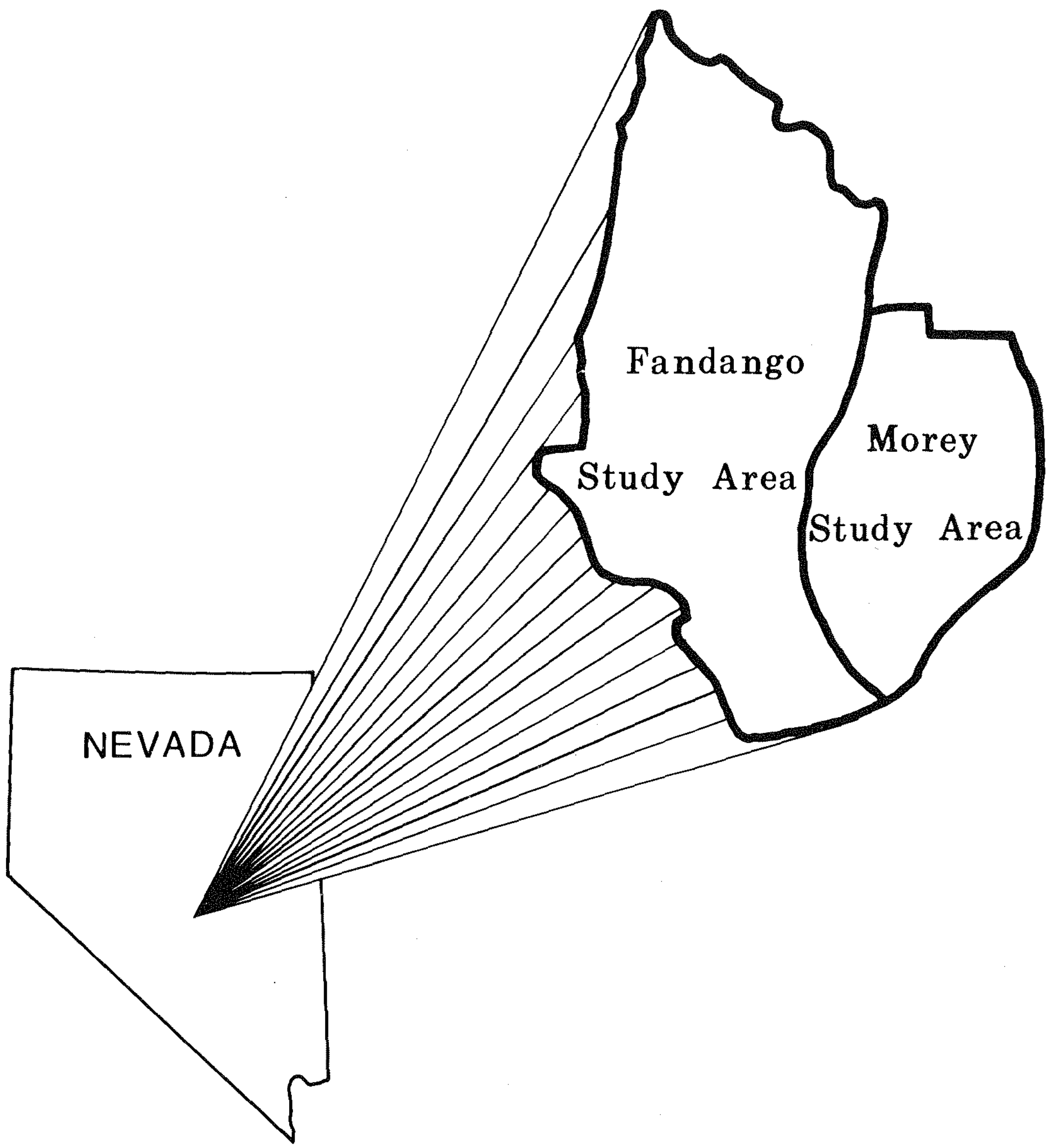
MLA 61-85

Mineral Land Assessment
Open File Report/1985

Mineral Investigation of the Fandango (NV-060-190) and Morey (NV-060-191) Wilderness Study Areas, Nye County, Nevada



United States Department of the Interior
Bureau of Mines

MINERAL INVESTIGATION OF THE FANDANGO (NV-060-190) AND MOREY (NV-060-191) WILDERNESS STUDY AREAS, NYE COUNTY, NEVADA

by

John R. McDonnell, Jr.

MLA 61-85
1985

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 the Fandango (NV-060-190) and Morey (NV-060-191) Wilderness Study Areas, Nye County, Nevada.

This open-file report summarizes the results of a Bureau of Mines 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 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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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

°F	degrees Fahrenheit	oz	troy ounce(s)
ft	foot, feet	oz/t	troy ounce(s) per short ton
in.	inch(es)	ppm	part(s) per million
mi	mile(s)	%	percent

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SUMMARY

The Fandango and Morey Wilderness Study Areas lie adjacent to each other and respectively comprise 40,940 and 20,120 acres in north-central Nye County, Nevada. In 1984, the Bureau of Mines conducted a mineral investigation, as required by Public Law 94-579 (October 21, 1976), of the Bureau of Land Management's "preliminary suitable acreage" (31,740 and 14,560 acres, respectively). The investigation included a review of literature concerning mineral resources and mining activity in the study areas, and a field examination of mines, prospects, and mineral occurrences.

Mining and prospecting within the Morey study area are related to activity in the Morey mining district along the northern boundary of the study area. The Wist, Bhum, and Donna Louise prospects explore east-striking fault-vein systems in rhyolitic tuff. The veins contain low silver, lead, and zinc values with associated manganese, molybdenum, and tin. Analytical and geological data suggest that deposits of low-grade silver, lead, and zinc could exist in these areas. Further studies are recommended for the prospects to delineate possible structural relationships and define mineralized zones.

Mining activity in the Fandango study area is centered on the CL claim group in the northeastern part of the study area. Preliminary reconnaissance studies by Long Lac Mineral Exploration, Inc., delineated three areas of potential mineral resources and a drilling program was focused on one area where a large-tonnage, low-grade gold deposit was suspected. The drilling program encountered low-grade gold values, and by continued drilling Long Lac

is attempting to determine if the gold occurrence is economical. Further observation of exploration in the area is recommended; even if the occurrence proves to be currently uneconomical, its status should be reevaluated as metal prices change.

INTRODUCTION

In 1984, the Bureau of Mines, in cooperation with the U.S. Geological Survey (USGS), conducted a mineral investigation of the Fandango and Morey Wilderness Study Areas (WSA's), Nye County, Nevada. The Fandango and Morey WSA's respectively comprise 40,940 and 20,120 acres of public land administered by the Bureau of Land Management (BLM). This Bureau investigation included only those areas designated as "preliminary suitable acreages" by the BLM, and respectively comprise 31,740 and 14,560 acres of the Fandango and Morey WSA's. The Bureau surveyed and studied mines, prospects, and mineral occurrences to evaluate identified resources. The USGS assessed the undiscovered mineral resource potential based on reconnaissance geological, geochemical, and geophysical evidence. This report presents the results of the Bureau of Mines study, which was conducted before the USGS's results were available.

Geographic and geologic setting

The Fandango and Morey study areas lie adjacent to each other and are separated by a jeep road in South Sixmile Canyon (fig. 1). The areas are in north-central Nye County, Nevada, about 70 mi northeast of Tonopah, Nevada, and 10 mi northwest of U.S. Highway 6. Access to the areas is by maintained dirt roads from Highway 6. Jeep roads to livestock watering areas and hiking trails provide access within the study areas.

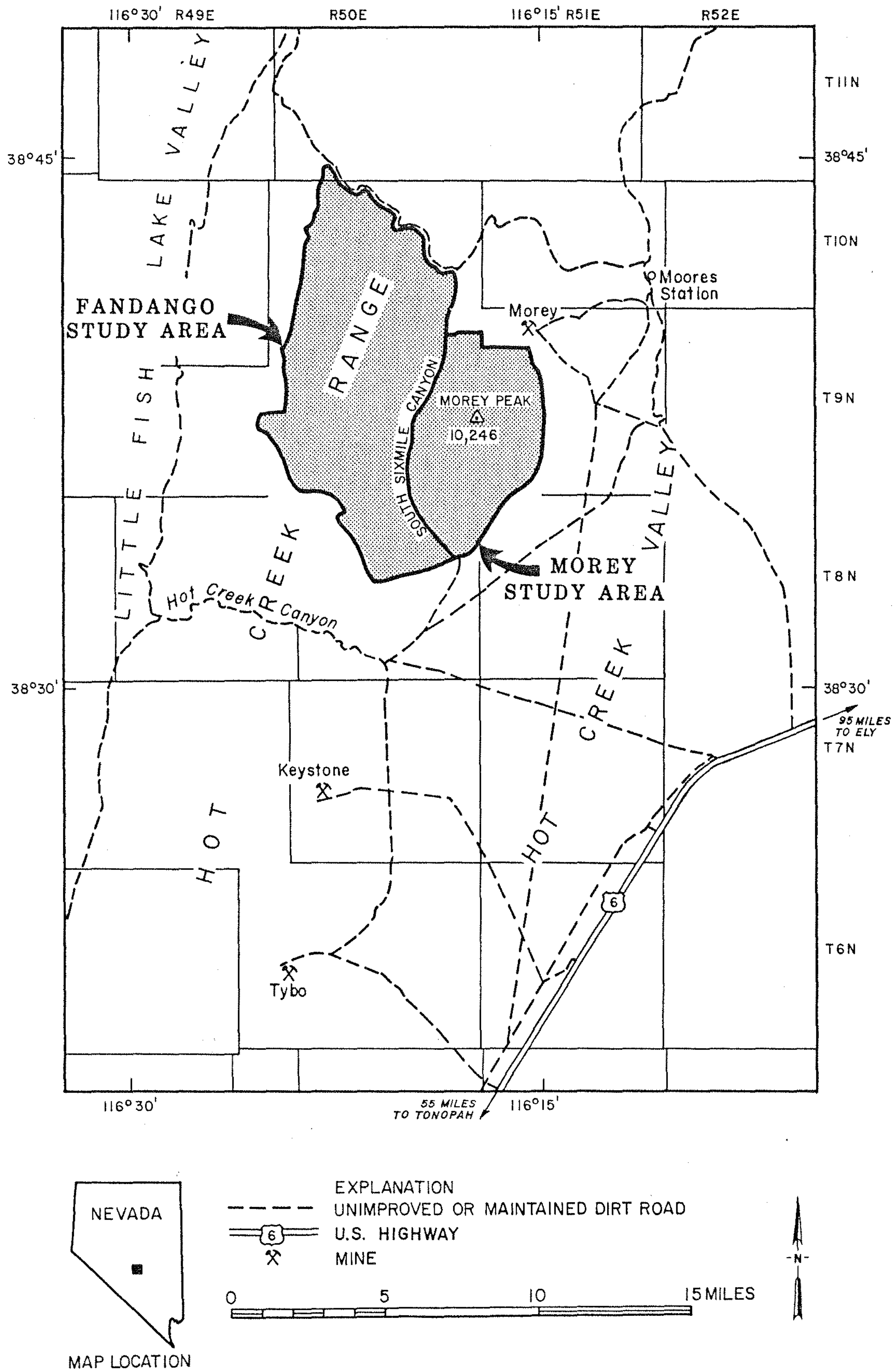


Figure 1.--Index map of the Fandango and Morey study areas, Nye County, Nevada.

The study areas lie in the northern Hot Creek Range in the Basin and Range physiographic province. The region is arid with mountainous areas receiving as much as 10 in. of precipitation a year. The Fandango study area has moderate to steep relief with broad drainages and elevation ranging from 5,760 to 9,825 ft, whereas the Morey study area has extremely rugged terrain with steep, narrow canyons and elevation ranging from 5,780 to 10,246 ft.

The study areas are along the northern boundary of the Hot Creek Valley caldera complex (pl. 1). The southern two-thirds of the Fandango study area and most of the Morey study area are within the caldera complex and primarily consist of Tertiary ash-flow tuffs that have been intruded by rhyolitic and andesitic dikes and plugs. The northern third of the Fandango study area and the northwestern corner of the Morey study area are along the arcuate rim of the caldera complex and consist mostly of Mesozoic and Paleozoic carbonate rocks with some interbedded quartzite and calcareous shale. These rocks are faulted and intruded by rhyolitic and andesitic ring dikes. A northeast-striking thrust fault, which has been reported as part of the Roberts Mountains Thrust, has placed middle Paleozoic siliceous sediments over middle to upper Paleozoic carbonate rocks in the northern part of the Fandango study area. These sediments typically are strongly brecciated and hydrothermally altered, and the underlying carbonate rocks locally have been altered to jasperoid. (See John, 1985, p. 12-16; Garratt Geoservices USA, 1982, p. 7-10; Britton, 1970, p. 5-6; and Kleinhampl and Ziony, 1967.)

Method of investigation

This investigation included a review of available published and unpublished material related to the mineral resources and mining activity in the Fandango and Morey study areas and vicinity. Mining claim information and land status plats were obtained from the BLM State Office in Reno, Nevada. Minerals information and production data were collected from Bureau of Mines files and other sources.

In June and September 1984, Bureau personnel conducted a 40-man-day field examination that focused on mines, prospects, and known mineral occurrences within and up to 1 mi outside the study area boundaries (pl. 1). The examinations included reconnaissance by helicopter, four-wheel-drive vehicle, and foot traverses across the study areas. Mining claim locations were examined and accessible workings within the study areas were mapped and surveyed by tape and compass.

One hundred and fifteen samples, including chip, select, and grab samples, were collected from workings and mineralized areas. All samples were analyzed for gold and silver by either standard fire assay or fire assay combined with inductively coupled plasma-atomic emission spectrometry (ICP). Additional analyses were conducted by atomic absorption spectrophotometry for arsenic, tin, antimony, and thallium; by ICP for manganese, molybdenum, lead, and zinc; by X-ray fluorescence for barium; and by chemical methods for mercury. A 40-element analysis by semiquantitative optical emission spectrography was also performed to disclose any unsuspected mineral occurrences (see appendices). Sample data are summarized in figures 3-7, 9-10, and table 3 in this report; complete data for all samples, and details of grade and tonnage estimates are available for public inspection at the Bureau of Mines, Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, Colorado 80225.

Acknowledgments

Personnel at the BLM Resource Area Office in Tonopah, Nevada provided BLM facilities and equipment. Claim owner Victor J. Barndt provided exploration, mining, and production data from mines in the Morey and Tybo mining districts. Robert E. Bennett, Jr. of Long Lac Mineral Exploration (Texas), Inc., Reno, NV, provided geologic and exploration information for company-held claims in the Fandango study area.

MINING HISTORY

Prospecting and mining in the vicinity of the study areas began about 1865 when silver was discovered in the areas that became the Morey and Tybo mining districts. The Morey district is along the northern boundary of the Morey study area, and the Tybo district extends about 25 mi southward from Hot Creek Canyon, which is 3-4 mi south of the study areas (pl. 1).

