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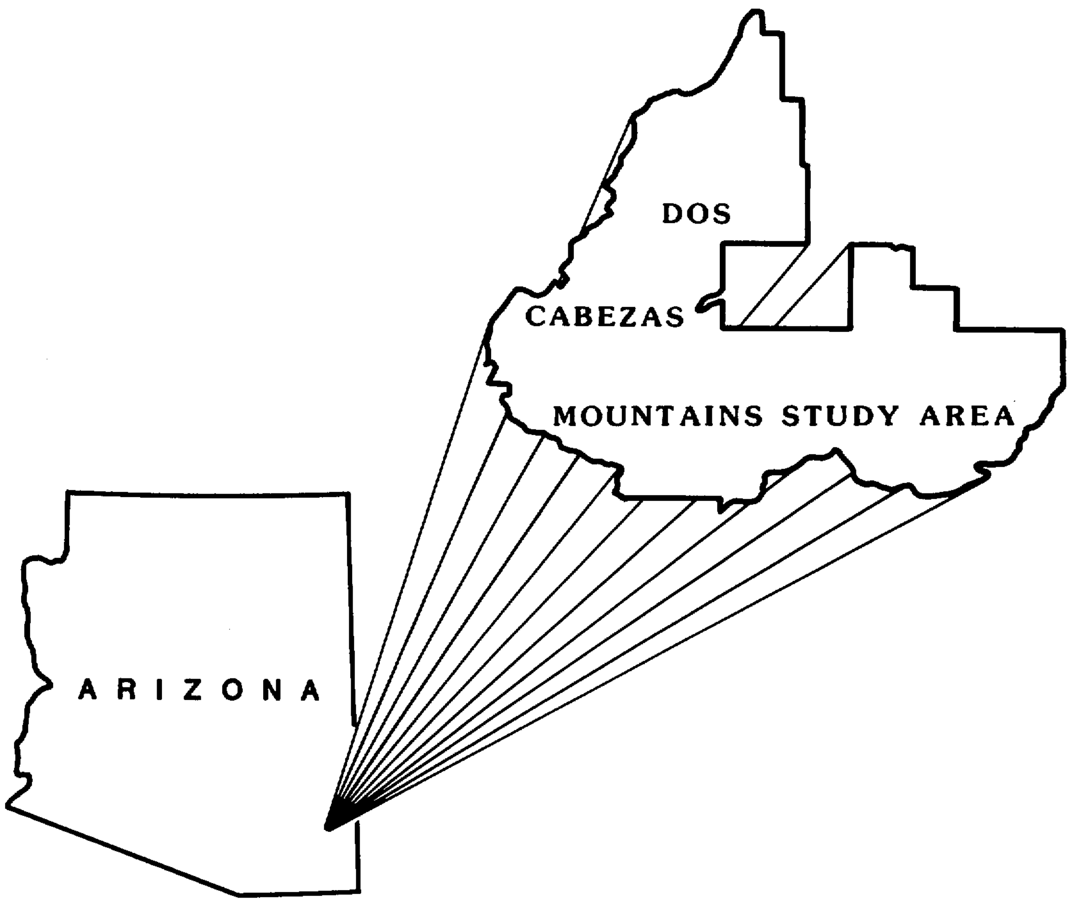
Mineral Resources of a Part of the Dos Cabezas Mountains Wilderness Study Area (AZ-040-065), Cochise County, Arizona



BUREAU OF MINES
UNITED STATES DEPARTMENT OF THE INTERIOR

MINERAL RESOURCES OF A PART OF THE DOS CABEZAS MOUNTAINS WILDERNESS STUDY AREA (AZ-040-065), COCHISE COUNTY, ARIZONA

by

Jeanne E. Zelten

MLA 2-86
1986

Intermountain Field Operations Center, Denver, Colorado

UNITED STATES DEPARTMENT OF THE INTERIOR
Donald P. Hodel, Secretary

BUREAU OF MINES
Robert C. Horton, Director

PREFACE

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine the mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of a part of the Dos Cabezas Mountains Study Area (AZ-040-065), Cochise County, Arizona.

This open-file report summarizes the results of a Bureau of Mines wilderness study. The report is preliminary and has not been edited or reviewed for conformity with the Bureau of Mines editorial standards. This study was conducted by personnel from the Branch of Mineral Land Assessment (MLA), Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, CO 80225.

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UNITS OF MEASURE ABBREVIATIONS USED IN THIS REPORT

°	degrees	oz	troy ounces(s)
ft	foot, feet	oz/st	troy ounce(s) per short ton
ft^3/st	cubic feet per short ton	ppm	parts per million
in.	inch(es)	%	percent
mi	mile(s)		

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SUMMARY

The Dos Cabezas Mountains Wilderness Study Area covers 18,509 acres in the Dos Cabezas Mountains of southeastern Arizona, approximately 3 1/2 mi southwest of Bowie and about 15 mi east of Willcox, AZ. In 1984 and 1985, the Bureau of Mines conducted a mineral investigation of the 11,921 acres of the Wilderness Study Area that were preliminarily designated as suitable for inclusion in the National Wilderness Preservation System, as required under the Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976).

The study area is included in the Dos Cabezas and Teviston mining districts where lode and placer mining have been carried out since the late 1800's. Mining claims cover about ten percent of the western part of the study area, but no mineral production has been recorded from them.

Geologic formations and structures in the Dos Cabezas Mountains align in broad northwest-trending belts. Intrusive and volcanic rocks of Precambrian age underlie about 60 percent of the study area; Cretaceous and Tertiary age sedimentary and igneous rocks cover the rest. The Apache Pass fault zone, a high-angle reverse fault that trends northwest, dips steeply southwest, and roughly parallels the southern study area boundary, was a major structural feature controlling mineralization in the Dos Cabezas Mountains.

Structures related to the Apache Pass fault zone contain base- and precious-metal-bearing sulfide deposits, tungsten deposits, uranium occurrences, and high-purity precious-metal-bearing quartz veins.

Ore-bearing structures dip away from and are not present in the study area. Faults and veins branching from the main fault zone may extend at depth into the area and could be mineralized.

High-purity precious-metal-bearing quartz veins are exposed in the study area. A flat-lying quartz vein capping the southern part of Rough Mountain, in the northwestern part of the study area, contains at least 580,000 short tons of material that could be mined by surface methods and has resource value as silica smelter flux. Because of the currently depressed U.S. copper industry the demand for smelter flux is low. The Rough Mountain vein and other high-purity quartz veins in the study area contain minor amounts of silver and gold, that may be recoverable at a smelter. Until the price of copper increases sufficiently to restart smelter operations, these veins will be unmined.

INTRODUCTION

In 1984 and 1985, the Bureau of Mines, in a cooperative program with the U.S. Geological Survey (USGS), studied the mineral resources of a part of the Dos Cabezas Mountains Wilderness Study Area (WSA), Cochise County, Arizona. These lands are administered by the Bureau of Land Management (BLM). The WSA comprises 18,509 acres, of which the Bureau studied the 11,921 acres deemed preliminarily suitable for inclusion in the National Wilderness Preservation System. "Study area" as used in this report refers only to the smaller area. The Bureau surveys and studies mines, prospects, and mineralized areas to appraise reserves and identified subeconomic resources. The USGS assesses the potential for undiscovered mineral resources based on regional geological, geochemical, and geophysical surveys. This report presents the results of the Bureau of Mines study. The USGS will publish the results of their studies. A joint USGS-Bureau report, to be published by the USGS, will integrate and summarize the results of studies by both agencies.

Geographic setting

The Dos Cabezas Mountains study area, which covers 11,921 acres in the Dos Cabezas Mountains of southeastern Arizona, is approximately 3 1/2 mi southwest of Bowie and about 15 mi east of Willcox, AZ (fig. 1). Several unpaved roads provide access to the area from Interstate Highway 10 to the north and from Arizona Highway 186 to the south.

The study area is in the Mexican Highland section of the Basin and Range physiographic province (Thornbury, 1967, p. 471). Elevations range from about 4,080 ft at the northeastern tip of the study area to 7,950 ft on the summit of Cooper Peak (pl. 1). Rugged peaks and steep canyons characterize most of the area. The topography becomes more moderate near the northern and eastern boundaries. Vegetation includes desert shrubs, scrub grass, and cactus at lower elevations, and mountain shrubs, juniper, oak, and pinon at higher elevations.

Several intermittent streams, most of which empty into Happy Camp Canyon, drain the study area. The northern, southern, and western boundaries follow ridges above the Happy Camp Canyon drainage, but exclude patented mining claims. The eastern boundary follows legal subdivisions and Sheep Canyon, and excludes private property.

Previous studies

Tungsten deposits in the Dos Cabezas Mountains were described by Dale and others (1960). The geology of the study area was mapped by Drewes (1980; 1985). The geology was mapped and geochronology of the Dos Cabezas Mountains, including the study area, was studied by Erickson (1968). Gold mining near

