- composite grab sample - 3" quartz vein	Au 0.004
EM 1128	Ellison Mine Map No. 3 Open cut	- composite grab sample - 3" quartz vein	Au 0.428

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INTRODUCTION

This brief report was prepared for Mr. Daniel Small of Lakewood Gold Corporation on behalf of Brahma Resources Incorporated. The Gold Gulch Property consist of 18 unpatented mining claims divided into two groups. The "Houden Claims" include 8 contiguous mining claims, numbers 1 through 8 inclusive. The "Ellison Claims" consist of 10 contiguous mining claims, located south of the Houden Claims and adjoining them by an overlapping fraction claim. The Gold Gulch Property is located in the Spring Creek Mining District in the Northern end of the Sierra Ancha Mountains, within Sections 1, 2, 11, and 12, T9N, R12E, Gila and Salt River Meridian, Gila County, Arizona, (see appended location map).

This report is based on data furnished by Mr. W. Sorsen and Mr. C. Withers of Globe, Arizona, published information on the area at Arizona State University and open-file information at the Arizona Department of Mineral Resources. I have also benefitted from discussions with Nyal Niemuth, Arizona Department of Mineral Resources, Mr. J. Fletcher and Mr. R. Town all of whom are familiar with the property.

This property was examined on November 6 to 13, 1987.

PROPERTY ACCESS

The Gold Gulch Property is located approximately 10 miles west of Young, Arizona and 90 miles northerly of Globe, Arizona. The property can be reached by travelling west of Young, on Spring Creek Road for approximately 8 miles to the Board Cabin Draw turnoff. Turn right at the intersection and travel 1.5 miles on the Board Cabin Draw road until road number 133 is reached. Turn left onto road number 133, following it for approximately 5 miles to the Gold Gulch Property.

TOPOGRAPHY AND VEGETATION

The property is in the northern end of the Sierra Ancha Mountains on the northwest-facing slope of Board Cabin Draw, and the south-facing slope of Gold Gulch near Diamond Butte. Elevations range from 4,800 to 5,300 feet. Vegetation consist of thickets of mountain oak and cedar, mazanita, cat claw and scrub oak brush intermixed with cacti and grasses.

HISTORY AND DEVELOPMENT

The history of the Gold Gulch Property prior to 1980's remains somewhat of a mystery, although considerable mining activity did take place on both the Houden and Ellison Claims. Several adits, shafts, open cuts and numerous prospect pits and trenches were noted on the property.

Local residents claim that the Houden Mine was first operated in 1897, by the owner, Mr. Houden who was ambushed and killed by Indians. Later, during the 1930's the Houden Mine was sporadically operated by, unknown parties with unrecorded results, as evident by the various dump piles. The only remnants of the early operations are a crumbling hoist house and ore bin. Scraps of mill machinery are scattered in the vicinity.

The previous history of the Ellison Mine also is uncertain. Large mine dumps on the property attest to considerable past production from underground workings along vein systems. Past production records were not located.

RECENT ACTIVITIES

During the 1980's the Gold Gulch Property has been leased for short-term exploration work by several small mining contractors.

Various types of exploration work has been performed by the following companies: Silver Bullet Incorporated, Nicky Brite Mines Incorporated, Diamond Butte Mining Company, and Arizona Flux Mines Incorporated.

Most recently, the property has undergone an extensive exploration program which included mechanical overburden stripping, rock trenching, detailed geological mapping and sampling. In addition, a caved portal was reopened to permit sampling and mapping of the accessible underground workings.

Mr. J. B. Fletcher of Glpbe, Arizona has overseen recent annual assessment work on the claims. The mechanical overburden stripping was completed by C. D. Withers of Globe, Arizona between September 10 to 27, 1987. During this period F. W. Croxen collected samples for analyses from the bulldozed trenches. The reopening of a caved portal, utilizing a slusher, operated by R. C. Town and T. Town of Globe, Arizona, was performed between October 22 to 30, 1987. In addition, R. C. Town and T. Town, drilled and blasted several rock trenches to expose fresh rock surfaces, from November 6 to 13, 1987. Detailed geological mapping and sampling was completed by R. J. Dutka during the same period.

A total of 52 rock samples were collected and shipped to Bondar-Clegg and Company Limited, of Ottawa, Ontario, Canada, for gold

analyses. The sample locations along with the local geology are presented on the accompanying maps appended to this report. The assay certificate corresponding to the sampling program may also be found in the appendixes of this report.

GEOLOGY

The geology of the area is described in the Geological Society of America Bulletin, volume 59 (Gastil, R. G. 1958) and shown on his accompanying map at a scale of 1":24,000'. Gastil (1958) proposes that the Diamond Butte quadrangle, which covers the area of the property, is underlain by a sequence of Precambrian metavolcanic and metasedimentary rocks. Detailed mapping has enabled Gastil to establish a stratigraphic sequence, involving five separate Precambrian formations. He describes the depositional sequence as follows:

> "The oldest is the Alder Formation, consisting of wacke, slate, quartzite, and conglomerate. It is conformably overlain by the Flying W Formation consisting of interbedded basic and acidic volcanic rocks and conglomerate. This is overlain with slight unconformity by the conglomerate, quartzite, and slate of the Houden Formation. Above the Houden is the Board Cabin Formation composed of porphyritic, pillow, and pyroclastic volcanic rocks, and volcanic sediments.

> The rhyolites and conglomerates of the Haigler Formation complete the sequence. The Haigler is believed to be overlain by still younger rhyolites, and the Alder may be underlain by an older sequence of slate and basic volcanic rocks." (Gastil, 1958)

Observations noted during this property visit indicate that the Gold Gulch Property contains representative rock units from at least three Precambrian Formations described by Gastil (1958). Metavolcanic and metasedimentary rock sequences from the Houden, Board Cabin and Haigler Formations are present on the property.

Well-bedded quartzites, sandstones and shale which comprise the Houden Formation, are observed on the Ellison Claims. These metasedimentary rocks are the host to structurally-controlled gold-bearing quartz veins.

The southwestern portion of the Ellison Claims are underlain by thick sequences of quartzites. The quartzite is a vitreous white colour, medium-to-fine-grained, and cross-laminated in beds 6 to 10 inches thick. The quartzite member grades upwards into pebbly sandstones, sandstones and shale; becoming progressively interbedded toward the top of the metasedimentary sequence of the Houden Formation.

The Board Cabin Formation includes rocks above the Houden

Formation and below the Haigler Formation. Rocks of the Board Cabin Formation consist predominately of mafic metavolcanic flows, pillowed flows and pyroclastic rocks, with minor interbedded metasediments.

Porphyritic mafic metavolcanic flows are the most distinctive and abundant rock type of the Board Cabin Formation; occupying the central portion of the Gold Gulch property.

The porphyritic flows consist of tabular, cream-white feldspar phenocrysts, ranging from 2 to 5 mm in length, contained within a fine-grained, dark-green, chlorite-carbonate matrix. Approximately 60% feldspar phenocrysts are present, with accessory chlorotic-rich clots and quartz filled amygdules. Locally the porphyritic flows have been sheared, developing a preferred crystal orientation of the feldspar phenocrysts.

Several outcrops of volcanic derived sandstone and pebbly sandstone, belonging to the Board Cabin Formation, were observed. These metasedimentary rocks consist of sorted grains of volcanic rock, with minor quartz and feldspar. The feldspar crystals are sericitized, and much of the groundmass appears to be sericite, chlorite, carbonate, with minor hematite and apatite. The metasediments are relatively coarse grained, well sorted, and appear to be composed of locally derived volcanic material.

Above the Board Cabin Formation is the Haigler Formation, which is predominately exposed throughout the northern portion of the Gold Gulch Property. The Haigler Formation is composed of alternating sequences of rhyolite, fragmental tuff breccia and conglomerates.

Only minor occurrences of rhyolite were noted, primarily as a fine-grained, porphyritic, massive-textured rock. The rhyolite has a vitreous luster and is blackish-brown on fresh surfaces; with the weathered surface having a reddish-brown hue due to oxidation. Quartz occurs as small phenocrysts (1 to 2 mm), comprising approximately 60% of the rock volume. There are a few phenocryst clasts filled with epidote and chlorite.

The fragmental tuff breccia consists of coarse, irregular volcanic clasts in a matrix of finer-grained tuff. The chlorotic-rich clasts constitute approximately 50 to 60% of the rock, and possesses a well-developed schistose fabric. The clasts appear flattened, quite often elongated up to 3 cm in length. Their boundaries are typically serrated, which is common to fragmental rocks formed by explosive processes. The matrix of the fragmental breccia consists of feldspar, chlorite-sericite and carbonate. Composition variations along with grain size differences, occur throughout the fragmental tuff breccia unit.

The most predominant member of the Haigler Formation found on the

property is conglomerate. The conglomerate contains abundant clasts of local volcanic derivation, which are well-rounded and range in size from pebbles to cobbles. The matrix fraction of the conglomerate is chiefly composed of chlorite and carbonate.

Structurally all of the rock formations have undergone extensive deformation by folding and faulting. Gastil (1958) proposed that the rocks are tightly to openly folded about northeast-southwest trending fold axes which plunge northeast. He considers the rocks of the entire Diamond Butte region to be part of a major anticlinorium. Several major faults of older Precambrian age trend northeast parallel to the folding. Block faulting is quite evident by the steep local relief and deep erosional channels found on the Gold Gulch Property. A well-developed schistosity, striking northeast-southwest with near vertical dips, is present throughout much of the metasedimentary rocks.

Mineralization appears to be confined to structurally-controlled quartz veins and shear zones which crosscut all of the geological formations. Pyrite, chalcopyrite, specular hematite, galena, sphalerite, visible gold, bornite, and their oxidized equivalents, were observed in several of the old workings and mine dumps.

Much of the previous exploration work has been focussed on mineralized, structurally-controlled, quartz veins within the

metasedimentary rock units. Various generations of quartz veining are present throughout the property as evident by the differing vein attitudes and thicknesses.

One prominent vein system located on the northern portion of the Gold Gulch Property strikes N40W and dips 30 degrees northeast. The vein is approximately four feet wide, composed of glassy white quartz containing minor carbonate, chlorite, sericite and disseminated sulphide mineralization. Intense wallrock alteration has resulted in the formation of chlorite-sericite-carbonate schist next to the vein. A caved inclined adit, several open cuts, prospect pits and trenches have exposed the vein along strike for a distance of approximately 400 feet. Significant gold values have been obtained from chip samples collected across the inclined vein and will be discussed in the forth coming section. Houden Claims - Detail Map No. 1 (see appendix), illustrates the local geology, sample locations, and old workings along the inclined vein.

Another vein system approximately 1,000 feet southeast of the caved inclined adit was prospected by an open cut and several trenches. This vein system strikes N45E to N60E and dips between 70 to 80 degrees southeast. The vein ranges from two to five feet in width and has been exposed over a distance of 600 feet, along a steep fault valley. The vein is composed of glassy, white quartz with accessory carbonate, chlorite, sericite and

minor sulphide mineralization. Several narrow, second-order quartz-carbonate veins/veinlets appear to be associated with the main vein system. A prominent wallrock alteration surrounding the principal vein is best exposed in trenches located near the creek bed at the bottom of the valley. Here the wallrock has undergone silicification and pyritization, resulting in a fine-grained, dark-grey, silicious rock containing disseminated pyrite (2-3%). The alteration zone is up to two feet wide and is easily identifiable by the reddish-brown oxidation on weathered surface. Visible mineralization within the vein consist of disseminated pyrite, chalcopyrite, galena and specular hematite. Low gold values were obtained from chip samples collected across the vein and altered wallrock. Both the vein and the wallrock have been affected by late stage fracturing. The local geology, sample locations and trenches are illustrated on Houden Claims - Detail Map No. 2, which is appended to this report.

Several narrow quartz-carbonate veins are present on the Ellison Claims. These veins range from 1/2 to 2 inches in width, strike northeast-southwest with variable moderate dips. The veins appear to be structurally-controlled, crosscutting the stratigraphy and display pinch-and-swell features. Glassy, whitish-grey to reddish-brown iron stained varieties of quartz make up the main vein composition. Minor carbonate, chlorite and sericite occur as accessory minerals. The veins are mineralized with disseminated, fine-grained specular hematite, pyrite,

chalcopyrite and visible gold.

Many of the veins have received considerable past production and exploration as evident by the numerous adits, shafts, open cuts and trenches present on the property. Significant gold values were obtained from samples collected from many of the old workings and recent bulldozer trenches. The local geology, sample locations and old workings are illustrated on the Ellison Mine - Detail Map No. 3 in the appendix of this report.

