400

Mr. Robert E. Adams, Chief
Operations Control & Statistics Division

April 26, 1954

Iron and Ferro-Alloys Division, DMEA

Docket No. DMEA-3191 - Tungsten
Copper Canyon Mining Company
Copper Canyon Mine
Lander County, Nevada

The above-captioned docket has been removed from the active files of this division and is sent to you herewith since the applicant notified the Field Team by letter of April 6, 1954, that he wished to withdraw his application.

Chief, Iron and Ferro-Alloys Division

Attachment

cc: Docket
Adm. Read. File
Field Team, Reg. 3
Code 400

407

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

1012 Flood Building
870 Market Street
San Francisco 2, Calif.

April 15, 1954

Memorandum

To: George C. Selfridge, Chairman, Operating Committee, DMEA, Interior Building, Washington 25, D. C.

From: Executive Officer, DMEA Field Team, Region III

Subject: Docket No. DMEA-3191 - Tungsten
Copper Canyon Mining Company
Copper Canyon Mine
Lander County, Nevada

Reference is made to your letter dated November 5, 1953, requesting a field examination of the subject property. The examination has been made and there are attached four copies of a report entitled "DMEA-3191, Copper Canyon Tungsten Deposit, Lander County, Nevada," by Russell R. Trengove, Mining Engineer, U. S. Bureau of Mines, and R. J. Roberts, Geologist, U. S. Geological Survey, dated March 31, 1954.

In view of Mr. Robert H. Raring's letter dated April 6, 1954, of which copies were sent to you attached to our memorandum dated April 9, requesting that the application be withdrawn, no further action on this application is necessary at this time.

H. C. MILLER

H. C. Miller
Executive Officer
DMEA Field Team, Region III

Attachment

Copy to: Roscoe Smith, USGS
A. C. Johnson, Reno

Thru O.C.
4-23-54

UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION III

DMEA-3191, Copper Canyon Tungsten Deposit

Lander County, Nevada

Russell R. Trengove, Mining Engineer
U. S. Bureau of Mines

R. J. Roberts, Geologist
U. S. Geological Survey

March 31, 1954

EXAMINATION REPORT

Docket No.: DMEA-3191 (Tungsten)

Name and address of applicant: Robert H. Raring, Gen. Mgr.
Copper Canyon Mining Co.,
Battle Mountain, Nev.

Name and location of property: Copper Canyon Tungsten Deposit
Lander County, Nevada

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

An engineer of the Bureau of Mines examined the Copper Canyon tungsten deposit in January 1954. The property is situated 18 miles south of Battle Mountain, Nev. The purpose of the examination was to determine if the geological conditions and the grade of mineralization were favorable to justify approval of an application for a Government loan and also to determine the best site for the proposed drilling program. The total estimated cost of a proposed amendment, which was not submitted by the applicant, for a maximum of 3,000 feet of drilling amounts to $19,300.

The ore mineral is scheelite. The International Smelting & Refining Co., a subsidiary of the Anaconda Mining Co., did considerable development work, and exploring by 30,000 feet of diamond drilling for lead-zinc ore from 1936 to 1941. One of the diamond drill holes (DDH 9) that extended below the 700 level had an intercept 100 feet long that assayed 0.56% WO_3. Other drill hole cores also showed notable amounts of scheelite, but no ore grade material was found.

INTRODUCTION

An application for a Government loan under sec. 202 of the Defense Production Act of 1950 was made by Robert H. Raring, general manager, Copper Canyon Mining Co. on October 12, 1953. An engineer of the Bureau of Mines examined the property in January 1954. He was accompanied by Robert H. Raring, general manager.

PROPERTY AND OWNERSHIP

Property holdings comprise 19 patented lode claims, 17 unpatented lode claims, and 3 unpatented placer claims. The concentrator and mine are in the NW 1/4 SW 1/4 and the SW 1/4 NW 1/4, sec. 27, T. 31 N., R. 43 E.

The Copper Canyon Mining Co. is the owner, with main offices at 25 Broad St., New York City. Principal officers are L. E. Whicher, president, New York City, and Robert H. Raring, vice president and general manager, Battle Mountain, Nev.