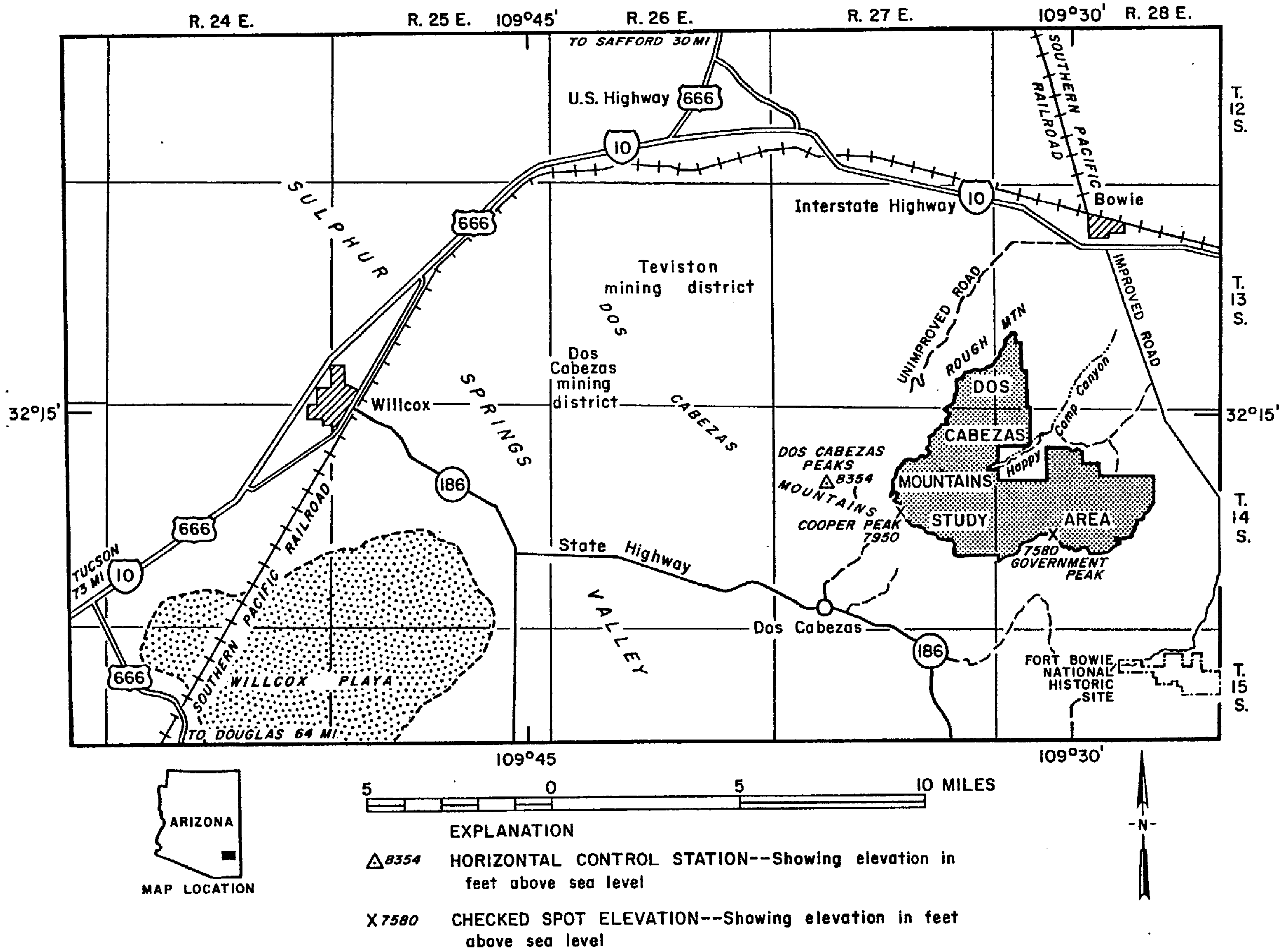

Figure 1.--Index map of the Dos Cabezas Mountains study area, Cochise County, Arizona.

the study area was discussed by Johnson (1972) and Wilson (1934; 1937). Mining properties and mineral deposits near the study area were described by Keith (1973) and Richter and Lawrence (1983).

Method of evaluation

Prior to field investigations in 1984 and 1985, Bureau geologists reviewed published and unpublished literature for minerals information regarding the Dos Cabezas Mountains study area. Residents and personnel from the Bureau, BLM, and USGS were interviewed regarding minerals in and near the area. BLM and county records were examined for locations of patented and unpatented mining claims and mineral leases.

Two Bureau geologists spent thirteen days in January and February 1984, conducting a field examination in and within 1 mi of the study area. An additional 5 field days were required in September 1985, after the study area was enlarged by the acquisition of private land by the BLM. Mines, prospects, and mineralized areas were mapped and sampled. Chip samples were taken at workings and across outcrops of altered and mineralized areas; grab or select samples were taken of mine dump material. Fifty-eight samples were taken and analyzed by fire assay or fire assay-atomic absorption spectrophotometry for gold and silver. Samples were analyzed by x-ray fluorescence or colorimetry for tungsten; by inductively coupled plasma (ICP) spectrometry or atomic absorption for beryllium, bismuth, copper, iron, lead, lithium, manganese, molybdenum, silica, titanium, and zinc, when minerals containing these elements were identified or suspected. Twenty-three samples were analyzed by semiquantitative optical emission spectrography for 40 elements (appendix).

Fire assay, x-ray fluorescence, ICP, and emission spectrographic analyses were performed by the Bureau of Mines Reno Research Center, Reno, Nevada.

Fire assay-atomic absorption, colorimetric, and atomic absorption analyses were performed by Barringer Resources Inc., Wheat Ridge, Colorado.

Geologic setting

Precambrian through Tertiary sedimentary, igneous, and metamorphic rocks are exposed throughout the Dos Cabezas Mountains and crop out in the Dos Cabezas study area. The Apache Pass fault zone, a major fault system influencing mineralization in the Dos Cabezas Mountains, slightly overlaps the southern study area boundary. Base and precious metals have been produced from mines in the fault zone and associated structures. The Dos Cabezas Mountains are in a proposed extension through southern Arizona of the oil- and gas-rich Overthrust Belt.

Geologic formations in the Dos Cabezas Mountains crop out in northwest-trending belts. A northwest-trending belt of older Precambrian intrusive and volcanic rocks covers about the central 60% of the study area. These older Precambrian rocks are included in the Pinal Schist, which consists of phyllites, schists, metaquartzite, metarhyolite, metadacite, and meta-andesite. Younger Precambrian granite and amphibolite are exposed mostly in the northwestern and southeastern parts of the study area. A narrow band of Mississippian through Cretaceous age sedimentary rocks, that extends not more than about 2,000 ft into the study area, crops out for about 1 1/4 mi along the southern boundary. These sedimentary rocks, which dip steeply to the southwest, consist of thinly bedded limestone, shale, sandstone, siltstone, graywacke, and conglomerate. Cretaceous and Tertiary volcanic rocks, exposed in the southwestern part and covering about 30% of the study area, are intrusives, flows, and breccias of acidic to intermediate composition. A Tertiary granitic intrusive, exposed in the northeastern part of the study area, covers about 10% of the area. Tertiary rhyolite porphyry and diabase dikes and quartz veins are exposed in the western and southern parts of the study area. (See Drewes, 1980, 1985; Erickson, 1968.)

The Apache Pass fault zone (pl. 1) is a regional high-angle reverse-fault system that trends northwest, dips steeply to the southwest, and was a major structural feature controlling mineralization in the Dos Cabezas Mountains. This zone roughly parallels and partly overlaps the southern study area boundary. Steeply west-dipping Cambrian through Tertiary sedimentary and volcanic rocks are exposed throughout the fault zone. Northwest-trending and steeply southwest-dipping Tertiary rhyolite intrusives and quartz veins are also present. The fault zone continues for almost 10 mi to the northwest and almost 30 mi southeast of the study area. Near the study area this fault zone is about 1/2 mi wide and consists of two major parallel faults and numerous subsidiary faults. These smaller subsidiary faults branch from, and some younger faults slightly offset, the major faults. Initial movement along the Apache Pass fault zone was probably during the Precambrian; the movement has recurred several times since. Breccia pipes, quartz veins, small stocks, and other intrusives in and near the fault zone are indications of a general geologic influence of the fault zone. (See Drewes, 1980, 1985; Erickson, 1968; Wilson and others, 1969.)

Sulfide mineral deposits, common in the Apache Pass fault zone, produced substantial amounts of base and precious metals, predominantly copper and gold (table 1). Mines, prospects, and mineral occurrences, all common along the fault zone, are in breccia pipes, small stocks, or quartz veins. Most of the veins dip away from the study area. Colluvium inhibited tracing the mineral occurrences very far beyond the workings examined. Mines in the fault zone and

Table 1.--Major mines within 1 mi of the Dos Cabezas Mountains study area, Cochise County, Arizona.

[Underlined metal is major commodity from each mine.]

Property name and location	Description	Development	Past production	Mineralization observed	References
Austin Mine - near head of Wood Canyon, about 1/2 mi south of study area.	Originally located for gold. Scheelite, discovered in 1943, occurs in veinlets and a quartz pod near contact of silicified limestone and schist in Apache Pass fault zone.	2 adits (150 ft and 200 ft), 85-ft-deep shaft, several pits.	Gold, copper, lead, zinc, in early 1900's. Remaining ore estimated to contain 1-3% WO_3, 3% lead, traces of copper, gold, silver.	Bornite, chalcopyrite, galena, malachite, pyrite, gray-streaked quartz, minor hematite and manganese oxide staining.	BLM files (Safford, AZ) Bureau files (Denver, CO Richter and Lawrence, 19
Buckeye Mine (part of Buckeye Apache Mine Group) - in Buckeye Canyon, about 1 mi west of study area.	Sulfide-rich quartz veins in Precambrian granite. Veins strike north, dip west, contain gold, silver, galena, pyrite.	Adits, shafts, and open cuts; more than 2,000 ft of underground workings.	Records vary from 4,000 to 10,000 tons of gold, silver, lead ore, from late 1800's through 1940's.	Not observed.	BLM files (Safford, AZ) Bureau files (Denver, CO Keith, 1973 Richter and Lawrence, 19
Elma Mine (part of Mascot Group) - about 1 mi west of study area.	Base-metal sulfides in breccia pipe. Shear zone in brecciated and metamorphosed Paleozoic limestone and Laramide rhyolitic and granitic rocks.	Adit, several shafts; more than 5,000 ft of underground workings.	More than 8,000 tons of copper ore, containing gold, molybdenum, and silver, from late 1910's through 1960's.	Masses of pyrite, magnetite, chalcopyrite, often tens of feet across. Bornite, chalcocite, chalcopyrite.	BLM files (Safford, AZ) Keith, 1973 Richter and Lawrence, 19
Gold Prince Mine - near head of Bean Canyon, about 1 mi south of study area.	NW-striking, SW-dipping quartz veins in Apache Pass fault zone contain pyrite and gold-bearing base-metal sulfides.	Adits and shafts; more than 3,000 ft of underground workings, at least 750 ft deep, several levels.	More than 10,000 tons of gold ore, between 1900 and 1950. Copper, lead, silver, zinc.	Not observed.	BLM files (Safford, AZ) Keith, 1973 Richter and Lawrence, 19 Wilson, 1934
Mascot Mine Group - in Mascot Canyon, about 3/4 mi southwest of study area.	Veins and replacement deposits in faulted and metamorphosed Paleozoic limestone and sedimentary and Laramide volcanic rocks intruded by granite plutons.	Adits, shafts, and and prospects. More than 4,000 ft of underground workings - now mostly caved or flooded	About 60,000 tons of ore, between 1910 and mid-1950's. Copper, gold, silver, bismuth,iron, lead.	Bornite, chalcopyrite, galena, magnetite, pyrite occur with chlorite, epidote, garnet, talc, in irregular veins and masses. Abundant azurite, chrysocolla, hematite, magnetite.	BLM files (Safford, AZ) Keith, 1973 Richter and Lawrence, 19

associated structures were not examined to identify resources because the mineralized structures do not trend toward the study area. Where the Apache Pass fault zone crosses the southern part of the study area, there are no mines or prospects and there is no surface evidence of mineralization similar to that south and west of the area.

