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FIRSTMISS GOLD, INC.
GETCHELL MINE

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INTRODUCTION

Welcome to the Getchell Mine. We at FirstMiss Gold are pleased to have you as our guests. Every precaution has been taken to insure your safety and we ask that you please observe these safety rules:

1. Always wear protective headgear and glasses when outdoors.

2. No alcoholic beverages, controlled substances, firearms or explosives allowed on the property.

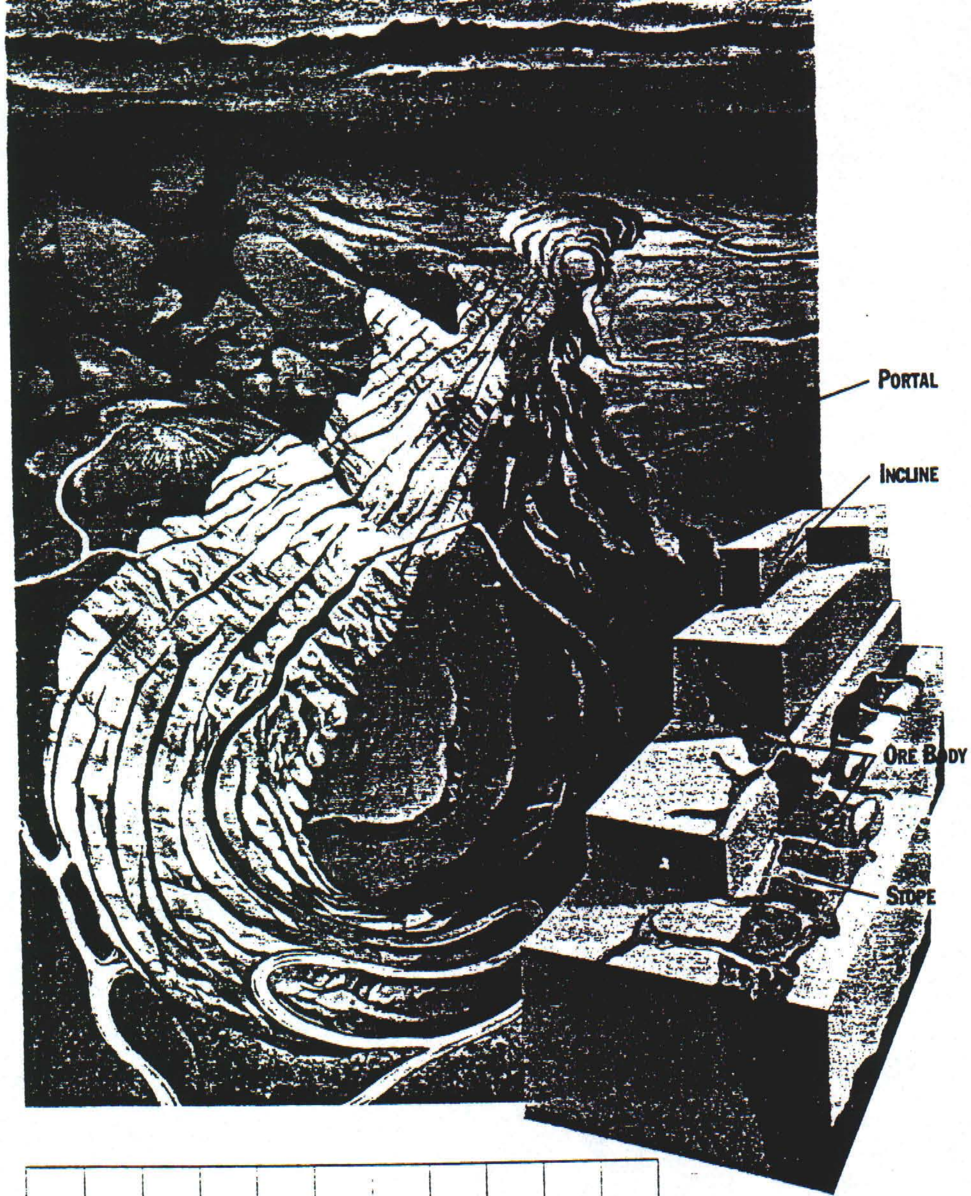
3. Stay with tour guide at all times and follow his/her instructions.

4. Always watch where you step and avoid loose rocks.

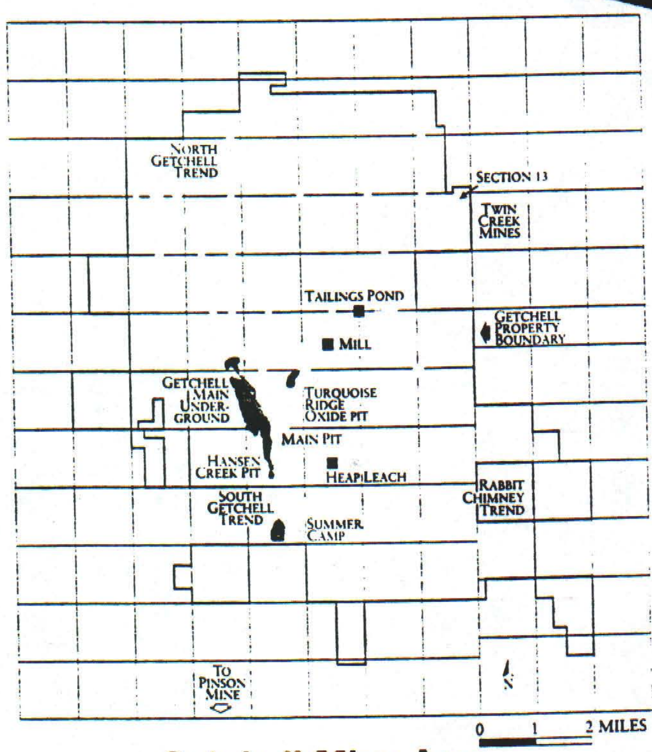
FIRSTMISS GOLD INC. is a gold mining and exploration company incorporated in Nevada in August 1987. Headquarters are in Reno. The Company operates the Getchell Mine in north central Nevada. Getchell operations include exploration, open pit and underground mining, a nominal 3,000-ton-per-day pressure oxidation mill, and a 3,000-ton-per-day heap leach operation.

Proven and probable mineable gold reserves are approximately 1,591,700 ounces.

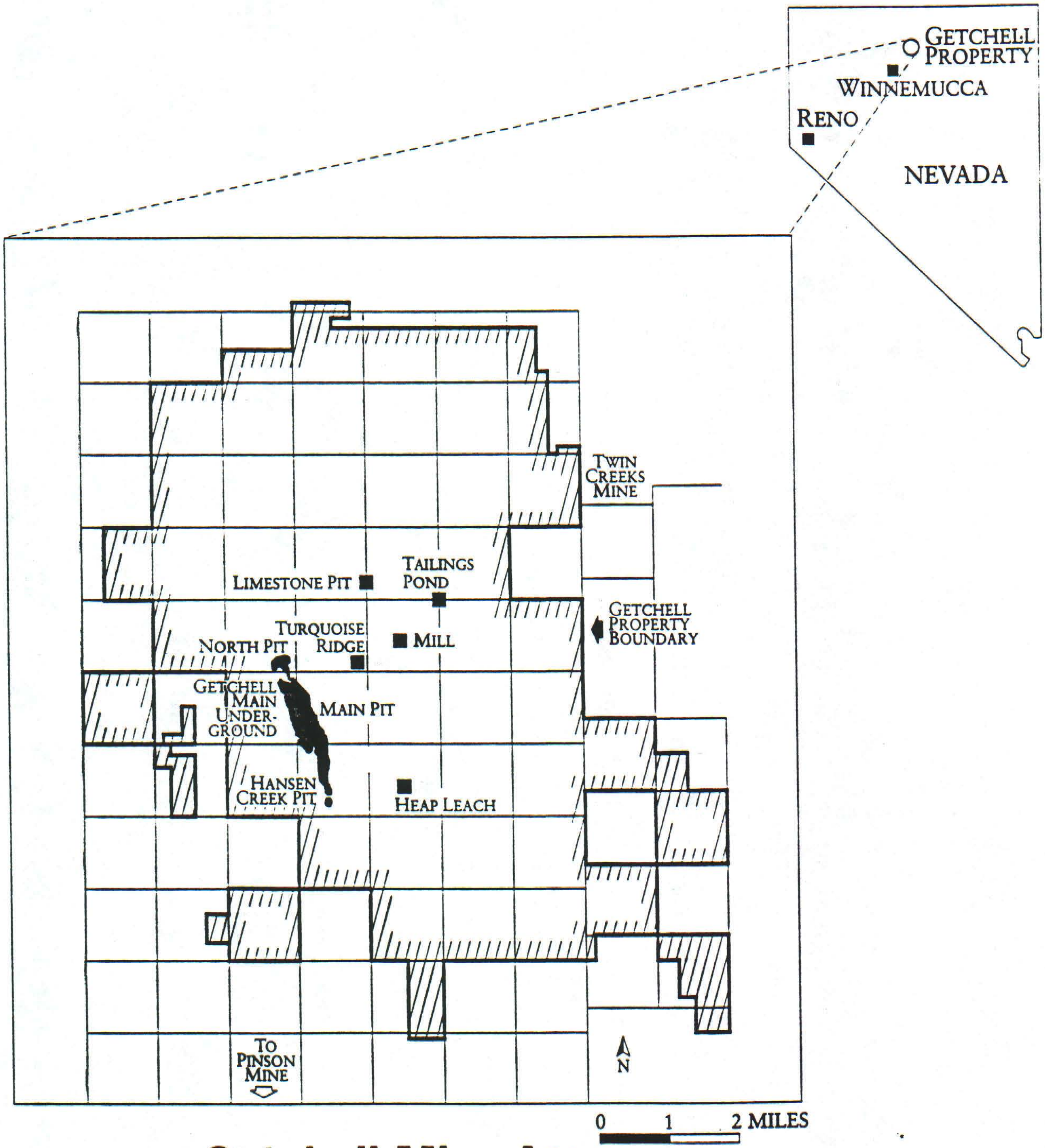
FirstMiss Gold stock is listed on the NASDAQ Stock Market. The stock symbol is "FRMG."