SAMPLING PROGRAM

A total of 52 rock samples were collected by the author during November 9 to 12, 1987, with various assistance by R. C. Town, T. Town and C. D. Withers. Thirty-seven chip samples and fifteen composite-grab samples, representative of the mineralized vein systems and adjacent wallrocks, were shipped to Bondar-Clegg, 5420 Canotek Road, Ottawa, Ontario, Canada, for analyses. Sample location, descriptions and assay results are presented in Table No. 1. In addition, sample location and assay results are illustrated on the detail sketch maps found at the back of this report. The official assay certificate is appended to the report.

DISCUSSION AND CONCLUSIONS

The results of the sampling program indicate that precious metals are concentrated within structurally-controlled quartz veins. Significant gold values were obtained from samples mineralized with appreciable amounts of specular hematite, pyrite and chalcopyrite. Fine-grained visible gold was observed in several narrow quartz veins located on the Ellison claims.

A review of previous geological reports and sampling programs completed on the property confirm the results of this program. Limited precious metal analyses show variable values for samples collected in the same areas as this sampling program. Significant gold values have been reported in previous sampling programs. Assuming previous sampling and assaying were properly carried out, the differences probably result from the spotty, irregular nature of free gold mineralization.

RECOMMENDATIONS

It is recommended that a 7,000 foot diamond drill program be undertaken on the property in order to properly evaluate the economic mineral potential. A series of vertical diamond drill holes designed to test the continuity and mineralization of the inclined vein is proposed. The proposed diamond drill holes,

located in the vicinity of the old workings, are projected to intersect the mineralized vein structure at the 100 and 150 foot levels. This diamond drill pattern is illustrated on Houden Claims - Detail Map No. 1. In addition, the vertical vein should also be tested by diamond drilling, particularly in the vicinity of the open cut.

The Ellison Claims require a systematic exploration program consisting of detailed geological mapping, prospecting, sampling and further trenching. A detailed geological map of the property, showing the location of all the quartz veins and old workings should be completed on a scale of 1":200'. Particular emphasis on the structural controls of the quartz veining should be closely examined to see if a possible intersecting structure may lead to a larger exploration target. Further prospecting and sampling in the area may extend known quartz veins. Continued work at up-grading and reopening the old workings should progress to allow for future mapping and sampling. A program of overburden removal in favorable areas outlined by prospecting and mapping should be undertaken to further expose the mineralized zones. Rock trenching and sampling of these mineralized zones will help to delineate potential diamond drill targets.

BUDGET

A three phase exploration program will be required to delineate and evaluate the auriferous structures on the Gold Gulch Property.

Phase 1 will incorporate geological mapping, sampling and prospecting over a surveyed grid to identify favorable horizons. Overburden stripping and trenching will outline mineralized structures.

Phase 2 consist of up-grading and re-opening the old workings to allow for detailed mapping and sampling of the underground workings.

Phase 3 consist of intensive diamond drilling to further delineate and evaluate the economic potential of the structures.

PHASE 1

Survey grid 10 miles @ $800.00/mile	$ 8,000.00
Geological mapping and prospecting 20 days @ $350.00/day	$ 7,000.00
Stripping and trenching 35 hours @ $100.00/hour	$ 3,500.00
Sampling and Assaying (all assaying to be completed in Canada) 100 samples @ $25.00/sample	$ 2,500.00
Reports and Administration	$ 1,050.00
Contingencies	$ 3,150.00
TOTAL PHASE 1	$ 25,200.00

PHASE 2

Upgrading and re-opening old workings	$ 15,000.00
Detail mapping and sampling of old workings 20 days @ $350.00/day	$ 7,000.00

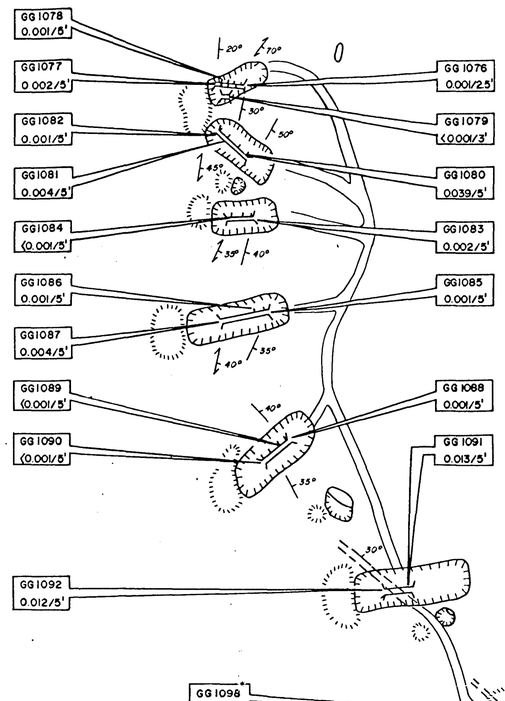
Sampling and Assaying (all assaying to be completed in Canada) 100 samples @ $25.00/sample	$ 2,500.00
Report and Administration	$ 1,225.00
Contingencies	$ 3,675.00
TOTAL PHASE 2	$ 29,400.00

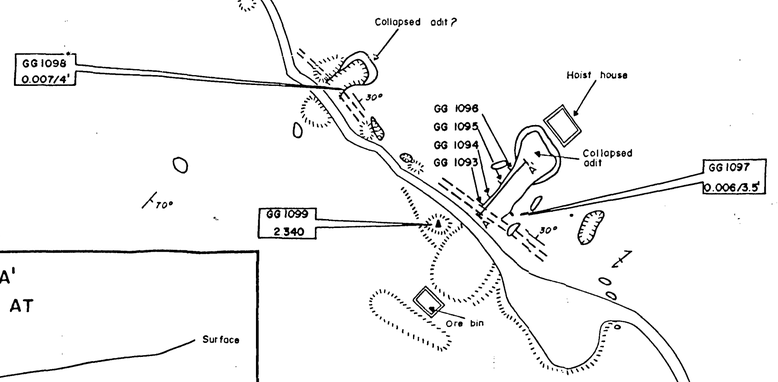
PHASE 3

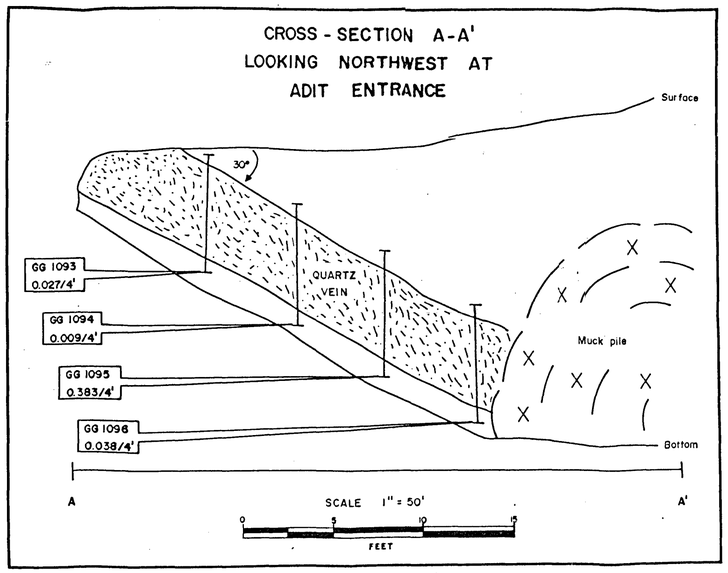
Diamond Drilling 7,000 feet @ $30.00/foot	$ 210.000.00
Drill Management $5.00/foot	$ 40,000.00
Core Sampling and Assaying (all assaying to be completed in Canada) 500 samples @ 25.00/sample	$ 12,500.00
Report and Administration	$ 13,125.00
Contingencies	$ 39,375.00
TOTAL PHASE 3	$ 315,000.00

TOTAL OF PHASE 1	$ 25,200.00
TOTAL OF PHASE 2	$ 29,400.00
TOTAL OF PHASE 3	$ 315,000.00
TOTAL	$ 369,600.00

HOUDEN CLAIMS (DETAIL MAP No. 1)







BRAHMA RESOURCES INC.

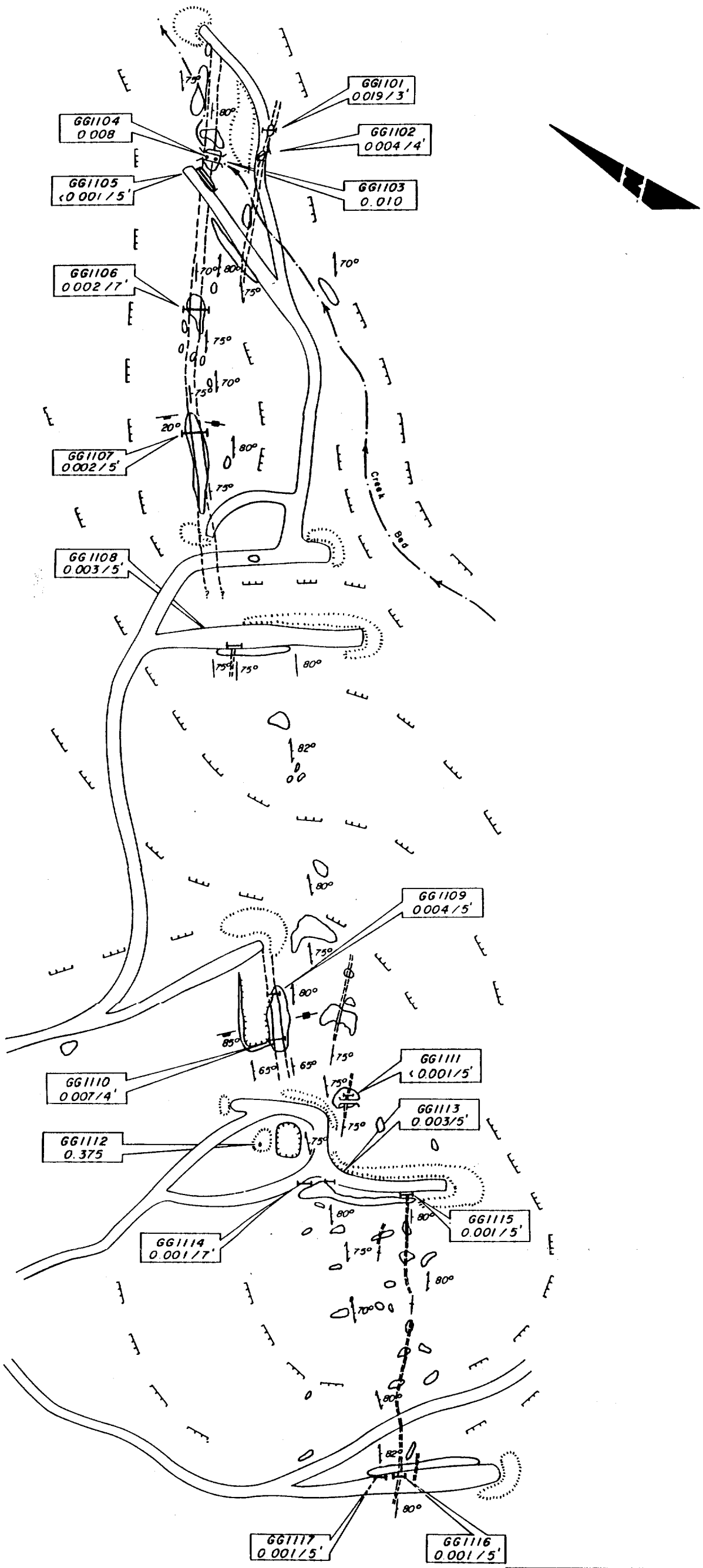
GOLD GULCH PROPERTY

SCALE 1" = 500'

0 50 100 150

FEET

HOUDEN CLAIMS (DETAIL MAP No. 2)