The Overthrust Belt, an oil- and gas-rich zone in western Wyoming, northern Utah, and Mexico, has been proposed to extend south through Utah and across western and southern Arizona, including the Dos Cabezas Mountains study area (Keith, 1979, p. 11). Precambrian igneous and metamorphic rocks cover much of the study area and are not suitable source or reservoir rocks for hydrocarbons. The Paleozoic through Cenozoic sedimentary and volcanic rocks that cover the rest of the area have been intruded by plutons, cut by faults, veins, and dikes, and therefore also would not be suitable reservoirs.

MINING HISTORY AND ACTIVITY

The study area is included in the Dos Cabezas and Teviston (or Tevis) mining districts from which base and precious metals have been mined within 1 mi of the study area since the late 1800's. Placer gold has been mined from gulches throughout these mining districts. Tungsten was mined south of the study area. Exploration for porphyry copper deposits has been carried on in areas adjacent to the western boundary. Quartz is being mined south of the area for use as smelter flux; gold is being recovered from the quartz. Lode mining claims, uranium claims, and oil and gas leases have been staked in and near the study area.

The Dos Cabezas mining district covers the southern slopes of the Dos Cabezas Mountains and the Teviston district the northern slopes. Lode and placer mining have been carried out in these districts but there is no record or other evidence of mining within the study area. Since the 1950's mining activity in the region has been minimal. Lode mining through 1970 has yielded slightly over 100,000 tons of ore, mainly from the Dos Cabezas district. This production includes about 2,000 tons of copper, 700 tons of lead, 19 tons of zinc, 430,000 oz of silver, and 10,000 oz of gold, for a total value of $1.775 million. In addition to the above, minor amounts of beryl, fluorspar, iron, manganese, tungsten, and uranium also were recovered. (See Bureau files, Denver, CO; Keith, 1973, p. 8; Richter and Lawrence, 1983, p. 53.)

More than 1,000 oz of placer gold has been mined intermittently throughout the Dos Cabezas and Teviston mining districts (Johnson, 1972, p. 84). Placer gold occurs in small quantities in many of the gulches throughout the districts and probably came from the gold-bearing quartz veins and stringers that are in the Mesozoic and older rocks outside the study area (Wilson, 1937, p. 69). Several placer claims are in Buckeye Canyon, about 1 mi northwest of the boundary. No placer mining or prospecting has been carried out in the study area.

Unrecorded quantities of scheelite, a tungsten ore mineral, have been produced from several mines within 2 mi south of the study area (sec. 28-30, T. 14 S., R. 28 E.). The Austin Mine (table 1, pl. 1) is the closest of these mines to the study area. These mines are in the Apache Pass fault zone and originally were worked for copper, gold, lead, silver, and zinc. Most of the scheelite occurrences are in or adjacent to quartz pods or veins which strike northwest to northeast and dip vertically or steeply to the south. Scheelite is found in quartz: 1) in weathered volcanic rocks; 2) along shear zones in limestone; 3) with epidote in sheared metamorphic rocks; 4) in sedimentary rocks with wollastonite; 5) in tactite zones (skarns); and 6) in fissure veins

(Dale and others, 1960, p 6-26). The formations and structures at these mines are truncated by the Apache Pass fault zone and do not extend along the surface into the study area (Drewes, 1985).

Although there are no mines inside the study area, quartz veins, volcanic rocks, and dikes have been prospected (figs. 2-3; table 2). There is no evidence of placer prospecting or mining in the study area. Major mines within 1 mi of the study area are described in table 1 and shown on plate 1. Miscellaneous mineral occurrences are in brecciated volcanics, skarns, faults, fractures, dikes, and quartz veins (figs. 4-5; tables 3-4).

From 1973 through 1975, U.S. Borax and Chemical Corporation explored for the possibility of a deeply-buried porphyry copper deposit in an area west of the study area, specifically between Dos Cabezas Peaks, the Mascot Mine, Cooper Peak, and the Elma Mine (pl. 1). Drilling, carried out in 1975 as part of this project, did not reveal the presence of such a deposit, and exploration was discontinued. (Michael Rauschkolb, U.S. Borax and Chemical Corporation, Tucson, AZ, oral and written commun., 1985.)

The most recent mining activity is that of Phelps Dodge Corporation, which has reopened the Gold Prince Mine, on patented claims, about 1 mi south of the study area (pl. 1). They are mining (May 1985) high-purity (80% or greater silica) vein quartz for use as smelter flux in their Douglas, AZ, copper smelter. Gold in unreported quantities also is being recovered from this quartz (Michael Pawlowski, geologist, Phelps Dodge Corporation, oral commun., 1984).

Currently (May 1985), some of the western part of the study area is covered by unpatented mining claims, and both patented and unpatented claims are along and within 1 mi of the western boundary (pl. 1). Current claims

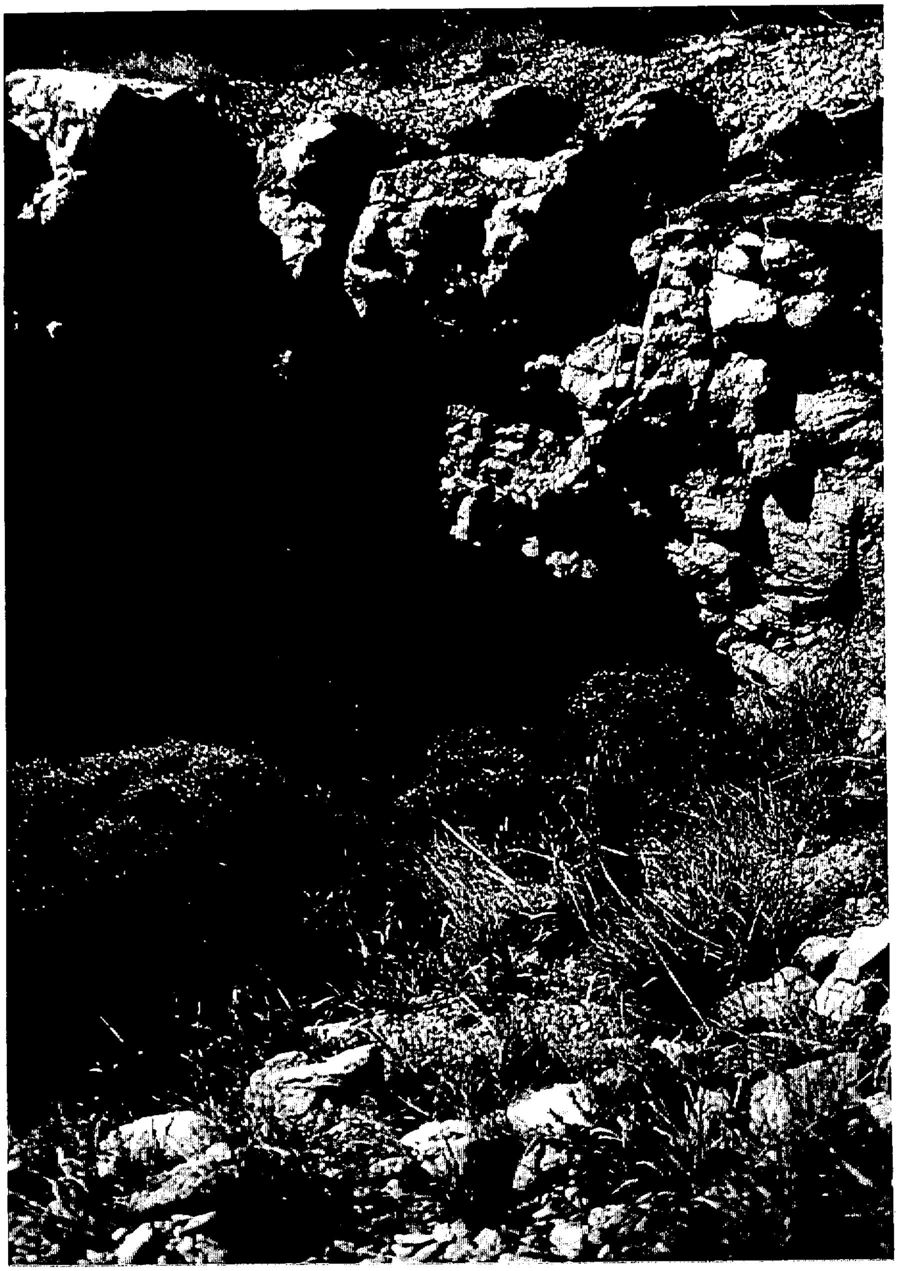

Figure 2.--Photograph of the portal of adit on Rough Mountain.

Sample		Analytical data1/2/						Description
No.	Length of chip (ft)	Ag (oz/st)	Cu	Mo	Pb (%)	SiO_2	Zn	
1	6.0	1.1	0.083	0.014	0.14	97.9	0.022	Flat-lying quartz vein; abundant malachite and azurite, minor chalcopyrite, hematite staining.
2	3.6	2.5	.09	.0032	.32	100.0	.028	Flat-lying quartz vein; malachite and azurite staining, pyrite, chalcopyrite, hematite staining.
3	5.0	5.4	.24	.0083	1.8	98.7	.031	Flat-lying quartz vein; malachite and azurite staining, chalcopyrite, covellite?, hematite staining.

Au and Ag by fire assay (detection limits of 0.005 and 0.1 oz/st, respectively); Cu, Mo, Pb, and Zn by atomic absorption analysis (detection limits of 5, 30, 30, and 5 ppm, respectively); SiO_2 by inductively coupled plasma analysis (detection limit of 100 ppm).

1/ Traces of Au were detected in all three samples.
2/ Spectrographic analysis data are in appendix.