Right, development work is proceeding on five levels in the Getchell Main Underground mine. Access is via a 950-foot decline which links production levels extending north along the footwall of the Getchell fault zone, below and to the west of the Main Pit. Production is scheduled to begin during the second quarter of fiscal 1995 using drift and fill mining and should reach about 2,000 tons per day by fiscal year end. Average ore grade is expected to exceed 0.300 ounces per ton. ■



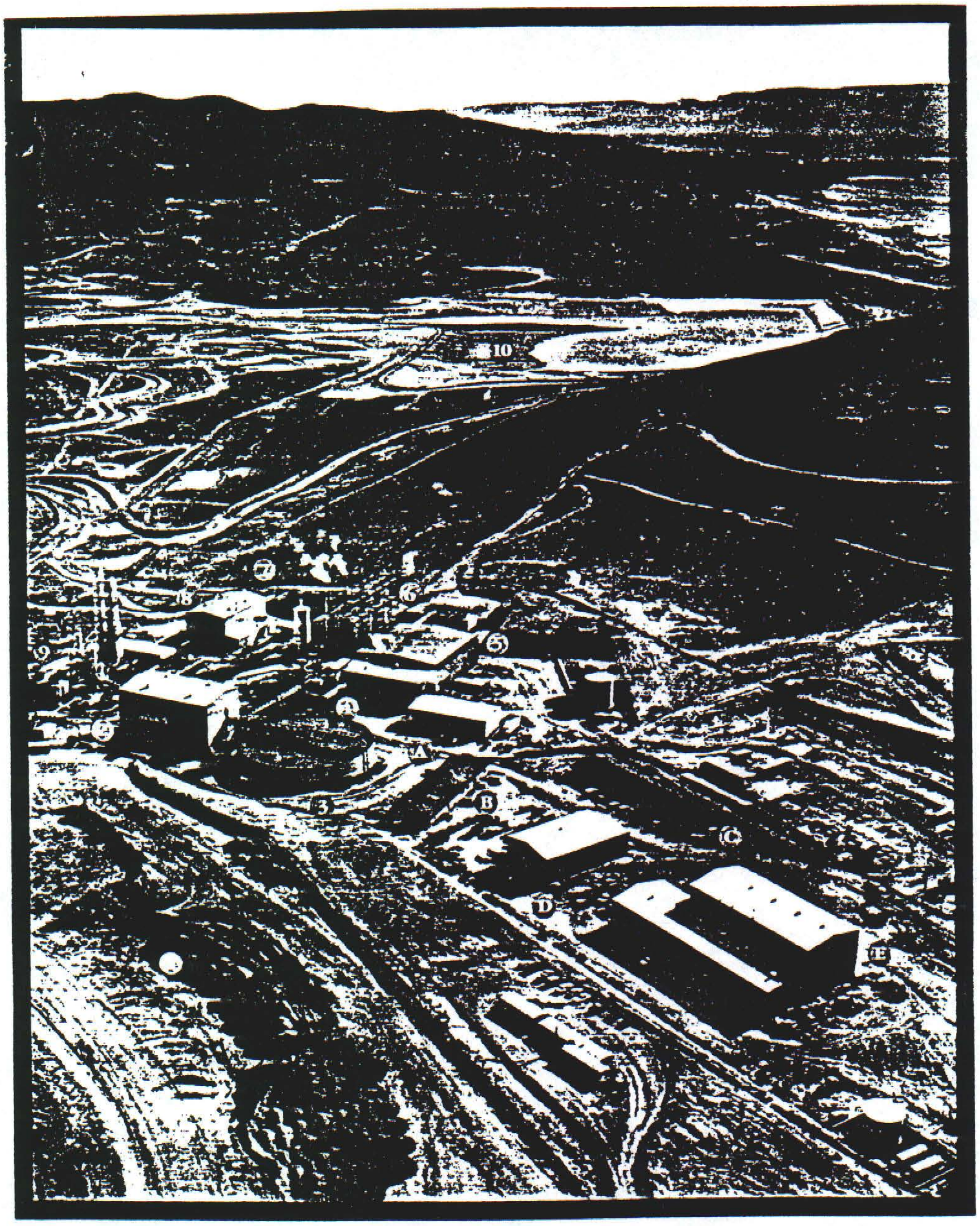
Getchell Mine Area
■ Pits Major Anomalies Trends

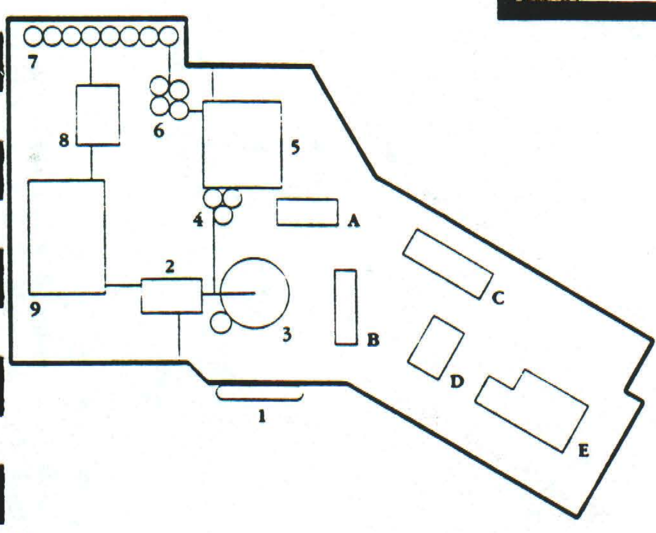


Getchell Mine Area

HUMBOLDT COUNTY, NEVADA

PLANT SITE

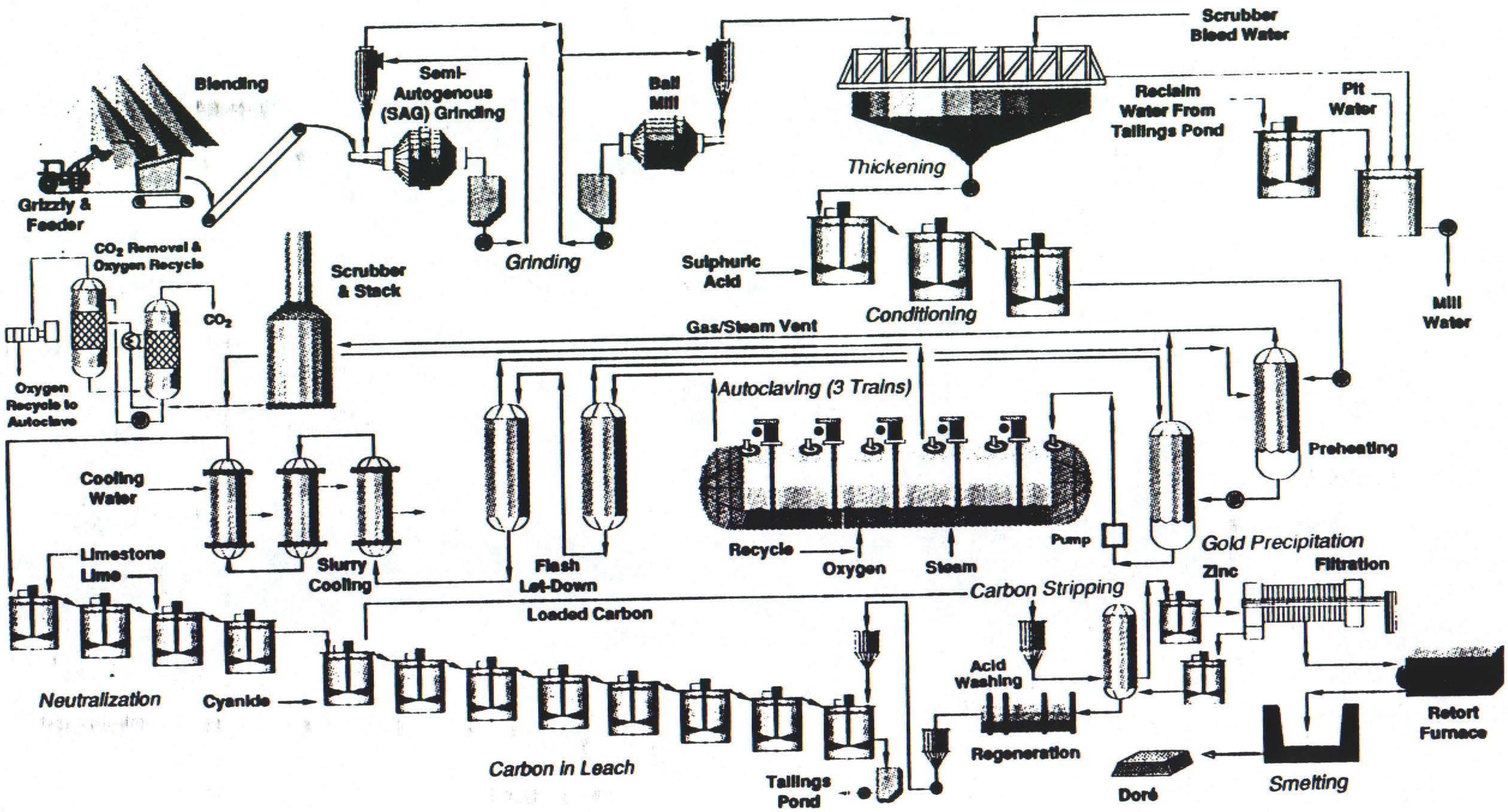




ABOVE & DIAGRAM — *1 — Ore Stockpile, 2 — Grinding Circuit, 3 — Thickener Tank. 4 — Conditioning Tanks, 5 — Autoclave Circuit, 6 — Neutralization Tanks, 7 — Carbon-in-Leach Tanks, 8 — Carbon Stripping & Refinery, 9 — Oxygen Plant, 10 — Tailings Pond. A — Mill Maintenance Shop, B — Assay Lab, C — Administration. D — Warehouse. E — Mine Maintenance Shop.* RIGHT — *Gold mining and ranching are two important industries in Nevada. At Getchell the two co-exist in close accord.*

FirstMiss Gold Inc.

Production Flow Chart



Introduction

FirstMiss Gold Inc. (the "Company") is engaged in the business of mining and processing gold ores and exploration for such ores. Essentially all of the Company's revenues are derived from the sale of gold. During fiscal 1994, 243,826 ounces of gold were produced and sold.

The Company was incorporated in August 1987 by First Mississippi Corporation ("First Mississippi") for purposes of financing, developing and operating the Getchell gold mining project and for conducting minerals exploration. Construction of a mill and ancillary facilities was completed in July 1989 using proceeds from a project financing gold loan and from the May 1988 initial public offering of 3,250,000 shares of the Company's stock. Currently, 81% of the Company's stock is held by First Mississippi.

The Company owns and operates the Getchell Property located in the Potosi Mining District on the eastern side of the Osgood Mountain Range 35 miles northeast of the town of Winnemucca, Nevada ("Getchell Property"). (See map on page 10.) Operations on the Getchell Property include a pressure oxidation (autoclave) mill facility and an oxide heap leach facility. Currently, sulfide ores for the mill are produced from an open pit and from an underground mine in the initial stages of development. Oxide ores for the heap leach facility are produced from two smaller pits, old dumps and stockpiles. Portions of the Getchell Property are located on property of a wholly owned subsidiary, FMG Inc. ("FMG"). The Company is actively conducting exploration on the 33,000 acre Getchell Property.

Access to the mine site is via Nevada State Highway 18 and an all-weather gravel road maintained jointly by the Company and various competitors who use the same access.

In February 1990, First Mississippi, which holds approximately 81% of the stock of the Company, announced plans to distribute this stock to its shareholders. According to First Mississippi, the spin-off was subject to a favorable tax ruling from the Internal Revenue Service and a favorable operating and financial outlook. The required ruling was received in December 1990. However, in the interim, gold prices had fallen and the spin-off was put on hold. In July 1994, First Mississippi requested a new ruling to permit a tax-free spin-off. According to First Mississippi, upon receipt of a favorable ruling, the spin-off will be contingent on the Company's ability to succeed as a viable, stand-alone company.

The Company's principal executive offices are located in Reno, Nevada. As of June 30, 1994, the Company had 164 employees.

Gold Prices

Gold is traded on numerous commodity exchanges around the world with daily adjustments to a market clearing price. Prices typically fluctuate over a wide range in response to numerous factors, all of which are beyond the Company's control, including expectations of inflation, interest rates, political and monetary policies of various national governments, the needs of industrial and jewelry manufacturers, trends in worldwide mine output and currency exchange rates.

The aggregate effect of the above factors on gold prices is impossible to predict. The Company's revenues, cash flow and operating results are all materially impacted by gold prices. A prolonged downturn in gold prices could also adversely affect the carrying value of various assets and the Company's reserve position.

The Getchell Property

History. Gold mining commenced at the Getchell Property in the late 1930's and has continued intermittently since that time under several different owners. First Mississippi purchased the property (inactive at the time) from Conoco, Inc. in 1983 and began an oxide heap leach operation in June 1985. Company exploration efforts identified substantial sulfide gold reserves on the property. A 3,000 ton per day pressure oxidation mill was constructed to process the sulfide ore and has been operating since 1989. Over one million ounces have been produced and sold since FirstMiss Gold began operation in 1985.

Essentially all of the Company's production to date has come from surface mining operations but an underground mine is in development and should become the major source of sulfide ore after mid-fiscal 1995.

Geology. Gold mineralization on the Getchell Property occurs in a series of discrete zones associated with the north-trending Getchell Fault and with the northeast-trending Turquoise Ridge Fault. Both systems cut through a thick sequence of interbedded early paleozoic sedimentary and volcanic units. The northwest-dipping Turquoise Ridge Fault and the eastward-dipping Getchell Fault intersect in the Main Pit.