Morey mining district

The Morey district was organized in 1866 and covered the ridge between North and South Canyons where the initial silver discovery was made (pl. 1). In the early 1870's, two mills were built at Morey but they operated only a short time; most of the ore was shipped 23 mi south to Tybo for processing (V.J. Barndt, oral commun., 1984). Intermittent production through 1948 was estimated to be about 6,500 tons of ore containing more than 606,000 oz silver. From 1948 to 1968, mining activity was intermittent and little or no production resulted. (See Kleinhampl and Ziony, 1984; Garratt Geoservices, 1982; and Kral, 1951.) Since 1968, three overlapping exploration projects have investigated properties in the vicinity of Red Mountain, north of South Canyon, in the Morey district (pl. 1): International Minerals and Chemicals (IMC), 1968-1970; Superior Oil, 1978-1981; and Canorex International, Inc., 1981-1983.

The IMC project evaluated the potential for a low-grade disseminated silver deposit and deeper extensions of the high-grade veins. Surface and trench sampling delineated geochemical anomalies that led to the drilling of four diamond drill holes to test for silver values at depth. The results indicated that the silver deposit was uneconomic and exploration for the primary silver target was discontinued. A second target was discovered during the geologic reconnaissance and IMC conducted an induced polarization survey and drilled three more holes trying to define a possible disseminated copper-molybdenum deposit. Although the drill holes encountered significant quantities of disseminated sulfides, IMC concluded that the occurrence was a large, uneconomic disseminated iron sulfide body and no further work was done. (See Britton, 1970.)

Superior Oil conducted a surface reconnaissance program and drilled five exploratory holes for a possible porphyry molybdenum deposit below the silver veins. Drill hole results were not available but it is assumed that no commercial deposit was located, as the property was dropped in October 1981 (Garratt Geoservices, 1982, p. 4).

The exploration program by Canorex International, Inc., was initiated by Garratt Geoservices USA, Inc., for a possible silver-tin deposit, as part of a strategic metals investigation. An extensive geologic mapping and surface geochemical reconnaissance program was conducted. Garratt Geoservices (1982) concluded that the Red Mountain area of the Morey district offered "several good exploration opportunities" and exploratory drill holes were recommended. One hole was drilled in 1983 but the results were "not very interesting" and it was concluded that it was a much deeper system than hoped (Scott Tregaskis, Canorex International, oral commun., 1984). In 1984, property owner Victor J. Barndt (oral commun.) indicated that the project had been discontinued.

Tybo mining district

The Tybo district was organized in 1867 and includes, among others, the Hot Creek and Page Mine areas (pl. 1). Mining activity in the district began when silver was discovered in the Hot Creek area in 1866, and at least two mills were built. In 1872, a smelter was built about 10 mi south of Hot Creek at the Tybo discovery and by the 1880's Tybo had become the center of mining activity. (See Kleinhampl and Ziony, 1984; and Kral, 1951.) Intermittent production continued until about 1944; Kleinhampl and Ziony (1984, p. 211-212) estimated that more than 596,000 tons of ore containing unspecified amounts of silver, lead, gold, copper, and zinc were produced. They also list production of more than 23 tons of antimony, mined from veins in rhyolitic volcanic rocks in the Page Mine area, 2-5 mi southwest of the study areas.

Exploration, development, and some small scale mining have continued into the 1980's near the study areas. In September 1984, the owners of the Uncle Sam Mine in Hot Creek (pl. 1) were readying a bulk sample for metallurgical testing. The mine is a patented property where silver and gold have been produced from along a north-northeast-trending fault, which may be an extension of the mineralized structures at Tybo, and extends toward the study areas. Silver and gold occur in quartz veins in the fault zone and also are disseminated in the limestone host rock along the fault. Trenches were dug on the Bolo claim group, north and east along the Uncle Sam Mine claims, to explore possible extensions of the same mineralized system.

As of July 1985, Long Lac Mineral Exploration, Inc., had detected anomalous antimony, gold (as much as 0.151 oz/t), and arsenic in samples from the Page Mine area. The mineral values are in thin quartz-stibnite veinlets that occur in rhyolitic tuff and trend northeast toward the Fandango study area. Long Lac had drilled four exploratory holes in the anomalies in 1984, but currently (1985) they are directing their exploration efforts to the CL claim group in the Fandango study area (Robert E. Bennett, Jr., Senior Geologist, Long Lac Mineral Exploration (Texas), Inc., Reno, Nevada, oral commun., 1985).

Mining activity outside mining districts

The CL claims are inside and along the northeastern boundary of the Fandango study area (pl. 1) and were originally staked in 1982 by Canyon Resources Corporation. Long Lac acquired the properties in September 1983 and conducted intensive geological, geochemical, and geophysical exploration programs for a large-tonnage, low-grade disseminated gold deposit. A hydrothermally altered area with anomalous gold, arsenic, antimony, molybdenum, thallium, and mercury values was delineated, and in 1984 a drilling program was initiated in an area north of Cold Spring (pl. 1). As of July 1985, 13 holes had been drilled a total of nearly 4,000 ft to explore a disseminated gold target in a northeast-trending thrust fault breccia. Eleven of the holes had poor recovery, but two holes intersected a favorable east-trending, gold-enriched horizon at depth. In July 1985, Long Lac was pursuing this second target but indicated that the deposit may be too deep to be economically developed at current gold prices (Robert E. Bennett, Jr., oral and written commun., 1984 and 1985).

ENERGY RESOURCES

There have been no reported oil and gas discoveries or Federal leases or lease applications filed in either the Fandango or Morey study area. Leases have been filed, however, for both the Little Fish Lake Valley west of the study areas and the Hot Creek Valley east of the study areas. The speculative oil and gas leasing is probably related to recent discoveries in stratigraphic traps that underlie the valley fill in neighboring valleys. Sandberg (1982) evaluated the petroleum potential of wilderness lands in Nevada by applying plate-tectonic concepts to regional-biostratigraphic and source-rock studies, and by geothermometry techniques. The evaluation rated the Fandango and Morey study areas as among the areas with "zero" petroleum potential because they do not contain rock types that have petroleum source or reservoir characteristics.

No information was found regarding geothermal waters or leasing activity within the Fandango and Morey study areas. Thermal springs that occur along Hot Creek Canyon (2-5 mi south of the study areas) and in Little Fish Lake Valley (2-8 mi west of the study areas) have temperatures ranging from 72° to 180° F. The hot springs are thought to be the result of heated water rising along permeable fault zones from a deep intrabasin ground water flow system. (See Garside and Schilling, 1979, p. 49, 54.)

No uranium or thorium occurrences are known within the Fandango and Morey study areas. Uranium occurrences have been reported by Garside (1973, p. 93) and Hurley and Parker (1982) north to northeast of the study areas, but none were actively being developed in 1984. Current (1985) BLM records show the MO claims 2-4 mi north to northeast of the study areas (pl. 1). The properties originally were staked for uranium in 1956-57 by John Titus, and were acquired by Dean Webb in the early 1980's. Webb conducted a surface geochemical survey that delineated anomalous uranium, molybdenum, arsenic, and mercury in the host shale and was trying to market the property, but the uranium market declined and stopped any further development (Dean Webb, oral commun., 1984).

APPRAISAL OF SITES EXAMINED

The sites examined are discussed in order of their relative resource importance. Exploration data for the Morey area indicate an extension of known resources into the study area. For the Fandango study area the resource appraisal is based on exploratory data that has not yet defined a resource.

Morey study area

Mining and prospecting within the Morey study area generally are related to activity in the Morey mining district along the northern boundary of the study area. The district lies about 1 mi within the northern boundary of the Hot Creek Valley caldera complex. Mineralization is thought to have occurred along fracture systems caused in pre-existing structures by caldera collapse and possible resurgent doming (Garratt Geoservices, 1982, p. 16). Past silver production from the district was from veins in a typically east-striking fracture system that dips steeply to the south. The veins occur in rhyolitic tuff, are generally discontinuous along strike, and are up to 6 ft wide. Surface geochemical anomalies of lead, silver, and molybdenum, which were interpreted by IMC for the Morey mineralized area (Britton, 1970, pl. II), extend into the Morey study area in the Wist area (fig. 2).

Access to the Wist area is by an unmaintained dirt road from the Morey townsite via North Canyon. Several road cuts and bulldozer cuts cross this area, but the main veins are exposed by three 4- to 8-ft-deep pits, a 22-ft-deep shaft, and a 180-ft-long opencut (fig. 3). A 10-ft-long adit, about 2,000 ft southeast of the other workings, also is discussed here because of proximity and similarity of occurrence. Veins at these prospects typically strike east, dip steeply to the south, and occur in rhyolitic tuff. Assay data for 7 of 10 samples taken at the prospects show silver values ranging

EXPLANATION OF SYMBOLS FOR FIGURES 2-7, 9, and 10

APPROXIMATE BOUNDARY OF THE MOREY STUDY AREA

SAMPLE LOCALITY
--Showing sample number

SURFACE OPENINGS

- Shaft
- Prospect
- Trench or opencut
- Adit
- Portal of adit; that on right with opencut
- Opencut
- Pit
- Opencut; showing underground workings dashed; used when surface and underground workings overlap

AREA OF ANOMALOUS SILVER VALUES

AREA OF ANOMALOUS MOLYBDENUM VALUES

AREA OF ANOMALOUS LEAD VALUES

PILLAR

STOCKPILE

WINZE

CAVED MATERIAL

INCLINED WORKING
--Showing degree of inclination; chevrons pointing down

STOPED ABOVE

VEIN--Showing vertical and inclined dip; dashed where approximate

FAULT--Showing vertical and inclined dip; dashed where approximate

FAULT ZONE--Showing vertical and inclined dip; dashed where approximate

CONTOUR--Showing elevation in feet above sea level

INTERMITTENT STREAM

LITHOLOGY

- Rhyolite tuff
- Limestone

TABULAR DATA

- Tr, trace
- ---, not detected
- n.a., not applicable

ELEMENTS (lower detection limits)

- Ag, silver (0.1 oz/t; 0.3 ppm)
- As, arsenic (5 ppm)
- Au, gold (0.01 oz/t; 0.007 ppm)
- Hg, mercury (2 ppm)
- Mn, manganese (5 ppm)
- Mo, molybdenum (2 ppm)
- Pb, lead (80 ppm)
- Sb, antimony (2 ppm)
- Sn, tin (5 ppm)
- Tl, thallium (2 ppm; 0.01%)

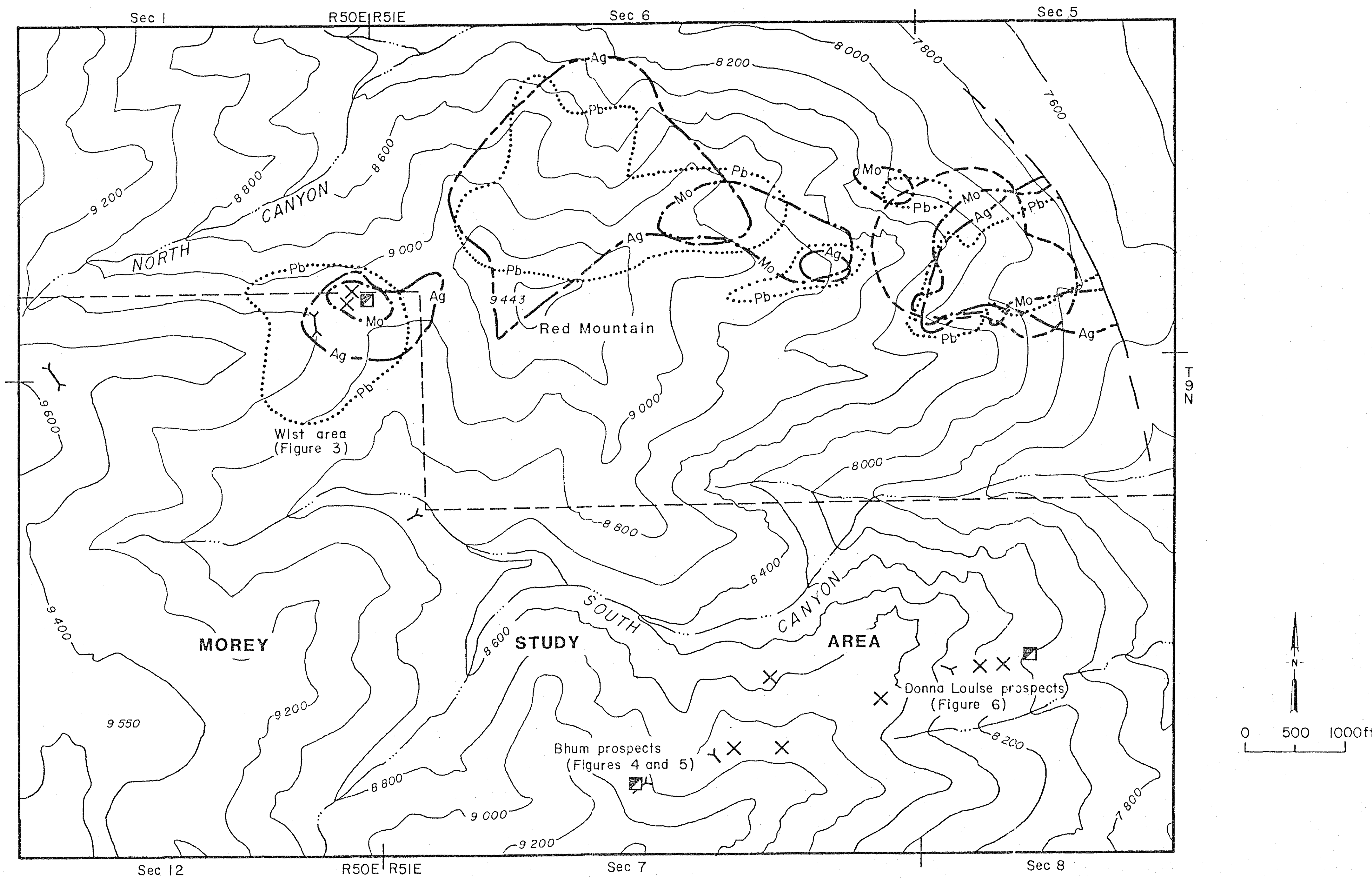
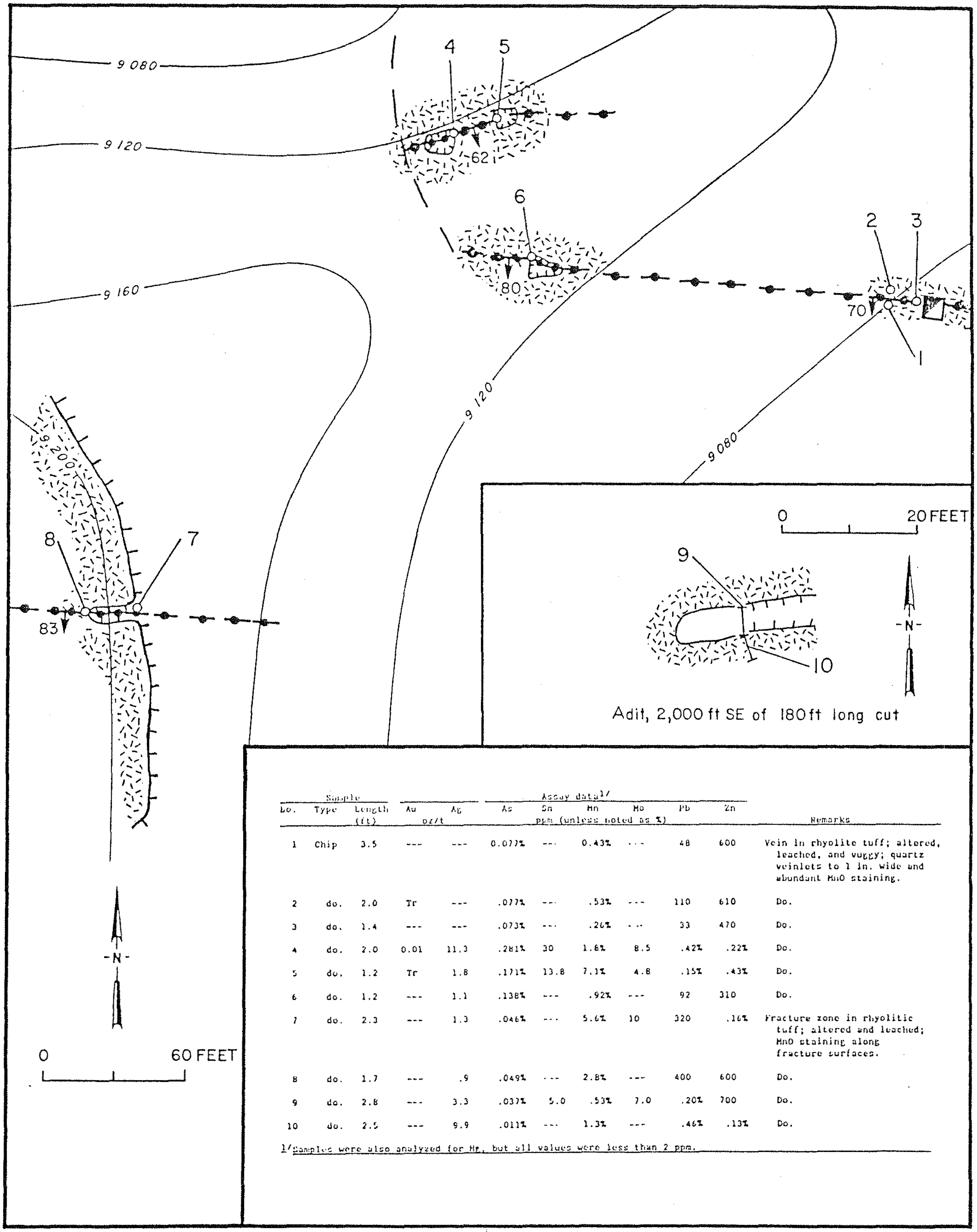