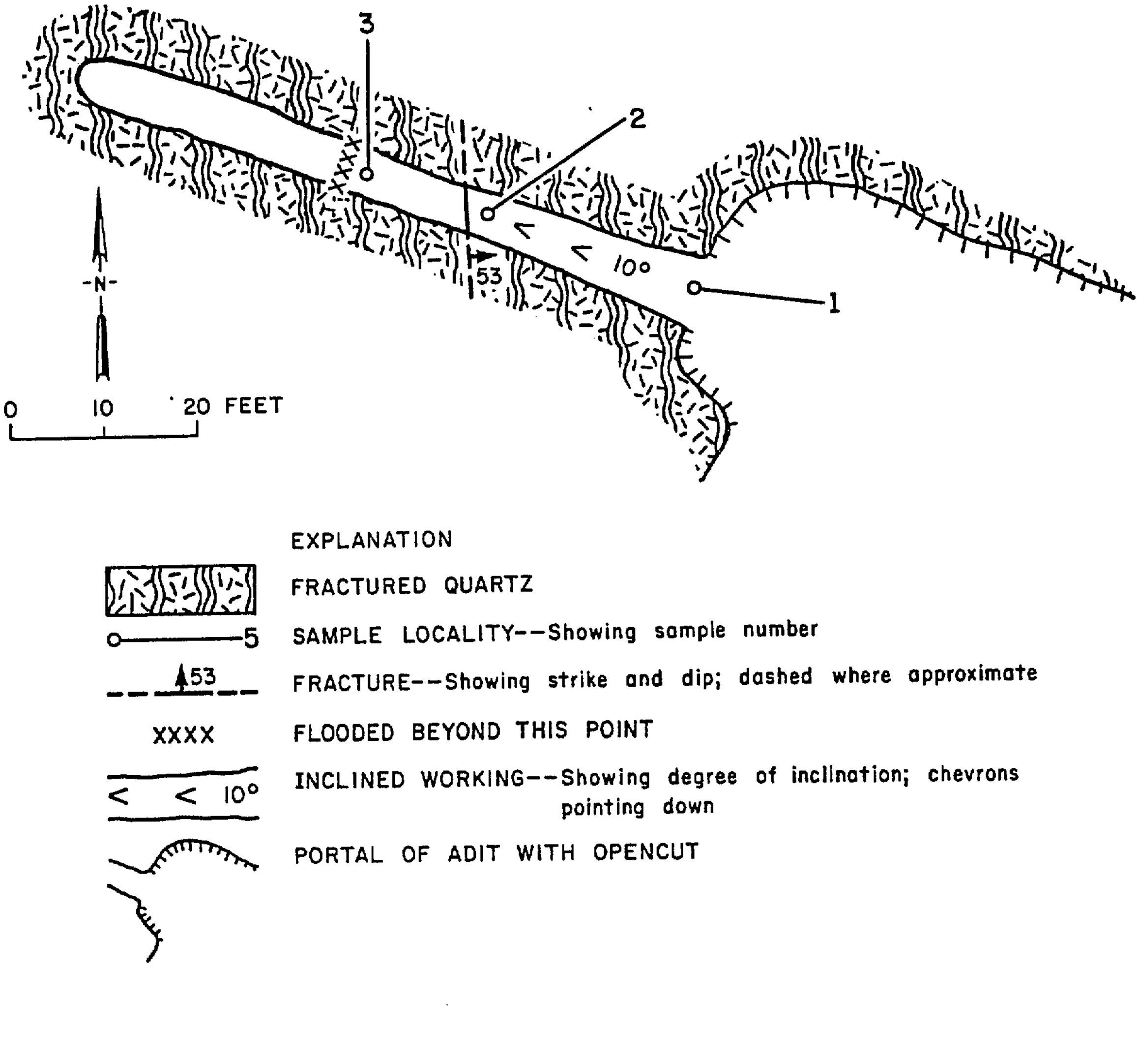

Figure 3.--Map of adit on Rough Mountain, showing sample localities 1-3. Table shows sample data.

which could be accurately located from BLM and courthouse records are shown on plate 1.

Much of the area within 3 mi south of the study area has been staked for uranium. Prospects at a claim about 1 1/2 mi to the south (NW 1/4 sec. 32, T. 14 S., R. 28 E.) are on radioactive quartz-fluorite veins in Precambrian granite. Drill core samples of the vein assayed 0.3% and 1.09% U_3O_8 (Richter and Lawrence, 1983, p. 52). Uranium production has not been recorded from any of these claims. Uranium-bearing structures and formations south of the study area are truncated by the Apache Pass fault zone and do not extend into the area (Drewes, 1985).

Oil and gas leases cover the entire eastern part of the study area (fig. 6), but no exploratory holes have been drilled and there is no record of oil or gas production. Ryder (1983) rated the southeastern corner of Arizona, including the study area, as having a low petroleum potential because of extensive faulting and pluton emplacement.

APPRAISAL OF SITES EXAMINED

High-purity quartz veins containing minor amounts of precious and base metals are the only identified mineral resources in the Dos Cabezas Mountains study area. Rocks present in the study area could be used for construction purposes.

High-purity quartz veins

In the study area, a quartz vein on Rough Mountain has sufficient continuity and exposure to calculate resources. Other quartz veins associated with the main vein, and the quartz veins south of Rough Mountain, are neither continuous nor exposed enough to determine resources.

Rough Mountain quartz veins

A flat-lying to gently-dipping quartz vein in metarhyolite caps the southern part of Rough Mountain, in the northwestern part of the study area. Three associated steeply-dipping quartz feeder veins are exposed on the northern and southern slopes of the mountain.

The outcrop of the roughly 10-ft-thick flat-lying vein on Rough Mountain can be traced for about 1/2 mi west from a 70-ft-long adit. Three vein samples were taken in this adit (samples 1-3, figs. 2-3). Azurite, malachite, pyrite, chalcopyrite, and hematite staining were noted at the sampled sites. Seven outcrop samples were taken from along the main quartz vein (samples 4-10, table 2). All of the above samples contained trace amounts of gold and from 0.02 oz silver/st (0.7 ppm) to 5.4 oz silver/st. Silica content ranged from 74.8% to 100%.

An inferred resource of at least 580,000 short tons of high-purity quartz is present. This resource estimate is based on the following measurements: exposed length (3,500 ft), width (200 ft), and thickness (10 ft). A tonnage factor of 11.9 ft^3/st was used to convert from volume to weight. Cover for most of the vein is less than 20 ft of rock and soil.

Three steeply dipping quartz feeder veins to the flat-lying vein were noted on Rough Mountain. The first feeder vein (samples 11-15, pl. 1), north of the main vein on Rough Mountain, is 4- to 6-ft-thick, strikes N. 10° E., and dips nearly 90°. Pyrite, limonite after pyrite, and manganese- and iron-oxides are present in two small prospect pits on the vein. Although the vein is discontinuously covered by colluvium near the pits, it is traceable along strike for about 600 ft from the main flat-lying vein.

The second quartz feeder vein (samples 17-20, pl. 1) is exposed discontinuously for about 1,500 ft along the southern slope of Rough Mountain. The vein, which is up to 10 ft thick, strikes N. 10° E., and dips 54° SE. Minor amounts of pyrite, chalcopyrite, galena, malachite, pyrophyllite, and hematite staining are exposed in a pit on this quartz vein.

The third feeder vein (sample 16, pl. 1), exposed in an opencut on the southern slope of Rough Mountain, is 10 ft thick, strikes N. 10° E, and dips about 90°. Pyrite, chalcopyrite, and galena were noted in the vein. The quartz vein is exposed for about 100 ft up the hillside. It trends toward and probably also connects with the flat-lying vein.

Samples 11-20, of the quartz feeder veins and adjacent country rock, contained precious and base metals (table 2). Six of the ten samples contained from 0.003 oz silver/st (0.1 ppm) to 2.2 oz silver/st; five samples contained trace amounts of gold. Silica content of the five quartz samples ranged from 56.7% to 100% and averaged 85.8%.

Quartz veins in other areas

Steeply-dipping, high-purity quartz veins in metarhyolite, which are exposed at 3 locations south of Rough Mountain, and may be genetically related to the Rough Mountain vein system, are described below. Quartz vein resources were not determined for these other veins because they could not be mined by surface methods, as the flat-lying vein could, and only limited exposures are present.

Brecciated rhyolite, about 1/2 mi inside the western boundary, is cut by a 2-ft-thick, high-purity quartz vein (samples 28-31, pl. 1), striking N. 40° W. and dipping 30° SW. Malachite, azurite, bornite, pyrite, chalcopyrite, galena, epidote, and hematite were present on the dump of a small opencut.

Silver (up to 8.0 oz/st), copper (up to 3.0%), lead (up to 6.2%), and trace amounts of gold were present in samples taken of the quartz and of the rhyolite (table 2). The quartz vein is exposed for about 4 ft in the opencut; therefore, resources were not calculated. This vein could be part of the same system as the Rough Mountain vein(s), but is too far away for a definite correlation.

Across the creek from the above opencut is a collapsed adit (samples 32-34, pl. 1), where a 7-in.-thick quartz vein is exposed in brecciated rhyolite in an opencut below the collapsed adit. The vein strikes N. 50° W., and dips 42° SW. Quartz vein and country rock samples contained trace amounts of gold and from 0.009 to 0.03 oz silver/st (0.3 to 1.2 ppm). Silica content of the quartz vein was 80.2% (table 2).

Two other quartz veins, which are south of Rough Mountain, strike northeast to northwest, dip steeply to the west, and vary from 3 to 10 ft in thickness. They are covered by talus and colluvium and not exposed for more than a few tens of feet on the surface or in small workings (samples 22-27, pl. 1). Minor amounts of hematite staining and pyrite were noted in the veins, along with traces of chalcopyrite, galena, malachite, pyrophyllite and manganese oxide staining. All six samples contained silver, from 0.006 oz/st (0.2 ppm) to 2.1 oz/st; all but sample 24 contained trace amounts of gold, and sample 22 contained lead (1.0%). Silica content ranged from 54.3% to 97.1% (table 2).

High-purity quartz veins in the study area contain minor amounts of precious and base metals. The quartz can be used for smelter flux and some of the silver and gold metals could be recovered as by-products at a smelter. Because the U.S. copper industry is currently (1985) depressed, the demand for smelter flux is low, and is being satisfied by using quartz from other areas that have higher precious metal content than that present in the study area samples. The vein being mined by Phelps Dodge south of the study area is such a case. Quartz from the study area will not be in demand for use as silica flux until the economics of U.S. copper mining improve.

Industrial rocks

The Precambrian igneous and metamorphic rocks and Tertiary and Cretaceous sedimentary and igneous rocks that underlie the study area can be used for construction purposes. However, these rocks have no unique characteristics to make them more desirable than rocks elsewhere, closer to population centers and markets.

CONCLUSION

Prospecting in and near the Dos Cabezas Mountains study area has been carried out since the late 1800's. Mineral deposits are epithermal fissure veins controlled by the Apache Pass fault zone, a major structural feature in the region. Second order or smaller structures associated with the Apache Pass fault zone contain base- and precious-metal-bearing sulfide deposits, tungsten deposits, uranium occurrences, and high-purity, precious-metal-bearing quartz veins. In outcrop and at workings outside the study area, these structures dip away from and do not appear to continue along the surface into the study area. Drilling would be necessary to determine if any undiscovered mineralized structures exist at depth in the study area.