Gold sulfide mineral deposits are found at depth along the Getchell Fault and in sedimentary units in contact with the Getchell Fault. Recent drilling has identified similar gold sulfide mineral deposits in various sedimentary and volcanic units in contact with the Turquoise Ridge Fault northeast of its intersection with the Getchell Fault.

Oxidized gold mineral deposits are also associated with the Getchell and Turquoise Ridge fault zones, typically occurring as discrete zones at depths shallower than the sulfide mineralization.

A mineral deposit is a naturally occurring concentration of minerals that may or may not be economically mineable. A mineable reserve is that part of a mineral deposit that has been drilled out sufficiently to define the tonnage and grade and which may be extracted at a profit. Mineral deposits do not qualify as commercially mineable ore bodies (proven and probable mineable reserves) under Securities and Exchange Commission rules until a final and comprehensive economic, technical and legal feasibility study based upon adequate test results is concluded.

Reserves

The following table sets forth the proven and probable mineable ore reserves on the Getchell Property.

PROVEN AND PROBABLE MINEABLE RESERVES

Confirmed by Mine Development Associates
As of July 1, 1994

	Ore Tons	Grade (Weighted Average)	Contained Gold Ounces
Sulfide	6,725,400	0.225	1,511,800
Oxide	2,860,800	0.028	79,900
Total	9,586,200	0.166	1,591,700

Sulfide reserves assume a 0.100 ounce per ton cutoff for open pit reserves and a 0.200 ounce per ton cutoff for underground reserves. Oxide reserves are based on a 0.010 cyanide soluble cutoff grade. Included in sulfide reserves are low-grade stockpiles containing 2,080,500 tons at an average grade of 0.115 ounces per ton, or 238,400 contained ounces. Also included in sulfide reserves are 3,733,700 tons of underground ore at an average grade of 0.302 ounces per ton, or 1,127,700 contained ounces. The proven and probable mineable ore reserve ounces are "contained" ounces. Actual ounces expected to be recovered during milling and heap leach processing will be less due to recovery process inefficiencies.

Proven and probable mineable ore reserves reflect estimates of quantities and grades of ore which can be economically recovered based on assumptions of a $400 per ounce future gold price and projected future mining and milling costs. Although the Company has carefully prepared and verified these reserves, such figures are estimates. Prolonged decreases in gold prices may render uneconomic the mining of various ore reserves containing low grades of mineralization.

At June 30, 1994, proven and probable mineable sulfide ore reserves increased 22% and the average sulfide grade increased 9% over the prior year end. Oxide proven and probable mineable ore reserves increased slightly to 79,900 ounces from 76,600 ounces. Exploration added 558,700 new contained ounces of reserves during the year, while ore containing 280,000 ounces was processed through the mill and heap leach.

Operations

Mining. There are currently three open pit mines in operation on the Getchell Property: the Main Pit, which produces sulfide mill feed, the Turquoise Ridge Pit, which produces oxide ore for the heap leach operation and the recently reactivated Hansen Creek Pit, which will also produce oxide ore for heap leaching. Mining of the North Pit sulfide ore body was completed during the year.

An underground sulfide operation ("Getchell Main Underground") is now nearing its operational phase. This is the Company's first underground mine. Access to the underground workings is via a 950-foot decline. Underground stope testing has begun and small tonnages of development ore have been mined and milled. The mineralogy of the underground ore is similar to that previously mined in the Main Pit, but carries a higher gold grade, averaging in excess of 0.300 ounces per ton. The Getchell Main Underground reserves are located immediately west and below the Main Pit, in tabular zones sub-parallel to the Getchell Fault.

The underground operation will initially utilize a conventional drift-and-fill method but will switch to open stoping when ground conditions permit. Both methods are widely used for the mining of gold and other minerals. Underground mining is inherently more difficult, more costly and more hazardous than surface mining. Mining costs are higher than those of a surface pit operation because smaller, less efficient mobile equipment is required by the limited size of underground openings. Unanticipated changes in ore thickness, orientation and stability can also add difficulty and contribute to higher costs. The Company anticipates, however, that the increased cost of underground mining will be offset by higher underground ore grades.

A 1,000-ton-per-day production rate for the underground mine is planned by early fiscal 1995, increasing to approximately 2,000 tons per day by the end of the year, although no assurance can be given that this production schedule will be met.

All mining is performed by independent contractors who also provide and maintain substantially all of the mining equipment. Both open pit and underground mining operations are performed under the direction of Company employees, who are responsible for mine design, planning, scheduling, surveying, sampling and ore control.

Milling Process. Economic gold recoveries from the sulfide ores on the Getchell Property can be attained if the ore is oxidized prior to treatment by conventional carbon in leach ("CIL") processes. The Company's mill was designed and constructed to use high temperature pressure oxidation autoclaves to oxidize sulfides in the ore. Prior to pressure oxidation, ore is ground in a conventional grinding circuit, thickened to form an ore slurry, treated with sulfuric acid to remove carbonate minerals and preheated. The preheated ore slurry then enters the autoclaves where the temperature and pressure are increased and high purity oxygen is added to oxidize the sulfide minerals. As the ore slurry leaves the autoclaves, limestone and lime are added to adjust pH. The ore slurry is then transferred to a conventional CIL circuit where gold is adsorbed onto carbon granules. Loaded carbon is periodically removed from the cyanide circuit and processed to strip the gold. The stripping process culminates in a gold/silver precipitate which is collected in filter presses and smelted into doré bars for shipment. The Company is currently one of the few U.S. gold companies using autoclaves for processing ore.

The mill was designed to process an average daily nominal throughput of 3,000 tons at an average recovery rate of 89%. Since September 1991, liquid oxygen has been purchased to supplement oxygen produced by an on-site plant. This additional oxygen has helped to increase average daily throughput above nominal capacity. In fiscal 1994, the average daily mill throughput was 3,268 tons and gold recovery was 89%. Autoclave availability averaged 90% in fiscal 1994 versus 85% in 1993.

Heap Leach Process. Heap leaching is a process used to recover gold from naturally oxidized, permeable ore. Since recovery rates from heap leaching are lower than from conventional CIL milling, this process is not usually applied to high-grade ore. Heap leach recovery has averaged 75% of the cyanide soluble gold for the last three years.

Heap leach operations consist of three active pads, five ponds and a processing plant. A new leach pad is currently under construction. Ore is stacked on an impermeable, synthetically-lined pad to form a heap, with a piping and sprinkling system set on top. The sprinkling system irrigates the heap with a dilute cyanide solution that dissolves the gold. The gold-bearing solution is collected and pumped through activated carbon columns where the contained gold is adsorbed. The carbon is transferred to the mill where gold is stripped from the carbon, precipitated, smelted and poured into doré bars.

During fiscal 1994, oxide ore for heap leaching was mined from the Turquoise Ridge Pit, old dumps and stockpiles. The Turquoise Ridge Pit, Hansen Creek Pit and old dumps will provide oxide ore in fiscal 1995.

Production. Fiscal 1994 production was as follows:

	Sulfide Ore				Oxide Ore
	North Pit	Main Pit	Under-ground	Total Sulfide Ore	Total Oxide Ore
Tons Processed	283,946	896,368	12,553	1,192,867	1,285,614
Grade	0.321	0.164	0.319	0.203	0.030
Recovery	89.1%	88.9%	88.9%	88.9%	74%
Ounces produced	81,212	130,591	3,560	215,363	28,463
Strip Ratio 1994	12.3:1	17.3:1	N/A	N/A	4.5:1*

* Turquoise Ridge Pit

Ancillary Facilities and Raw Materials. Oxygen is supplied under a long-term agreement by an independent contractor who owns and operates a plant at the mill site. The agreement has a remaining term of approximately 9.5 years. Payments were $4.0 million in fiscal 1994 and estimated to be approximately $3.3 million in fiscal 1995. Supplemental liquid oxygen is delivered by truck when mill needs exceed the oxygen plant output.

Electricity is provided by an independent utility company under an electric services agreement. The mill uses reclaimed water pumped from the tailings pond and from the dewatering of the pits. Makeup water for the milling process comes from two wells located on the Getchell Property approximately four miles from the plant. A limestone deposit located on the Getchell Property is mined and stockpiled by an independent contractor for use in neutralizing acid in the autoclave slurry discharge.

Other materials necessary in the milling process, such as sodium hydroxide, sulfuric acid, lime, carbon, propane and sodium cyanide, are available for purchase from more than one supplier and are hauled by truck to the Getchell Property. These materials may be subject to shortages from time to time, resulting in higher costs.

The Company has constructed a tailings dam and pond on 172 acres of land on the property. Additional lifts to increase capacity will be constructed as needed. The pond is lined with a synthetic liner and is designed to accommodate run-off from a 100-year flood event and reasonably expected seismic activity for the site.

Exploration

The Company's exploration activities are concentrated on the Getchell property and include drilling, geological mapping, geophysical and geochemical surveys and aerial photo interpretation.

Prior to fiscal 1994 exploration was oriented toward development of known ore zones and evaluation of the numerous exploration targets on the property. In fiscal 1994, exploration concentrated along the Turquoise Ridge Fault zone, where high grade gold sulfide mineralization has been encountered. The mineralization is located between 700 and 2,500 feet below the surface. Fiscal 1995 exploration efforts will continue to concentrate on the Turquoise Ridge area. An oxide exploration program at Getchell is also planned for fiscal 1995.

An extensive development drilling program added substantial new reserves during the year. Most of the additions are extensions of the Getchell Main Underground ore body at depth and to the north (See

"Reserves" discussion above). The ore body remains open at depth and along strike. Fiscal 1995 development drilling will concentrate on deeper portions of the Getchell Main Underground ore body and areas along strike from the current reserves.

Sales and Marketing

Refining and Marketing. During fiscal 1994, the Company's doré was refined and sold under contracts to Metalor USA Refining Corporation of North Attleborough, Massachusetts and to Engelhard S. A. of Paris, France. The Company's doré can be sold to a large number of refiners or trading companies throughout the world on a competitive basis. Consequently, the Company does not believe that the loss of any single outlet would deny a market for its product. Total ounces of gold sold were 243,826, 210,644 and 218,821 for fiscal 1994, 1993 and 1992, respectively. Of these sales, 7% were exported (to France) in 1994, 28% were exported (to France) in 1993, and 31% were exported (to Canada) in 1992.

Forward Commitments to Deliver Gold. In fiscal 1988, FMG (a wholly owned subsidiary), with the Company as guarantor, entered into agreements with certain lenders which provided a limited-recourse gold loan facility and a limited-recourse credit agreement for the purpose of mill construction, mine development, financing costs and working capital requirements. FMG borrowed a total of 150,000 ounces of gold at an average price of $475 per ounce. The loan has been repaid in quarterly instalments, and in fiscal 1994, FMG repaid the remaining 20,625 ounces due on the gold loan as scheduled, extinguishing the loan and satisfying all obligations under the loan agreement. All escrow moneys and balances held by the lender have been released.

Pursuant to the gold loan agreements, FMG was required to enter into a five-year gold hedging agreement providing for a $400 per ounce floor price covering 202,600 ounces of gold and a ceiling price of $450 per ounce covering 70,600 ounces. During fiscal 1994, FMG exercised forward sale agreements on 47,000 ounces, at $400 per ounce, thereby fulfilling all remaining delivery commitments under this program.