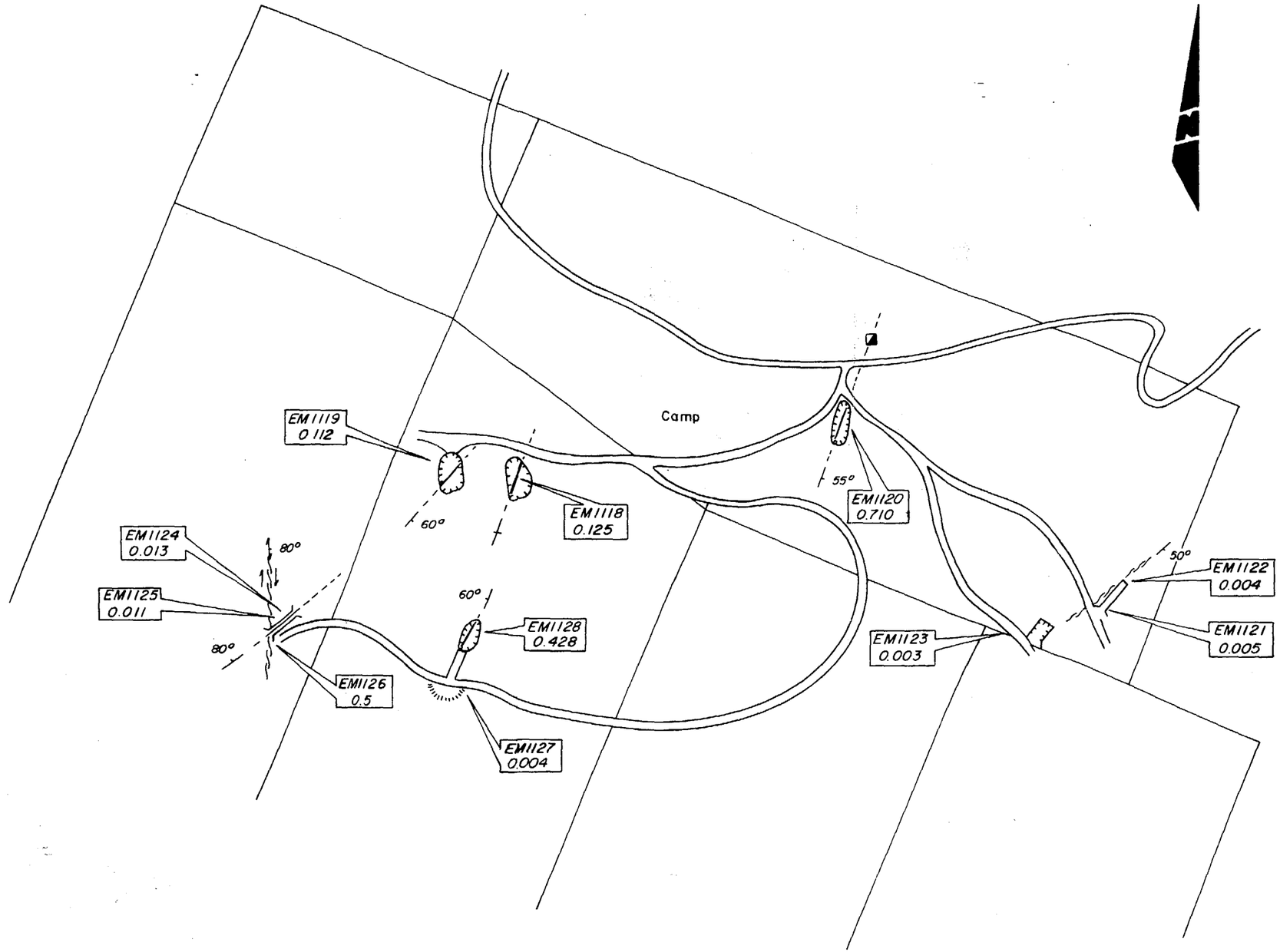
BRAHMA RESOURCES INC.

GOLD GULCH PROPERTY

SCALE 0 50 100 Feet

Map No. 2

ELLISON MINE (DETAIL MAP No. 3)



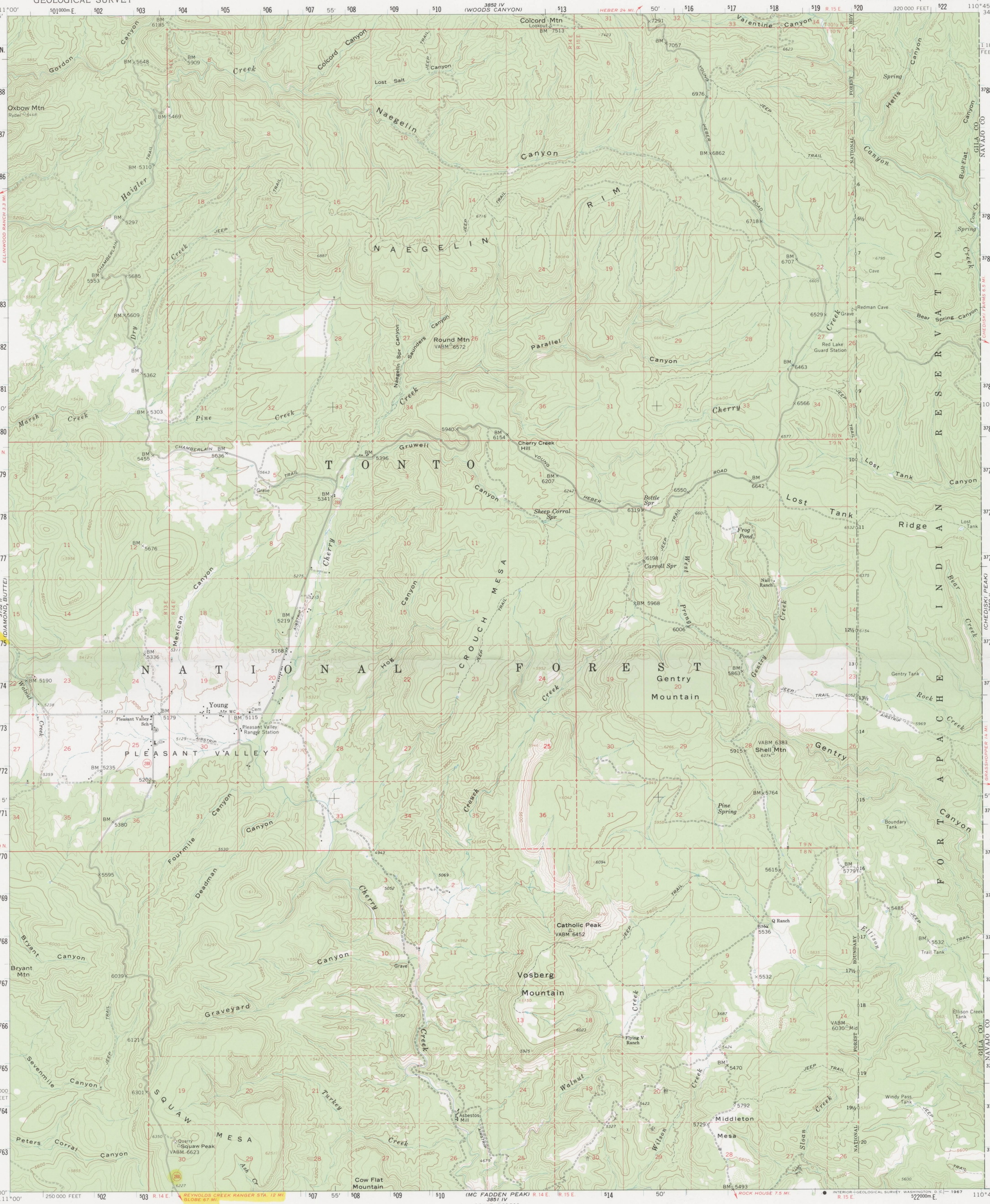
BRAHMA RESOURCES INC.

GOLD GULCH PROPERTY

SCALE
0 100 200 400 Feet

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

YOUNG QUADRANGLE
ARIZONA
15 MINUTE SERIES (TOPOGRAPHIC)



Diamond Butte 7½' quad.

Buzzard Roost Mesa 7½' quad.

Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, and State of Arizona

Topography by photogrammetric methods from aerial photographs taken 1958. Field checked 1961

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, east zone
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

Where omitted, land lines have not been established

UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:62 500

CONTOUR INTERVAL 80 FEET
DATUM IS MEAN SEA LEVEL

QUADRANGLE LOCATION

ROAD CLASSIFICATION
Light-duty — Unimproved dirt
State Route

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225 OR WASHINGTON, D. C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

YOUNG, ARIZ.
N3400—W11045/15

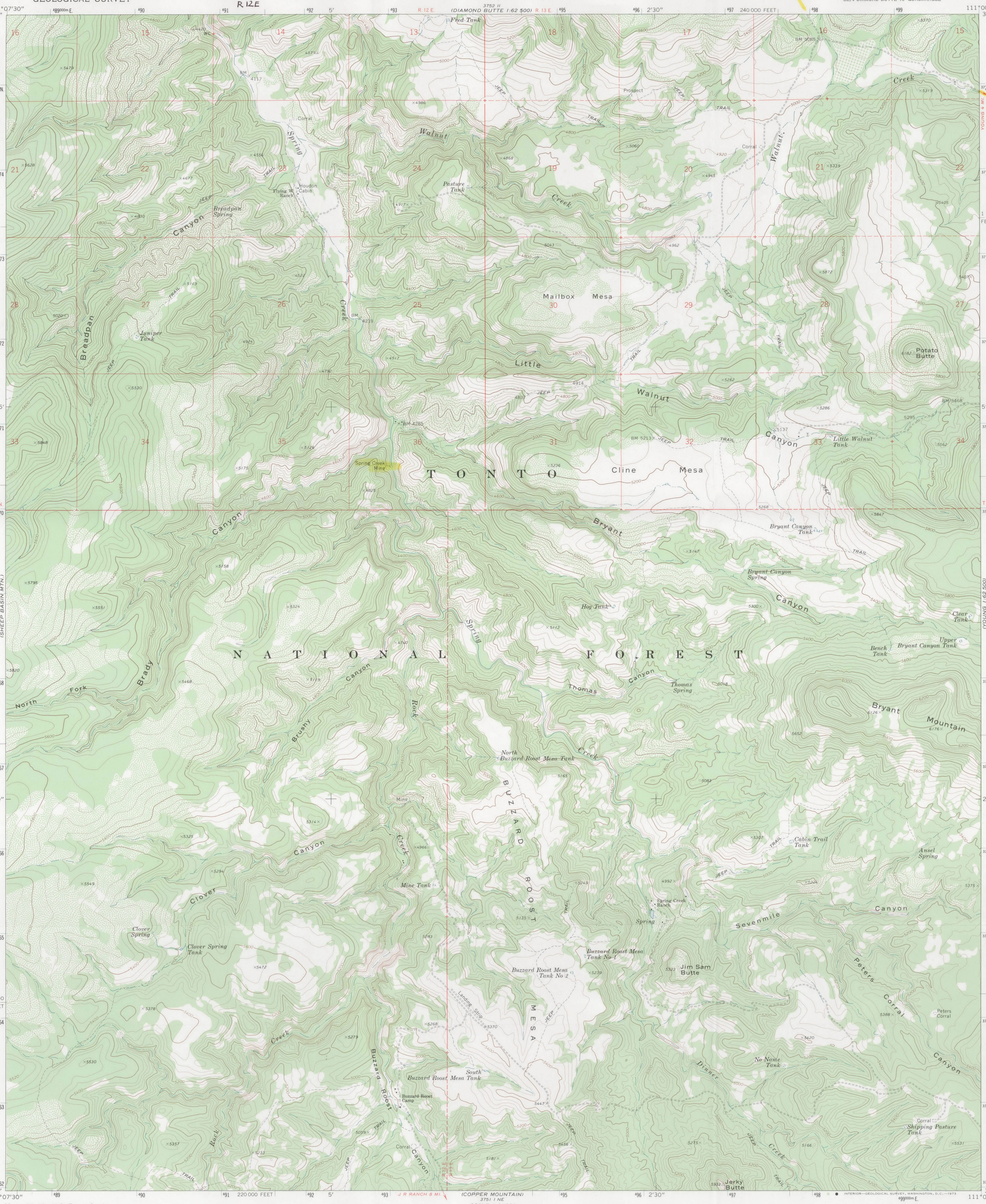
1961

AMS 3852 III—SERIES V798

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Buzzard Roost Mesa 7½' Quad

BUZZARD ROOST MESA QUADRANGLE
ARIZONA–GILA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 DIAMOND BUTTE 15' QUADRANGLE



Mapped by the U.S. Forest Service
Edited and published by the Geological Survey

Control by USGS, USC&GS, and USFS

Topography by photogrammetric methods from aerial photographs taken 1965. Field checked by USGS 1972

Projection and 10,000-foot grid ticks: Arizona coordinate system, east zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue. 1927 North American datum

Fine red dashed lines indicate selected fence lines

Where omitted, land lines have not been established

UTM GRID AND 1972 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D. C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Primary highway, hard surface — Light-duty road, hard or improved surface
Secondary highway, hard surface — Unimproved road
Interstate Route — U. S. Route — State Route

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1973

BUZZARD ROOST MESA, ARIZ.
SE/4 DIAMOND BUTTE 15' QUADRANGLE
N3400—W11100/7.5

1972

AMS 3752 II SE—SERIES V898

[redacted]

[redacted]

attachment A

Hoodoo Shaft area

270' ① ±~~270~~ NE of shaft on contour in ~~[illegible]~~ 5th bulldozer cut.

H-1 6' cut of volcanic, shows HW, vole bx & flows.

H-2 4' cut of crushed, green alt "tuff" with hem-qtz-

H-3 5' cut of massive shear laminated volcanic w/ qtz seam, w/ hem, veg zones etc.

Structure shows N 20 W 25° NE

② ± ~~1320~~ 1280' NE of Hoodoo Shaft (3rd bat at ?)

H-4. 8' cut HW purple vole debris, flow, some showing narrow 1/2-1" qtz vein in last 2 ft towards vein.