Small amounts of placer gold have been produced from within 2 mi north, south, and west of the study area, and small quantities of tungsten have been produced from base- and precious-metal mines to the south. Exploration for porphyry copper deposits has been carried out west of the study area, and exploration for uranium has been carried out to the south. There is no surface evidence of resources of these minerals in the study area. Although the study area is partly covered by oil and gas leases, there is no indication that oil and gas are present in the area, nor is the geologic setting favorable for hydrocarbons.

High-purity precious- and base-metal-bearing quartz veins are exposed in the study area. The largest such exposed deposit is a flat-lying quartz vein capping the southern part of Rough Mountain. This deposit contains an inferred resource of at least 580,000 short tons of high-purity quartz that has resource value as silica smelter flux and that could be mined by open pit methods. A similar deposit is being mined at the Gold Prince Mine, about 1 mi south of the study area. Silver and gold could be recovered as by-products. Because of the currently (1985) depressed U.S. copper industry the demand for smelter flux is low. The combined silica and precious metal content of quartz veins examined in the study area is not sufficient to make them economic or competitive with veins being mined elsewhere. Until the price of copper increases substantially to increase the demand for smelter flux, these veins will not likely be developed.

The sedimentary and igneous rocks in the study area can be used for construction purposes, but have no unique characteristics to make them more useful than rocks present in great quantities outside the area.

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Sample		Analytical data[1/][2/]					
No.	Length of chip (ft)	Cu	Fe	Mn (%)	Ti	Zn	Description
35	3.0	0.071	4.7	0.11	0.43	0.0012	Minor fine pyrite, hematite staining; propylitic alteration.
36	2.0	.029	6.1	.36	.45	--	2-ft-wide fracture zone, fine pyrite, hematite staining, gouge; propylitic alteration.

--, analyzed for, but not detected. Au and Ag by fire assay (detection limits of 0.005 and 0.1 oz/st, respectively); Cu, Mo, Pb, and Zn by atomic absorption analysis (detection limits of 5, 30, 30, and 5 ppm, respectively); Fe, Mn, and Ti by inductively coupled plasma analysis (detection limits of 5, 0.5, and 5 ppm, respectively).

1/ Both samples were analyzed for Au, Ag, Mo, and Pb, but none was detected.
2/ Spectrographic analysis data are in appendix.

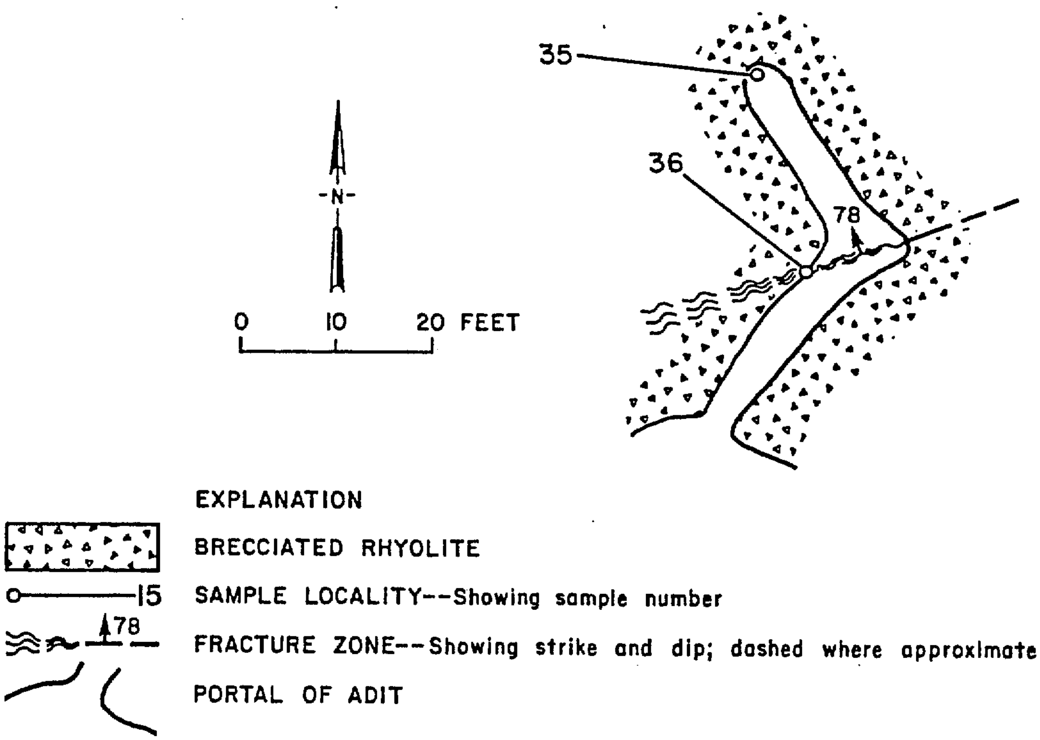


Figure 4.--Map of adit on the southeast flank of Cooper Peak, showing sample localities 35-36. Table shows sample data.

Sample No.	Length of chip (ft)	Analytical data[1/][2/] Ag (oz/st)	Cu (%)	Zn (%)	Description
37	4.0	--	0.022	0.0012	Breccia; clay; propylitic alteration.
38	3.5	0.1	--	.0052	Breccia; finely disseminated hematite, clay; propylitic alteration.
39	3.8	--	--	.0041	Breccia; abundant specular hematite blebs up to 3/4 in. diam.; propylitic alteration.
40	4.0	--	--	--	Breccia; clay; propylitic alteration.
41	3.5	--	--	.0065	1-ft-wide fault; gouge, heavily hematite and limonite stained; propylitic alteration.
42	3.0	.1	.014	.0062	4-in.-wide fault; gouge, heavily hematite and limonite stained; propylitic alteration.
43	4.0	--	--	--	Breccia; propylitic alteration.
44	4.0	--	--	--	Breccia; clay; propylitic alteration.
45	1.3	--	--	.0047	Fracture; limonite and hematite stained gouge; propylitic alteration.

--, analyzed for, but not detected; diam, diameter. Au and Ag by fire assay (detection limits of 0.005 and 0.1 oz/st; respectively); Cu, Mo, Pb, and Zn by atomic absorption analysis (detection limits of 5, 30, 30, and 5 ppm, respectively).

1/ All samples were analyzed for Au and Mo, but none was detected. 0.0016% of Pb was found in #37, but none was detected in the other samples.

2/ Spectrographic analysis data are in appendix.

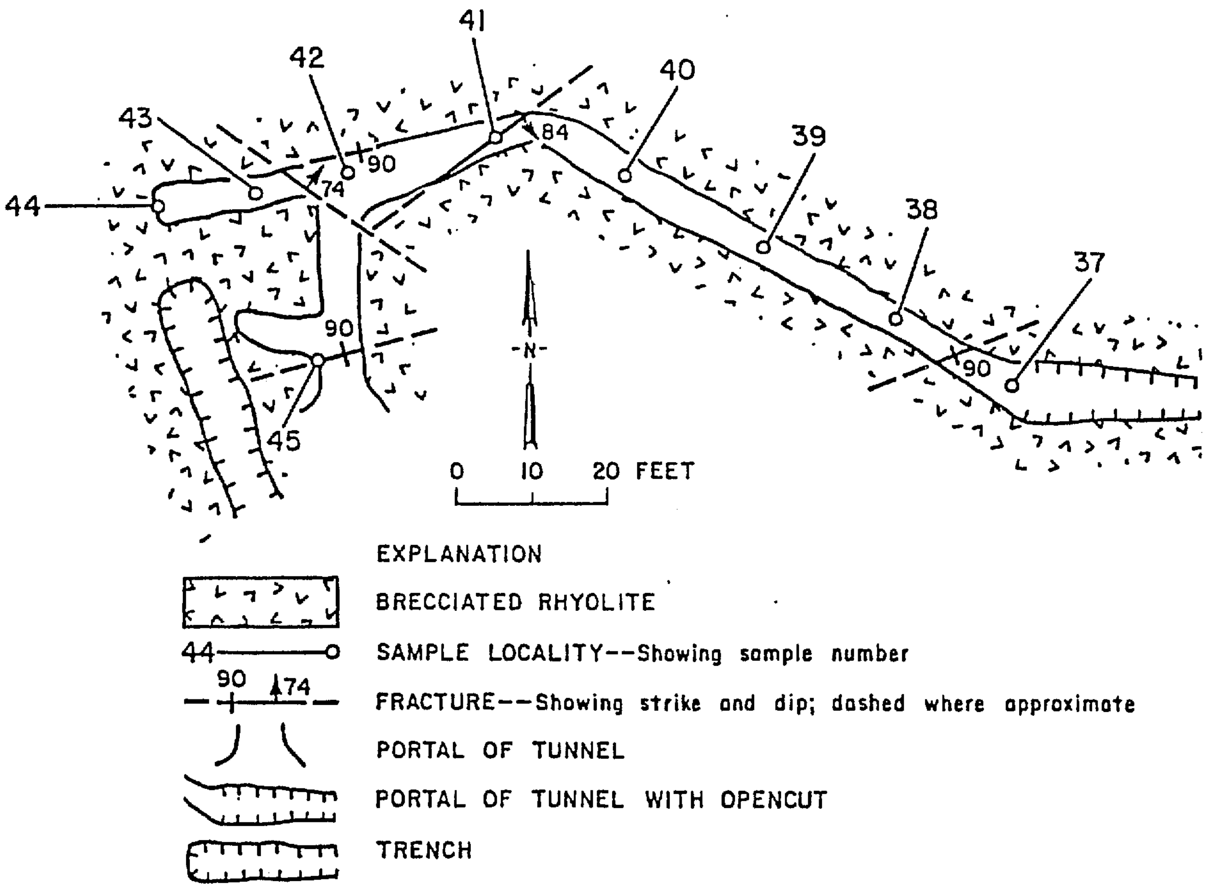


Figure 5.--Tunnel on the southeast flank of Cooper Peak, showing sample localities 35-36. Table shows sample data.