The Company periodically employs hedging techniques to reduce the impact of gold price fluctuations on earnings and cash flow. In August 1993, the Company began selling gold using spot deferred forward contracts which allow the Company to establish a forward price and delivery date, but also roll any contracted delivery ahead to a new date and higher price while selling at the spot price if the spot price is higher than the contract price on the scheduled date of delivery. The new forward price equals the original contract price plus the "contango," which is the difference between market interest rates and gold loan borrowing rates. The contango compounds each time a contract is rolled forward. The current hedging program is designed to cover 60% to 70% of the ensuing 18 months' scheduled gold production. At June 30, 1994, 225,000 ounces were hedged for fiscal 1995 delivery at an average price of $391 per ounce, and 92,000 ounces were hedged for fiscal 1996 delivery at an average price of $392 per ounce. See Note 5 to the Consolidated Financial Statements.

Property Interests at the Getchell Property

The Getchell Property consists of approximately 18,900 acres of unpatented lode and mill site mining claims and 14,100 acres of fee land owned by the Company. Approximately 65% of the Getchell Property, including all current proven and probable reserves, is subject to a 2% net smelter royalty owned by a third party.

Unpatented mining claims are located on public land pursuant to procedures established by the General Mining Law of 1872 ("Mining Law"), and by Nevada law in a manner consistent with common mining industry practices.

The Mining Law governs hardrock mining on federal public land and invites the public to explore for, discover and produce valuable mineral deposits. There is now pending legislation in both the U.S. House of Representatives and the U.S. Senate that propose significant changes to the Mining Law. These proposed changes include royalties on gold and other minerals produced from federal lands, additional environmental restrictions and regulations and extensive new permitting procedures. The Company cannot at this time forecast the likelihood or form of any changes in the Mining Law.

While over 95% of the Company's current reserves are on fee land and thus would not be subject to federal royalties as now proposed. future development of the Company and future environmental compliance costs could be adversely affected by many of the proposed legislative changes.

Environmental Matters and Safety

Environmental Regulations. The Company and its operations are subject to numerous federal environmental laws which regulate mining and exploration activity, air and water pollution, emergency preparedness and reporting, wildlife and endangered species. waste management and reclamation. The state of Nevada has also promulgated laws which regulate mining and exploration, mine waste, mineral processing waste, mine closure, air and water pollution control, wildlife management, water resources and reclamation. In most cases, Nevada environmental compliance requirements are more stringent than federal regulations. The state of Nevada maintains an active inspection program to insure mining industry compliance.

The Company currently has all federal, state and local environmental permits and approvals necessary for operation. Many permits issued by regulatory agencies require periodic renewal or review of their conditions.

The Company's mining and ore process operations generate solid wastes regulated by the U.S. Environmental Protection Agency ("EPA") and the State of Nevada Division of Environmental Protection ("NDEP") under the Resource Conservation and Recovery Act ("RCRA") and under Nevada law. RCRA applies to hazardous and nonhazardous waste. The Solid Waste Disposal Act Amendments of 1980 temporarily excluded certain solid waste generated from the "extraction," "beneficiation" and "processing" of ores and mined materials from regulation under RCRA. These materials are currently regulated under Nevada laws and regulations which are sanctioned by the Federal Clean Water Act.

Compliance Costs. The Company incurred compliance costs of $292,000, $216,000 and $199,000 in fiscal 1994, 1993 and 1992, respectively, in connection with government environmental regulation. Federal legislation has recently been proposed by both the U.S. Senate and House of Representatives that propose extensive new environmental and permitting restrictions for the mining industry. Other federal legislation has been proposed which, if enacted, would extend federal regulation of surface and groundwater quality and federal protection of endangered species. Since none of the proposed legislation is in final form and since it is unknown if the proposed regulations would exceed those of the state of Nevada, the Company is unable to predict the effects of any of these proposed regulations on its future earnings or liquidity.

Capital Costs. Environmental capital expenditures were $1.0 million in fiscal 1994 and are expected to be approximately $1.9 million in fiscal 1995. These projected expenditures are based on laws and regulations currently in effect and should not have a material adverse effect on the Company's earnings or competitive position.

Reclamation. In accordance with the State of Nevada Division of Environmental Protection ("NDEP"), the Company has submitted a plan to the NDEP for the eventual closure and reclamation of the Getchell Property and is awaiting approval and permitting. As of June 30, 1994, the Company had accrued a total of $3.0 million for eventual reclamation and closure costs. The Company has begun reclamation of surface mining disturbances and anticipates an ongoing program of reclamation over the next several years. Activities have included regrading, revegetation and soil stabilization.

Safety. The Company is required to comply with the Federal Mine Safety and Health Act of 1977, as amended, which is enforced by the Mine Safety and Health Administration ("MSHA"), an agency of the U.S. Department of Labor. All mines are subject to inspections by MSHA. The Occupational Safety and Health Administration also has jurisdiction over safety and health standards not covered by the Federal Mine Safety and Health Act. There are areas where the administrative authority of both agencies overlap.

Competitive Conditions

The Company competes with other mining companies for the acquisition of mineral interests and the recruitment and retention of qualified employees. Many of the competitors have substantially larger financial resources and produce substantially larger amounts of gold. As such, it may be difficult for the Company to obtain potential development properties in the future on acceptable terms.

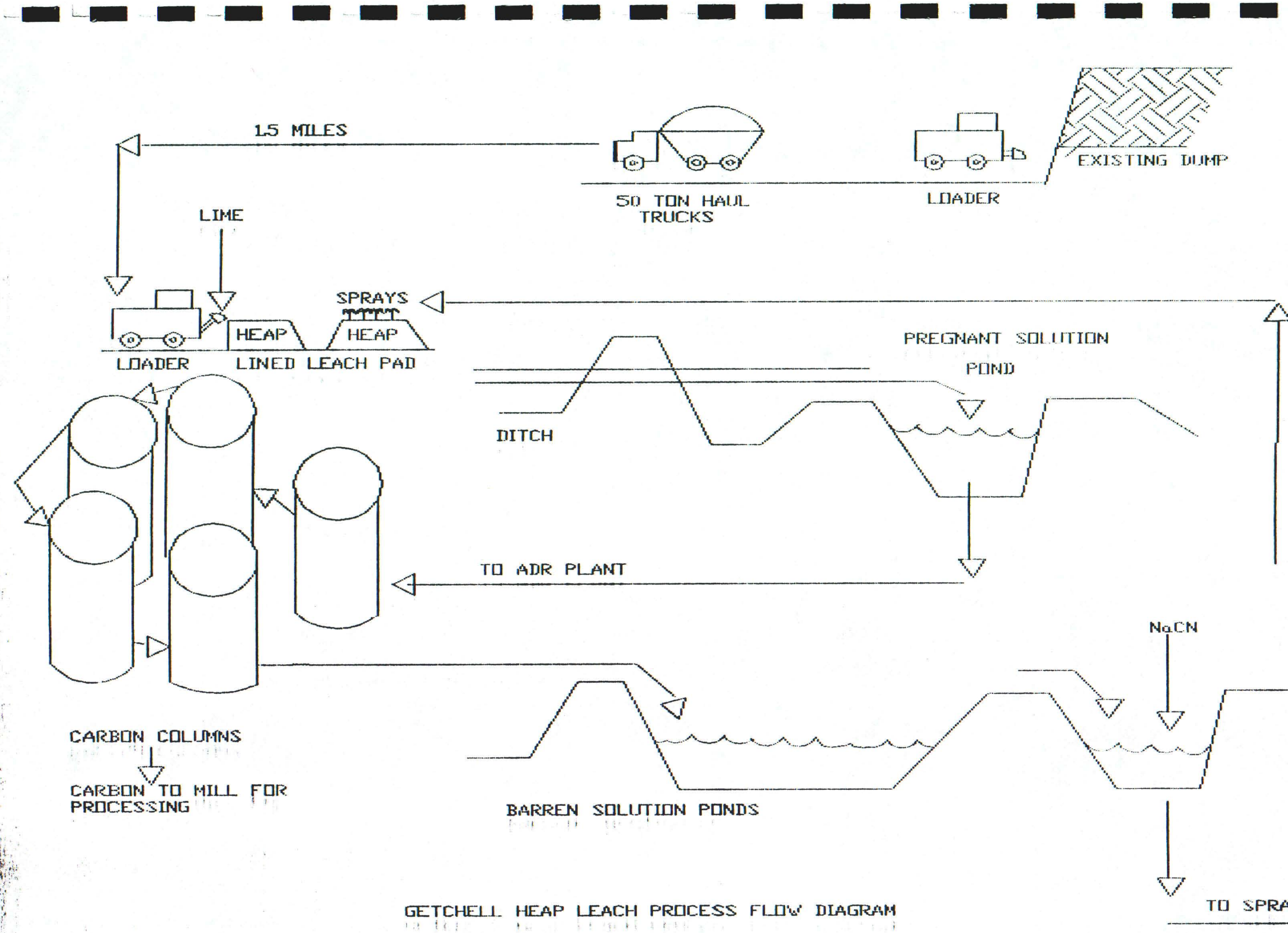
Working Capital Requirements and Seasonality of Business

Changes in ore inventory will typically have the most effect on working capital requirements. Ore inventory tonnages fluctuate in response to various factors including scheduled milling rates, projected ore availability, weather conditions and efficient scheduling of mine production. Accounts payable was up temporarily at June 1993, however, as payments totaling $3.6 million for contract services were delayed until October 1993 through January 1994 under special arrangement with a service provider.

Winter weather extremes may affect gold production from the heap leach operations.

Research and Development

During the year, the Company conducted numerous laboratory tests in an effort to determine more economical ways to recover gold from oxide and sulfide ores. Studies were continued on materials for construction of valves and vent lines.



GETCHELL HEAP LEACH PROCESS FLOW DIAGRAM

ORE MINERALS OF THE GETCHELL MINE, HUMBOLDT COUNTY, NEVADA

Acathite	Ag_2S	Haidingerite	$CaHAsØ_4$-H_2O
Arsenic	As	Ilmenite	$FeTiO_3$
Arsenopyrite	FeAsS	Llsemannite	$Mo_3O_8nH_2O$ (?)
Barite	$BaSO_4$	Jalpaite	Ag_3CuS_2
Bismuthinite	Bi_2S_3	Laffittite	$AgHgAsS_3$
Calcite	$CaCO_3$	Magnetite	$Fe^{+2}Fe^{+3}{}_2O_4$
Cassiterite	SnO_2	Marcasite	FeS_2
*			
Chalcocite	Cu_2S	Molybdenite	MoS_2
Chalcopyrite	$CuFeS_2$	Orpiment	As_2S_3
Cinnabar	HgS	*	
Coloradoite	HgS	Polhemusite	$(Zn,Hg)S$
Covellite	CuS	Pyrite	FeS_2
Dioside	$CaMgSi_2O_6$	Quartz	SiO_2
Fluorite	CaF_2	Realgar	AsS
Galena	FbS	Scheelite	$CaWO_2$
Getchellite	$AsSbS_3$	Silver	Ag
Gold	Au	Sphalerite	ZnS
Graphite	C	Stibnite	Sb_2S_3
Grossularite	$Ca_3Al_2(SiO_4)_3$	Teallite	$PbSnS_2$
Gypsum	$CaSo_4$ $2H_2O$	Weilite	$CaHA_5O_4$
*		Wollastonite	$CaSiO_3$

*Chabazite $Ca(Al_2Si_4)O_{12}$ $6H_2O$
*Galkhaite $(Cs_4Ti)(Hg_2Cu_2Zn)_6(As_2Sb)_4S_{12}$
*Guerinite $Ca_5H_2(AsO_4)_4$ $9H_2O$
*Picropharmacolite $H_2Ca_4Mg(AsO_3)_4$ $11H_2O$

the Getchell Mine
Humboldt County
NEVADA

Craig S. Stolburg
3231 Woodmont Drive
San Jose, California 95118

Gail E. Dunning
773 Durshire Way
Sunnyvale, California 94087

The Getchell mine, located in north-central Nevada, has for many years been the world's leading producer of fine crystallized realgar. In addition, crystals of orpiment and rare sulfosalts including galkhaite, laffittite and getchellite (type locality) occur in the arsenic orebody.