H-5 4' cut qtz shows stockwork vein, hem veins in bleached vole. flow?

H-6 20' FW cut of grey purple vole slab & tuff bx few qtz-hem seams.

③ ± ~~1320~~ 1100' NE of HS 1st cat cut

H-7 25' cut HW grey-green vole bx, purple flow, yellow qtz

H-8 6' cut crushed sponge qtz shear bx in "tuff"

H-9 3' cut massive hem-qtz seam zone in purple laminated flow

H-10 6' FW cut of grey purple porphyry vole flow banding w/ few 1/4" qtz hematite veins seam, pyr.

④ 65' along cat NE of caved Hoodoo Shaft

H-11 port debris area, caved out? face 6' cut vert of vole. bleached yellow brown to purple vole flow bx. in HW. (6' covered area to qtz vein below)

Mean water worn pebbles in HW, air cut fell - maybe contact near surface hot spring in vole setting

H-12 Vein N 25-30 W, 25° E. 6' vert cut massive qtz crossed by hem-qtz bx zones (hydrical).

(pseudo HW "bedding" similar Pebbles zones at high angle

H-13 gob of Hoover Shaft much ore pile.

H-14 New Deal N 15° E 70° S Upper adit & cut along top
Gob of 1.5' gb attached in gulch ~~top~~ air fan?
water worked? + of 1" - 3" gb stringer.

Lower gulch extension of New Deal H-14, in gulch steep
H-15 FW of altered green-grey rock flow type w/ bull gb
veinlets, some yellow brown FeOx seams. 20' cut.
H-16 5' gb vein in altered weathered rock, brown;
more massive brown SiO2.
H-17 4' massive gb w/ green lens; py oxide present. brecciation

on cut above work
H-18 3' cut massive quartz w/ hem seam stain, may in
part dip shallow to NE.
H-19. 10' cut in FW; vertical small veinlets in sheared
"lift" w/ red-brown yellow FeOx

PRELIMINARY REPORT

RENO: 1500 Glendale Ave,SPARKS 894:
P.O. Box 71060, RENO 89570
Ph (702)356 0606 Fax 3561413

ASARCO, INC.

REPORT : SP 014190 1 Page(s) Date : 10/03/91

Client reference : H-1/19 Project : HOUDEN

Cost code :

Copies to : JAMES D. SELL

WILLIAM W. SORSEN (RESULTS)

Samples : Type Preparation code
Received : 10/01/91 ----------

Analysis	Code	Quality Parameter	Detection	Units
Au	FA60	Acc. 15 %	5	ppb
Au(R)	FA60	Acc. 15 %	5	ppb

OCT 3 1991
Exploration

Signatory : Jorge Ugarte

PRELIMINARY REPORT

REPORT : SP 014190

Sample	Au ppb	Au(R) ppb
H-1	18	
H-2	47	
H-3	11	
H-4	33	
H-5	28	
H-6	22	
H-7	5	
H-8	600	
H-9	494	
H-10	25	
H-11	18	
H-12	542	
H-13	3154	
H-14	18550	20370
H-15	218	
H-16	730	
H-17	142	
H-18	58	
H-19	440	

Please refer to the cover sheet for further analysis details.

PRELIMINARY REPORT

RENO: 1500 Glendale Ave,SPARKS 894
P.O. Box 71060, RENO 89570
Ph (702)356 0606 Fax 3561413

ASARCO, INC.

REPORT : SP 014190 1 Page(s) Date : 10/03/91

Client reference : H-1/19 Project : HOUDEN

Cost code :

Copies to : JAMES D. SELL

WILLIAM W. SORSEN (RESULTS)

Samples : Type Preparation code
Received : 10/01/91 ----------

Analysis	Code	Quality Parameter	Detection	Units
Au	FA60	Acc. 15 %	5	ppb
Au(R)	FA60	Acc. 15 %	5	ppb

ASARCO Incorporated
OCT 3 1991
SW Exploration

Signatory : Jorge Ugarte

PRELIMINARY REPORT

REPORT : SP 014190

Sample	Au ppb	Au(R) ppb
H-1	18	
H-2	47	
H-3	11	
H-4	33	
H-5	28	
H-6	22	
H-7	5	
H-8	600	
H-9	494	
H-10	25	
H-11	18	
H-12	542	
H-13	3154	
H-14	18550	20370
H-15	218	
H-16	730	
H-17	142	
H-18	58	
H-19	440	

Please refer to the cover sheet for further analysis details.

PRELIMINARY REPORT

RENO: 1500 Glendale Ave,SPARKS 8943
P.O. Box 71060, RENO 89570
Ph (702)356 0606 Fax 3561413

ASARCO, INC.

REPORT : SP 014190 [Page(s)] Date : 10/03/91

Client reference : H-1/19 Project : HOLDEN

Cost code :

Copies to : JAMES D. SELL

WILLIAM W. SORSEN (RESULTS)

Samples Received : 10/01/91	: Type	Preparation code

Analysis	Code	Quality Parameter	Detection	Units
Au	FA60	Acc. 1s 4	5	ppb
Au(R)	FA60	Acc. 1s 3	5	ppb

ASARCO Inc.
OCT 3 1991
SW Exploration

Signatory : Jorge Ugarte

PRELIMINARY REPORT

REPORT : SP 014190

Sample	Au ppb	Au(R) ppb
H-1	18	
H-2	47	
H-3	11	
H-4	33	
H-5	28	
H-6	22	
H-7	5	
H-8	600	
H-9	494	
H-10	25	
H-11	18	
H-12	542	
H-13	3154	
H-14	18550	20370
H-15	218	
H-16	730	
H-17	142	
H-18	58	
H-19	440	

Please refer to the cover sheet for further analysis details.

SAMPLE SUBMITTAL FORM

American Assay Laboratories Inc.

Sparks Office
1500 Glendale Ave.
Nevada 89431
Box 71060
Reno, NV. 89570
Telephone
(702) 356-0606
Fax
(702) 356-1413

Elko Office
2320 Last Chance Rd.
Nevada 89801
Box 2908
Elko, NV. 89801
Telephone
(702) 738-9100
Fax
(702) 738-2594

Company: [illegible]

Address: [illegible] 5747 Tucson AZ 85703

Telephone Number: (602) 792-3016 Fax Number: (602) 792-5934

Project Name: Houden Purchase Order Number: _____

Transport Company: _____ Waybill Number: _____

Date Shipped: 9/20/91 Number of Packages: _____ [ ] Prepaid [ ] Collect

[illegible] Tucson

ANALYSIS REQUIRED

SAMPLE	TYPE	ELEMENTS REQUIRED
H-1 thru H-19	Rock	Au Ag FA60 (2 [illegible])
		also AAL-[illegible] ICP [illegible]
		01/2

COARSE REJECTS (Normally Discarded)

[X] Return COD after analysis complete
[ ] By prior arrangements

PULPS (Normally Stored Free For One Month)

[ ] Discard after one month
[X] Return COD after one month
[ ] By prior arrangements

RESULTS AND INVOICES TO BE SENT TO:

Please mark invoice person and address [I]

(1) [illegible]

(2) [illegible]

(3)

Comments:

GB [illegible]

JDS

ASARCO

Southwestern Exploration Division

October 1, 1991

FILE NOTE

Spring Creek Mine
Sec. 35-36, T9N, R12E
Buzzard Roost 7½' Quad
Gila County, Arizona

Mr. Bill Sorsen, 770 Sunset Drive, Globe, AZ 85501, phone 602/425-4096, loaned me his file copy on the Spring Creek Mine, Gila County, AZ, which is about six miles south of his Houden Mine area.

Feliciano L. Leon sampled and reported on the mine in 1987, along with a previous sample map of 1929. The plus 1.0 opt gold value is generally a foot or less of quartz vein material. Wall rock values drop off rapidly according to the Leon and previous sample values over wider widths.

Ore shipment settlement sheets from Asarco El Paso, indicate 150 tons of hand sorted ore was shipped between January 1926 and January 1931. This is probably not all the settlement sheets; based on the Umpire sheet of January 5, 1928 which did not have a corresponding settlement sheet.

I did not inspect the Spring Creek Mine area.

James D. Sell

James D. Sell

JDS:mek
Att.

cc: W.L. Kurtz (w/o att.)

JDS

ASARCO

Southwestern Exploration Division

October 1, 1991

FILE NOTE

Houden-Ellison Mines
Sec. 1 and 12, T9N, R12E
Diamond Butte 7½' Quad
Gila County, Arizona

I send to the files a report on the sampling of the Houden-Ellison mine areas by R.J. Dutka in 1988.

In my file note of February 1, 1991, I had mislabeled the properties as the "Hoodoo"-Ellison Mine, controlled by Bill Sorsen, 770 Sunset Drive, Globe, AZ 85501, phone 602/425-4096.

Dutka's sampling of the Houden, low-angled structure shows spotty gold values, with the best value as 4 feet of 0.383 opt gold taken in a collapsed shaft pillar wall (Map 1). Map 2 is sample results of a steep vein to the south and only low gold values are reported, other than an "ore pile" sample. At the Ellison Mine, Map 3, half ounce gold values are evident in narrow quarty veins.

Mr. Sorsen reported verbally that hand picked wire gold was mined by four relative/friends of the owner during the high $400/ounce time. They sold it as mineral specimens and not a bulk tonnage to the smelter.

I sampled part of the Houden cat cuts, with samples in the hanging and footwalls for bulk indications. These 19 samples are in press.

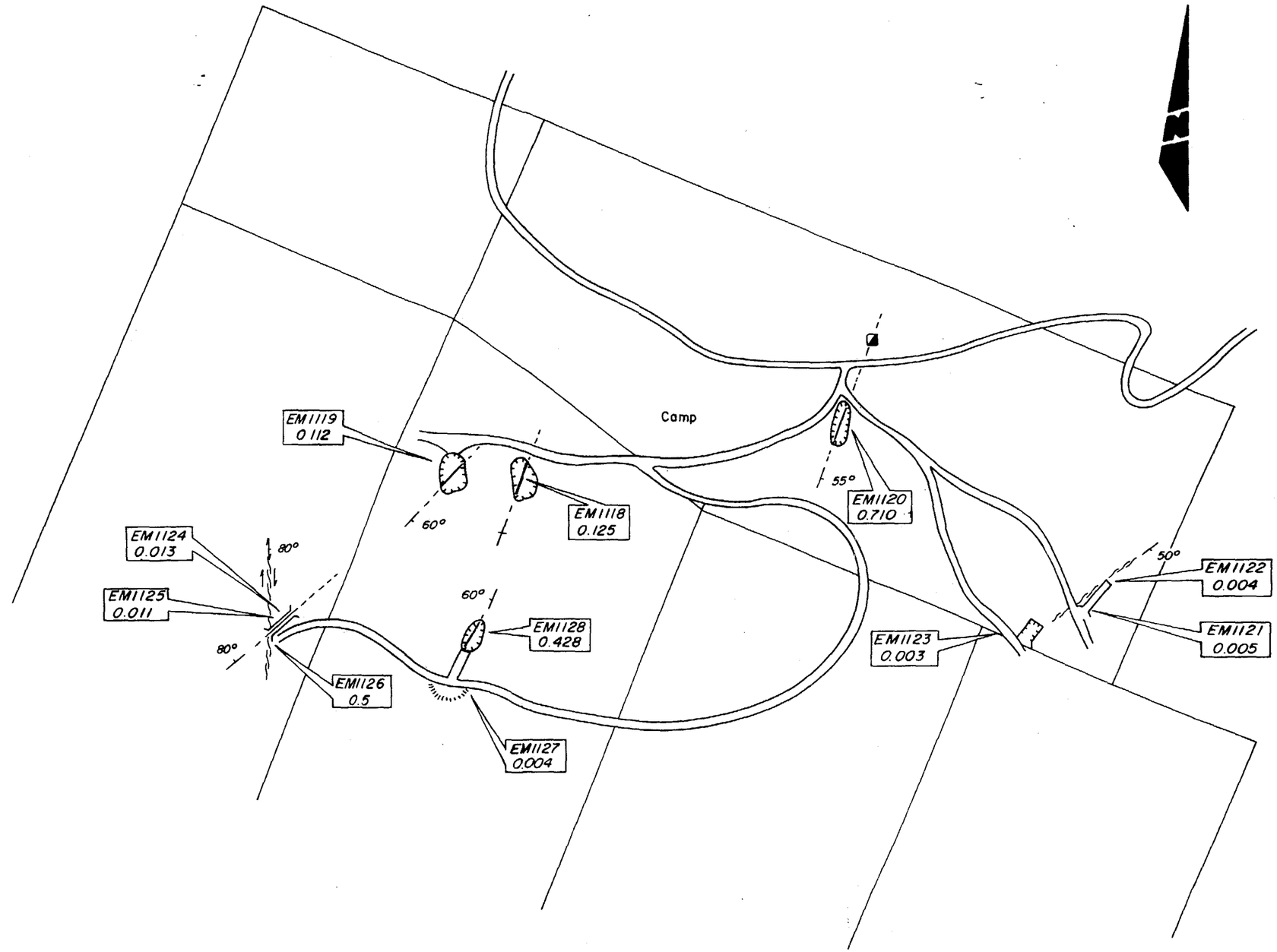
James D. Sell

James D. Sell

JDS:mek
Att.

cc: W.L. Kurtz (w/o att.)