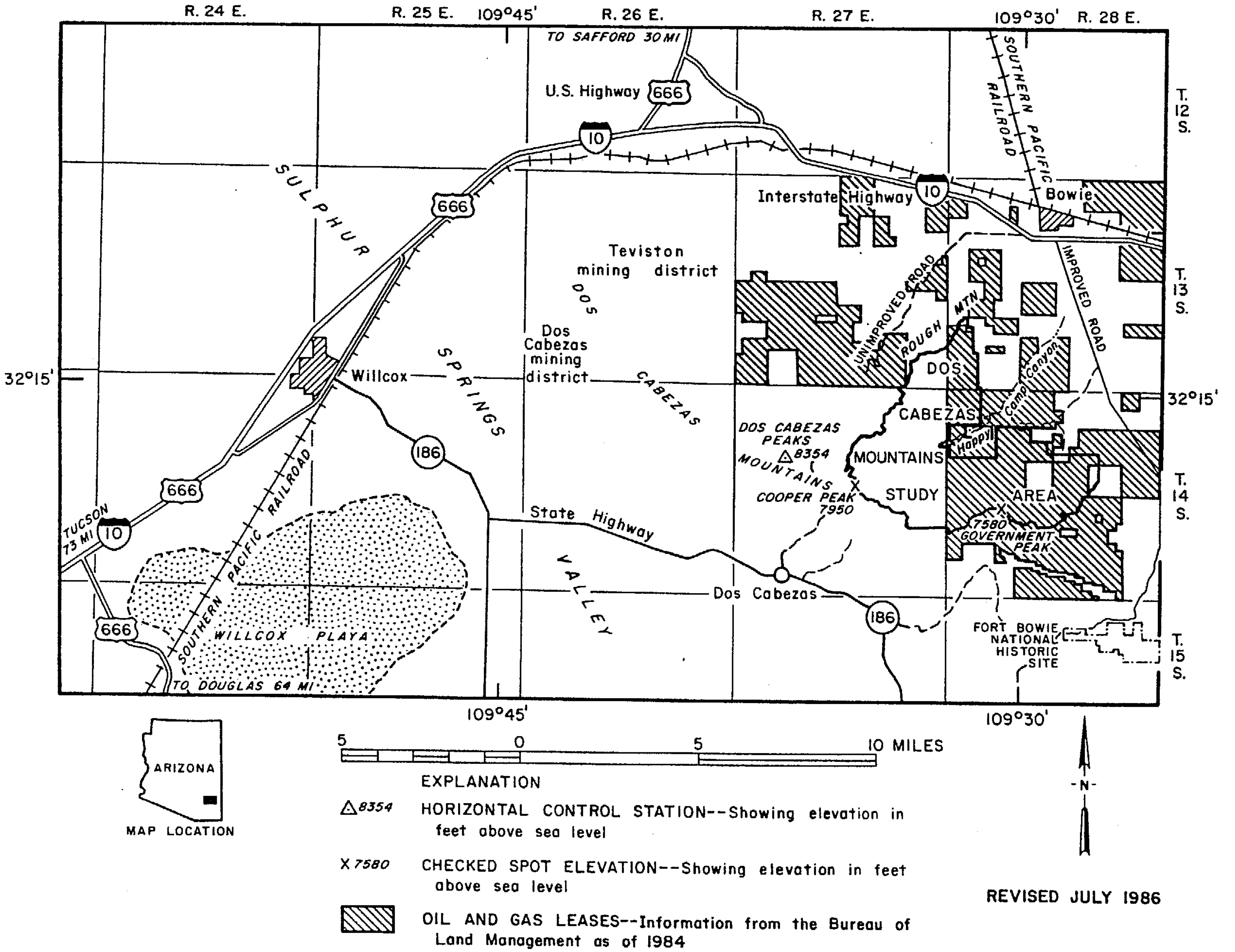


Figure 6.--Oil and gas lease map for the Dos Cabezas Mountains study area, Cochise County, Arizona.

Table 2.--Data for samples from quartz veins in the Dos Cabezas Mountains study area, Cochise County, Arizona.

[--, analyzed for, but not detected; na, not analyzed for; xx, not applicable; Tr, trace; >, greater than. Au and Ag by fire assay (detection limits of 0.005 and 0.1 oz/st, respectively); Cu, Mo, Pb, and Zn by atomic absorption analysis (detection limits of 5, 30, 30, and 5 ppm, respectively); SiO_2 by inductively coupled plasma analysis (detection limit of 100 ppm). Spectrographic analysis data are in appendix.]

Sample			Analytical data							
No.	Type	Length (ft)	Au (oz/st unless noted)	Ag (oz/st unless noted)	Cu (%)	Mo (%)	Pb (%)	SiO_2 (%)	Zn (%)	Description
4*	Chip	6.0	0.0009 ppm	10.9 ppm	0.0063	0.0054	0.07	80.2	0.0025	Quartz vein, 6 ft thick, strike E., gentle dip; in metarhyolite; hematite, limonite, and manganese-oxide staining.
5*	do.	7.0	.0015 ppm	52.7 ppm	.0123	.0086	.12	81.3	.0078	Same quartz vein as sample no. 4, 9 ft thick; in metarhyolite; hematite, limonite, and manganese-oxide staining.
6*	do.	9.0	.0009 ppm	31.5 ppm	.009	.0024	.06	85.5	.0049	Same quartz vein as sample no. 4, 10 ft thick; in metarhyolite; hematite, limonite, and manganese-oxide staining.
7*	do.	7.0	.0002 ppm	1.9 ppm	.0033	.0006	.0056	80.2	.0006	Same quartz vein as sample no. 4, 12 ft thick; in metarhyolite; hematite, limonite, and manganese-oxide staining.
8*	do.	9.2	.0036 ppm	140.0 ppm	.0171	.0092	.21	90.9	.0079	Same quartz vein as sample no. 4, 12 ft thick, strike N. 40° W., dip 26° NE.; in metarhyolite; hematite, limonite, and manganese-oxide staining.
9*	do.	6.0	.0004 ppm	3.8 ppm	.003	.001	.0068	83.4	.0017	Same quartz vein as sample no. 4, 10 ft thick, strike N. 60° W., dip 29° NE.; in metarhyolite; hematite, limonite, and manganese-oxide staining.
10*	do.	2.5	.0004 ppm	.7 ppm	.0035	.0006	.0018	74.8	.0008	Same quartz vein as sample no. 4, 7 ft thick, strike N. 59° W., dip 25° NE.; in metarhyolite; hematite and manganese-oxide staining.
11*	do.	4.0	.0002 ppm	.4 ppm	.004	.0002	.0018	na	.07	Mafic dike, 4 ft thick, strike N. 10° E., steep dip; in metarhyolite; quartz veinlets, hematite and manganese-oxide staining.
12*	do.	4.0	.0004 ppm	.3 ppm	.002	.0006	.0025	56.7	.0053	Quartz vein, 4 ft thick, parallel and adjacent to dike in sample no 11; in metarhyolite; pyrite, abundant limonite after pyrite, muscovite, limonite, and hematite staining.
13	do.	4.5	--	--	--	--	--	100.0	--	Pit; same quartz vein as sample no. 12, 6 ft thick, parallel and adjacent to 2- to 3-ft-thick altered diabase dike, strike N. 10° E., vertical dip; in metarhyolite; pyrite, manganese-oxide and hematite staining.
14	Select	xx	--	--	--	--	--	na	.034	Same pit as sample no. 13; dike, next to quartz vein in sample no. 13; in metarhyolite; abundant limonite after pyrite.
15	Chip	3.0	--	--	--	--	--	90.2	--	Pit; same quartz vein as sample no. 12, 3 ft thick; in metarhyolite abundant limonite after pyrite, minor hematite staining.

Table 2.--Data for samples from quartz veins in the Dos Cabezas Mountains study area, Cochise County, Arizona--Continued

Sample			Analytical data							
No.	Type	Length (ft)	Au (oz/st unless noted)	Ag (oz/st unless noted)	Cu (%)	Mo (%)	Pb (%)	SiO_2 (%)	Zn (%)	Description
16	Chip	6.5	Tr	--	--	--	0.012	96.3	--	Opencut; quartz vein, 10 ft thick, strike N. 10° E., vertical dip; in metarhyolite; galena, pyrite, minor chalcopyrite, minor hematite staining.
17	Select	xx	--	2.2	0.082	--	.53	90.0	0.029	Pit, dump; quartz vein, >10 ft thick, strike N. 10° E., dip 54° SE.; in metarhyolite; schist inclusions, pyrite, malachite, galena, chalcocite?, pyrophyllite, chalcopyrite, hematite and manganese-oxide staining.
18*	Chip	10.0	0.0017 ppm	47.5 ppm	.0083	0.004	.15	81.3	.0065	Same quartz vein as sample no. 17, 10 ft thick; in metarhyolite.
19*	do.	3.0	--	.1 ppm	.0021	.0002	.0007	na	.0007	Metarhyolite on west side of sample no. 18 vein.
20*	do.	3.0	.0002 ppm	.2 ppm	.0022	--	.0053	na	.0011	Metarhyolite on east side of sample no. 18 vein.
22	Select	xx	Tr	2.1	.015	--	1.0	93.0	.14	Quartz vein, 3 to 4 ft thick, strike N. 20° E., dip 70° NW.; in 40-ft-deep shaft; in metarhyolite.
23	do.	xx	Tr	.1	.011	--	.026	54.3	.0077	Stockpile on dump of caved adit in quartz vein, 3- to 4-ft-thick, and adjacent 5-ft-thick diabase dike, strike N. 10° E., vertical dip; in metarhyolite; pyrite, chalcopyrite, minor galena, pyrophyllite, manganese-oxide and hematite staining.
24	Chip	5.0	--	.1	--	--	--	97.1	--	Pit; quartz vein, 10 ft thick, strike N. 20° W., dip 68° SW.; in granite; pyrite, galena, minor hematite staining.
25*	do.	3.5	.01 ppm	1.5 ppm	.0046	.0004	.0032	75.9	.0002	NW part of same vein as sample no. 24; in granite; minor manganese-oxide staining.
26*	do.	2.5	.0124 ppm	.7 ppm	.0031	.0006	.0042	71.6	.0003	SE part of same vein as sample no. 24; in granite; minor manganese-oxide staining.
27*	do.	2.5	.0025 ppm	.2 ppm	.0019	--	.0053	na	.0028	Granite adjacent to vein in sample no. 24.
28	Grab	xx	Tr	8.0	3.0	--	6.2	na	--	Opencut in brecciated rhyolite, dump; quartz with schist inclusions, pyrite, chalcopyrite, galena, bornite, malachite, azurite, epidote, hematite staining.
29*	Chip	4.3	.001 ppm	.2 ppm	.0074	--	.008	71.6	.0035	Quartz vein in brecciated rhyolite at above opencut, strike N. 40° W., dip 31° SW; contains abundant clay and rhyolite breccia.
30*	do.	4.3	.0002 ppm	.1 ppm	.0013	--	.0025	na	.0063	Rhyolite breccia at above opencut; quartz, clay, epidote, manganese oxide staining.