Figure 2.--Prospects within the Morey study area in the vicinity of the Morey mining district showing silver (Ag), lead (Pb), and molybdenum (Mo) anomalies defined by Garratt Geoservices (1982).



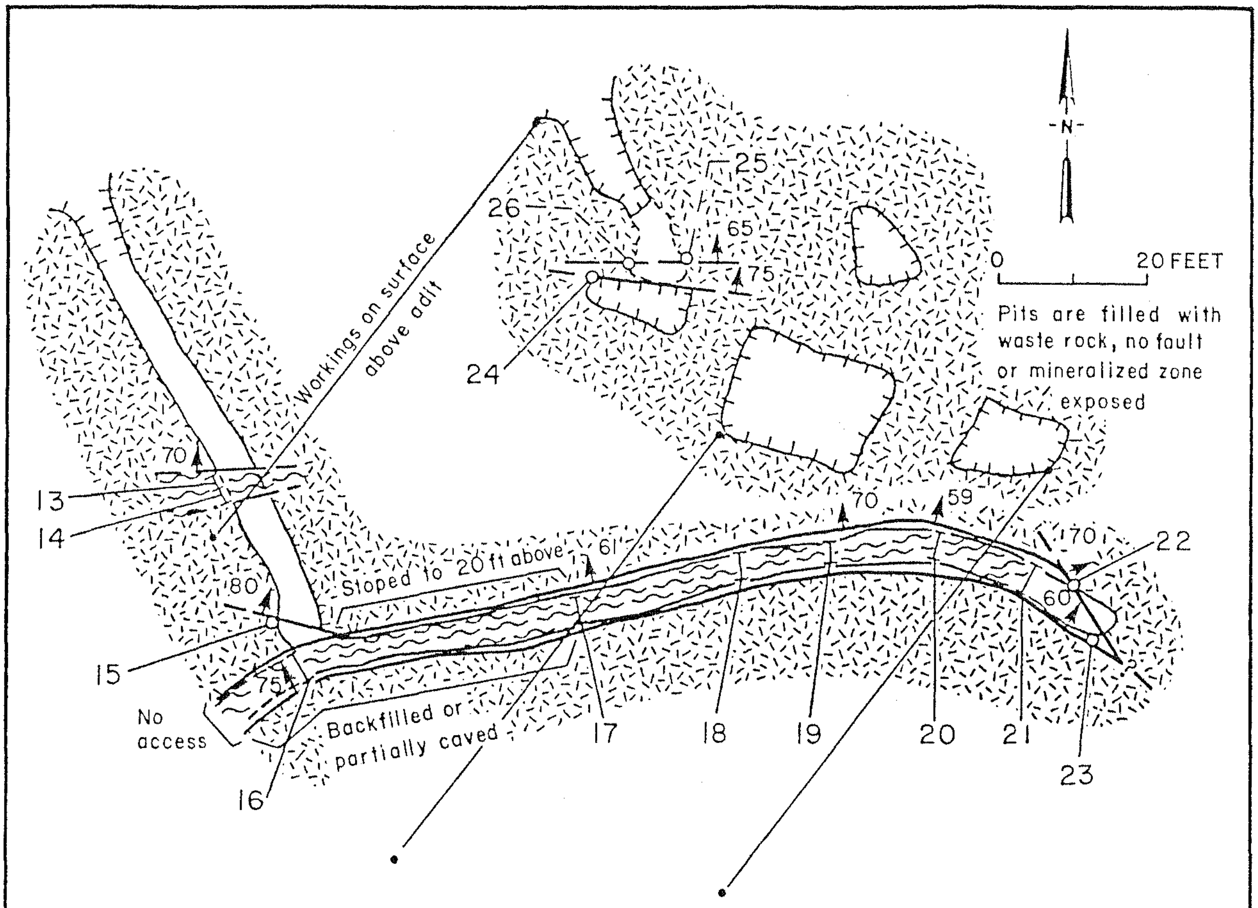
Sample No.	Sample Type	Sample Length (ft)	Au oz/t	Ag oz/t	As	Sn	Mn	Mo	Pb	Zn	Remarks
					Assay data[1/] ppm (unless noted as %)						
1	Chip	3.5	---	---	0.077%	---	0.43%	---	48	600	Vein in rhyolite tuff; altered, leached, and vuggy; quartz veinlets to 1 in. wide and abundant MnO staining.
2	do.	2.0	Tr	---	.077%	---	.53%	---	110	610	Do.
3	do.	1.4	---	---	.073%	---	.26%	---	33	470	Do.
4	do.	2.0	0.01	11.3	.281%	30	1.6%	8.5	.42%	.22%	Do.
5	do.	1.2	Tr	1.8	.171%	13.8	7.1%	4.8	.15%	.43%	Do.
6	do.	1.2	---	1.1	.138%	---	.92%	---	92	310	Do.
7	do.	2.3	---	1.3	.046%	---	5.6%	10	320	.16%	Fracture zone in rhyolitic tuff; altered and leached; MnO staining along fracture surfaces.
8	do.	1.7	---	.9	.049%	---	2.8%	---	400	600	Do.
9	do.	2.8	---	3.3	.037%	5.0	.53%	7.0	.20%	700	Do.
10	do.	2.5	---	9.9	.011%	---	1.3%	---	.46%	.13%	Do.

1/Samples were also analyzed for Hg, but all values were less than 2 ppm.

Figure 3.--Wist area, showing localities and assay data for samples 1-10.

from 0.9 to 11.3 oz/t. Lead, zinc, manganese, molybdenum, tin, and gold were also detected (fig. 3, table). Exploration data and the geochemical anomalies shown in figure 2 suggest that a low-grade silver deposit possibly exists in the Wist area, as an extension into the Morey study area of resources from the Morey mining district. How far the mineralized area projects into the study area has not been determined. Garratt Geoservices (1982, p. 22) speculated that the Wist area is a down dropped fault block and Britton (1970, p. 8) reported that a "large inferred structure [fault] in South Canyon ... separates the tuffs in the Morey area from other volcanics to the south." This interpretation, if correct, suggests that the mineralized area in the Morey district may not extend very far into the Morey study area. A 300-ft-long bulldozer cut, about 2,500 ft west of the Wist workings (fig. 2) exposes no veins or faults and suggests that the cut either missed any existing mineralized structures or that the structures do not extend that far.

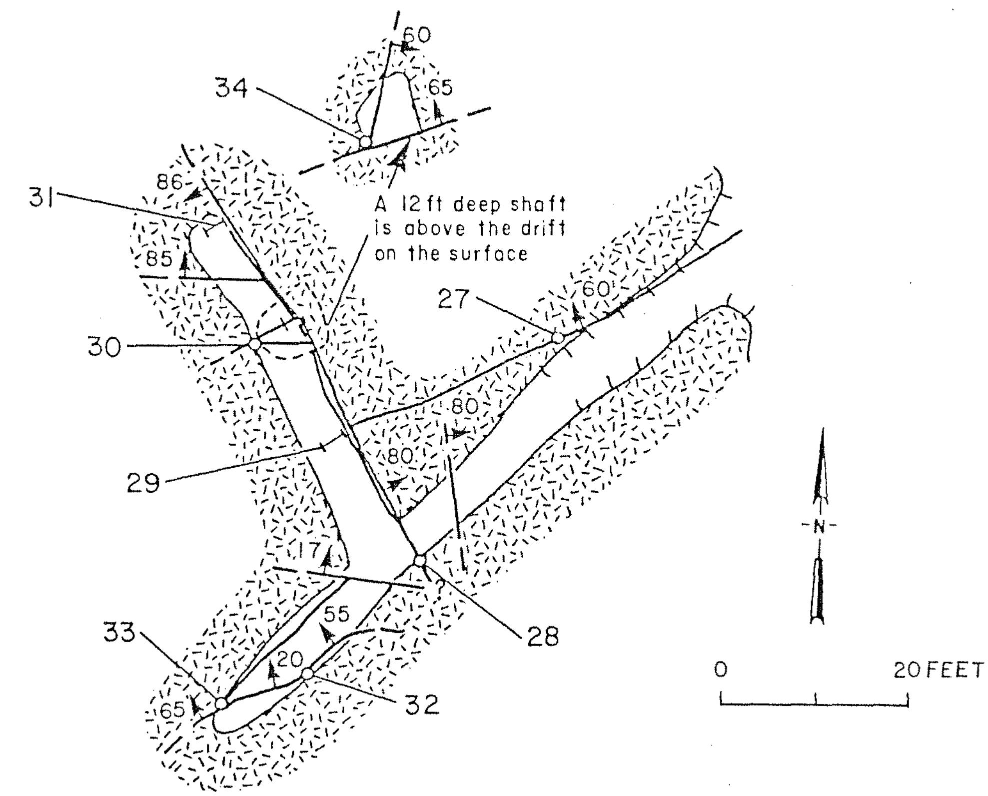
The Bhum prospects are southeast of the Wist area across South Canyon (fig. 2). The prospects are within the Morey study area and can be reached by foot, either from the Wist area or from a dirt road that runs from Morey along the eastern base of the range; either route is 1 to 1 1/2 mi over very steep terrain. No production records were found for the workings, but the extent of the adits and amount of stoping suggest that some ore may have been produced. The prospects expose a generally east-striking mineralized fault system in rhyolitic tuff. Tuffaceous gouge in a fault zone is exposed in the main adit and in workings above (fig. 4); 8 of 11 samples taken across the zone show silver values ranging from 0.1 to 16.6 oz/t. Manganese values range from 0.13 to 6.9%; minor lead, zinc, and molybdenum values, and traces of gold also were detected (fig. 4, table). A second adit and a shaft (fig. 5), about 1,000 ft



Sample No.	Sample Type	Sample Length (ft)	Au oz/t	Ag oz/t	As	Sn	Mn	Mo	Pb	Zn	Remarks
			Assay data[1/]		ppm (unless noted as %)						
13	Chip	3.0	Tr	4.4	0.060%	---	1.2%	11	0.34%	0.15%	Fault zone in rhyolitic tuff; abundant limonite, hematite, and MnO staining.
14	do.	2.0	---	.5	.018%	---	.52%	7.5	.11%	.13%	Do.
15	do.	.8	---	.8	.069%	---	.65%	2.9	.18%	.16%	2-in.-wide fracture in rhyolitic tuff; abundant limonite, hematite and MnO staining.
16	do.	3.0	Tr	.8	.280%	---	1.5%	11	.25%	.25%	Rhyolitic tuff fault gouge; vuggy quartz and quartz stringers to 1 in. wide; abundant limonite, hematite, and MnO staining.
17	do.	3.8	---	---	.037%	---	.43%	13	470	.23%	Do.
18	do.	4.2	---	3.7	.057%	---	3.7%	24	.19%	.28%	Do.
19	do.	3.0	Tr	.4	.034%	---	.28%	16	.16%	950	Do.
20	do.	3.9	Tr	.4	.027%	---	.79%	11	.17%	.11%	Do.
21	do.	3.8	Tr	---	46.	---	.16%	8.1	---	380	Do.
22	do.	.3	Tr	.3	.032%	---	6.9%	34	.41%	.26%	Do.
23	do.	1.6	---	---	35.	---	.13%	---	---	180	Do.
24	do.	2.8	Tr	.6	.257%	---	1.2%	5.1	.24%	.53%	Rhyolitic tuff fault gouge; moderate limonite and minor MnO staining.
25	do.	1.3	Tr	.1	.028%	---	.31%	3.0	340	.13%	Do.
26	do.	.8	0.01	16.6	.196%	---	1.2%	28	2.4%	.64%	Do.

1/Samples were also analyzed for Hg, but all values were less than 2 ppm.

Figure 4.--Bhum prospects, main adit and surface workings, showing localities and assay data for samples 13-26.



Sample			Assay data[1]									
No.	Type	Length (ft)	Au oz/t	Ag oz/t	As	Sn	Mn	Mo	Pb	Zn	Remarks
					ppm (unless noted as %)						
27	Chip	0.2	---	0.1	0.027%	---	6.1%	18	430	820	Fracture zone in rhyolitic tuff; hematite and MnO staining along fractures.
28	do.	1.7	---	.2	.018%	---	.64%	4.3	.13%	830	Do.
29	do.	2.3	---	---	.013%	---	2.1%	5.7	190	.14%	Rhyolitic tuff fault gouge; limonite, hematite and MnO staining.
30	do.	1.7	---	---	.024%	---	950	---	---	120	Do.
31	do.	1.0	---	---	.120%	---	.22%	4.1	---	65	Do.
32	do.	.7	---	---	.014%	---	.23%	---	---	91	Do.
33	do.	1.3	---	.1	.024%	---	.45%	---	100	200	Do.
34	do.	2.0	---	.2	.023%	---	2.1%	9.4	.11%	.11%	Altered rhyolitic tuff; limonite, abundant hematite and MnO staining.