ELLISON MINE (DETAIL MAP No. 3)

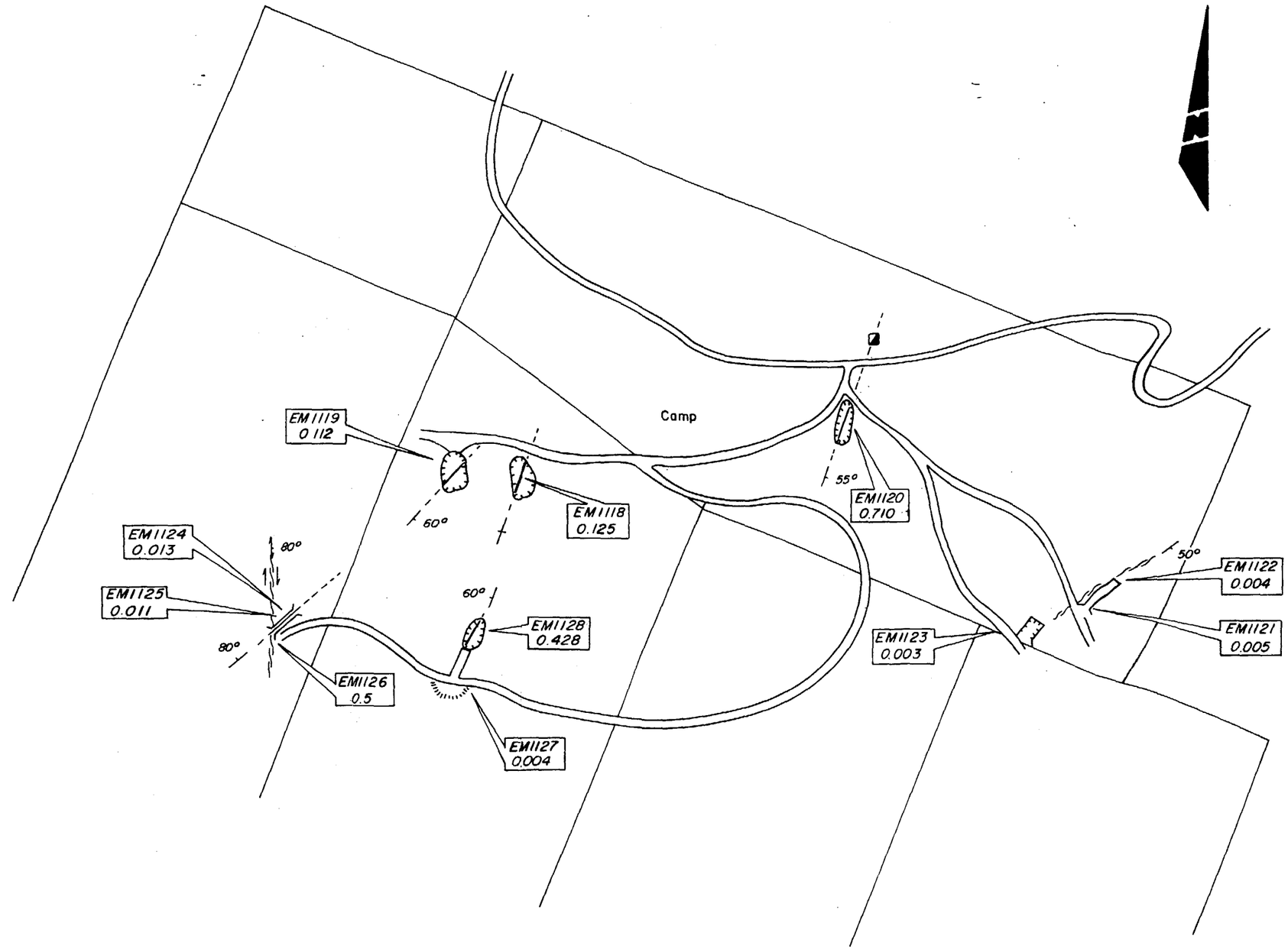


BRAHMA RESOURCES INC.

GOLD GULCH PROPERTY

SCALE
0 100 200 400 Feet

ELLISON MINE (DETAIL MAP No.3)

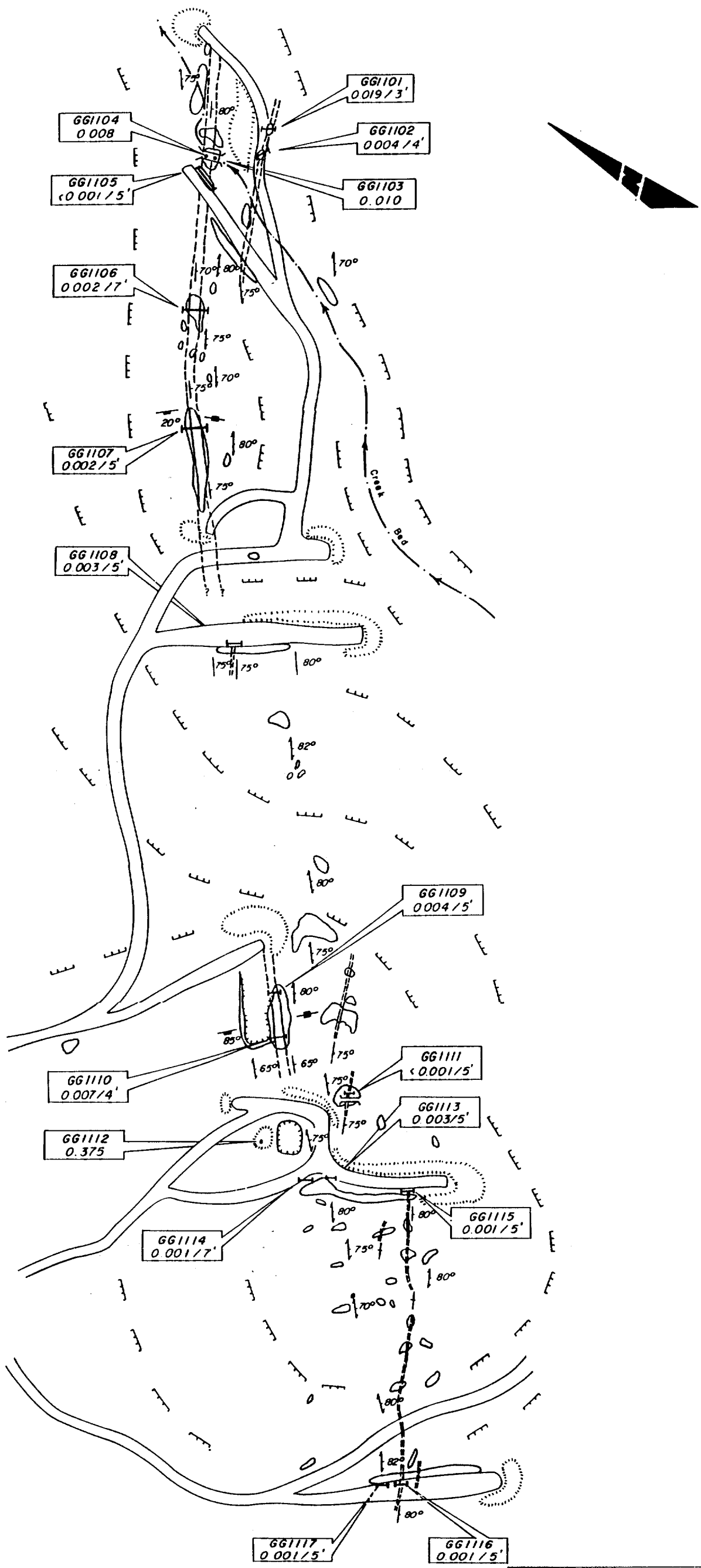


BRAHMA RESOURCES INC.

GOLD GULCH PROPERTY

SCALE
0 100 200 400 Feet

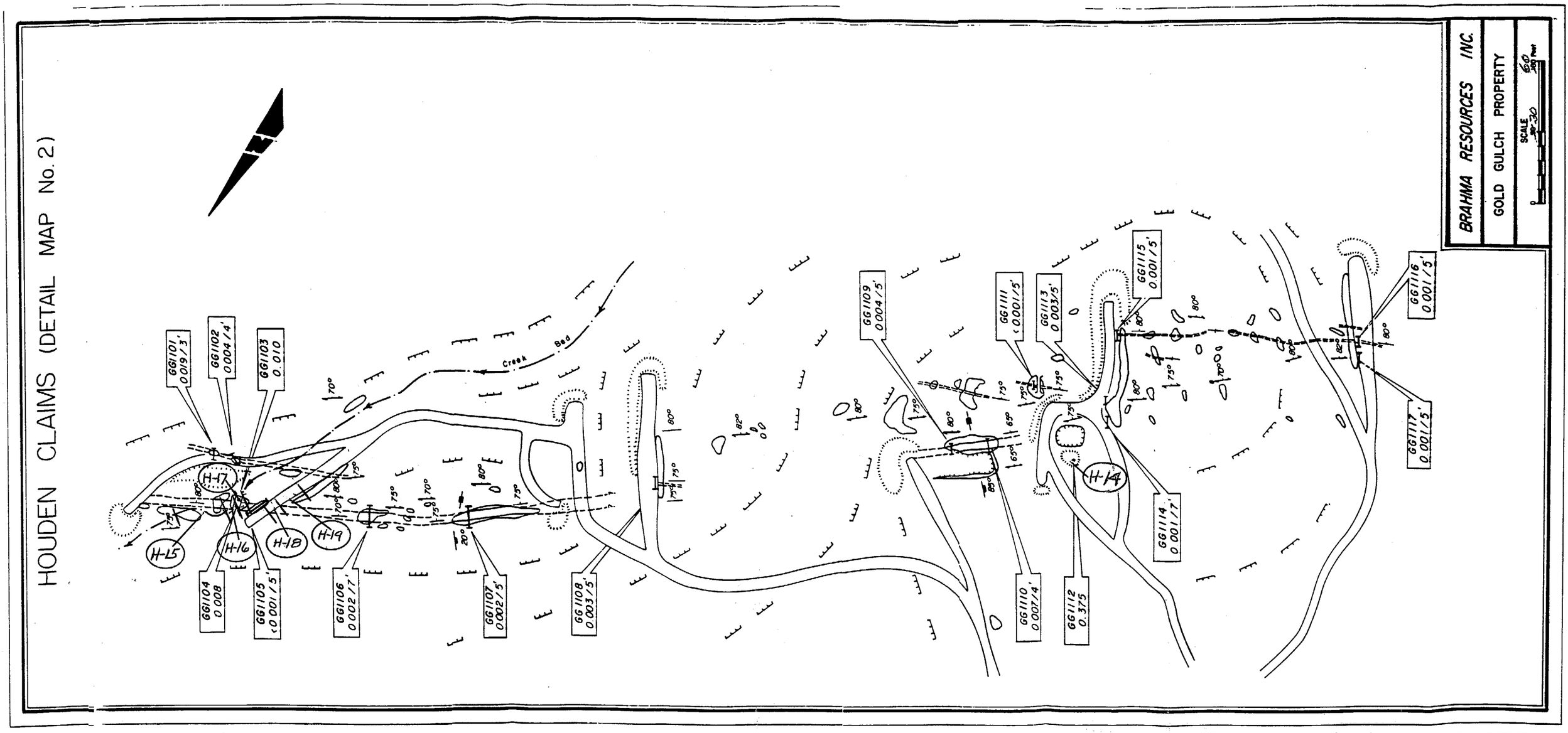
HOUDEN CLAIMS (DETAIL MAP No. 2)



BRAHMA RESOURCES INC.

GOLD GULCH PROPERTY

SCALE 0 50 100 Feet



ASARCO Incorporated SOUTHWEST EXPLORATION DEPT.