Table 2.--Data for samples from quartz veins in the Dos Cabezas Mountains study area, Cochise County, Arizona--Continued

Sample			Analytical data							Description
No.	Type	Length (ft)	Au (oz/st unless noted)	Ag (oz/st unless noted)	Cu (%)	Mo (%)	Pb (%)	SiO_2 (%)	Zn (%)	
31*	Select	xx	0.272 ppm	110.0 ppm	1.63	0.0004	2.9	na	0.0022	Same opencut as sample no. 28, dump; quartz, malachite, azurite, bornite, chalcopyrite, oxidized pyrite, epidote, limonite, hematite and manganese-oxide staining.
32*	Chip	2.0	.0003 ppm	.3 ppm	.0044	--	.008	na	.0022	Opencut, collapsed adit; in metavolcanics; metavolcanics above and adjacent to quartz vein (sample no. 33), tiny and sparse cubes of limonite after pyrite, manganese-oxide staining.
33*	do.	.6	.0006 ppm	1.2 ppm	.0038	.0002	.0061	80.2	.0041	Same opencut in metavolcanics as sample no. 32; quartz vein, 7 in. thick, strike N. 50° W., dip 42° SW.; manganese-oxide staining.
34*	do.	.4	.0065 ppm	1.1 ppm	.03	--	.05	na	.0052	Same opencut as sample no. 32; metavolcanics below and adjacent to quartz vein (sample no. 33); abundant limonite after pyrite, manganese-oxide staining.
51*	do.	6.3	.0002 ppm	--	.003	.0004	.0009	83.4	.0006	Quartz vein, 6 1/2 ft thick, strike N. 65° W., dip 78° NE.; in metavolcanics; pyrite, muscovite, biotite, chlorite coating, minor hematite staining.
52*	do.	5.0	--	--	.0027	.0004	.0006	77.0	.0012	Same vein as sample no. 51, 5 ft thick; in metavolcanics; pyrite, chlorite coating, hematite, and manganese-oxide staining.
53*	do.	3.4	.0002 ppm	--	.002	.0002	.0006	84.5	.0007	Quartz vein, strike E., dip 52° S.; in granite; minor limonite after pyrite and manganese-oxide staining.
54*	do.	1.2	--	--	.0028	.0002	.0006	87.7	.0034	Same vein as sample no. 53; in granite; minor pyrite, limonite after pyrite, hematite staining, epidote; manganese-oxide staining.
55*	do.	1.3	.0002 ppm	--	.0026	.0002	.0006	73.8	.0011	Same vein as sample no. 53; in granite; abundant epidote, minor pyrite; and manganese-oxide staining.
56*	do.	1.2	--	--	.0029	.0002	.0006	83.4	.0015	Quartz vein, strike N. 65° E., dip 45° SE.; in granite; minor pyrite, epidote, and hematite staining.
57*	do.	.8	.0002 ppm	.1 ppm	.0024	.0002	.0018	75.9	.0046	Same vein as sample no. 56; in granite; abundant epidote, minor pyrite.

*Samples analyzed by Barringer Resources Inc., Wheat Ridge, Colorado. Au and Ag by fire assay-atomic absorption analysis (detection limits of 0.0002 and 0.1 ppm, respectively); Be, Cu, Li, Mo, Pb, Zn, and SiO_2 by atomic absorption analysis (detection limits of 0.1, 1, 0.1, 2, 1, and 1 ppm, and 0.05% respectively); WO_3 by colorimetry (detection limit of 5 ppm). Sample 51 contained Li (11 ppm), Be and WO_3 were not detected in this sample. WO_3 was not detected in sample no. 52.

Table 3.--Miscellaneous mineral occurrences in the Dos Cabezas Mountains study area.

Sample no. (pl. 1)	Location	Summary	Workings	Sample data
35-36	Cooper Peak	Brecciated, propylitized rhyolite. Abundant hematite staining and finely disseminated pyrite in breccia exposed in the adit. Ground cover prohibited tracing the breccia zone beyond the limited exposure at the adit.	46-ft-long adit (fig. 5).	Two chip samples taken in the adit contained iron (4.7% and 6.1%) (fig. 4).
37-45	Cooper Peak	Brecciated propylitized andesite. Breccia exposed in the tunnel contains much clay and gouge material. Limonite and hematite staining are prevalent. The breccia zone is exposed along the ridgetop for about 30 ft around the workings.	165-ft-long tunnel (fig. 6).	Two chip samples contained silver (0.1 oz/st) (fig. 5).
48-49	Dos Cabezas Catchment area	This area of skarn float is approximately 15 ft in diameter. Chalcopyrite, malachite, pyrite, and manganese oxide staining occur in the float and dump material that consists of calcite, epidote, garnet, magnetite, pyroxene, quartz, and minor hematite staining.	90-ft-deep shaft exposes skarn.	Sample 49 contained 0.01 oz gold/st, 1.0 oz silver/st, 1.6% copper, and 1.3% lead. No unusual concentrations of elements were present in sample 48 (table 4).
50	Dos Cabezas Catchment area	This area of skarn float material is about 6 ft in diameter and contains visible epidote, quartz, and hematite staining.	Small pit in float.	No unusual concentrations of elements were present in the sample (table 4).

Table 4.--Data for samples not shown on other tables and figures.

[--, analyzed for, but not detected; na, not analyzed for; xx, not applicable; Tr, trace. Au and Ag by fire assay (detection limits of 0.005 and 0.1 oz/st, respectively); Cu, Mo, Pb, Zn by atomic absorption analysis (detection limits of 5, 30, 30, and 5 ppm, respectively); Fe, Mn, SiO_2, and Ti by inductively coupled plasma analysis (detection limits of 5, 0.5, 100, and 5 ppm, respectively); WO_3 by x-ray fluorescence (detection limit of 0.01%). Spectrographic analysis data are in appendix.]

Sample			Analytical data											
No.	Type	Length (ft)	Au (oz/st unless noted)	Ag	Cu (%)	Fe	Mn	Mo	Pb	SiO_2	Ti	WO_3	Zn	Description
21	Grab	xx	--	--	na	na	na	na	na	na	na	na	na	Pit, dump; in granite; small exposure of aplite dike; minor pyrite, hematite staining.
46*	Chip	1.5	--	0.1 ppm	0.0011	na	na	--	0.0009	na	na	na	0.0014	Collapsed adit, portal; in metarhyolite; fault, strike N. 70° E., steep dip; white weathered and fractured metarhyolite, manganese-oxide staining.
47*	do.	2.0	0.0065 ppm	.1 ppm	.0016	na	na	--	.0007	na	na	na	.0039	Collapsed adit (same as sample no. 46), portal; in metarhyolite; grey, highly fractured metarhyolite, minor manganese-oxide staining.
58	Chip	6.0	Tr	--	na	na	na	na	na	97.8	na	na	na	Pit; 6-ft-thick quartz vein, strike N. 55° W., dip 86° SW; in alluvium; hematite and manganese-oxide staining.
Skarns														
48	Grab	xx	--	--	--	5.2	0.11	--	--	na	0.56	--	.0059	90-ft-deep shaft, dump; chalcopyrite, malachite, pyrite, manganese oxide staining; calcite, epidote, garnet, magnetite, pyroxene, quartz and minor hematite staining.
49	Select	xx	.01	1.0	1.6	10.0	.16	0.021	1.3	na	.35	0.01	--	Same shaft as sample no. 48, stockpile; chalcopyrite, malachite, pyrite, manganese oxide staining; calcite, epidote, garnet, magnetite, pyroxene, quartz, and minor hematite staining.
50	Grab	xx	--	--	--	na	na	--	--	na	na	na	.0034	Pit; float, poorly developed skarn; epidote, quartz, hematite staining.

*Samples analyzed by Barringer Resources Inc., Wheat Ridge, Colorado. Au and Ag by fire assay-atomic absorption analysis (detection limits of 0.0002 and 0.1 ppm, respectively); Cu, Mo, Pb, and Zn by atomic absorption analysis (detection limits of 1, 2, and 1 ppm, respectively).

APPENDIX--Semiquantitative optical emission spectrographic analysis data and detection limits, U.S. Bureau of Mines, Reno Research Center.

	SAMPLE NUMBERS										
	1	2	3	13	14	15	16	17	21	22	23
ELEMENTS	CONCENTRATION, PERCENT										
AG	.007	.006	.02	<.0005	<.0005	<.0005	<.002	.008	<.0005	.01	<.0005
AL	>3.	<.2	<.2	.6	>6.	>4.	>3.	>3.	>5.	.2	>5.
AS	.04	<.009	<.009	<.03	<.03	<.03	<.009	<.02	<.009	<.009	<.01
AU	<.004	<.002	<.002	<.003	<.002	<.003	<.002	<.003	<.002	<.002	<.002
B	.02	.02	.01	.02	.01	.02	.01	.02	.01	.01	01
BA	.005	.007	.01	<.002	.05	.003	.009	.006	.3	.004	.1
BE	.0004	.0006	.0004	<.0002	.002	.001	.002	.01	.0007	.0004	.003
BI	<.04	<.01	<.03	<.01	<.01	<.02	<.01	<.02	<.02	<.01	<.01
CA	<.05	.2	.1	<.05	.4	<.05	<.05	<.05	.4	<.05	5.
CD	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005
CO	<.004	<.003	<.008	<.005	<.001	<.009	<.005	<.006	<.002	<.007	<.001
CR	.005	.002	.002	.004	.006	.007	.003	.006	<.0007	.005	<.0004
CU	.1	.07	.2	<.0006	.003	.02	.004	.1	.0008	.03	.02
FE	2.	.9	.7	.4	6.	4.	3.	4.	4.	6	4.
GA	<.001	<.0002	<.002	<.0006	<.0004	<.0009	<.001	.002	<.0008	<.001	<.0006
K	<1.	<.6	<.6	<.6	>10.	10.	3.	9.	>10.	<.6	>10.
LA	<.01	.03	.04	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
LI	<.002	<.005	.009	<.002	>.2	.01	<.002	.03	<.003	<.002	>.1
MG	.08	.003	.003	.04	3.	.6	.3	1.	1.	.02	2.
MN	.02	.005	.006	.01	.4	.1	.02	.3	.2	.009	.3
MO	.0004	<.0001	.0004	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
NA	<.3	<.3	<1.	<.3	<.3	<.3	<.3	<.3	3.	<.3	<.3
NB	<.007	<.007	<.007	<.007	<.01	<.007	<.007	<.007	<.01	<.007	<.009
NI	.001	<.0006	.0008	.0009	.005	.002	.001	.002	.001	.0009	.001
P	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7
PB	.4	.3	2.	<.005	<.004	.02	.04	1.	<.003	3.	.03
PD	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
PT	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006
SB	<.06	<.06	<.06	<.06	<.06	<.06	<.06	<.06	<.06	<.06	<.06
SC	<.0004	<.0004	<.001	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004
SI	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.
SN	<.006	<.002	<.004	<.006	<.01	<.008	<.007	<.008	<.006	<.006	<.005
SR	<.0001	<.0001	.0002	<.0001	<.0001	<.0001	<.0001	<.0001	.01	<.0001	<.0001
TA	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02
TE	<.04	<.05	<.08	<.04	<.05	<.04	<.05	<.04	<.05	<.06	<.04
TI	<.03	<.05	<.07	<.03	.8	.08	.08	.09	.3	<.03	.2
V	<.01	.01	.02	<.005	.02	<.01	<.01	.01	<.009	.01	<.006
Y	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009
ZN	.03	.05	.06	<.0001	.08	.01	<.0007	.06	.01	.2	.05
ZR	.005	.004	.01	.003	<.003	<.003	.006	.008	.004	.007	<.003