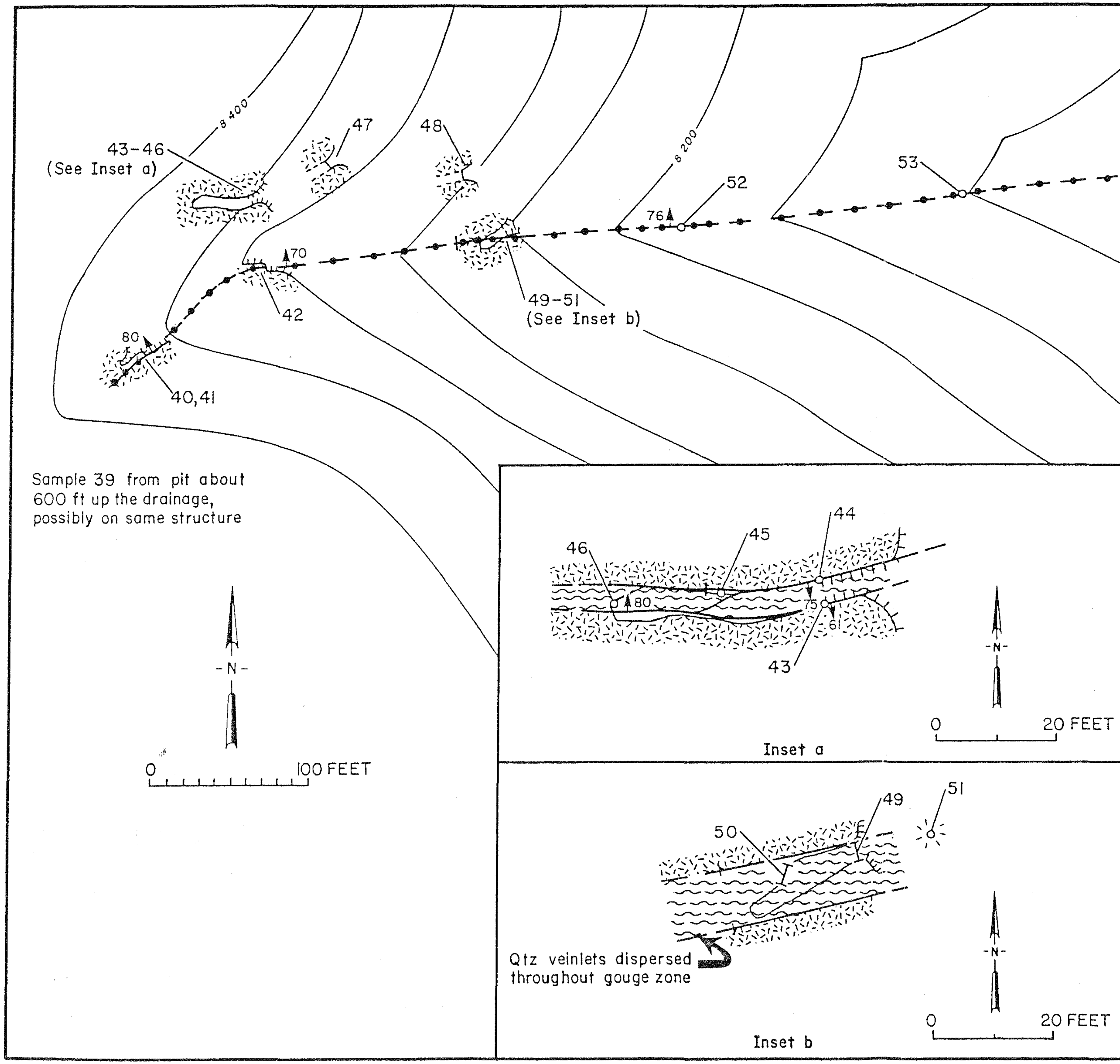
1/Samples were also analyzed for Hg, but all values were less than 2 ppm.

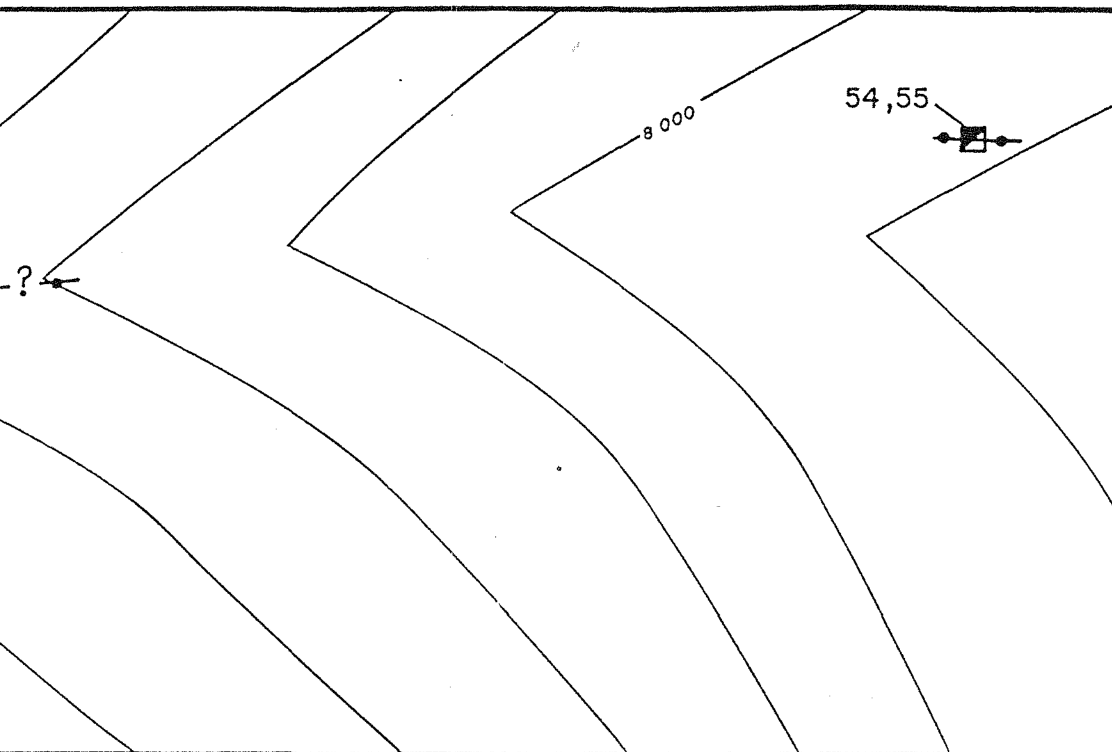
Figure 5.--Bhum prospects, adit and shaft, showing localities and assay data for samples 27-34.

southwest of the main adit, expose several smaller faults. The smaller faults are along the fault system strike, but lead, zinc, and molybdenum values for samples from the second adit are weaker, and silver and gold values are lacking (fig. 5, table). Survey and assay data for the Bhum prospects indicate that silver, lead, zinc, and molybdenum mineralization has occurred in discontinuous pods along the fault-vein system. Although a low-grade deposit could be present, the mineral values are too erratic to warrant grade and tonnage estimations with the available data.

The Donna Louise prospects are about 1/2 mi north-northeast of the Bhum prospects, and are also within the Morey study area (fig. 2). Access is by foot along a ridge from the Bhum prospects or by hiking up a small drainage just south of South Canyon. The prospects are along a generally east-striking mineralized fault-vein system that dips steeply north in rhyolitic tuff (fig. 6). Assay data for samples taken at the prospects (fig. 6, table) show that silver-lead-zinc mineralization, similar to that at the Bhum prospects, has occurred along this system. A topographic projection of, and analytical data for, the two fault-vein systems suggest a continuous silver-lead-zinc occurrence, which is 1 to 1 1/2 mi long, on the south side of South Canyon within the Morey study area.

The Brigham claims are about 4 mi south of South Canyon, inside the eastern boundary of the Morey study area (pl. 1). Access is by about 1 1/2 mi of jeep trail from a dirt road in Hot Creek Valley. The claims include two adits and several prospect pits that expose an east-striking, nearly vertical, fault-vein system in rhyolitic tuff. The workings were cut at different levels and follow the vein for about 600 ft; ground cover prevented tracing the vein farther. Assay data for 8 of 15 samples taken across the vein show





Sample No.	Sample Type	Sample Length (ft)	Au (oz/t)	Ag (oz/t)	As	Sn	Mn	Mo	Pb	Zn	Remarks
					Assay data[1/] ppm (unless noted as %)						
39	Chip	2.7	---	---	0.025%	---	3.16%	3.0	80	210	Fault zone in silicified rhyolitic tuff; abundant hematite and MnO staining.
40	Grab	n.a.	---	0.8	.023%	---	.54%	---	.73%	.20%	Stockpile of silicified rhyolitic tuff from fault zone; abundant hematite and MnO staining.
41	Chip	1.5	Tr	.4	.029%	---	.15%	---	.12%	440	Fault zone in silicified rhyolitic tuff; abundant hematite and MnO staining.
42	do.	4.0	---	.1	.028%	---	.68%	---	.13%	.29%	Do.
43	do.	1.2	---	---	.016%	---	480	---	81	370	Fault gouge in silicified rhyolitic tuff; moderate hematite and MnO staining.
44	do.	.6	---	---	.025%	---	.99%	---	.15%	.41%	Do.
45	do.	.8	---	.1	.027%	---	.93%	---	740	.18%	Do.
46	do.	1.3	---	---	.203%	---	.61%	---	500	.25%	Do.
47	do.	2.6	---	.1	.047%	---	.36%	---	.36%	.46%	Do.
48	do.	3.1	---	---	.019%	---	.25%	---	81	440	Fracture zone in silicified rhyolitic tuff; minor hematite.
49	do.	2.7	---	.1	.012%	---	1.7%	---	810	.11%	Fault zone in silicified rhyolitic tuff; quartz veinlets and stringers; hematite and MnO staining.
50	do.	2.3	---	---	.145%	---	1.3%	---	140	.20%	Do.
51	Select	n.a.	---	.3	.047%	---	4.8%	5.5	.50%	.34%	Stockpile of silicified rhyolitic tuff; quartz veinlets; MnO staining.
52	Chip	2.0	Tr	.1	.057%	---	.85%	---	310	680	Silicified rhyolitic tuff outcrop; abundant hematite and MnO staining.
53	do.	2.5	---	1.1	1.8%	---	.16%	---	.73%	.15%	Silicified rhyolitic tuff outcrop; abundant limonite, hematite, and MnO staining; minor pyrite.
54	Grab	n.a.	---	---	.063%	---	.43%	---	810	.11%	Dump material, silicified rhyolitic tuff; abundant limonite, hematite, and MnO staining; minor galena, pyrite, and sphalerite.
55	Select	n.a.	0.01	1.3	.54%	9.3	520	8.6	1.1%	.32%	Do.

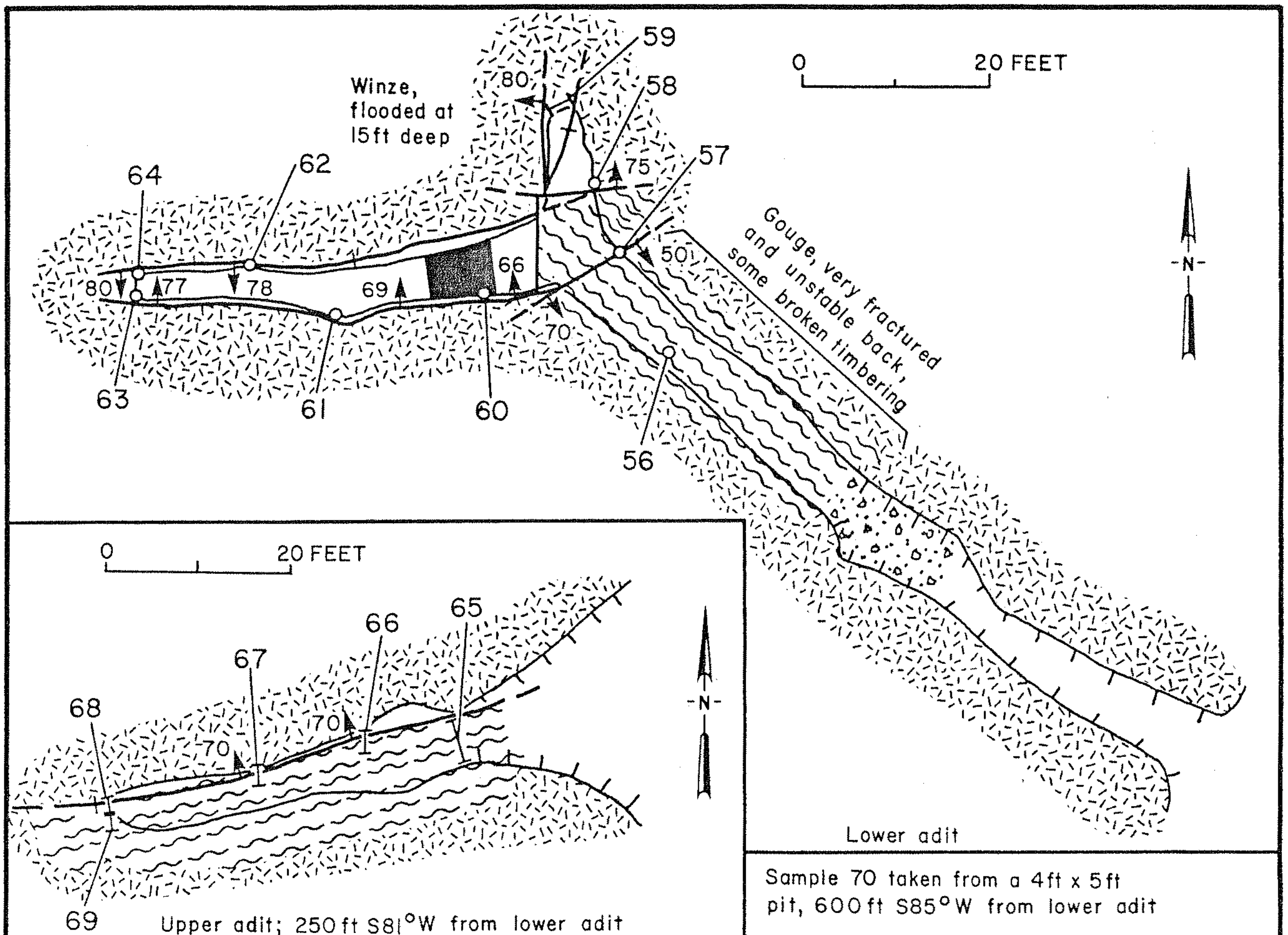
[1/] Samples were also analyzed for Hg, but all values were less than 2 ppm.