HOUDEN MINE AREA

SOUTH VEIN AREA (NEW DEAL VEIN)

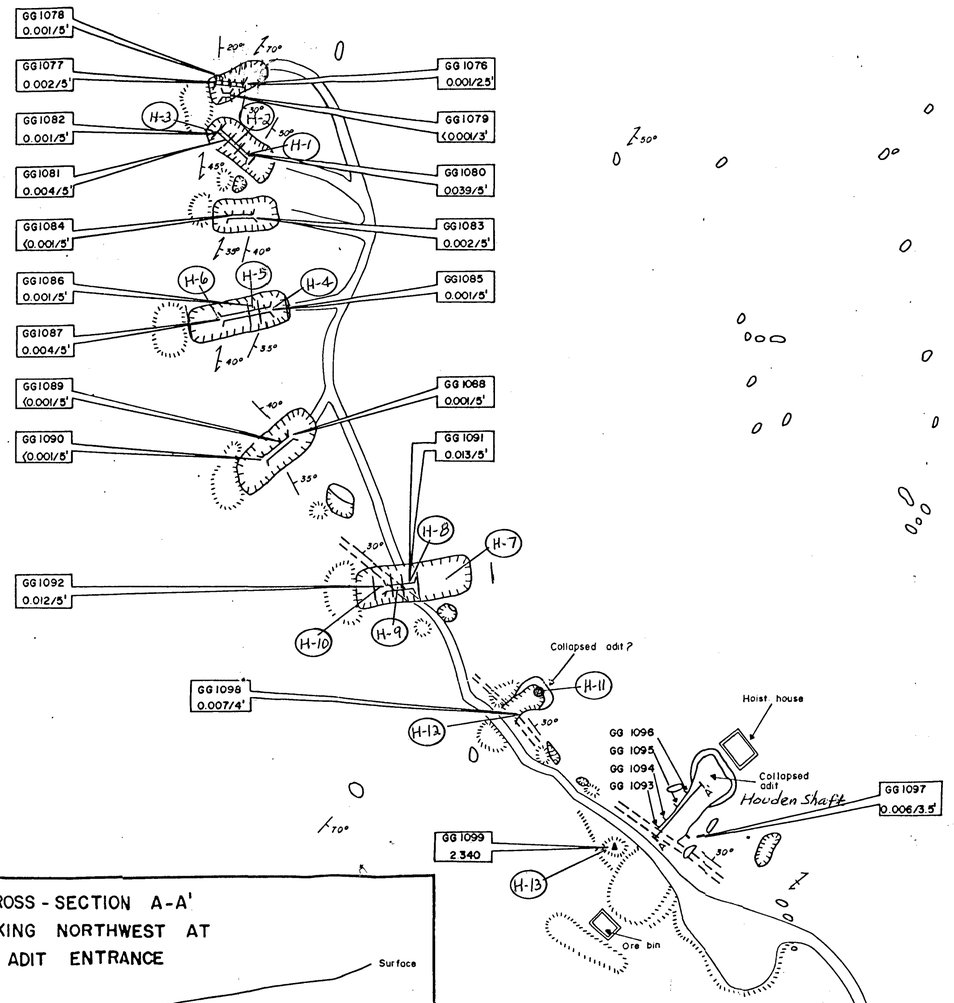
SAMPLE SITES H-14 THRU H-19

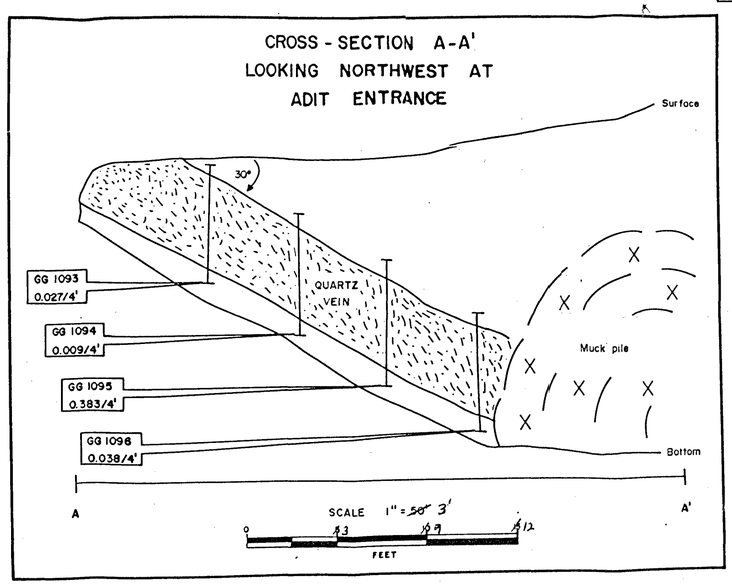
J.D.SELL 09/28/91

mn HM911002 JDS/DAM tuc 10/02/91

ATTACHMENT A

HOUDEN CLAIMS (DETAIL MAP No. 1)





ASARCO Incorporated SOUTHWEST EXPLORATION DEPT.

HOUDEN MINE AREA

HOUDEN SHAFT AREA

SAMPLE SITES H-1 THRU H-13

J.D.SELL 09/28/91

mn HM911003 JDS/DAM tuc 10/02/91

BRAHMA RESOURCES INC.

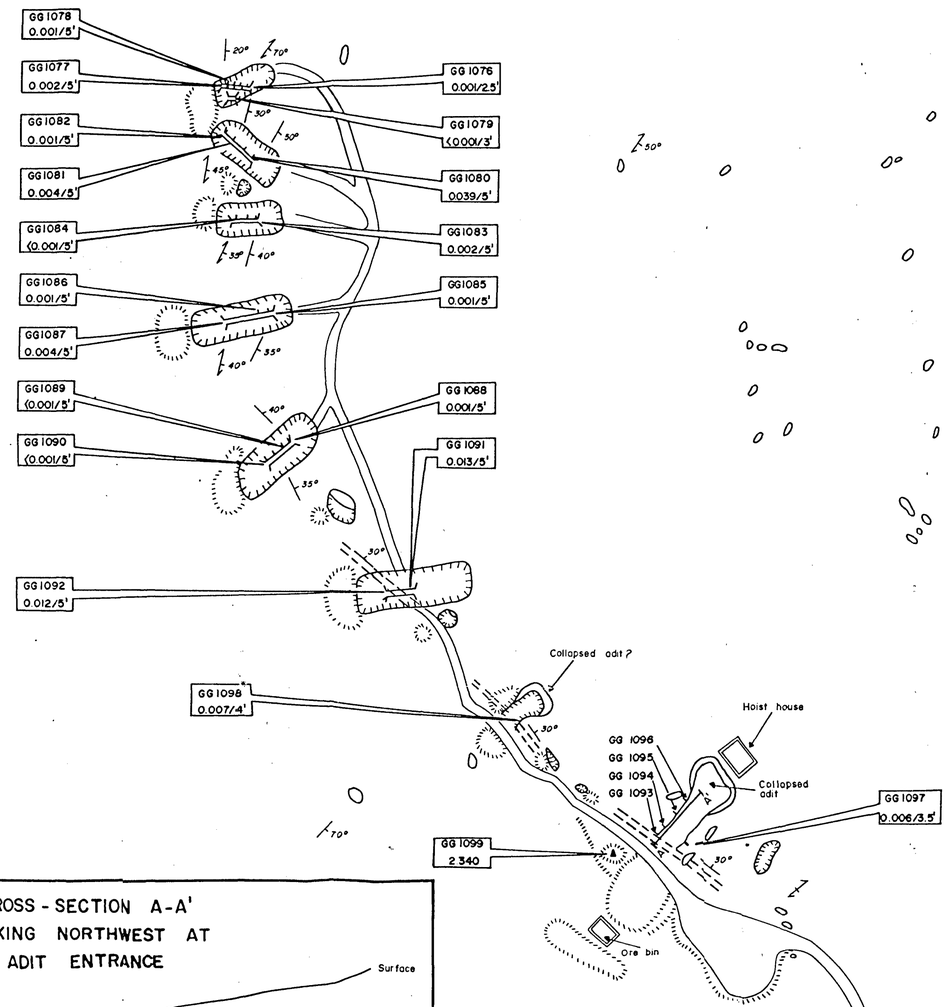
GOLD GULCH PROPERTY

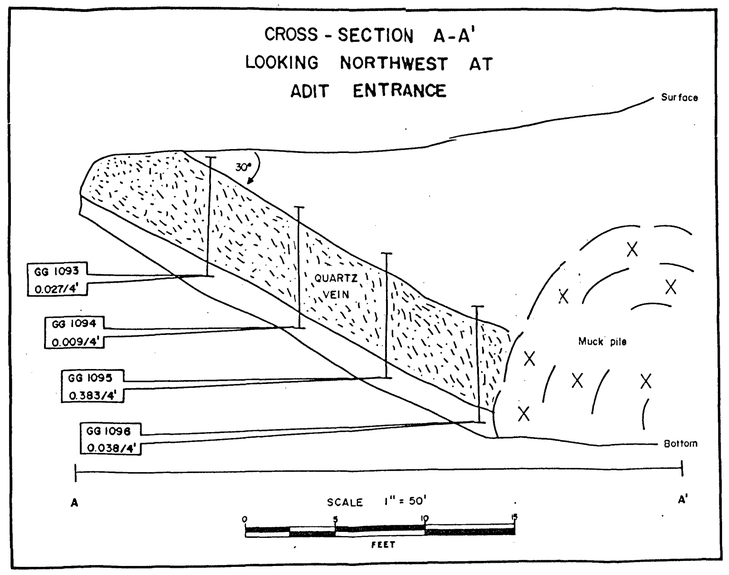
SCALE 1" = ~~500'~~ 30'

0 30 60 90

FEET

HOUDEN CLAIMS (DETAIL MAP No. 1)





BRAHMA RESOURCES INC.

GOLD GULCH PROPERTY

SCALE 1" = 500'

0 50 100 150

FEET

American Assay Laboratories

INVOICE

Remit To: P.O. Box 71060
Reno, NV 89570
Phone No.: 702-356-0606
Fax No.: 702-356-1413

AMERICAN ASSAY LABORATORIES
P. O. BOX 71060
RENO, NV 89570

(702) 356-0606

INVOICE NO: SP 0014190-IN
INVOICE DATE: 10/11/91

INVOICE TO:
ASARCO, INC.
P. O. BOX 5747
TUCSON AZ 85703

ASARCO, INC.
P. O. BOX 5747
TUCSON AZ 85703

CUSTOMER P.O.	PROJECT	TERMS
	HOUDEN	NET 30

QUANTITY	DESCRIPTION	PRICE	AMOUNT
19	SAMPLES RECEIVED	.00	.00
19	JAW CRUSHING CHARGE	1.20	22.80
19	SPLITTING CHARGE	.50	9.50
19	KEEGOR MILLING CHARGE	2.00	38.00
19	Au (2 A.T. FIRE ASSAY)	9.50	180.50
19	MULTI-ELEMENT ICP PACKAGE	9.90	188.10

ASARCO Incorp

OCT 17 1991

SW Exploration

APPROVED FOR PAYMENT

By:_____
(Signature)

NET INVOICE:	438.90
LESS DISCOUNT:	.00
FREIGHT:	.00
INVOICE TOTAL:	438.90

ANALYSIS REPORT

American Assay Laboratories Inc.

RENO: 1500 Glendale Ave,SPARKS 89431
P.O. Box 71060, RENO 89570
Ph (702)356 0606 Fax 3561413

ASARCO, INC.

REPORT : SP 014190 1 Page(s) Date : 10/10/91

Client reference : H-1/19 Project : HOUDEN

Cost code :

Copies to : JAMES D. SELL

WILLIAM W. SORSEN (RESULTS)

Samples : Type Preparation code
Received : 10/01/91

Analysis	Code	Quality Parameter	Detection	Units
Au	FA60	Acc. 15 %	5	ppb
Au(R)	FA60	Acc. 15 %	5	ppb

ASARCO Inc.

OCT 17 1991

SW Exploration

ANALYSIS REPORT

American Assay Laboratories Inc.

REPORT : SP 014190

Sample	Au ppb	Au(R) ppb
H-1	18	
H-2	47	
H-3	11	
H-4	33	
H-5	28	
H-6	22	
H-7	5	
H-8	600	
H-9	494	
H-10	25	
H-11	18	
H-12	542	
H-13	3154	
H-14	18550	20370
H-15	218	
H-16	730	
H-17	142	
H-18	58	
H-19	440	

Please refer to the cover sheet for further analysis details.

ASARCO Inc.

OCT 17 1991

SW Exploration

ANALYSIS REPORT

American Assay Laboratories Inc.

RENO: 1500 Glendale Ave,SPARKS 89431
P.O. Box 71060, RENO 89570
Ph (702)356 0606 Fax 3561413

ASARCO, INC.

REPORT : SP 014190 1 Page(s) Date : 10/10/91

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Cost code :

Copies to : JAMES D. SELL

WILLIAM W. SORSEN (RESULTS)

Samples : Type Preparation code
Received : 10/01/91

Analysis	Code	Quality Parameter	Detection	Units
Au	FA60	Acc. 15 %	5	ppb
Au(R)	FA60	Acc. 15 %	5	ppb

ASARCO Inc.

OCT 17 1991

SW Exploration

Signatory : Jorge Ugarte

ANALYSIS REPORT

American Assay Laboratories Inc.