HISTORY AND PRODUCTION[1/]

The first recorded mining operations at Copper Canyon were carried on by an English company, who purchased the property about 1870 and worked it continuously for a period of about 10 years. This company opened up two lodes - on one of which they sank a shaft to a depth of 590 feet. It is stated more than 40,000 tons of oxide ores were shipped to Swansea, Wales, and that these shipments averaged 50 percent copper. The company also owned

1/ This section is from the files of the Copper Canyon Mining Co.

and operated a concentrating plant, which was situated on Willow Creek, 2-1/2 miles from the mine. After remaining idle for a period of five years, the mine was sold to a local company. The local company sold the old mill and allowed the property to remain idle until 1897, when it was acquired by the Glasgow and Western Exploration Co., Limited, who reopened the mine, equipped it with new machinery, and commenced more or less active mining operations, stoping out the old pillars and other ore left standing by the previous operators. During the years 1898, 1899, and 1900, according to old company records, there was extracted about 2,000 tons of 12 percent copper ore from the old workings, and in 1907 the mine produced 844 tons of the same grade ore. In 1907, the mine was shut down and the machinery dismantled. The workings caved in and became inaccessible below the 90-foot level.

About 1912, the Glasgow & Western Exploration Co. erected a leaching plant at Copper Canyon to treat low-grade oxidized copper ores, but it was metallurgically unsuccessful, as an extraction of only 47 percent was obtained. In 1914 the Glasgow & Western Exploration Co. ceased operations, and in 1916 the newly formed Copper Canyon Mining Co. acquired the Copper Canyon mines. During World War I, between August 1916 and December 1918, the company shipped 22,481 tons of ore averaging 9 percent copper. This production was made from the Estes vein between the 188-foot level and the surface and from the Willow Creek dump. The ore was hauled to Dillon, a point on the Nevada Central rail-

road to the smelters at Garfield, Utah.

After World War I, the mine was inactive until 1927, when lessee production started. In 1935, after the discovery of gold in 1932 by lessees, the company reorganized, and development was conducted by the Copper Canyon Mining Co. from 1936 to 1941. In 1941 the property was taken over by a subsidiary of the Anaconda Mining Co., the International Smelting & Refining Co., on an operating agreement basis. They did considerable development work and exploring by core drilling. The development included 30,000 feet of diamond drilling. This drilling disclosed a lead-zinc ore body, but no effort was made to mine it at that time. Production of copper, silver, and gold ore continued until December 1945, when the property, with all improvements and equipment, was returned to the Copper Canyon Mining Co. This company continued mining copper ore until the premium on copper was dropped in July 1947. At that time production ceased, and operations were started on sinking the shaft 218 feet to the 700 level. This was completed January 1, 1948, but the 700-level drift did not reach the lead-zinc ore in the hornfels until July 1948 because of the large flow of water encountered while the drift was being advanced. Mining the ore body started immediately, and the first lead-zinc ore was put through the mill August 9, 1948. From August 9, 1948 to October 15, 1952, when operations ceased, 193,470 dry tons were milled.

The annual production since 1935 is as follows:

Year	Tons	Oz. Au	Oz. Ag	Lb. Cu	Lb. Pb	Lb. Zn
1935	1,970	1,232.92	3,975.8	29,926		
1936	574	382.53	2,577.0	4,744		
1937	1,576	491.80	2,692.3	160,879		
1938	3,956	1,600.35	7,802.7	478,114		
1939	6,283	1,389.85	12,791.1	699,510		
1940	7,189	1,333.22	13,561.8	724,180		
1941	1,631	205.42	2,788.2	164,324		
1942 1/	85,640	4,687.98	47,302.8	1,127,019		
1943	99,582	7,928.19	85,772.7	1,769,710		
1944	76,544	6,064.70	91,144.7	1,130,893		
1945	47,935	5,638.11	52,765.0	617,542		
1946	76,714	3,470.11	58,762.3	958,314		
1947	35,764	2,816.64	22,442.1	537,284		
1948	16,814	894.21	26,119.0	45,120	399,788	236,861
1949	72,132	1,213.80	194,077.0	126,197	2,808,904	1,343,658
1950	34,430	525.73	77,742.0	84,820	1,126,258	513,488
1951	15,890	339.63	34,983.0	42,740	501,680	250,360
1952	54,204	857.83	122,701.0	96,858	1,716,963	744,978

1/ Mill started Feb. 26, 1942.
Closed Oct. 15, 1952

LOCATION AND PHYSICAL FEATURES

The Copper Canyon mine is in Lander County, Nev. (fig. 1), 18 miles south-southwest of Battle Mountain, a town on U. S. Highway 40 and on the Southern Pacific and Western Pacific Railroads. Battle Mountain is 220 miles northeast of Reno, Nev., and 310 miles west of Salt Lake City, Utah.