Figure 6.--Donna Louise prospects, showing localities and assay data for samples 39-55.

silver values ranging from 0.2 to 1.8 oz/t. Manganese and lead values range from 450 to 123,000 ppm (0.045 to 12.3%) and from below detection (less than 100 ppm) to 101,000 ppm (less than 0.01 to 10.1%), respectively. Tin, molybdenum, zinc, and traces of gold also were detected (fig. 7, table). Although lesser amounts of all the constituents were detected in the lower adit, the assay data indicate that silver-lead mineralization, similar to that found in the Morey district, has occurred in the Brigham vein in the Morey study area.

Fandango study area

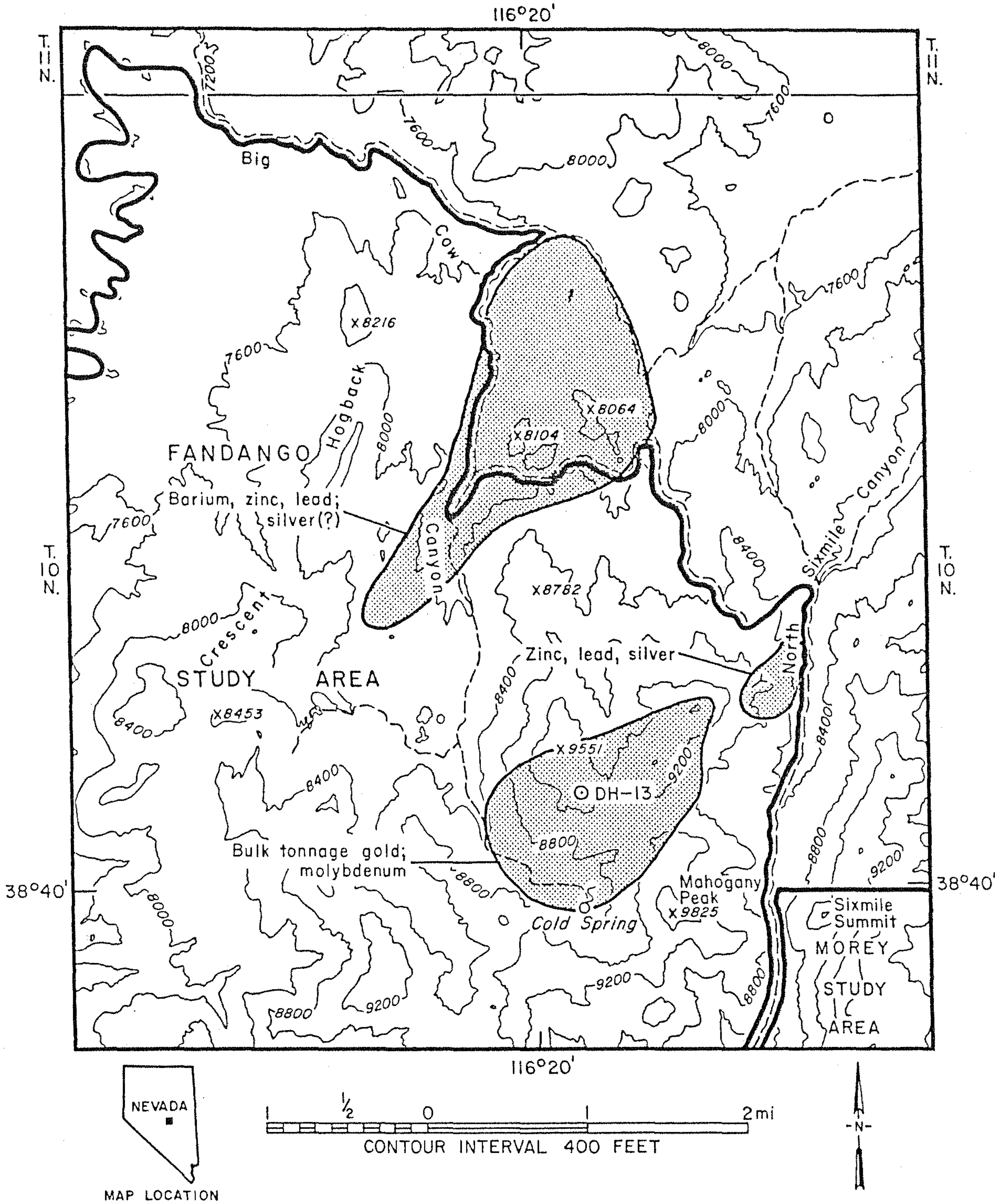
Mining activity within the Fandango study area is centered on the CL claim group in the northeastern part of the study area (pl. 1). Access to the claims is by 20-25 mi of improved and unimproved dirt roads from U.S. Highway 6. As discussed in the Mining History section of this report, the claims currently are being explored by Long Lac Mineral Exploration, Inc. Long Lac's initial exploration programs identified areas with potential mineral resources: 1) barium, zinc, lead, and silver; 2) zinc, lead, and silver; and 3) low-grade, large-tonnage (bulk-tonnage) gold, and anomalous molybdenum (fig. 8). Mineralization in the bulk-tonnage gold area is associated with a north-striking, west-dipping jasperoid thrust-fault breccia, which may be related to the Roberts Mountains Thrust. Since 1984, Long Lac has been drilling in this area, trying to delineate a deposit. Many of the drill holes did not reach the projected target because the fractured underlying strata prohibited the recovery of drill hole cuttings and the drilling was stopped short. Although the drilling results for the primary target were not satisfactory, two drill holes intersected a northeast-striking, southeast-dipping, gold-enriched zone. DH-13 (fig. 8), one of the two holes,



Sample			Assay data[1/]								
No.	Type	Length (ft)	Au (oz/t)	Ag (oz/t)	As (ppm (unless noted as %))	Sn	Mn	Mo	Pb	Zn	Remarks
56	Grab	n.a.	---	---	7.5	---	610	13	---	84	Rhyolitic tuff; material from caved area
57	Chip	0.5	---	---	4.9	---	450	15	---	83	Altered rhyolitic tuff fault gouge; limonite.
58	do.	1.0	---	---	5.8	---	.10%	15	140	120	Leached 1-in.-wide gouge zone in rhyolit tuff; hematite staining; calcite.
59	do.	3.0	---	---	6.6	---	460	19	110	130	Fractured rhyolitic tuff; limonite and hematite; calcite along fractures.
60	do.	1.3	---	0.2	8.3	37.	.71%	19	1.1%	1.1%	Fault gouge in silicified rhyolitic tuff limonite; galena and pyrite.
61	do.	.6	Tr	.6	10.0	.018%	.33%	20	10.1%	.25%	Do.
62	do.	.7	---	---	7.3	---	.34%	7.6	650	880	Do.
63	do.	0.4	---	---	13.1	20.4	.33%	17	600	580	Do.
64	do.	0.4	---	---	5.6	---	.13%	15	170	78	Do.
65	do.	3.5	---	1.7	44.	.010%	3.6%	25	1.4%	.31%	Fault gouge in silicified rhyolitic tuff hematite and MnO staining.
66	do.	1.5	Tr	.2	.011%	.016%	3.5%	32	1.8%	.70%	Do.
67	do.	1.0	---	1.0	17.6	68.	1.3%	18	5.8%	.38%	Do.
68	do.	2.1	---	.2	.015%	.026%	4.6%	47	.57%	1.1%	Fault gouge in rhyolitic tuff; hematite MnO staining; pyrite and chalcopyrite.
69	do.	1.3	---	.3	49.	.022%	12.3%	35	1.1%	1.1%	Do.
70	do.	1.8	Tr	1.8	24.3	.025%	8.5%	21	1.1%	.42%	Fault gouge in rhyolitic tuff; limonite hematite.

[1/] Samples were also analyzed for Hg, but values were all less than 2 ppm.

Figure 7.--Workings on the Brigham claims, showing localities and assay data for samples 56-70.



EXPLANATION

APPROXIMATE BOUNDARIES OF THE FANDANGO/MOREY STUDY AREAS

Zinc, lead, silver — APPROXIMATE AREA OF ANOMALOUS GEOCHEMICAL RESULTS--Showing elements

SURFACE OPENINGS

⊙DH-13 Drill hole--Long Lac No. 13

Adits

8800 CONTOUR--Showing elevation in feet above sea level

X8782 VERTICAL CONTROL STATION--Showing elevation in feet above sea level

UNIMPROVED ROAD OR TRAIL

Figure 8.--Areas of potential mineral resources on the CL claim group, showing locality of drill hole 13. (Data from Long Lac Mineral Exploration, Inc., 1985.)

had a 45-ft interval with an average gold value of 0.016 oz/t; assay values ranged from 0.008 to 0.022 oz/t for individual 5-ft intervals. Long Lac's projection of the horizon indicated that it should crop out within the bulk-tonnage gold area, but colluvium covers the area of the projected surface exposure. In July 1985, exploration was continuing. (R.E. Bennett, Jr., oral and written commun., 1984 and 1985)

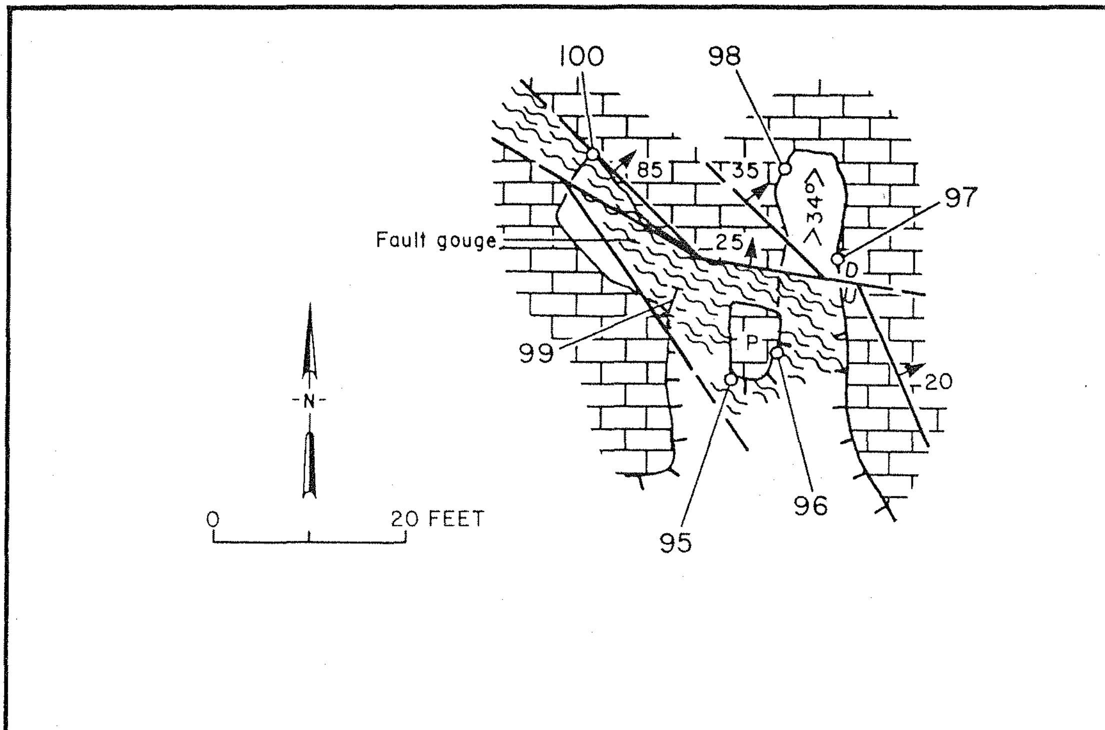
During the Bureau of Mines field investigation of the CL claims, 24 chip samples were taken from outcrops of, or prospects in, jasperoid. The samples were analyzed for gold, silver, mercury, arsenic, antimony, barium, and thallium (table 1, samples 71-94). No gold was detected and only two samples contained detectable silver (table 1). Three elements used as indicators for disseminated gold deposits, mercury, arsenic, and antimony, were detected in amounts that are considered anomalous at other known deposits in similar geologic environments (Silberman, 1982, p. 136-137). Mercury values greater than 2 ppm were detected in 10 samples; the highest value was 72 ppm. Arsenic values were detected in all 24 samples; 9 values were greater than 300 ppm and the highest was 2,790 ppm. Antimony values greater than 2 ppm were detected in 19 samples; 11 values were greater than 30 ppm and the highest value was 390 ppm. A thallium value greater than 0.01% was detected in one sample and barium values greater than 0.05% were detected in three samples (table 1).

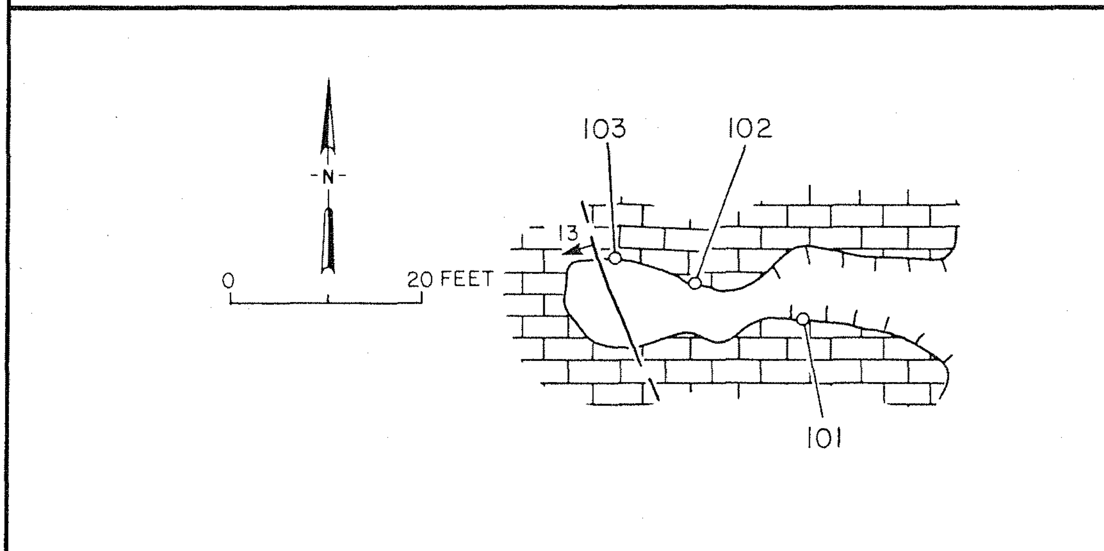
Although no gold was detected in samples taken by the Bureau, the distribution and level of mercury, arsenic, and antimony values, and the geologic environment, suggest that the northeastern corner of the Fandango study area is a good exploration target for a disseminated gold deposit. Exploration and drill hole information submitted by Long Lac indicates that a low-grade gold occurrence exists at depth in this area.

Three adits in a tributary to North Sixmile Canyon on the CL claims are within the Fandango study area (pl. 1) were surveyed and sampled by Bureau personnel (figs. 9, 10). This locality is the old Lead Pipe property, which reportedly produced some high-grade lead ore during World War I (Kral, 1951, p. 134-135). The workings were driven into slightly silicified carbonate rock at three different levels and do not appear to be on a common structure.