REPORT : SP 014190

Sample	Au ppb	Au(R) ppb
H-1	18	
H-2	47	
H-3	11	
H-4	33	
H-5	28	
H-6	22	
H-7	5	
H-8	600	
H-9	494	
H-10	25	
H-11	18	
H-12	542	
H-13	3154	
H-14	18550	20370
H-15	218	
H-16	730	
H-17	142	
H-18	58	
H-19	440	

Please refer to the cover sheet for further analysis details.

ASARCO Inc.

OCT 17 1991

SW Exploration

CLIENT: ASARCO, INC.
CLIENT REF: HOUDEN
AAL REF: SP014190
METHOD: AAL 01-2

1500 GLENDALE AVE. SPARKS
NEVADA 89431
TELEPHONE (702) 356 0606
FACSIMILE (702) 356 1413

ASARCO Inc.
OCT 17 1991
SW Exploration

ELEMENT SAMPLES	Ag ppm	Al %	As ppm	B ppm	Ba ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Hg ppb	K %	La ppm	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P %	Pb ppm	Sb ppm	Sr ppm	Th ppm	Ti %	U ppm	V ppm	W ppm	Zn ppm
H-1	0.1	0.65	6	4	119	2	0.44	1	7	10	8	4.89	5	0.26	60	0.11	366	1	0.02	5	0.145	2	2	29	3	0.1	5	12	1	24
H-2	0.1	0.66	3	3	69	2	0.34	1	9	21	17	4.17	10	0.22	45	0.11	190	2	0.01	11	0.108	4	2	28	3	0.03	5	10	1	27
H-3	0.1	0.63	3	5	91	2	0.33	1	11	15	13	4.83	5	0.27	58	0.12	336	2	0.01	8	0.111	5	2	31	3	0.06	5	6	1	28
H-4	0.1	0.52	8	2	115	2	0.27	1	8	16	20	4.88	10	0.23	46	0.08	635	2	0.02	9	0.09	4	2	33	3	0.08	5	14	2	30
H-5	0.1	0.48	8	2	60	2	0.28	1	9	18	26	4.45	5	0.19	34	0.09	196	2	0.01	10	0.09	5	2	28	2	0.03	5	11	2	26
H-6	0.1	0.65	6	2	103	8	0.14	1	8	13	8	8.59	10	0.36	32	0.03	259	2	0.01	5	0.05	8	3	15	3	0.2	5	16	2	16
H-7	0.1	0.7	7	2	122	2	0.44	1	10	21	14	4.54	5	0.15	37	0.23	728	1	0.04	17	0.098	5	2	30	2	0.12	5	19	1	57
H-8	0.1	0.63	13	2	65	2	0.2	1	8	23	38	4.02	15	0.17	42	0.1	255	2	0.01	14	0.052	5	2	17	3	0.03	5	12	2	28
H-9	0.2	0.29	14	2	44	2	0.16	1	7	18	24	3.09	10	0.15	27	0.04	187	2	0.01	10	0.053	2	2	14	2	0.01	5	8	3	20
H-10	0.1	0.44	4	3	74	2	0.29	1	5	12	11	4.45	10	0.25	65	0.05	116	1	0.01	7	0.099	5	2	20	4	0.08	5	6	2	9
H-11	0.1	0.45	9	5	187	2	0.39	1	11	20	35	4.53	10	0.17	52	0.06	1606	1	0.03	13	0.128	6	2	40	2	0.05	5	14	1	28
H-12	0.2	0.18	8	2	51	2	0.06	1	7	22	35	2.63	15	0.09	11	0.02	440	2	0.01	12	0.017	9	2	8	2	0.01	5	7	2	14
H-13	0.8	0.22	16	3	46	7	0.1	1	7	20	182	2.5	95	0.11	13	0.05	327	2	0.01	11	0.033	5	51	11	2	0.01	5	6	2	21
H-14	4.6	0.13	105	2	77	5	0.01	1	16	18	77	5.37	15	0.08	5	0.01	109	437	0.01	11	0.012	42	2	25	2	0.01	5	17	2	5
H-15	0.2	0.42	9	2	121	2	0.23	1	8	16	53	3.62	5	0.23	41	0.05	489	12	0.03	10	0.073	8	2	22	2	0.03	5	9	1	11
H-16	0.4	0.23	9	2	62	2	0.08	1	9	19	58	2.45	5	0.13	14	0.03	303	2	0.01	12	0.024	3	2	9	2	0.01	5	7	1	7
H-17	0.2	0.14	2	4	41	2	0.03	1	9	21	22	2.25	5	0.09	3	0.01	201	3	0.01	11	0.008	2	2	4	2	0.01	5	6	2	6
H-18	0.1	0.21	10	2	58	2	0.08	1	26	16	32	2.04	5	0.12	9	0.02	417	2	0.01	12	0.016	3	2	9	2	0.01	5	8	1	7
H-19	0.2	0.32	39	2	53	2	0.07	1	23	14	58	2.77	5	0.16	22	0.03	216	13	0.01	10	0.032	9	2	99	2	0.01	5	13	2	7
STANDARD C	7.4	1.9	42	34	183	21	0.47	18.5	32	58	61	3.95	1500	0.15	39	0.88	1061	20	0.06	69	0.09	39	16	52	41	0.09	17	57	11	132
DETECTION:	0.2	0.01	2	2	2	2	0.01	0.2	1	1	1	0.01	5	0.01	2	0.01	1	1	0.01	1	0.01	2	2	1	2	0.01	5	2	1	1

0.500 GRAMS OF PULP IS DIGESTED WITH HYDROCHLORIC AND NITRIC ACID AT 95 DEGREE CENTIGRADE FOR ONE HOUR.
DIGEST IS PARTIAL FOR B Ba Ca Cr Fe La Mg Mn Sr Ti AND W
DIGEST IS LIMITED FOR Al K AND Na

American Assay Laboratories

JDS

ASARCO

Exploration Department
Southwestern United States Division
James D. Sell
Manager

October 17, 1991

Mr. Bill Sorsen
770 Sunset Drive
Globe, AZ 85501

Houden Mine Area
Sec. 1 & 2, T9N, R12E
Gila County, Arizona

Dear Bill:

I am returning all the data you loaned me, including the Brahma Resources report and the Spring Creek Mine report. I have Xeroxed an extra copy for you.

Also included are two maps (Attachments A & B) modified from the Brahma Resources maps, and having the Asarco H-series sample sites highlighted. Also attached is Table 1 which lists the Asarco sample descriptions and the gold-silver values. Table 2 is the assay results.

As you will note, the sample values are very similar to that reported to Brahma Resources. The important factor at the present time is the lack of any values in either the hanging wall or footwall units sampled.

You should have received your copy of the assay results directly from American Assay Laboratory, Sparks, Nevada, and in looking over them, I do not note any increased values of other elements in the samples.

I thank you for the opportunity of reviewing all the data, including the Spring Creek report.

I believe most of the placer gold found in the area is coming from the known quartz-gold veins in the district. Without some gold in the wall-rocks, and present sample shows none, or the finding of a stockwork zone of abundant quartz-gold structures, it is not encouraging for the type of deposit Asarco is looking for at this time.

ASARCO Incorporated P.O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue FAX (602) 792-3934 Phone (602) 792-3010

Perhaps I'll have some time later to follow up for additional veins and stockwork of interest.

Thank you for showing the property and sharing your knowledge of the district.

Sincerely,

James D. Sell

James D. Sell

JDS:mek
Atts.

cc: W.L. Kurtz

Table 1. Houden Mine Area - Sample Descriptions and Assays

September 29, 1991

A. Houden Shaft Area: Attachment A

A-a. Series, 270' NW of shaft; 5th bulldozer trench.

H-1. 6' cut in HW, sheared volcanic flows and volcanic conglomerate - breccia.
Au 18 ppb Ag 0.1 ppm

H-2. 4' cut of vein, crushed, sheared, green altered "tuff," with hematite-quartz.
Au 47 ppb Ag 0.1 ppm

H-3. 5' cut in FW, massive, weakly sheared volcanic flows with minor quartz veins and hematite-filled vugs.
Au 11 ppb Ag 0.1 ppm

A-b. Series, 220' NW of shaft; 3rd bulldozer trench.

H-4. 8' cut in HW, purple volcanic debris and flows with some shearing and narrow +"-1" quartz seams.
Au 33 ppb Ag 0.1 ppm

H-5. 4' cut of vein, stockwork, sheared quartz, hematite vugs, in bleached (altered volcanic flow).
Au 28 ppb Ag 0.1 ppm

H-6 20' cut in FW, grey-purple volcanic slate and tuff breccia, few quartz-hematite seams.
Au 22 ppb Ag 0.1 ppm

A-c. Series, 120' NW of shaft, 1st bulldozer trench.

H-7. 25' cut in HW, grey-green volcanic breccia, conglomerate, and purple volcanic flows.
Au 5 ppb Ag 0.1 ppm

H-8. 6' cut of vein, crushed gouge, quartz-hematite breccia in "tuff."
Au 600 ppb (0.018 opt) Ag 0.1 ppm

H-9. 3' cut of vein, quartz seams and zones of massive hematite-quartz, vuggy purple laminated, sheared flows.
Au 494 ppb (0.015 opt) Ag 0.2 ppm

Table 1. Houden Mine Area - Sample Descriptions and Assays

September 29, 1991

H-10. 6' cut in FW, grey purple porphyritic volcanic breccia and flows with few ¼" quartz-limonite vugs and seams.
Au 25 ppb Ag 0.1 ppm

A-d. Series, 65' NE of shaft, at caved inclined adit.

H-11. 6' cut in HW, bleached yellow-brown to purple volcanic breccia and air-fall tuff with numerous pebbles and conglomerate layers. (Pebble zones at high-angle to pseudo-bedding.)
Au 18 ppb Ag 0.1 ppm

H-12. 6' cut of vein. Massive quartz crosscut by hematite-quartz breccia zones. (Note: HW has fractures suggesting pseudo-bedding subparallel to the massive quartz banding.) (See Attachment A for attitudes.)
Au 542 ppb (0.016 opt) Ag 0.2 ppm

A-e. Series, Houden shaft ore pile.

H-13. Grab sample of ore pile, abundant quartz seams and massive quartz in silicified tuff-type volcanic. Some copper stain.
Au 3154 ppb (0.09 opt) Ag 0.8 ppm (0.02 opt)

B-a. South vein or New Deal Vein Area. Attachment B.

H-14. Grab sample of ore pile from 5' steep quartz vein. Silicified volcanic tuff, air-fall?, water-worked, with quartz stockwork veinlets 1"-3" in thickness throughout.
Au 18,550 ppb (0.55 opt) Ag 4.6 ppm (0.14 opt)

B-b. In creek bed at base of hill to east.

H-15. 20' cut in FW, green-purple, steep dipping volcanic flow-type with yellow-brown FeOx seams and minor 1" quartz seams.
Au 21 ppb Ag 0.2 ppm

H-16. 5' cut of steep vein, silicified, minor quartz seams in green volcanics flow-type.
Au 730 ppb (0.021 opt) Ag 0.4 ppm

H-17. 4' cut of steep vein, massive quartz with specular hematite, and oxidized pyrite vugs.
Au 142 ppb Ag 0.2 ppm

Table 1. Houden Mine Area - Sample Descriptions and Assays

September 29, 1991

B-c. Along road cut above creek bed.