INTRODUCTION

The Getchell gold mine is located approximately 42 km north of Golconda, Humboldt County, Nevada. The mine is situated on the eastern flank of the Osgood Mountains along the Getchell fault and is within the Potosi mining district. Gold bullion was produced intermittently between 1938 and 1967. This deposit is one of several disseminated-type gold deposits in the western United States, including Carlin, Cortez, Gold Acres, Jerrett Canyon and Mercur, in addition to numerous smaller deposits (Roberts *et al.*, 1971).

HISTORY

The history of the Potosi mining district dates back before 1918 when considerable mining activity centered around the tungsten deposits in the area. Hotz and Willden (1964) have summarized the mining history of the Getchell mine.

The deposit was discovered in the fall of 1934 by two prospectors, Ed Knight and Emmett Chase, who believed they had discovered a large low grade gold deposit. Within a year they had sold their mine to Nobel Getchell and his partner, George Wingfield. The mine was named after Nobel Getchell and, after just five years of production, it had achieved the distinction of being the largest gold producer in Nevada. It was not until 1954 that production of by-product gold from the Ruth mine at Ely, Nevada, exceeded Getchell's output.

The Getchell mine had the good fortune of mining an arsenic-bearing orebody at the beginning of World War II, when the federal government closed all non-essential gold mines. Due to the need for this strategic metal, Getchell was permitted to mine gold along with the arsenic. Production continued until 1951 when the easily mined gold ores were exhausted and mining of tungsten ore started along the major fault zone.

The production of tungsten ceased in 1957, when additional reserves of gold ore were discovered. The Getchell mine produced gold until 1968, when it became unprofitable to continue operations, and the mine closed. Since then, many mining companies have explored the possibility of reopening the mine for gold but, to date, none have found adequate reserves to warrant renewed mining operations.

GEOLOGY

The geology of the Getchell mine and surrounding Osgood Mountains has been mapped and studied by a number of authors including Hobbs (1948), Hotz and Willden (1964), Silberman and McKee (1971), Erickson and Marsh (1974), Joralemon (1951), Berger and Taylor (1974) and Berger (1980).

The rocks in the vicinity of the Getchell mine are lower Paleozoic sediments which have been intruded by a granodiorite stock of Cretaceous age. The oldest rocks consist of Middle and Upper Cambrian carbonaceous shale and thin-bedded limestone called the

Preble formation. This formation is unconformably overlain by a sequence of intercalated dolomitic limestone and chert, shale, siltstone and mafic volcanic rocks assigned to the Comus formation of Early and Middle Ordovician age. The Getchell fault system, a connecting group of high-angle, dip-slip faults, cuts the thrust faults along the eastern margin of the Osgood Mountains. Berger and Taylor (1974) have re-evaluated field evidence and concluded that the displacement of the fault has been predominantly vertical, and that the fault system controlled the emplacement of the granodiorite stock and related dikes. The fault system has remained active right up to the present, as shown by displacement of Quaternary (?) alluvium in the mine area.

copper, cesium, thallium and gold. Except for gold, these elements have combined with either arsenic or sulfur to form a number of sulfide and sulfarsenide minerals which have resulted from late-stage hydrothermal activity along the Getchell fault. Berger (1980) suggests that this hydrothermal activity has altered the limestone by decarbonatization accompanied by silicification. Early low-temperature hydrothermal action, which preceded the sulfide mineralization, deposited gold, the principal ore mineral, along the fault zone and replaced the limestone with quartz.

The minor ore minerals include cinnabar, stibnite, chalcopyrite and sphalerite. Molybdenite and scheelite are unrelated to the sulfide mineralization but are more closely associated with the

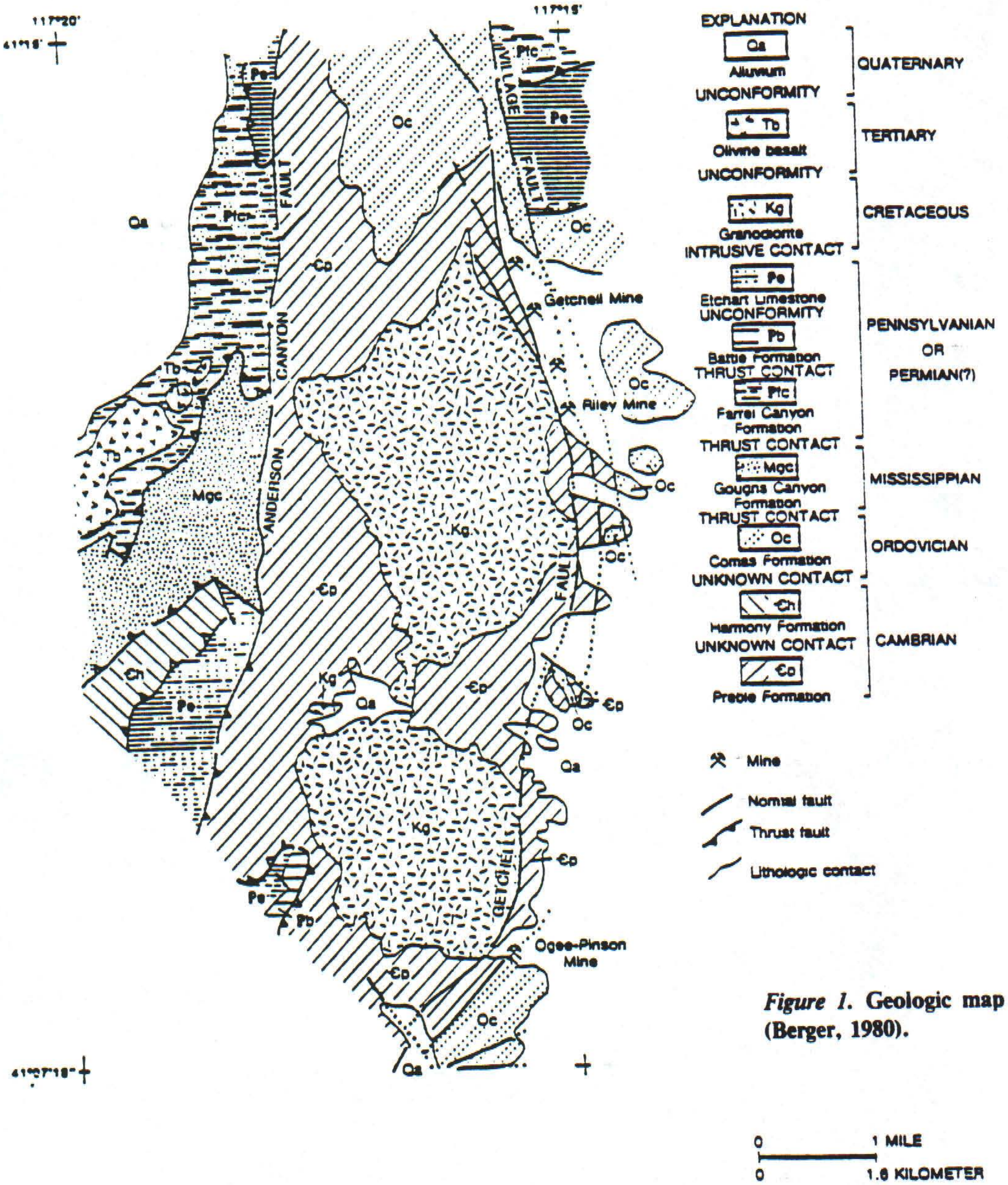


Figure 1. **Geologic map of the Getchell mine (Berger, 1980).**

Gold mineralization was controlled by three segments of the Getchell fault system which provided channels for the ascending epithermal solutions and resulted in silicification of the Preble formation limestone and carbonaceous shale beds.

MINERALOGY

Aside from the rock-forming minerals, the mineralogy of the Getchell mine is dominated by massive arsenic sulfide mineralization containing minor amounts of mercury, silver, antimony, zinc,

granodiorite rocks adjacent to the fault zone, especially in the South pit. Realgar and orpiment constitute the major arsenic sulfide minerals, which resulted from late-stage hydrothermal activity along the fault zone and rock fractures. The rare sulfosalts getchellite, galkhaite and laffittite occur in minor amount in the sulfide orebody and are usually found as small, granular crystals associated with realgar and orpiment.

In addition to quartz and calcite, the gangue minerals include marcasite, pyrite, arsenopyrite, magnetite, barite, fluorite and chabazite. Secondary minerals resulting from local weathering of

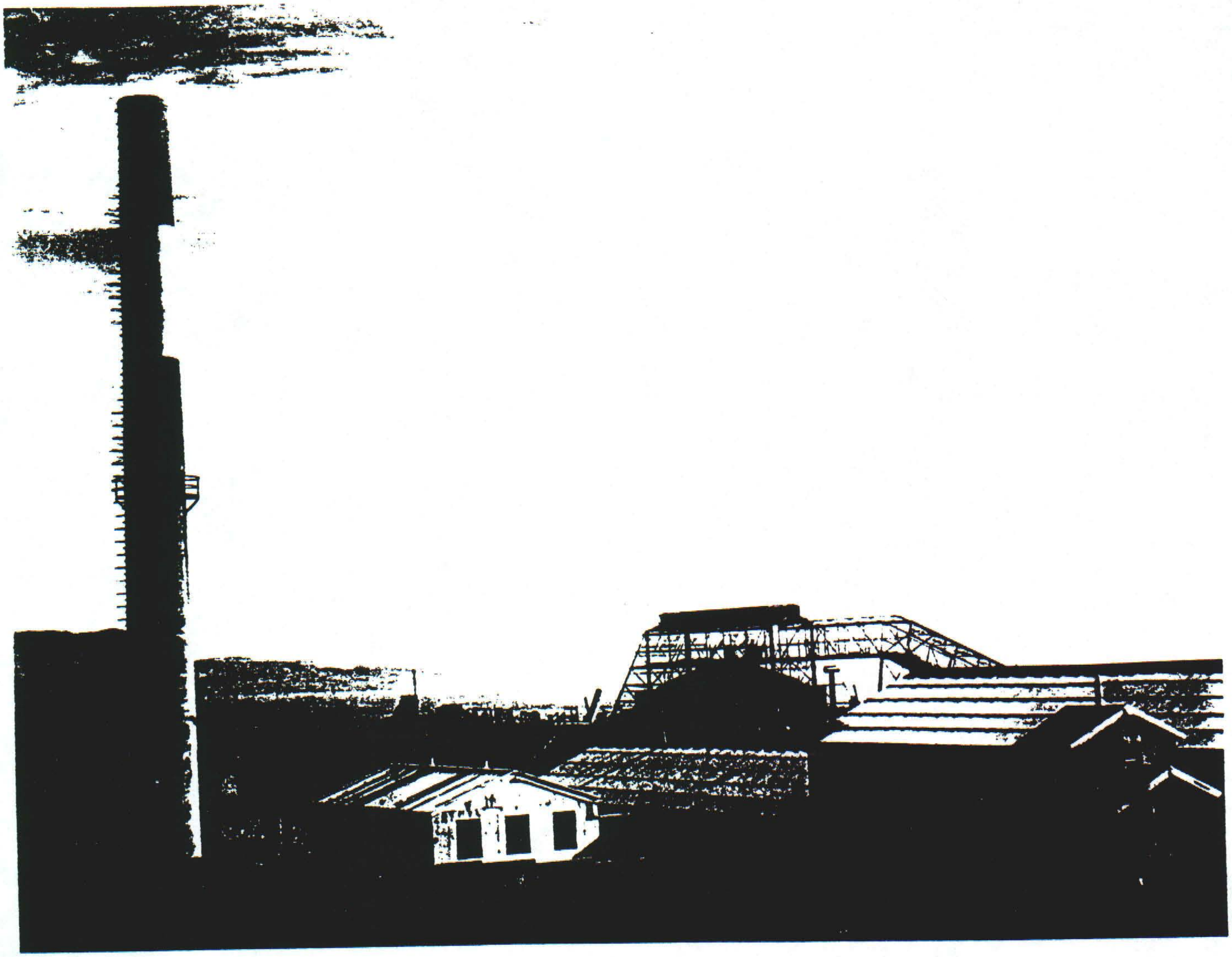


Figure 2. **Getchell mine in 1975; Stolburg photo.**

the ore minerals include gypsum, picropharmacolite and ilsemannite.