Twenty-one samples were taken from the workings. Gold was detected in one sample (lower working, sample 98, 0.055 ppm (0.0016 oz/t)), but silver was detected in all the workings with values ranging from 0.360 to 3.815 ppm (0.01 to .11 oz/t). The spectrographic analysis of samples from the upper adit showed zinc values for all 12 samples; 1 sample contained more than 10% zinc. The other samples were analyzed by ICP for zinc and all nine of the samples had zinc values (from 0.11% to 26.3%). Spectrographic analyses also showed magnesium values for all samples taken from the middle and lower workings (from 2% to more than 10%), and lead was detected in all but 2 samples from the lower working (from 0.02% to more than 10%).

Long Lac's exploration of the area identified a potential for zinc, lead, and silver resources in the vicinity of the Lead Pipe workings (fig. 8). Bureau data indicate that a zinc-lead-silver occurrence exists at these workings. The Bureau's survey detected metal values in all the workings, but the values were too spotty to calculate grade and tonnage except for the middle adit. By projecting the mineralized structure 10 ft beyond the adit walls, and applying analytical and survey data for samples from the middle adit, an estimated 200 tons of ore containing 12.6% zinc and 1.93 ppm (0.06 oz/t) silver are in place. The combined data suggest that a small zinc-lead-silver deposit is present at this locality.

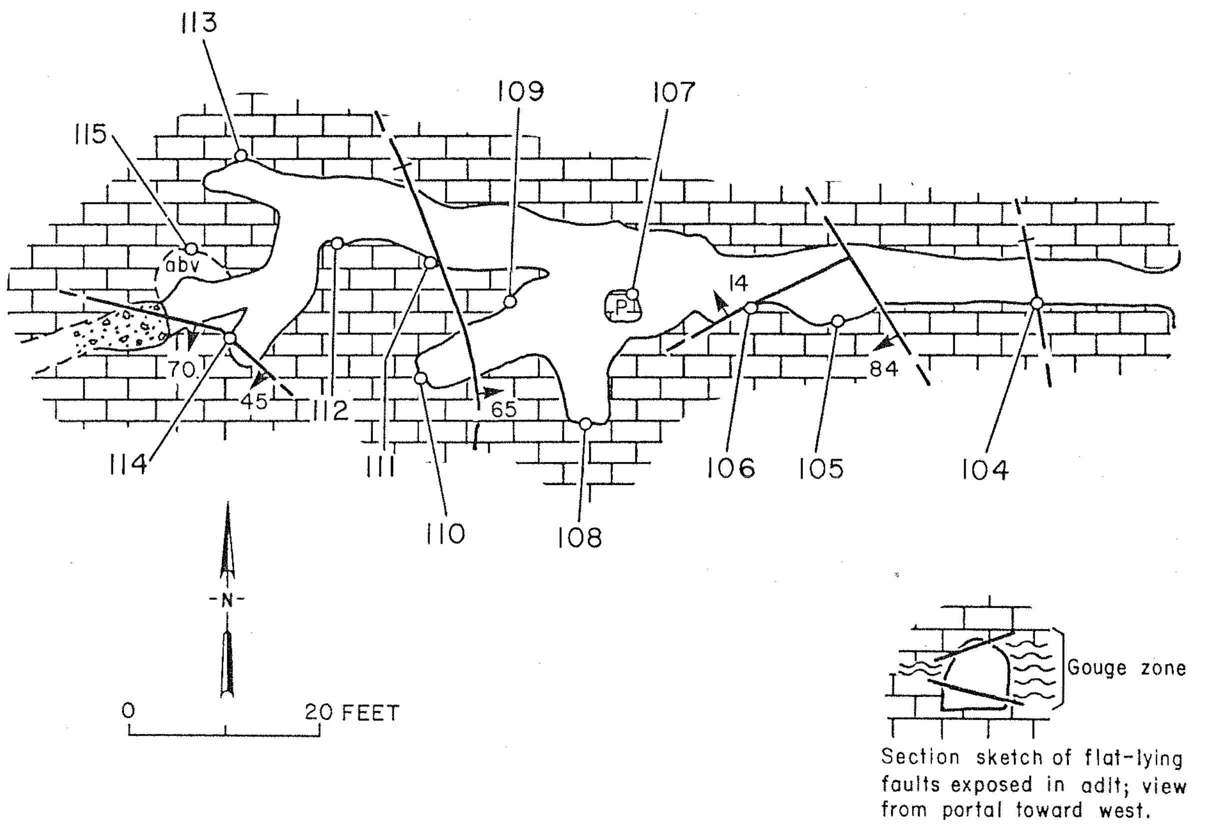




Sample			Assay data 1/							
No.	Type	Length (ft)	Au	Ag	As	Sb	Mo	Zn	Hg	Remarks
			ppm (unless noted as %)							
95	Chip	3.1	---	0.840	0.026%	8.3	11	2.1%	---	Silicified limestone and tuff; limonite and hematite; minor chalcopyrite streaks.
96	do.	3.0	---	1.817	.016%	5.	200	5.9%	---	Do.
97	do.	1.3	---	.450	57.	6.	4.0	.33%	---	Do.
98	do.	1.3	0.055	.360	95.	9.1	8.9	.38%	---	Do.
99	do.	4.0	---	---	27.7	---	---	.21%	---	Do.
100	do.	3.5	---	---	39.	8.3	---	.11%	---	Do.
101	do.	1.2	---	2.947	99.	3.	31	26.3%	3.0	Brecciated limestone, minor silicification; hematite; calcite veinlets.
102	do.	1.8	---	1.706	.013%	3.	31	14.4%	---	Do.
103	do.	1.6	---	1.832	.022%	11.6	32	3.4%	---	Do.

1/ Samples were also analyzed for Tl, but values were all less than 2 ppm.

Figure 9.--CL claims, lower working and middle adit, showing localities and assay data for samples 95-103.



Sample			Assay data[1/]				
No.	Type	Length (ft)	Au	Ag	As	Sb	Remarks
			ppm (unless noted as %)				
104	Chip	4.5	---	---	23.0	---	Silicified limestone and tuff; limonite and hematite; minor chalcopyrite streaks.
105	do.	3.3	---	---	.014%	15.7	Do.
106	do.	3.0	---	---	.015%	11.8	Do.
107	do.	2.3	---	0.440	.011%	8.0	Do.
108	do.	2.5	---	1.053	94.	6.	Do.
109	do.	1.7	---	---	90.	11.0	Do.
110	do.	4.0	---	---	19.7	3.	Brecciated limestone, minor silicification; hematite; calcite veinlets.
111	do.	2.1	---	3.815	85.	8.7	Do.
112	do.	3.3	---	1.247	.010%	6.	Do.
113	do.	2.8	---	---	.014%	6.	Do.
114	do.	1.2	---	---	52.	3.	Do.
115	do.	1.3	---	.400	67.	6.	Do.

1/ Samples were also analyzed for Tl, but values were all less than 0.01%.

Figure 10.--CL claims, upper adit, showing localities and assay data for samples 104-115.

COMMODITY HIGHLIGHTS

Mineral commodities identified as possible resources within the Fandango and Morey study areas are silver, gold, lead, and zinc. Statistics regarding domestic production and consumption of these commodities are presented in table 2 and are included as a guide to current (1985) commodity worth.

CONCLUSION

Mining and exploration company information for the Morey mining district indicate that an uneconomic silver, lead, and zinc deposit exists in east-striking veins in rhyolitic tuff, outside but along the northern boundary of the Morey study area. Geophysical and drill hole data indicate that a large disseminated iron sulfide body exists beneath the district, and silver, lead, and molybdenum geochemical anomalies associated with this sulfide mineralization extend into the northern part of the Morey study area in South Canyon. Although it has been suggested that a fault may terminate the extension of the mineralized area, Bureau of Mines surveys of workings in South Canyon show that low values of silver, lead, and zinc, with associated molybdenum and tin, occur in east-striking veins in rhyolitic tuff in the study area. The analytical data, geological similarity, and proximity to known deposits suggest that deposits of low-grade silver, lead, and zinc could exist in the northern part of the Morey study area along South Canyon.

Analytical data and field surveys show that a silver-lead mineralized vein is present on the Brigham claims within the study area, about 4 mi south of South Canyon. The occurrence is geologically similar to silver-lead-zinc occurrences in South Canyon and the Morey mining district, which suggests that a low-grade silver-lead deposit could be present in the eastern part of the Morey study area.

Exploration by Long Lac Mineral Exploration, Inc., on the CL claims identified a potential large-tonnage, low-grade gold resource in the northeastern part of the Fandango study area. The Bureau's survey of the claims detected no gold, but the distribution and level of mercury, arsenic, and antimony values, in conjunction with the geologic environment, suggest a good exploration target for a disseminated gold deposit. Assay data from one of Long Lac's drill holes shows an average grade of 0.016 oz/t of gold in a 45-ft intercept. This value is below the current domestic mining grade range for gold (0.02-.23 oz/t), but suggests that a gold deposit is present within the Fandango study area. It is not known if the deposit is an economical resource because its size, depth, and average grade are not yet known; Long Lac is continuing its drilling program to further define the deposit.

A small amount of lead production has been reported for three adits on the CL claims in the Fandango study area. Long Lac's exploration of the area identified a potential for zinc, lead, and silver resources, and a small zinc-lead-silver deposit has been identified by Bureau data. This information suggests that a zinc-lead-silver resource could exist in the northeastern part of the Fandango study area.

RECOMMENDATIONS FOR FURTHER STUDY

Additional studies are recommended for the South Canyon area in the northern part of the Morey study area. The Wist, Bhum, and Donna Louise prospects are on mineralized vein systems that may be extensions into the Morey study area of mineralization that occurred in the Morey mining district. The extent of the veins and their interrelationship are unknown. A geophysical survey to trace the veins and detailed soil geochemical sampling to see if the unexplored part of the veins have anomalous mineral concentrations would be the next steps. If these surveys have positive results, an exploratory drilling program would define any deposits along the veins.

Continued contact with companies exploring on the CL claims in the Fandango study area is also recommended. If a deposit is defined, but is deemed uneconomical, a record should be kept because higher gold prices or advances in mining technology may make future development possible.

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Table 1.--Analytical data for jasperoid samples 71-94, taken on the CL claims.

[NA, not applicable; ---, analyzed for but not detected; lower detection limits - silver (Ag), 0.3 ppm; mercury, (Hg), 2 ppm; arsenic (As), 2 ppm; antimony (Sb), 2 ppm, barium (Ba), 0.01%; samples were also analyzed for gold (Au) and thallium (Tl), but all contained less than lower detection limits (Au <0.007; Tl <0.01%), except sample 75]

Sample			Assay data					
No.	Type	Length (ft)	Ag	Hg (ppm, unless noted as %)	As	Sb	Ba	Remarks
71	Chip	2.8	---	8	0.010%	6.0	---	Jasperoid breccia, silicified tuffaceous and carbonate rock, limonite and hematite staining.
72	do.	1.5	---	72	92	9.5	---	Do.
73	do.	2.5	---	---	15.1	---	0.03%	Do.
74	do.	4.2	---	---	.010%	---	.03%	Do.
75	do.	4.3	---	58	.033%	.039%	.32%	Jasperoid breccia, silicified tuffaceous and carbonate rock, limonite and hematite staining; Tl, 0.021%.
76	do.	1.0	---	---	7	---	---	Fault contact between limestone and silicified brecciated limestone, abundant hematite staining.
77	do.	random	---	---	56	18.0	.02%	Jasperoid breccia, silicified tuffaceous and carbonate rock, limonite and hematite staining.
78	do.	1.7	---	4	.032%	.035%	.01%	Do.
79	do.	random	---	6	.016%	.012%	---	Do.
80	do.	1.4	---	---	58	18.0	---	Do.
81	do.	random	---	2	85	27.3	---	Do.

Table 1.--Analytical data for jasperoid samples 71-94, taken on the CL claims--Continued

Sample			Assay data					
No.	Type	Length (ft)	Ag	Hg	As (ppm, unless noted as %)	Sb	Ba	Remarks
82	Chip	2.0	---	---	0.016%	33.0	0.01%	Jasperoid breccia, silicified tuffaceous and carbonate rock, limonite and hematite.
83	do.	random	---	7	.032%	.011%	.01%	Do.
84	do.	1.7	---	24	.074%	.014%	.02%	Do.
85	do.	random	0.370	---	64	60	---	Do.
86	do.	3.1	---	29	.232%	.011%	.02%	Do.
87	do.	2.2	---	---	.279%	.020%	.05%	Do.
88	do.	random	---	---	.070%	62	.02%	Do.
89	do.	1.0	---	---	61	---	---	Highly fractured limestone, minor silica veinlets and chert; hematite.
90	Select	NA	---	---	.172%	15.7	---	Do.
91	Chip	2.3	---	---	.017%	3.0	.02%	Jasperoid breccia, silicified tuffaceous and carbonate rock, limonite and hematite.
92	Select	NA	---	---	.010%	5.0	.04%	Do.
93	Chip	3.0	---	---	.012%	3.0	.71%	Shaley, leached and altered sedimentary rock, cherty zones.
94	do.	3.0	.420	---	.047%	---	.31%	Do.

Table 2.--Statistics for the primary metallic commodities in the Fandango and Morey study areas, Nye County, Nevada. Data are from the U.S. Bureau of Mines Mineral Commodity Summaries (1985), unless noted otherwise.

[oz, troy ounces; oz/t, troy ounces per short ton; oz/yd^3, troy ounces per cubic yard; mt, metric tons; lb, pound; $, U.S. dollars]

Commodity	Average domestic mining grade (range) 1/	Domestic mine production (estimated)	Apparent consumption (estimated)	Major import sources	Net import reliance (%) 2/	Average domestic price ($/unit) 3/	Expected U.S. demand through 1990	Major uses
Silver	Nevada, Montana 1.8-2.0 oz/t Idaho, others 9.4-10.1 oz/t	43,000,000 oz	150,000,000 oz	Canada Mexico Peru United Kingdom	61	6.09/oz	Annual increase rate of 2.2%	Photography, electrical and electronic products, sterlingware, electroplate, jewelry, brazing alloys and solders.
Gold	Lode, 0.06 oz/t (0.02-.23 oz/t) Placer, 0.007 oz/yd^3	3,000,000 oz	4,900,000 oz	Canada Rep. of South Africa U.S.S.R.	16	318.37/oz	Annual increase rate of 2.0%	Jewelry and arts, industrial, dental, investment.
Lead	Primary, 6.58% (5.0-7.5%) By-product, 4.89% (3.5-7.5%)	470,000 mt	1,000,000 mt	Peru Honduras Mexico Canada Australia	18	.19-.26/lb	Annual increase rate of 1.3%	Transportation, construction, ammunition, electrical, TV glass, paint.
Zinc	Primary and by-product, 3.8% (3.0-6.0%)	300,000 mt	1,030,000 mt	Canada Peru Mexico Australia	67	.41-.47/lb	Annual increase rate of 2.2%	Construction materials, transportation, machinery, electrical.

1/ Average mining grades are from U.S. Bureau of Mines, Minerals Availability Field Office, Denver, Colorado (Thomas and Boyle, 1985; Kilgore and others, 1983).
2/ Net import reliance is equal to: imports minus exports plus adjustments for government and industry stock changes;
3/ Average domestic prices are for week ending July 19, 1985, from The Mining Record, July 31, 1985, vol. 97, no. 31, Denver, Colorado.