H-18. 3' vertical cut of vein, flat-dipping, massive quartz with hematite seams and staining.
Au 58 ppb Ag 0.1 ppm

H-19. 10' cut, horizontal in FW, sheared "tuff" type with vertical ¼"-1" quartz veinlets, and red-brown-yellow FeOx.
Au 440 ppb (0.013 opt) Ag 0.2 ppm

CLIENT: ASARCO, INC.
CLIENT REF: [illegible]
FILE REF: [illegible]
PROJECT: ALL 01-2

1500 GLENDALE AVE. SPARKS
NEVADA 89431
TELEPHONE (702) 356 0606
FACSIMILE (702) 356 1413

ASARCO Inc.
OCT 17 1991
SW Exploration

ELEMENT / SAMPLES	Ag ppm	Al %	As ppm	B ppm	Ba ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Hg ppb	K %	La ppm	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P %	Pb ppm	Sb ppm	Sr ppm	Th ppm	Ti %	U ppm	V ppm	W ppm	Zn ppm
H-1	0.1	0.65	6	4	119	2	0.44	1	7	10	8	4.89	5	0.26	60	0.11	366	1	0.02	5	0.145	2	2	29	3	0.1	5	12	1	24
H-2	0.1	0.66	3	3	69	2	0.34	1	9	21	17	4.17	10	0.22	45	0.11	190	2	0.01	11	0.108	4	2	28	3	0.03	5	10	1	27
H-3	0.1	0.63	3	5	91	2	0.33	1	11	15	13	4.83	5	0.27	58	0.12	336	2	0.01	8	0.111	5	2	31	3	0.06	5	6	1	28
H-4	0.1	0.52	8	2	115	2	0.27	1	8	16	20	4.88	10	0.23	46	0.08	635	2	0.02	9	0.09	4	2	33	3	0.08	5	14	2	30
H-5	0.1	0.48	8	2	60	2	0.28	1	9	18	26	4.45	5	0.19	34	0.09	196	2	0.01	10	0.09	5	2	28	2	0.03	5	11	2	26
H-6	0.1	0.65	6	2	103	8	0.14	1	8	13	8	8.59	10	0.36	32	0.03	259	2	0.01	5	0.05	8	3	15	3	0.2	5	16	2	16
H-7	0.1	0.7	7	2	122	2	0.44	1	10	21	14	4.54	5	0.15	37	0.23	728	1	0.04	17	0.098	5	2	30	2	0.12	5	19	1	57
H-8	0.1	0.63	13	2	65	2	0.2	1	8	23	38	4.02	15	0.17	42	0.1	255	2	0.01	14	0.052	5	2	17	3	0.03	5	12	2	28
H-9	0.2	0.29	14	2	44	2	0.16	1	7	18	24	3.09	10	0.15	27	0.04	187	2	0.01	10	0.053	2	2	14	2	0.01	5	8	3	20
H-10	0.1	0.44	4	3	74	2	0.29	1	5	12	11	4.45	10	0.25	65	0.05	116	1	0.01	7	0.099	5	2	20	4	0.08	5	6	2	9
H-11	0.1	0.45	9	5	187	2	0.39	1	11	20	35	4.53	10	0.17	52	0.06	1606	1	0.03	13	0.128	6	2	40	2	0.05	5	14	1	28
H-12	0.2	0.18	8	2	51	2	0.06	1	7	22	35	2.63	15	0.09	11	0.02	440	2	0.01	12	0.017	9	2	8	2	0.01	5	7	2	14
H-13	0.8	0.22	16	3	46	7	0.1	1	7	20	182	2.5	95	0.11	13	0.05	327	2	0.01	11	0.033	5	51	11	2	0.01	5	6	2	21
H-14	4.6	0.13	105	2	77	5	0.01	1	16	18	77	5.37	15	0.08	5	0.01	109	437	0.01	11	0.012	42	2	25	2	0.01	5	17	2	5
H-15	0.2	0.42	9	2	121	2	0.23	1	8	16	53	3.62	5	0.23	41	0.05	489	12	0.03	10	0.073	8	2	22	2	0.03	5	9	1	11
H-16	0.4	0.23	9	2	62	2	0.08	1	9	19	58	2.45	5	0.13	14	0.03	303	2	0.01	12	0.024	3	2	9	2	0.01	5	7	1	7
H-17	0.2	0.14	2	4	41	2	0.03	1	9	21	22	2.25	5	0.09	3	0.01	201	3	0.01	11	0.008	2	2	4	2	0.01	5	6	2	6
H-18	0.1	0.21	10	2	58	2	0.08	1	26	16	32	2.04	5	0.12	9	0.02	417	2	0.01	12	0.016	3	2	9	2	0.01	5	8	1	7
H-19	0.2	0.32	39	2	53	2	0.07	1	23	14	58	2.77	5	0.16	22	0.03	216	13	0.01	10	0.032	9	2	99	2	0.01	5	13	2	7
STANDARD C	7.4	1.9	42	34	183	21	0.47	18.5	32	58	61	3.95	1500	0.15	39	0.88	1061	20	0.06	69	0.09	39	16	52	41	0.09	17	57	11	132
DETECTION:	0.2	0.01	2	2	2	2	0.01	0.2	1	1	1	0.01	5	0.01	2	0.01	1	1	0.01	1	0.01	2	2	1	2	0.01	5	2	1	1

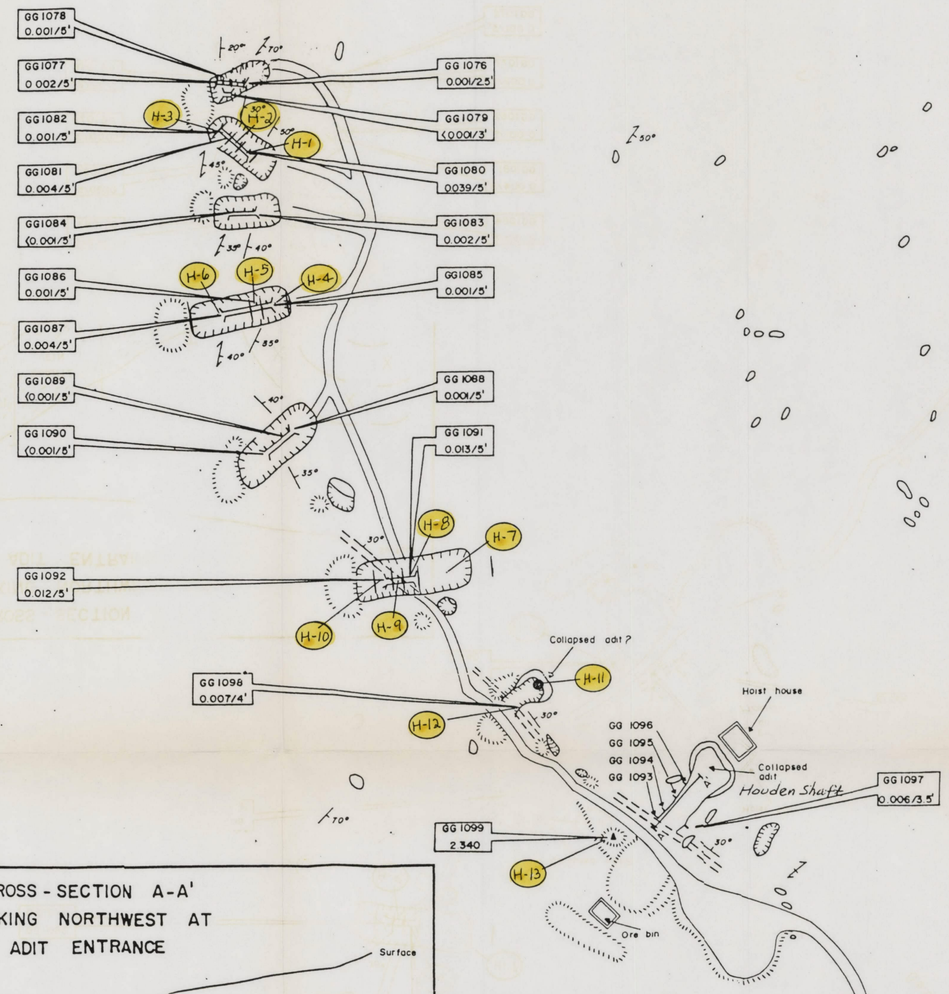
0.500 GRAMS OF PULP IS DIGESTED WITH HYDROCHLORIC AND NITRIC ACID AT 95 DEGREE CENTIGRADE FOR ONE HOUR.
DIGEST IS PARTIAL FOR B Ba Ca Cr Fe La Mg Mn Sr Ti AND W
DIGEST IS LIMITED FOR Al K AND Na

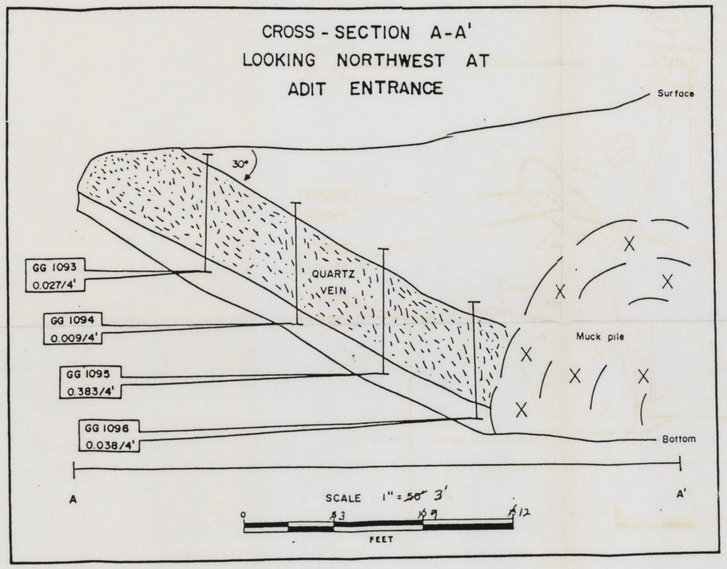
TABLE 2 - ASSAYS

American Assay Laboratories

ATTACHMENT A

HOUDEN CLAIMS (DETAIL MAP No. I)





ASARCO Incorporated SOUTHWEST EXPLORATION DEPT.

HOUDEN MINE AREA

HOUDEN SHAFT AREA

SAMPLE SITES H-1 THRU H-13

J.D.SELL 09/28/91

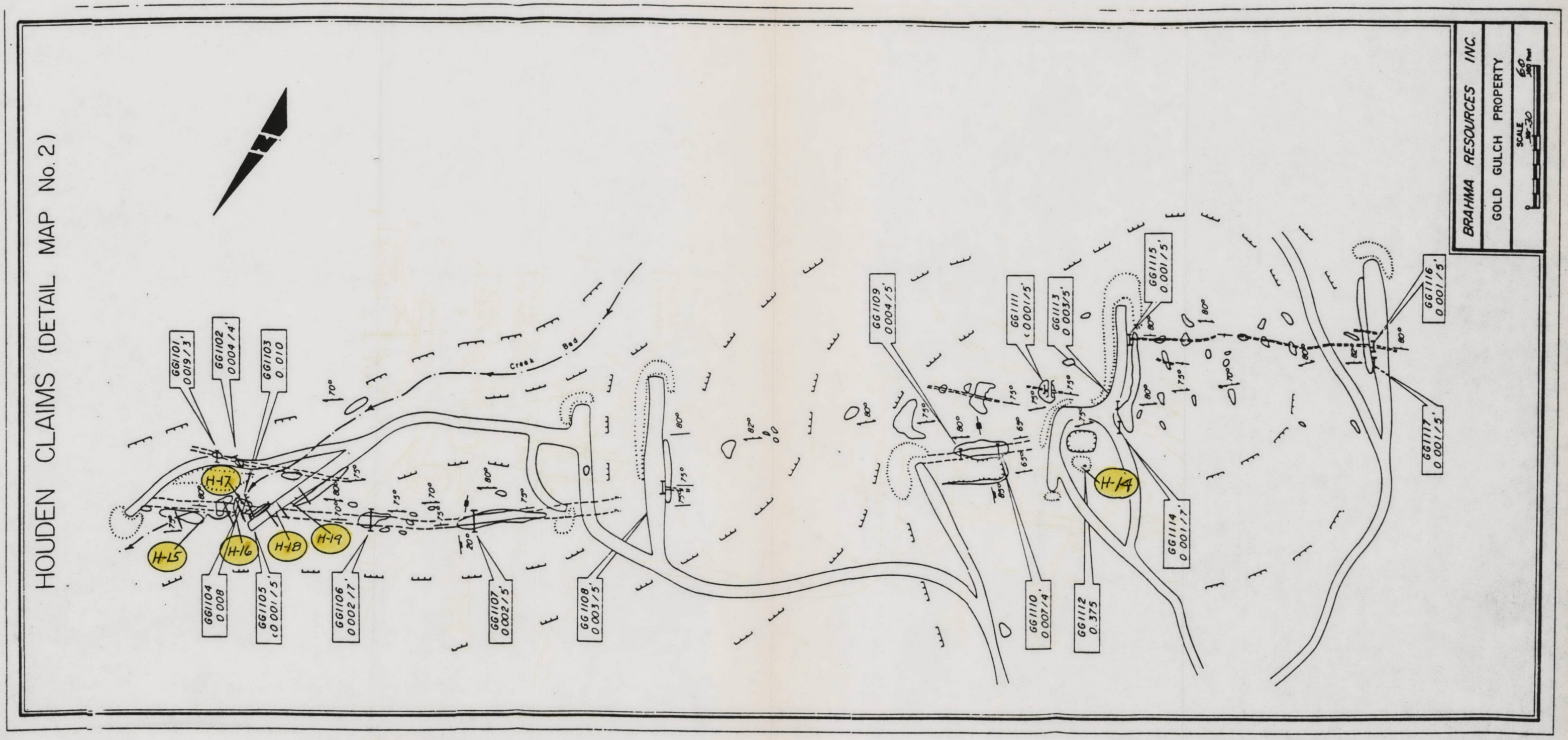
mn HM911003 JDS/DAM tuc 10/02/91

BRAHMA RESOURCES INC.

GOLD GULCH PROPERTY

SCALE 1" = 600' 30'

FEET



ASARCO Incorporated SOUTHWEST EXPLORATION DEPT.
HOUDEN MINE AREA
SOUTH VEIN AREA (NEW DEAL VEIN)
SAMPLE SITES H-14 THRU H-19

J.D.SELL 09/28/91

mn HM911002 JDS/DAM tuc 10/02/91