Cinnabar HgS

High mercury concentrations in the gold ore have been attributed to cinnabar in association with stibnite. The South pit ores show about five times the mercury concentration as do the ores of the North pit. Cinnabar occurs in very minor amounts in the Getchell orebody and it is usually found as very small (less than 1 mm), dark red, pseudocubic rhombohedral crystals associated with quartz, realgar and stibnite. The crystals are single or complex intergrowths attached to either quartz or realgar crystals. Most crystals are quite complex and twinned. Pyrite crystals and grains are in intimate association with cinnabar and are usually found nucleated on the faces of cinnabar crystals.

Fluorite CaF_2

Fluorite is one of the common accessory minerals found in the Getchell deposit. It typically occurs as simple cubes, often showing color zoning from clear to violet, in the carbonaceous quartz rock associated with orpiment and realgar. Late-stage calcite has covered much of the fluorite; this can be removed by mild acid etching. In the North pit area fluorite is associated with stibnite, orpiment, realgar and galkhaite. Crystals up to 1 cm on an edge are common.

Galkhaite $(Cs,Tl)(Hg,Cu,Zn)_6(As,Sb)_4S_{12}$

The rare sulfosalt galkhaite was first described by Gruzdev *et al.* (1972) from the Gal-Khaya deposit, Yakutia, and the Khaidaikan deposit, Kirgizia, U.S.S.R., as idiomorphic crystals up to 1 cm, crystal aggregates, and granular aggregates in mercury deposits (see also Jungles, 1974). Associated minerals in the Soviet deposits include pyrite, stibnite, cinnabar, metacinnabar, aktashite, wakabayashilite, orpiment, realgar, getchellite, calcite, fluorite and quartz. It has been replaced in many places by cinnabar and metacinnabar.

Galkhaite has since been discovered at the Getchell mine by Botinelly *et al.* (1973) and at the Carlin, Nevada, gold deposits by Dickson and Radtke (1978). A recent re-examination of galkhaite from Getchell by Chen and Szymanski (1981) has shown that cesium is an important element in the structure; cesium is rarely associated with thallium.

At Getchell, galkhaite is principally found on the dark gray, limy, carbonaceous quartz rocks in the North pit area. Here it is associated with pyrite, fluorite, realgar, stibnite and orpiment. Galkhaite occurs as simple cubes or as multiple intergrowths of cubes and is steel-gray to brownish black with a metallic luster. The color is probably due to included or surficial graphite. Where the crystals have been protected by calcite they are brilliantly deep red in color with deep red internal reflections. All crystals show the common $a\{100\}$ form. However, the forms $d\{110\}$ and $o\{111\}$ occur occasionally.

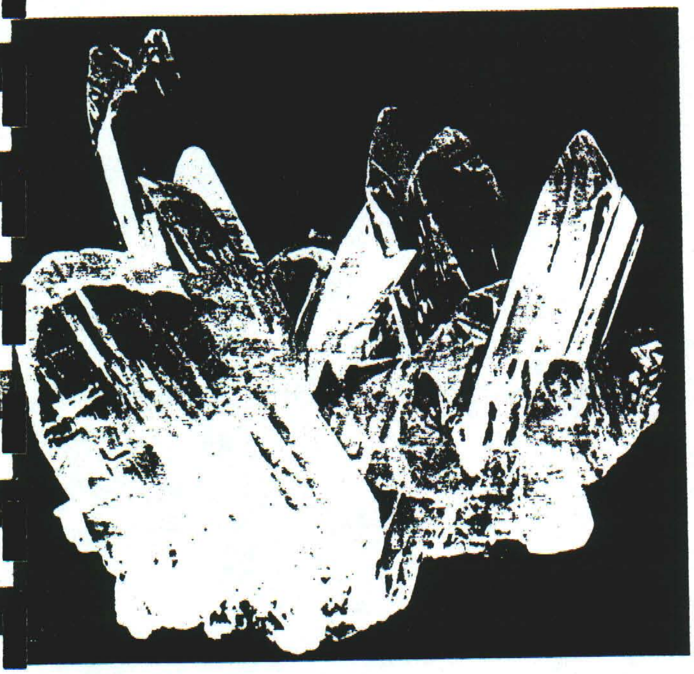
In the South pit galkhaite typically occurs in association with getchellite and cinnabar. The crystals are usually black, intergrown, simple cubes in cavities of massive getchellite, with realgar and orpiment.

Getchellite $AsSbS_3$

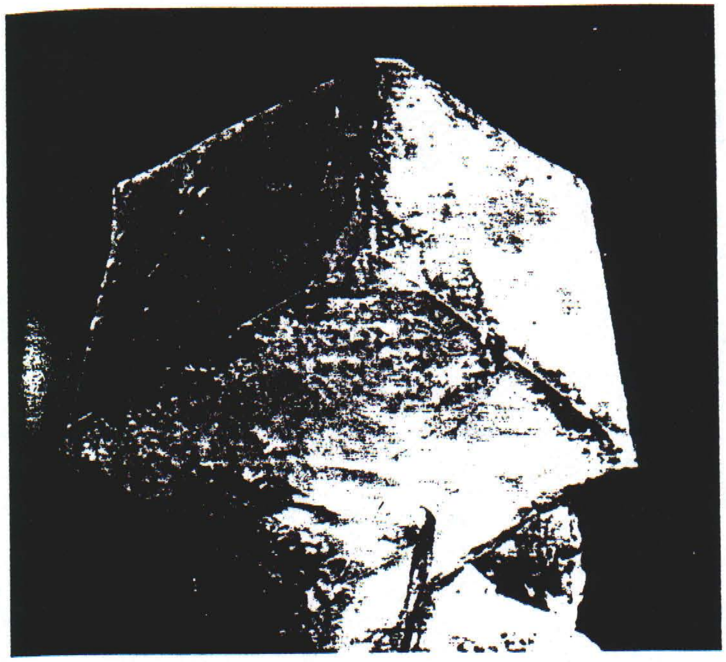
Getchellite was first described by Weissberg (1965) as a new mineral from the Getchell mine; it is intimately associated with abundant orpiment and realgar and lesser amounts of quartz, stibnite, cinnabar, galkhaite and laffittite. Other occurrences of getchellite include the Carlin, Nevada, gold deposit (Radtke *et al.* 1977), the Zarehchauran orpiment mine in northeastern Iran (Bariand *et al.*, 1965, 1968) and the Gal-Khaya deposit, U.S.S.R. (Gruzdev *et al.*, 1972).

At Getchell, getchellite was first discovered in the arsenic sulfide ores of the South pit extension where it has formed thin lenses and pods in the massive orpiment-realgar arsenic ore along the fault zone. Weissberg (1965) suggests that getchellite was one of the first hydrothermal minerals deposited after quartz.

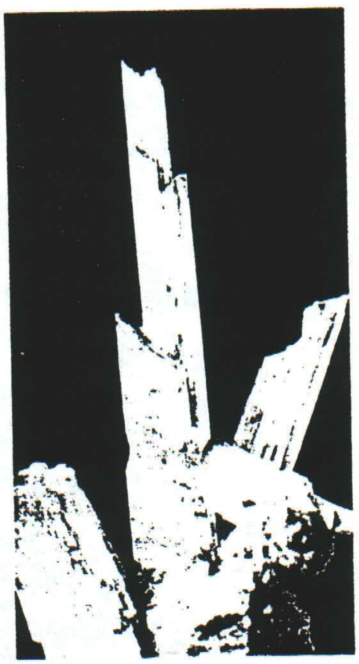
Getchellite occurs both as anhedral grains molded by realgar and orpiment and as rare euhedral crystals included in orpiment (Weissberg, 1965). Free-standing crystals are very rare and occasionally have been found in small cavities in the massive material. Both stibnite and galkhaite crystals have been observed partially filling small cavities in massive getchellite.



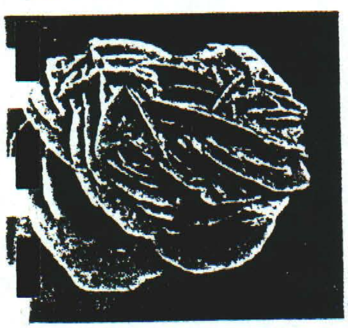
▲ Gypsum crystals (ca. ×1). !



▲ Rhombohedral calcite crystals (ca. ×1.5).



▸ Acicular gypsum crystals (ca. ×1.5).

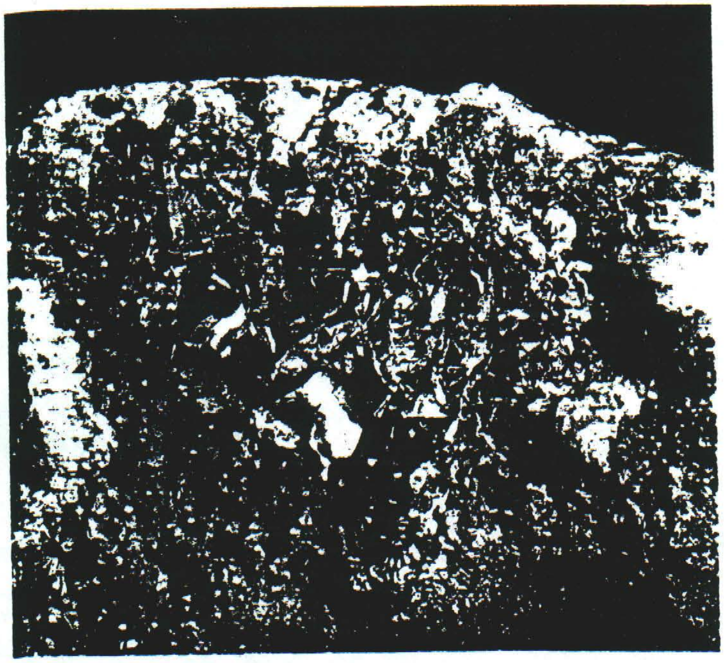


ypsum ("desert rose") (ca. ×0.5)

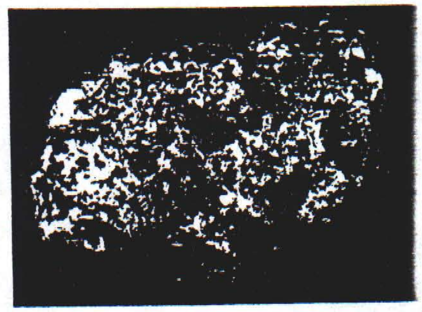
▶ Scalenohedral calcite crystal (ca. ×0.5). Val

▼ Calcite scalenohedron modified by rhombohedron (ca. ×0.5).

Aside from its darker red color and orange-red streak, getchellite closely resembles orpiment in physical properties. Crystals of both getchellite and orpiment are commonly bent or otherwise deformed by movements subsequent to ore deposition. Masses of getchellite up to 5 cm or larger are not uncommon in the veins. These masses, when broken, reveal the mineral's perfect basal cleavage and these multiple basal cleavages, surrounded by yellow orpiment, make very attractive specimens.



▲ Native gold crystals (ca. ×2).



▶ Native gold nugget with quartz (ca ×2).

▼ Native gold nugget (ca. ×2).

Gold Au

In the orebody gold occurs as micron to submicron-sized particles closely associated with carbonaceous quartz and shales, within the sulfide minerals, and as fine particles within and between quartz and clay grains. Although it is the principal ore mineral of the mine, no specimen quality samples of gold have been found. It is only by examining polished sections of ore that gold can be seen, although some isolated grains have been reported visible under low magnification.