Table 3.--Analytical data for samples 11, 12, 35-38, not listed in other tables, or discussed in text.

[NA, not applicable; ---, analyzed for but not detected; lower detection limits - arsenic (As), 5 ppm; manganese (Mn), 5 ppm; lead (Pb), 30 ppm; zinc (Zn), 5 ppm; gold, 0.01 oz/t; silver, 0.1 oz/t; mercury, 2 ppm; molybdenum, 1 ppm; tin, 5 ppm; samples were also analyzed for gold, silver, mercury, molybdenum, and tin, but all contained less than lower detection limits]

Sample			Assay data (ppm, unless noted as %)				
No.	Type	Length (ft)	As	Mn	Pb	Zn	Remarks
11	Chip	2.0	13.6	0.081%	---	0.014%	Quartz veinlets and stringers in rhyolitic tuff, altered and vuggy; abundant limonite staining.
12	do.	1.5	7.5	.023%	---	46	Do.
35	do.	1.0	59	.075%	---	.011%	Brecciated rhyolitic tuff; minor limonite and hematite, moderate manganese-oxide staining.
36	Select	NA	70	.056%	---	40	Dump sample, rhyolitic tuff with limonite and manganese-oxide staining.
37	Chip	1.5	.137%	1.3%	0.13%	.31%	Fault zone in rhyolitic tuff, abundant iron- and manganese-oxide staining, quartz veinlets to 1/2-in. in thickness.
38	do.	1.0	.116%	2.4%	.039%	.26%	Do.

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

Element	Detection limit (percent)	Element	Detection limit (percent)
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	Pt	.0001
Bi	.01	Re	.0006
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	Zn	.0001
Mg	.0001	Zr	.003
Mn	.001	Y	.0009

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.

Appendix B.--Semiquantitative optical emission spectrographic analytical results, analyses completed by the U.S. Bureau of Mines, Research Center, Reno, Nevada.
(<, less than; >, greater than)

Element	1	3	5	7	9	11	13	14	15	16	18	20	22	24	25	28	30	31
	Concentration, %																	
AG	<.0005	<.0005	<.004	<.0005	<.006	<.01	<.01	<.0005	<.003	<.0005	<.008	<.001	<.0008	<.0007	<.0005	<.0005	<.0005	<.0005
AL	>4.	>4.	>2.	>3.	>5.	>4.	>3.	>4.	>4.	1.	>3.	>3.	>3.	>3.	>3.	>4.	>4.	>3.
AS	.1	.08	<.07	.07	<.1	<.06	<.02	.03	.1	.2	<.09	<.03	<.08	.3	.03	<.02	<.01	.1
AU	<.002	<.002	<.002	<.002	<.004	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002
B	.01	.01	<.009	<.008	.03	<.02	<.003	.01	<.008	<.003	<.01	.01	<.006	<.008	.009	.01	.01	.02
BA	.007	.007	.06	.005	.3	.03	.06	.1	.2	.005	.05	.1	.3	.05	.08	.07	.06	.06
BE	.001	.001	.0008	.001	.003	.002	.0008	.0006	.0007	<.0002	.0003	.0007	<.0001	.0005	<.0001	.0005	<.0001	.0007
BI	<.01	<.01	<.01	<.01	<.09	<.01	<.01	<.01	<.02	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
CA	<.05	<.05	<.07	<.05	<.6	<.4	<.05	<.05	<.2	<.05	<.05	<.05	<.1	<.06	<.05	<.1	.5	2.
CD	<.0005	<.007	<.0007	<.0005	<.01	<.0005	<.001	<.0005	<.002	<.02	<.002	<.0005	<.002	<.003	<.0005	<.0005	<.0005	<.003
CO	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.002	<.001
CR	<.0005	.001	<.0007	<.0009	.002	<.0004	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003
CU	<.0006	<.0006	<.0006	<.0006	.005	<.0006	.001	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006
FE	2.	2.	2.	2.	10.	5.	4.	3.	4.	3.	4.	3.	5.	3.	3.	3.	3.	2.
GA	<.0002	<.0002	<.0002	<.0002	.002	<.0005	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0004	<.0002
K	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	9.	9.	10.	3.	10.	9.	10.	>10.	>10.
LA	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
LI	.02	>.04	>.03	>.1	.02	.02	<.002	<.002	<.004	<.002	.01	.02	<.005	<.002	<.004	<.002	<.003	<.003
MG	.4	.2	<.005	.04	.4	<.006	.3	.3	.4	.2	<.008	.2	<.03	.2	.6	.1	.4	.3
MN	>3.	>1.	>10.	>5.	>9.	>10.	>8.	>3.	>5.	>8.	>10.	>6.	>10.	>7.	>2.	>4.	.3	.9
MO	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
NA	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.7	<.3	<.3	<.3	<.3	<.3	<.3	<.3	4.	3.	<.3
NB	<.01	<.007	<.007	<.007	<.02	<.007	<.007	<.01	<.009	<.007	<.007	<.007	<.007	<.007	<.007	<.01	<.007	<.01
NI	<.0002	<.0002	<.0004	<.0002	<.001	<.002	<.002	<.0002	<.002	<.0008	<.001	<.001	<.003	<.001	<.0002	<.001	<.0005	<.0003
P	<.7	<.7	<.7	<.7	<1.	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7
PB	<.002	<.002	.2	<.002	.8	.04	.4	.1	.2	.1	.2	.2	.3	.1	.02	.1	<.002	<.002
PD	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
PT	<.0006	<.0006	<.0006	<.0006	<.001	<.001	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006
SB	<.06	<.06	<.2	<.1	<.5	<.2	<.2	<.08	<.1	<.06	<.1	<.09	<.1	<.1	<.06	<.09	<.06	<.06
SC	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.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.	>10.	>10.	>10.	>10.	>10.	>10.
SN	<.0006	<.0006	<.001	<.0008	<.03	<.006	<.004	<.0009	<.002	<.0006	<.001	<.001	<.004	<.001	<.0006	<.001	<.001	<.0006
SR	.0003	.0004	.001	.0009	.06	.08	.002	.001	.0005	.001	.01	.003	.01	.001	.0001	.001	.002	.002
TA	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02
TE	<.04	<.07	<.04	<.08	<.08	<.04	<.04	<.04	<.04	<.04	<.04	<.05	<.04	<.04	<.04	<.04	<.04	<.04
TI	<.06	<.04	<.03	<.03	.2	<.05	<.06	.08	.1	<.03	<.03	.08	<.04	<.05	<.07	.1	.2	.08
V	<.005	<.005	<.005	<.005	.02	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	.01	<.005
Y	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009
ZN	.2	.1	.5	.1	.2	.3	.3	.2	.3	.4	.4	.2	.2	.5	.3	.1	.03	.02
ZR	<.003	<.003	<.003	<.003	<.003	.05	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003

	Sample number																	
	33	34	35	36	37	38	41	42	43	44	47	48	50	51	52	53	54	55
Element	Concentration, %																	
AG	<.0005	<.0005	<.0008	<.0005	<.0005	<.006	<.0008	<.003	<.0005	<.0005	<.0005	<.001	<.0005	<.0005	<.0005	<.003	<.0007	<.004
AL	>4.	>4.	>4.	>3.	>4.	>4.	>3.	>4.	>4.	>4.	>3.	>2.	>4.	>4.	>3.	>3.	>4.	>3.
AS	.05	<.07	<.009	<.01	.03	.3	.06	.06	<.01	<.01	<.03	<.07	.1	<.01	<.02	2.	.2	1.
AU	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002
B	.02	<.003	.01	.01	.01	<.003	.01	.009	<.007	<.003	<.006	<.006	<.003	<.007	<.007	.01	.01	<.008
BA	.2	.01	.05	.03	.2	.04	.02	.03	.1	.09	.06	.02	.2	.3	.02	.02	.03	.003
BE	.0007	.0007	.001	.001	.001	.0004	.001	.001	.0006	.001	.0006	.0007	.001	.0008	.0006	.0008	.001	.0009
BI	<.01	<.01	<.03	<.01	<.01	<.04	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
CA	<.2	<.05	<.05	<.05	.3	<.05	<.05	<.05	<.05	<.06	<.05	<.05	<.05	.3	<.05	<.05	<.05	<.05
CD	<.0005	<.0005	<.0005	<.0005	<.0005	<.03	<.003	<.004	<.0005	.0007	<.001	<.002	<.0006	<.0005	<.001	<.5	<.001	<.3
CO	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
CR	<.0003	<.0003	.002	.001	<.0009	.001	.005	.003	<.0004	<.0003	<.0004	.001	.002	<.0003	<.0006	.001	<.0003	<.0009
CU	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	.001	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	.003	<.0006	.005
FE	3.	4.	2.	2.	3.	3.	2.	3.	3.	4.	3.	4.	3.	3.	2.	3.	3.	4.
GA	<.0002	<.0002	<.0002	<.0002	<.0002	<.0006	<.0002	<.0005	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002
K	>10.	>10.	>10.	>10.	>10.	>10.	>10.	10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	4.
LA	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
LI	<.003	<.002	>.06	>.06	<.002	.006	>.08	>.06	<.002	<.002	<.002	.03	.01	<.002	.03	>.05	.006	.03
MG	.4	<.05	.7	.3	.7	.3	.1	.2	.7	.6	.7	<.03	.3	.5	.2	.1	.6	.09
MN	>3.	>10.	.6	.3	>1.	>10.	.7	>5.	.1	>6.	>2.	>10.	>7.	.2	>7.	.7	>5.	.2
MO	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
NA	<.3	<.3	<.3	<.3	<.4	<.3	<.3	<.3	2.	<.3	<.3	<.3	<.3	2.	<.3	<.3	<.3	<.3
NB	<.01	<.007	<.007	<.007	<.009	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007
NI	<.0002	<.002	<.0003	<.0002	<.0002	<.001	<.0003	<.001	<.0002	<.0006	<.0004	<.0006	<.0004	<.0002	<.0003	<.0003	<.0004	<.0004
P	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7
PB	.02	.2	<.002	<.002	<.004	.07	.2	.4	<.002	.2	.5	.7	.01	<.002	.02	1.	.08	2.
PD	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
PT	<.0006	<.0006	<.0006	<.0006	<.0006	<.0008	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006
SB	<.06	<.1	<.06	<.06	<.06	<.06	<.06	<.09	<.06	<.1	<.06	<.2	<.1	<.06	<.06	<.06	<.07	<.06
SC	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.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.	>10.	>10.	>10.	>10.	>10.	>10.
SN	<.003	<.004	<.0008	<.0006	<.001	<.005	<.002	<.001	<.0006	<.002	<.0006	<.002	<.001	<.0006	<.0006	<.003	<.001	<.006
SR	.001	.001	.0002	<.0001	.004	.003	<.0001	.0002	.001	.0006	<.0001	.001	.004	.009	.0003	<.0001	.0005	<.0001
TA	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02
TE	<.04	<.04	<.04	<.04	<.04	<.04	.2	<.08	<.04	<.04	<.04	<.04	<.04	<.04	<.04	<.08	<.04	<.09
TI	.1	.08	.1	<.06	.2	.1	<.04	.08	.09	.1	.08	<.03	.09	.1	<.04	<.05	<.06	<.03
V	<.005	<.005	<.005	<.005	<.005	<.008	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005
Y	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009
ZN	.04	.2	.07	.03	.2	.3	.1	.4	.1	.6	.5	.3	.3	.02	.09	.2	.4	.4
ZR	<.003	<.003	.004	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003

Element	56	58	59	60	62	63	65	66	68	70	71	72	73	74	75	76	77	78
	Concentration %																	
AG	<.0008	<.002	<.0005	<.002	<.0005	<.0005	<.01	<.003	<.008	<.01	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005
AL	>4.	>4.	>4.	>4.	>4.	>4.	>4.	>4.	>4.	>3.	.04	.2	.8	>2.	.3	.07	.9	.9
AS	<.08	<.03	<.009	<.03	<.02	<.009	<.06	<.05	<.05	<.04	<.009	<.009	.03	<.01	.04	<.009	<.02	.06
AU	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002
B	.01	<.003	<.007	<.003	.01	<.006	<.01	<.008	<.007	<.008	<.003	<.003	.01	.01	<.008	<.003	.01	.01
BA	.3	.04	.02	.05	.08	.04	.1	.05	.03	.02	<.002	<.002	.04	.03	.6	<.002	.02	.02
BE	.001	.02	.0006	.02	.01	.002	.004	.003	.003	.002	<.0001	<.0001	.0003	.0004	.0007	<.0001	.0005	.0008
BI	<.04	<.02	<.01	<.01	<.03	<.01	<.01	<.02	<.01	<.01	<.01	<.01	<.02	<.01	<.01	<.01	<.01	<.02
CA	2.	2.	.6	3.	.7	4.	<.4	<.2	<.9	<.5	10.	4.	<.05	<.05	.3	8.	.1	.2
CD	<.0005	.003	<.0005	.001	<.0005	<.0005	<.0005	<.0005	.0009	<.0005	<.0005	<.0005	<.0005	<.0005	<.001	<.0005	<.0005	<.001
CO	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
CR	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0004	<.0003	<.0003	<.0003	.001	.002
CU	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	.002	<.0006	.003	.003	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006
FE	4.	6.	3.	5.	4.	3.	7.	7.	8.	8.	2.	.9	.8	2.	3.	.4	2.	2.
GA	<.0004	<.0003	<.0002	<.0008	<.0004	<.0002	<.0005	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002
K	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	10.	<2.	<.6	<.6	3.	6.	<2.	<.6	<1.	<.6
LA	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
LI	.01	>.03	<.004	>.04	.008	.01	.02	.02	.02	<.002	<.002	<.002	<.002	<.002	<.005	<.002	<.005	.02
MG	2.	1.	.8	1.	.9	.6	.5	.6	.6	<.05	>10.	2.	.08	.2	.06	2.	.1	.06
MN	.3	>7.	.4	>6.	>3.	>2.	>10.	>10.	>10.	>10.	.09	.05	.01	.005	.03	.01	.01	.04
MO	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	.0008	<.0001	<.0001	<.0001
NA	6.	<1.	<.3	<.3	<.3	<.3	<.3	<.3	<.8	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3
NB	<.02	<.01	<.007	<.03	<.01	<.008	<.01	<.01	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007
NI	.001	<.003	<.0004	<.003	<.0006	<.0003	<.005	<.005	<.007	<.009	.0008	<.0003	<.0005	<.0006	<.0007	<.0002	<.0006	.001
P	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7
PB	<.002	2.	<.002	1.	.1	.07	2.	2.	.9	2.	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002
PD	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
PT	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006
SB	<.06	<.2	<.06	<.1	<.07	<.06	<.3	<.2	<.3	<.3	<.06	<.06	<.06	<.06	.1	<.06	<.06	.09
SC	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004
SI	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	4.	>10.	>10.	>10.	>10.	>10.	>10.	>10.
SN	<.004	<.01	<.002	<.02	<.006	<.006	<.01	<.008	<.002	<.004	<.001	<.0006	<.001	<.003	<.002	<.0006	<.0008	<.001
SR	.03	.003	.0003	.003	.0001	.003	.005	.002	.006	.005	.0003	.0003	.03	.06	.001	.0001	.0009	.0005
TA	<.02	<.02	<.02	<.02	<.02	<.02	<.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	<.06	<.09	<.09	<.04	<.04	<.08
TI	.3	.1	.09	.2	.2	.1	.2	.1	<.03	.1	<.03	<.03	<.06	<.05	<.03	<.03	<.06	<.05
V	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005
Y	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009
ZN	.03	.8	.02	.6	.2	.1	.4	.7	1.	.2	.1	.6	.005	.007	.03	.01	.004	.03
ZR	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	.009	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003