SAMPLE NUMBERS

CONCENTRATION, PERCENT

ELEMENTS	24	28	35	36	37	39	43	45	48	49	50	58
AG	<.0005	.03	<.0005	<.003	<.001	<.0005	<.0005	<.003	<.0005	.005	<.0005	<.002
AL	.8	.2	>5.	>5.	>5.	>5.	>5.	>5.	>5.	>5.	>5.	1.
AS	<.02	<.009	<.009	<.009	<.02	<.02	<.01	<.06	<.02	<.009	<.06	<.03
AU	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.004
B	.07	.01	.009	.05	.03	.01	.02	<.004	.01	<.007	<.007	.02
BA	.02	.003	.1	.1	.6	.08	.2	.2	.2	.003	.2	.01
BE	.001	.0004	.0004	.002	.001	.0005	.0007	.0006	.0005	<.0003	<.0002	<.0003
BI	<.03	<.01	<.01	<.03	<.04	<.02	<.02	<.01	<.01	<.01	<.01	<.03
CA	<.05	<.05	6.	1.	2.	3.	<.05	<.05	6.	10.	3.	<.05
CD	.002	.0007	<.0005	.002	<.001	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005
CO	<.03	<.005	<.001	<.06	<.04	<.001	<.001	<.001	<.001	<.002	<.002	<.004
CR	.002	.001	<.0003	.003	<.0003	<.0003	<.0003	.003	<.0003	<.0003	<.0003	.003
CU	.07	6.	.08	.1	.1	.006	.004	.003	.002	3.	.002	.007
FE	1.	4.	5.	7.	6.	7.	4.	6.	6.	8.	5.	2.
GA	<.0002	<.0005	<.0002	<.0004	<.0002	<.0002	<.0002	<.0002	<.0002	<.0004	<.0007	<.0006
K	<.6	<.6	10.	8.	>10.	10.	>10.	>10.	>10.	<.6	10.	2.
LA	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
LI	.02	<.002	<.002	>.07	.03	<.002	<.002	<.002	<.002	<.002	<.002	<.002
MG	.1	.02	1.	2.	2.	2.	.7	.9	2.	2.	2.	.1
MN	.05	.01	.4	>3.	.2	.5	.1	>6.	.6	.7	.4	.02
MO	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
NA	<.3	<.3	<.3	<.7	3.	<1.	<.3	<.3	4.	<.3	2.	<.3
NB	<.007	<.007	<.007	<.02	<.02	<.01	<.007	<.007	<.01	<.007	<.007	<.007
NI	<.0003	<.0005	.0008	.002	.001	<.001	<.0005	<.003	.001	.002	.0009	.001
P	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7
PB	.02	5.	<.002	.02	.05	<.002	<.002	<.003	.009	2.	<.002	.05
PD	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
PT	<.0006	<.0006	<.0006	<.001	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.001
SB	<.06	<.06	<.06	<.09	<.06	<.07	<.06	<.06	<.06	<.07	<.06	<.06
SC	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004
SI	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.
SN	<.003	.004	<.007	<.02	<.01	<.008	<.002	<.004	<.007	<.02	<.006	<.009
SR	<.0001	<.0001	.004	.003	.02	.002	.0005	.004	.02	.02	.01	<.0001
TA	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02
TE	<.04	<.04	<.04	<.04	<.04	<.04	<.04	<.04	<.04	<.04	<.04	<.04
TI	<.03	<.04	.3	.6	.4	.6	.2	.4	.6	.4	.4	.1
V	.02	<.008	<.006	.02	<.009	<.01	<.005	<.006	<.01	<.01	<.01	.01
Y	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009
ZN	.001	.02	.007	.01	.02	.03	.005	.02	.05	.02	.02	<.0003
ZR	<.003	.005	<.003	.007	<.003	<.003	<.003	<.003	<.003	.006	.009	.003

Element	Detection limit (%)	Element	Detection limit (%)
Ag	0.002	Mo	0.0001
Al	.001	Na	.3
As	.01	Nb	.007
Au	.002	Ni	.0005
B	.003	P	.7
Ba	.002	Pb	.001
Be	.0001	Pd	.0001
Bi	.01	Pt	.0001
Ca	.05	Sb	.06
Cd	.0005	Sc	.0004
Co	.001	Si	.0006
Cr	.0003	Sn	.001
Cu	.0006	Sr	.0001
Fe	.0006	Ta	.02
Ga	.0002	Te	.04
K	2.0	Ti	.03
La	.01	V	.005
Li	.002	Y	.0009
Mg	.0001	Zn	.0001
Mn	.001	Zr	.003

These detection limits represent an ideal situation. In actual analyses, the detection limits vary with the composition of the material analyzed. These numbers are to be used only as a guide.

DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

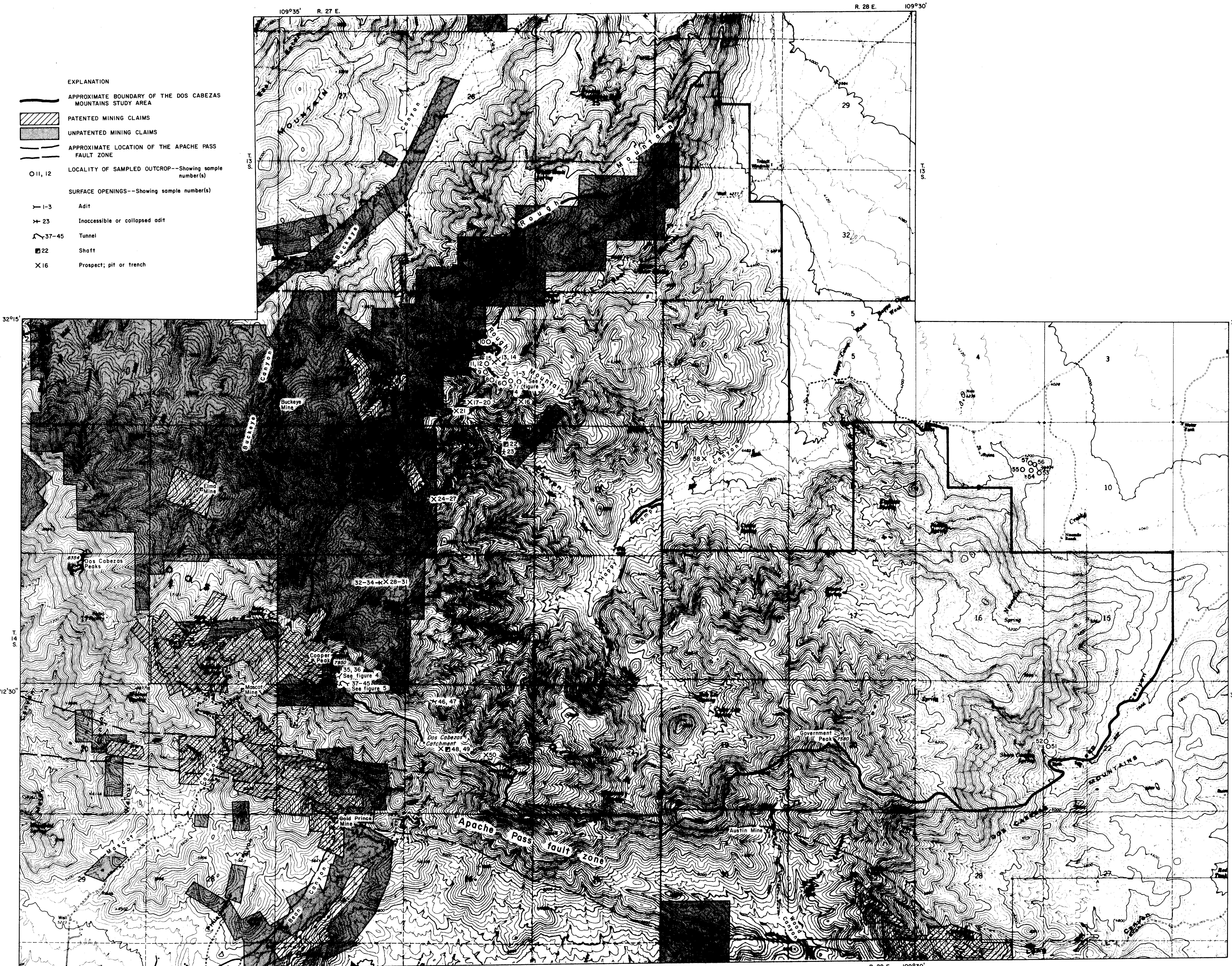
OPEN FILE REPORT
MLA 2-86
PLATE 1

EXPLANATION

- APPROXIMATE BOUNDARY OF THE DOS CABEZAS MOUNTAINS STUDY AREA
- PATENTED MINING CLAIMS
- UNPATENTED MINING CLAIMS
- APPROXIMATE LOCATION OF THE APACHE PASS FAULT ZONE
- O11, 12 LOCALITY OF SAMPLED OUTCROP--Showing sample number(s)

SURFACE OPENINGS--Showing sample number(s)

- 1-3 Adit
- 23 Inaccessible or collapsed adit
- 37-45 Tunnel
- 22 Shaft
- X16 Prospect; pit or trench



Base from the U.S. Geological Survey, 1:24,000 Bowie Mtn North, 1979; Dos Cabezas, 1978; and Luzena, 1979.

SCALE 1:24,000

CONTOUR INTERVAL 40 FEET

MAP LOCATION

Field work completed in 1984 and 1985 by Jeanne E. Zelten; assisted by Terry J. Kreidler.

Location of the Apache Pass fault zone adapted from Drewes, 1985.

MINE AND PROSPECT MAP OF THE DOS CABEZAS MOUNTAINS STUDY AREA, COCHISE COUNTY, ARIZONA

BY

JEANNE E. ZELTEN, U.S. BUREAU OF MINES

1986