Graphite C

Graphite, amorphous carbon and organic complexes occur in the silicified zones of the orebody and account for the dark gray color of the ore. The graphite is very fine grained and occasionally coats crystals of the ore minerals.

Gypsum $CaSO_4 \cdot 2H_2O$

Gypsum occurs as delicate radiating groups of clear acicular crystals in cavities and along fracture planes of the gray carbonaceous quartz-realgar ore of the North pit. The crystals show striations and typical terminations.

Ilsemannite $Mo_3O_8 \cdot nH_2O$ (?)

Local groundwater alteration of molybdenite in the North pit area has resulted in dark blue coatings of ilsemannite along fractures in the gray carbonaceous shales.

Laffittite $AgHgAsS_3$

The rare sulfosalt laffittite was first described from the Jas Roux mine, Hautes Alpes, France, by Johan *et al.* (1974). At this mine it occurs as small grains up to 0.2 mm associated with smithite, stibnite, pierrotite, realgar, sphalerite, pyrite and two thallium antimony minerals in dolomitic rocks. Laffittite has also been identified from the mines at Iquique, Chile.

Recently Nakai and Appleman (1983) discovered laffittite on a Smithsonian Institution specimen (#134796) labeled getchellite from the Getchell mine, Humboldt County, Nevada. In this specimen laffittite occurs as anhedral grains about 1 mm in maximum length which are generally surrounded by either getchellite or orpiment. This discovery prompted a thorough examination of the authors' getchellite-containing specimens. Laffittite was subsequently found in about 75% of the hand specimens examined.

Laffittite is most easily recognized when it occurs in massive, fine grained orpiment rather than in the darker red getchellite or realgar. Although very rare, monoclinic crystals of laffittite do occur in specimens containing veins of crystallized quartz and orpiment. Single or multiple contact crystals have formed in quartz cavities associated with acicular realgar crystals and foliated masses of orpiment. Laffittite crystals are deep red in color, resembling cinnabar, although slightly darker than getchellite. The developed faces are very brilliant and are striated. Both the crystals and anhedral grains show no cleavage when broken. They also are quite brittle, which accounts for the rarity of visible crystals when the rock is broken. Occasionally, small imperfect crystals are found in massive orpiment and, after weathering of the orpiment, stand out in relief.

The original description of getchellite by Weissberg (1965) makes no reference to material which might be ascribed to laffittite. The only dark red mineral that he refers to is cinnabar. Considering the abundance of laffittite in some samples of getchellite-orpiment-realgar ore, together with its physical and chemical properties, it is surprising that it was not recognized earlier.

Molybdenite MoS_2
Scheelite $CaWO_4$

Disseminated molybdenite together with scheelite can be found in the granodiorite stock adjacent to skarn along the west vein and granodiorite dikes in the east wall of the South pit (Berger, 1980).

Orpiment As_2S_3

Orpiment and realgar are the two most abundant arsenic sulfide minerals at Getchell. The major portion of orpiment occurs as veins of foliated, columnar or fibrous masses in the South pit extension, although it is distributed throughout the three main areas of mining. Where space permitted, crystals of orpiment formed in cavities along the quartz-rich fracture fillings. The crystals are generally small (1 cm or less), bright yellow-orange in color, and occur both as single and multiple intergrowths. The smaller crystals have a golden yellow color but, as the crystals become larger, the color deepens to a golden brown. The crystals are generally distorted, probably by remobilization of the ore following sulfide formation.

:ropharmacolite $H_2Ca_4Mg(AsO_4)_4 \cdot 11H_2O$

Picropharmacolite occurs at the west end of the North pit as ings along fracture surfaces in the realgar-rich carbonaceous es and quartz. It generally forms dense white coatings less than mm thick, or thicker botryoidal coatings showing a resemblance cauliflower. Under the scanning electron microscope these ings are seen to be composed of minute bladed crystals less n 0.2 x 9 microns in size. The massive material generally shows a adiating to foliated appearance. Oxidation of both realgar and or- nt under acidic conditions has resulted in the formation of pharmacolite. In addition, a number of unidentified calcium nates have been discovered in the partially oxidized realgar- rpiment veins. Owing to the complex nature of these secondary rals and their dehydration products, further description will be ved until their identification can be completed.

Realgar AsS

ealgar is one of the more spectacular sulfide minerals at chell. It was deposited, along with orpiment, as a late-stage oduct of local hydrothermal activity following the gold and uartz mineralization along veins and fractures of the Getchell fault em. In rocks with abundant carbonaceous material realgar and ment are found surrounded by dense mattes of late-stage remo- ized carbon (Berger, 1980).

he Getchell mine has been known for many years for its realgar tal groups. Especially attractive groups of divergent crystals rounded by calcite and attached to dark gray carbonaceous uartz have been recovered from the mine. After etching to remove t of the calcite, stout prismatic red crystals, commonly 10 cm or er, form a colorful contrast against the white calcite and dark y matrix rock.

n addition to the large, stout, elongated crystals, short stubby tals less than 5 mm in length have been found in cavities in the rtz-calcite host rock. These crystals are deep red, transparent, nd typically show contact twinning on (100).

long the facture faces in the North pit area realgar can also oc- as thin vein fillings of needle-like crystals less than 1 mm long, th typical terminations. These drusy coatings of crystals give a deep red brilliance in sunlight and under a microscope show a iating habit similar to gypsum.

CKNOWLEDGMENTS

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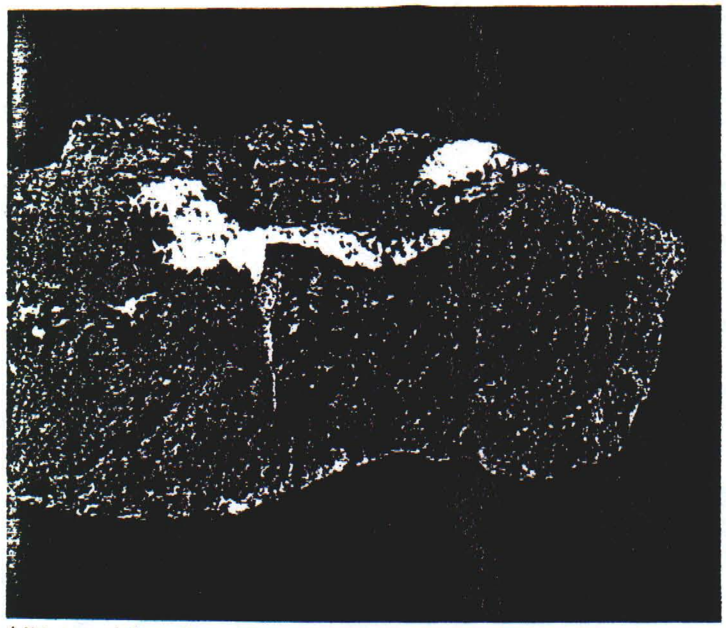
BLIOGRAPHY

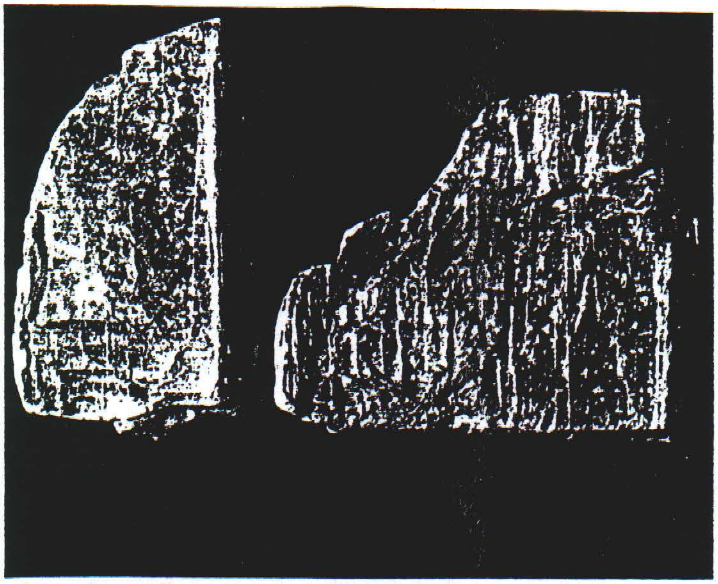
RIAND, P., ISSAKHANIAN, V., and SADRZADEH, M. (1965) Preliminary metamorphic map of Iran. *Report Geological Survey Iran*, 7, 1–48.

RIAND, P., CESBRON, F., AGRINIER, H., GEFFROY, J., and ISSAKHANIAN, V. (1968) La getchellite, $AsSbS_3$, de

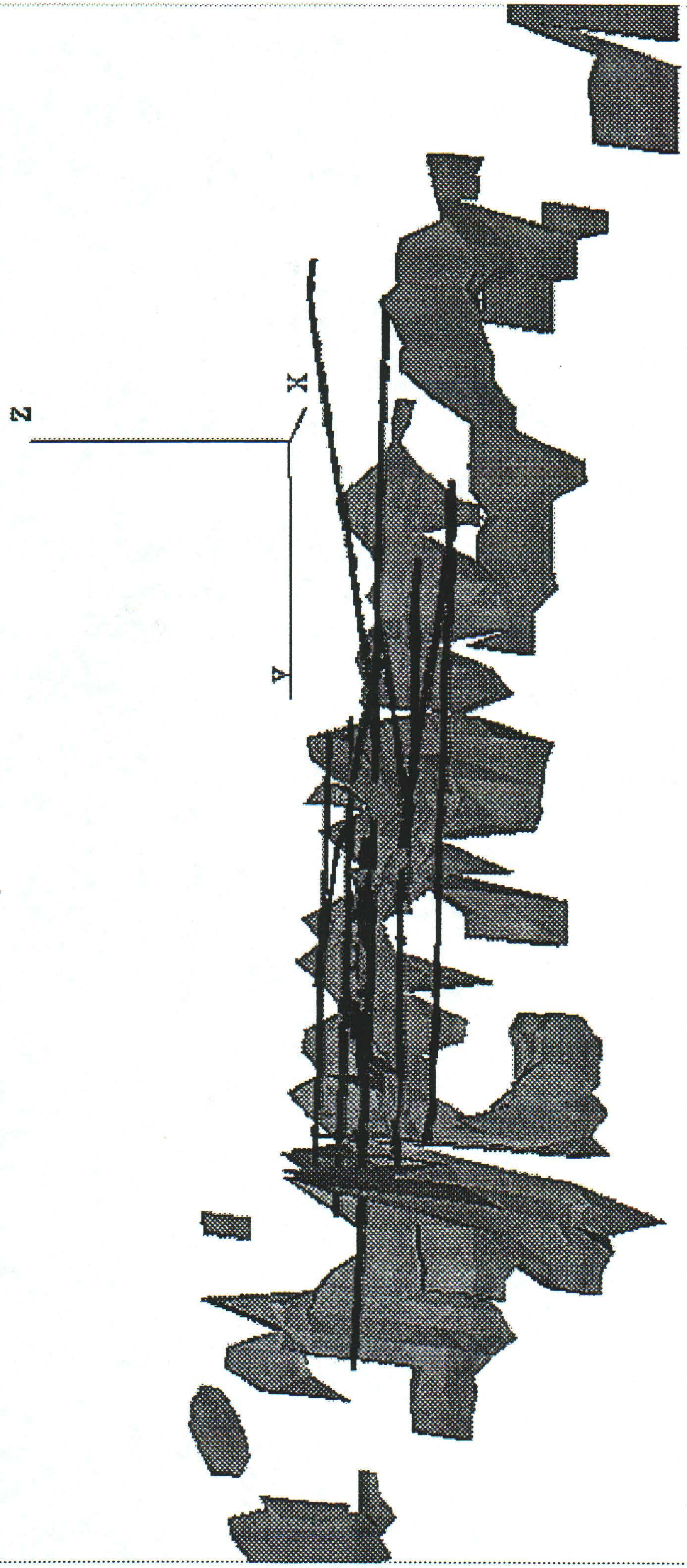
▲ Massive realgar (ca. ×1).