	Sample number																	
	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
Element	Concentration, %																	
AG	<.0005	<.0005	<.0005	<.002	<.0009	<.0005	<.001	<.002	.005	<.0005	<.0005	<.009	<.0005	<.0005	<.0005	<.002	<.001	<.0005
AL	.3	.1	.3	.2	1.	>3.	.2	.5	.5	.6	.05	.08	>2.	>3.	>3.	>3.	.5	.1
AS	.03	<.02	<.01	<.03	.05	.1	<.02	.3	.3	.08	<.009	.6	.03	<.02	<.009	.06	.04	<.009
AU	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002
B	<.008	<.007	<.006	.01	.01	.02	.01	.01	.009	.009	<.003	<.008	.02	.01	<.006	<.006	<.003	<.003
BA	.007	.003	.006	.02	.01	.03	.008	.07	.02	.008	<.002	.004	.01	.05	1.	.4	.002	<.002
BE	<.0002	<.0002	<.0002	.0006	.0005	.0006	.0004	.0005	.0003	<.0003	<.0001	<.0002	.0008	.0004	<.0003	.0003	<.0001	<.0001
BI	<.01	<.01	<.01	<.02	<.02	<.02	.05	<.03	.06	<.01	<.01	<.03	<.01	<.01	<.01	<.04	<.01	<.01
CA	.6	<.08	.9	<.07	<.06	<.06	<.05	.2	<.08	.4	10.	<.05	<.05	<.05	.4	<.08	>10.	9.
CD	<.0005	<.0005	<.0005	<.0005	<.0006	<.002	<.0005	<.02	<.009	<.0008	<.0005	<.0005	.0005	<.0005	<.0005	<.0005	<.0005	<.0005
CO	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
CR	.002	.002	.001	.001	<.0009	<.0007	.02	.002	<.0006	<.0006	<.0003	<.0003	<.0003	<.0003	.02	.02	<.0003	<.0003
CU	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	.002	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	.002	.0008	<.0006	<.0006
FE	1.	.7	1.	3.	3.	4.	2.	5.	6.	3.	1.	>10.	3.	3.	5.	5.	4.	1.
GA	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0003	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002
K	<.6	<.6	<.6	2.	<2.	<1.	<.6	<.6	2.	<.6	<.6	4.	6.	3.	>10.	5.	<.6	6.
LA	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
LI	<.002	<.002	.01	<.002	<.003	.008	<.002	<.004	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002
MG	.1	.02	.5	.02	.2	.2	.001	.07	.1	.3	>10.	.3	.3	.2	1.	.6	>10.	>9.
MN	.02	.01	.03	.04	.01	.02	.2	.007	.02	.01	.03	<.006	.01	.03	.2	.02	.1	.05
MO	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	.0004	<.0001	.002	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
NA	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<.3	<2.	<10.
NB	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007	<.007
NI	<.0006	<.0003	<.0005	.001	<.0007	.001	.008	.002	.002	<.0006	<.0002	.03	.002	.002	.008	.007	.01	.004
P	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.9	<.7	<.7	<.7	<1.	<.7	<.7	<.7	<.7	<.7	<.7
PB	<.002	<.002	<.002	<.008	<.002	<.002	<.002	.009	<.002	<.002	<.002	<.003	<.002	<.002	<.002	<.002	2.	1.
PD	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
PT	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0008	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006
SB	<.06	<.06	<.06	<.06	<.06	<.06	.1	<.06	<.06	<.06	<.06	<.1	<.07	<.06	<.06	.1	<.06	<.06
SC	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004
SI	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	>10.	.3	3.	>10.	>10.	>10.	>10.	5.	2.
SN	<.0007	<.0006	<.0008	.004	<.002	<.004	.02	.008	.007	<.002	<.0006	.07	<.002	<.002	<.003	<.006	<.005	<.0006
SR	.0001	<.0001	.0001	<.0001	.0004	.003	<.0001	.001	.002	.003	<.0001	<.0001	.004	.002	.08	.03	.0002	<.0001
TA	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02
TE	<.05	<.04	<.04	.1	<.07	<.08	<.1	<.07	<.04	<.04	<.04	<.04	<.06	<.06	<.04	<.04	<.04	<.04
TI	<.03	<.03	<.03	<.03	<.03	<.08	<.03	<.03	<.04	<.03	<.03	<.03	<.03	<.07	.3	.3	<.03	<.03
V	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.006	<.008	<.005	<.01	.06	<.01
Y	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009
ZN	.001	.001	.004	.09	.03	.01	.03	.01	.006	.01	<.0008	.01	.08	.05	.05	.03	1.	>9.
ZR	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	.006	<.003	<.003

	Sample number																		
	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115
Element	Concentration, %																		
AG	<.0005	<.0005	<.0005	<.0005	<.004	<.004	<.005	<.0005	.01	.02	<.009	<.004	<.01	.006	<.01	.01	<.0006	<.003	.01
AL	.3	.3	.1	.6	.1	.3	.3	.3	>3.	>2.	.7	.9	1.	.6	.6	.7	.2	.4	.2
AS	<.009	<.009	<.009	<.009	<.02	.04	.03	<.009	.06	.07	<.06	.03	<.06	<.01	<.05	.06	.04	<.01	.09
AU	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.01	<.002	<.007	<.002	<.002	<.002	<.002
B	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	.01	<.009	<.008	<.008	<.01	<.004	<.009	<.008	<.003	<.003	<.008
BA	<.002	<.002	<.002	<.002	.003	<.002	.002	<.002	.02	.02	.02	.005	.02	.003	.01	.01	<.002	<.002	.007
BE	<.0001	<.0001	<.0001	<.0001	<.0001	.0004	.0005	<.0001	.0007	.0008	.0008	<.0001	.001	<.0001	.001	.0004	<.0001	<.0001	<.0001
BI	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.05	<.06	<.07	<.03	<.07	<.01	<.04	<.01	<.02	<.01	.07
CA	>10.	>10.	>10.	>10.	5.	6.	6.	>10.	3.	6.	6.	10.	.4	>10.	3.	5.	6.	>10.	<.05
CD	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0006	<.001	.0007	<.002	<.0005	<.0009	<.0007	<.0005	<.0005	<.0005
CO	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.003	<.002	<.001	<.003	<.001	<.001	<.002	<.001	<.001	<.001
CR	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0008	<.0005	<.0006	<.0004	<.0003	<.0003	<.0003	<.0009	<.0003	<.0003	<.0003
CU	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	.0008	<.0006	<.0006	<.0006	<.0006
FE	2.	4.	.3	.8	5.	7.	6.	1.	10.	10.	>10.	7.	>10.	1.	>10.	10.	7.	1.	10.
GA	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002	.003	.004	.004	<.0003	<.003	<.0002	.004	.002	<.0002	<.0002	<.001
K	<.6	<.6	<.6	<.6	10.	10.	5.	<.6	10.	10.	8.	7.	10.	4.	10.	7.	<.6	<1.	3.
LA	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.02	<.02	<.01	<.01	<.01	<.02	<.01	<.01	<.01	<.01
LI	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.003	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002	<.002
MG	>10.	>10.	3.	>10.	3.	2.	2.	>10.	.6	.9	.7	2.	.1	4.	.6	.9	>10.	4.	.4
MN	.06	.04	.04	.09	.04	.07	.06	.1	.07	.05	<.02	.07	<.04	.07	<.007	.09	.05	.2	.02
MO	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0002	<.0002	<.0001	<.0002	<.0001	<.0003	<.0001	<.0001	<.0001	<.0001
NA	<.3	<.3	<.3	<.3	>3.	>2.	>4.	<.3	<***	<***	<***	<***	10.	<.3	<5.	<***	<***	<.3	<2.
NB	<.007	<.007	<.01	<.02	<.007	<.007	<.007	<.008	<.008	<.02	<.01	<.008	<.01	<.02	<.007	<.007	<.007	<.02	<.007
NI	.006	.009	<.0006	.002	.001	.004	.004	<.0004	.02	.02	.02	.003	.02	.002	.02	.02	.007	.001	.02
P	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.7	<.8	<1.	<.7	<.7	<2.	<.7	<2.	<.7	<.7	<.7	<.7
PB	.04	.3	<.002	<.002	.9	2.	2.	.04	8.	10.	10.	8.	>10.	.1	10.	6.	.3	.02	1.
PD	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0002	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
PT	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.0006	<.002	<.0006	<.003	<.0006	<.003	<.0006	<.003	<.0006	<.0006	<.0006	<.001
SB	<.06	<.06	<.06	<.06	<.06	<.06	<.06	<.06	<.2	<.2	<.2	<.06	<.4	<.06	<.4	<.1	<.09	<.06	<.06
SC	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0004	<.0009	<.0006	<.0004	<.0004	<.0004	<.0009	<.0004	<.0004	<.0004	<.0004
SI	.3	.4	.1	.6	5.	1.	1.	.3	>10.	4.	3.	4.	2.	.4	2.	4.	2.	.2	4.
SN	<.0009	<.003	<.0006	<.0006	.003	.02	.01	<.001	<.07	<.08	.1	.007	.2	.006	.1	.04	<.005	.003	.04
SR	<.0001	<.0001	<.0001	.0002	<.0001	<.0001	<.0001	.0003	.0004	.0005	.0003	.0005	.0006	.0004	.0003	.0002	<.0001	.0005	<.0001
TA	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.02	<.08	<.07	<.2	<.02	<.02	<.02	<.02	<.03	<.02	<.02	<.02
TE	<.04	<.04	<.04	<.04	<.04	<.04	<.04	<.04	<.05	<.07	<.04	<.04	<.3	<.04	<.3	<.04	<.04	<.04	<.04
TI	<.03	<.03	<.03	<.03	<.03	<.03	<.03	<.03	.1	.1	.1	<.05	.08	<.03	<.05	.1	<.03	<.03	<.08
V	<.005	<.006	<.005	<.005	<.005	.09	.1	<.005	.02	.02	.02	<.005	<.009	<.005	.02	.02	<.005	<.005	<.009
Y	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009	<.0009
ZN	.3	.5	.4	.2	1.	.8	.6	.4	.4	.6	.4	1.	.4	.08	.5	.5	>10.	.1	.5
ZR	<.003	<.003	<.003	<.003	<.003	<.003	<.003	<.003	.008	.01	<.009	<.003	<.005	<.003	<.007	.006	<.003	<.003	.004

<***, Due to Zn interference on Na.

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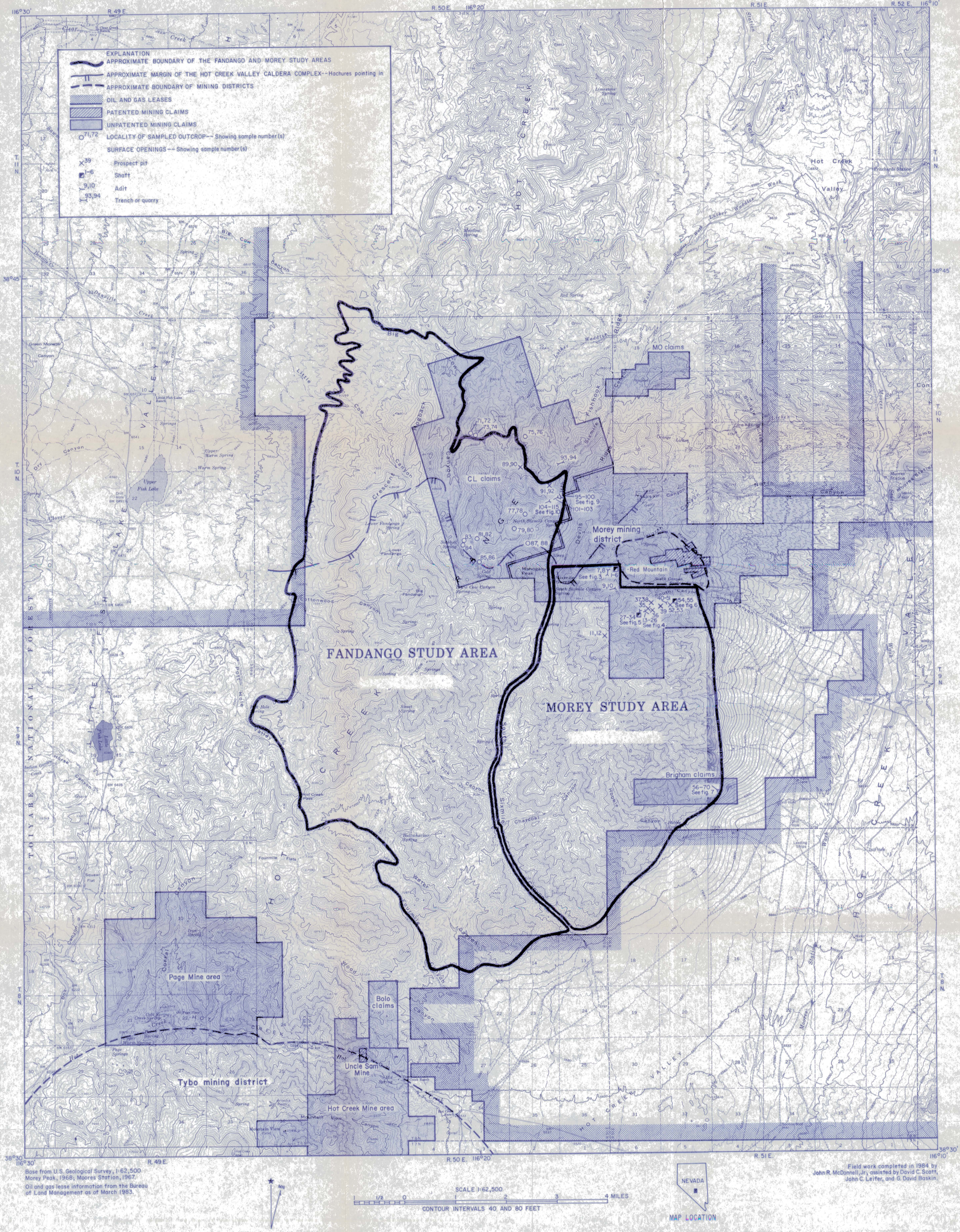
PLATE 1



MINE AND PROSPECT MAP OF THE FANDANGO AND MOREY STUDY AREAS, NYE COUNTY, NEVADA

BY

JOHN R. McDONNELL, JR., U.S. BUREAU OF MINES

1985