▲ Native arsenic (ca. ×1).



▲ Orpiment (ca. ×1).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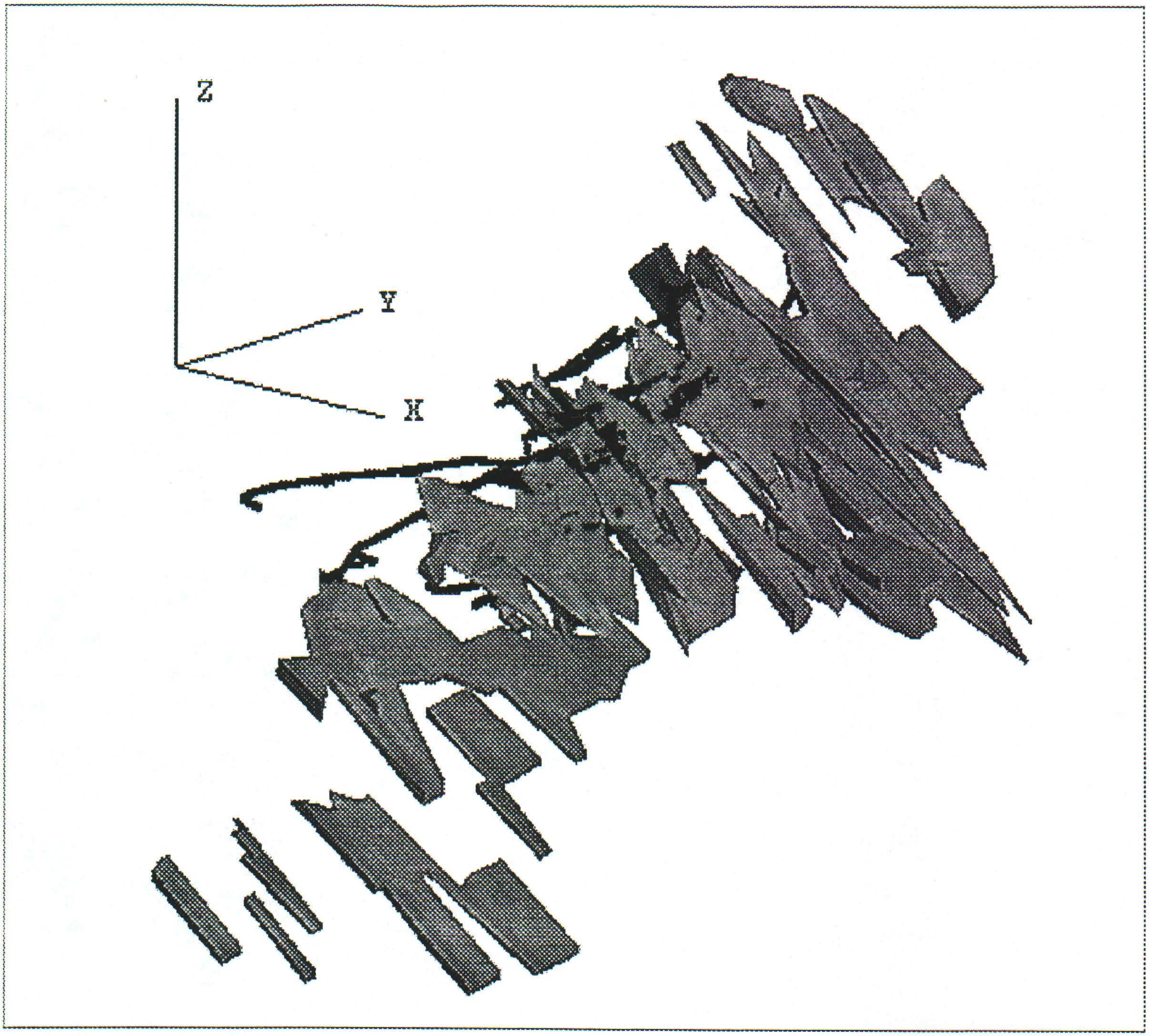
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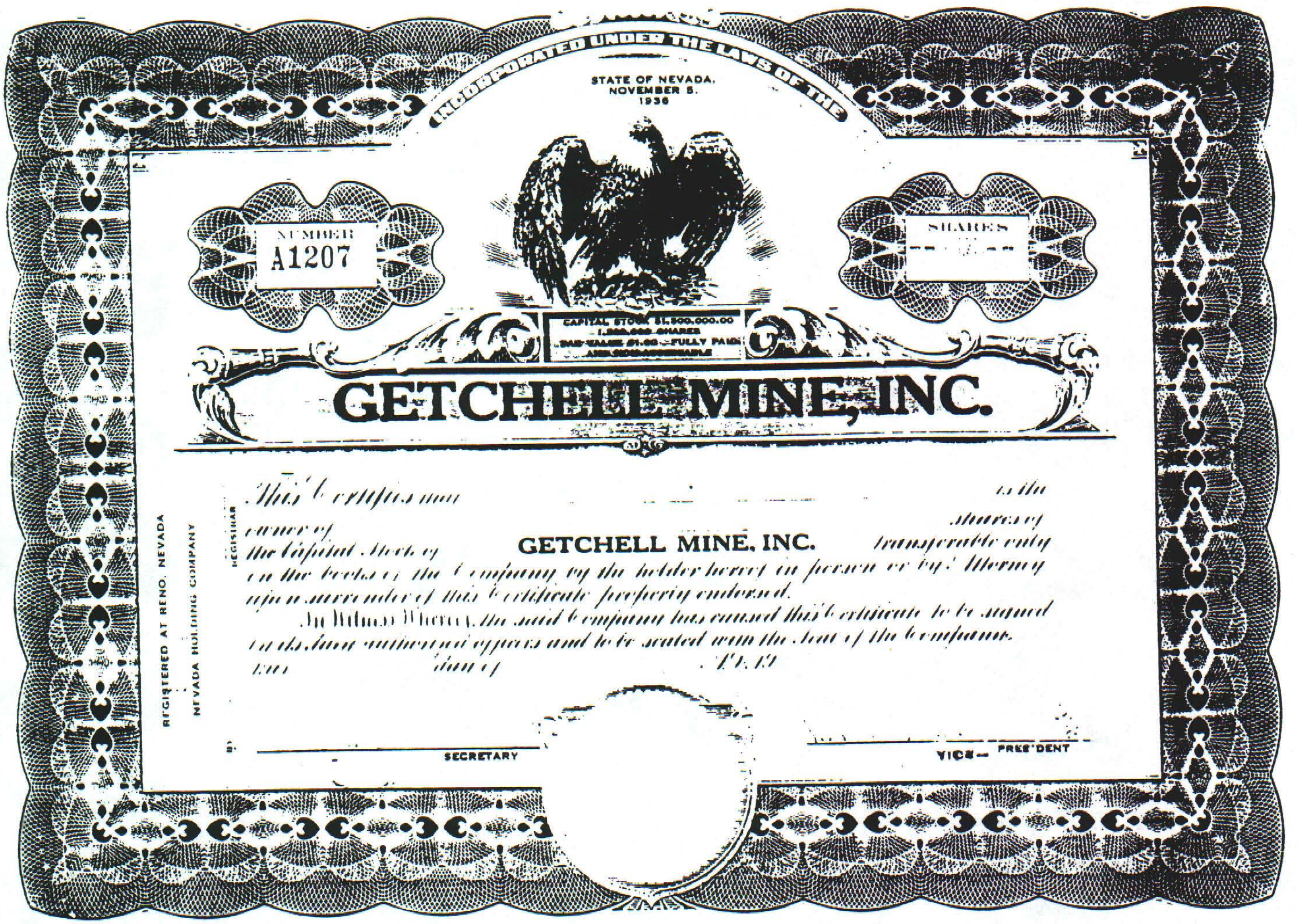

Zarehshuran, Afshar, Iran. *Bulletin Societe Française Mineralogie Cristallographie*, **91**, 403–406.

BERGER, B. R. (1980) Geological and geochemical relationships at the Getchell mine and vicinity, Humboldt County, Nevada. *Society of Economic Geologists Fieldtrip Guidebook, Field Conference to Northern Nevada*, 111–135.

BERGER, B. R., and TAYLOR, B. E. (1974) Pre-Cenozoic area for "basin-range" faulting, Osgood Mountains, north-central Nevada (Abs.). *Geological Society of America, Cordilleran Section*, Las Vegas, Nevada.

BOTINELLY, T., NEUERBURG, G. J., and CONKLIN, N. M. (1973) Galkhaite, $(Hg,Cu,Tl,Zn)(As,Sb)S_2$, from the Getchell mine, Humboldt County, Nevada. *Journal Research of the U.S. Geological Survey*, **1**, No. 5, 515–517.

CHEN, T. T., and SZYMANSKI, J. T. (1981) The structure and chemistry of galkhaite, a mercury sulfosalt containing Cs and Tl. *Canadian Mineralogist*, **19**, 571–581.

DICKSON, F. W., and RADTKE, A. S. (1978) Weissbergite, $TlSbS_2$, a new mineral from the Carlin gold deposits, Nevada. *American Mineralogist*, **63**, 720–724.

ERICKSON, R. L., and MARSH, S. P. (1974) Paleozoic tectonics in the Edna Mountain quadrangle, Nevada. *Journal Research of the U.S. Geological Survey*, **2**, No. 3, 331–337.

GRUZDEV, V. S., STEPANOV, V. I., SHUMKOVA, N. G., CHERNISTOVA, N. M., UDIN, R. N., and BRYZGALOV, I. A. (1972) Galkhaite $(HgAsS_2)$, a new mineral from arsenic-antimony-mercury deposits of the U.S.S.R. *Diklady Akademia Nauk S.S.S.R.* **205**, 1194–1197 (in Russian; translation: **205**, 150–153).

HOBBS, S. W. (1948) Geology of the northern part of the Osgood Mountains, Humboldt County, Nevada. Unpublished Ph.D. Thesis, Yale Univ., New Haven, 97 pages.

HOTZ, P. E., and WILLDEN, R. (1964) Geology and mineral deposits of the Osgood Mountains quadrangle, Humboldt County, Nevada. *U.S. Geological Survey Professional Paper* **431**, 128 p.

JOHAN, Z., MANTIENNE, J., and PICOT, P. (1974) La routhierite, $TlHgAsS_3$, et la laffittite, $AgHgAsS_3$, deux nouvelles especes minerales. *Bulletin Societe Française Mineralogie Cristallographie*, **97**, 48–53.

JORALEMON, P. (1951) The occurrence of gold at the Getchell mine, Nevada. *Economic Geology*, **46**, 267–310.

JUNGLES, G. (1974) Galkhaite: a newly described mineral from Siberia found at the Getchell mine, Nevada. *Mineralogical Record*, **5**, 290.

NAKAI, I., and APPLEMAN, D. E. (1983) Laffittite, $AgHgAsS_3$: crystal structure and second occurrence from the Getchell mine, Nevada. *American Mineralogist*, **68**, 235–244.

RADTKE, A. S., DICKSON, F. W., SLACK, J. F., and BROWN, K. L. (1977) Christite, a new thallium mineral from the Carlin gold deposit, Nevada. *American Mineralogist*, **62**, 421–425.

ROBERTS, R. J., RADTKE, A. S., and COATS, R. T. (1971) Gold-bearing deposits in north-central Nevada and southwest Idaho, *with a section on* Periods of plutonism in north-central Nevada by M. L. Silberman and E. H. McKee. *Economic Geology*, **66**, 14–33.

SILBERMAN, M. —., and McKEE, E. H. (1971) K-Ar ages of granitic plutons in north-central Nevada. *Isochron/West*, **1**, 15–32.

WEISSBERG, B. G. (1965) Getchellite, $AsSbS_3$, a new mineral from Humboldt County, Nevada. *American Mineralogist*, **50**, 1817–1826.

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