The property is in the Battle Mountain district, which is comprised of a series of steep northward-trending mountains bounded on the east by Reese River Valley and on the west by Buffalo Valley.

Altitudes range from 4,600 feet in the valley to 8,265 feet on Antler Peak, a few miles north. The mine is at an altitude of 5,700 feet in Copper

Canyon, which is on the rugged west slope of a northward-trending ridge near the south end of the range.

Climate in the area is semi-arid, with hot, dry summers and moderately cold winters. Precipitation occurs usually as snow, with occasional rains during the fall and spring. Vegetation consists of sagebrush and desert grass.

Water for milling purposes is obtained from the mine. Water for domestic purposes is purchased from the Natomas Co., which operates a gold dredge to the south. It is pumped from their reservoir, 1 mile distant. They obtain their water from Willow Creek and also from a well in the valley. Water can also be pumped from a 203-foot well owned by the Copper Canyon Mining Co., through 15,600 feet of 6-inch pipe line to a 112,000-gallon storage reservoir situated above the mill.

The mine is accessible by 12 miles of hardsurfaced road and 6 miles of gravel road from the town of Battle Mountain.

Freight and express shipments and telegraphic communications are handled through the railroad station at Battle Mountain. Daily postal service is maintained by truck from the Battle Mountain post office.

The camp can accommodate 27 families and 56 single men. It consists of 14 bunk houses for single men, 27 family homes, a boarding house capable of seating 90 men, a grocery store, office, and staff house.

Power for the mine and mill is obtained from three Diesel engines of 600 horsepower each direct-connected to 475 k.v.a. generators. Whsh

the mine is not in operation, power for the camp and mine buildings is obtained from the Natomas Co.

THE MINE WORKINGS AND MILL

The mine workings and mill are fully described in Report of Investigations 4774 "Investigation of Copper Canyon Lead-Zinc Deposit, Lander County, Nev." by Russell R. Trengove.

At the cessation of operations October 15, 1952, equipment on the 700-level was removed and stored on the 500-level and the surface. The water in the shaft was estimated to be about 70 feet below the 500-level at the time of the examination.

It is believed that if the proposed exploration from the 500-level was expedited, the project would be completed before pumping would be necessary.

GEOLOGY

The rocks in the Copper Canyon area include sedimentary rocks of Paleozoic age that belong to the Harmony, Battle, and Pumpernickel formations. These rocks have been intruded by quartz monzonite and have been recrystallized and metamorphosed to hornfels.

The oldest sedimentary unit is the Harmony formation (Ch) which is composed of sandstone and shale. This unit is overlain unconformably by the Battle formation. In the mine area (figs. 2, 3, and 4) the Battle formation consists of three members: A lower member of calcareous conglomerate (Cbl); a middle member of calcareous hornfels and conglom-

erate (Cbm); and an upper member of quartzite (Cbu). The Pumpernickel formation is composed of chert and shale. In the mine area it is found in the hanging wall of the Virgin fault in the upper plate of the Golconda thrust.

Quartz monzonite cuts the sedimentary units and is in contact with the Pumpernickel and upper Battle formations in the Farren tunnel area. The productive workings are 600 feet or more south of the quartz monzonite.

The rocks in the mine area are cut by two principal sets of normal faults: (1) North-trending faults that dip steeply west such as the Virgin fault; and (2) northwestward trending faults that dip northeast. Both sets of faults are mineralized. A thrust fault which brings the Pumpernickel formation over the Battle formation comes into the mine area but is not exposed at the surface; presumably it was dropped down on the hanging wall of the Virgin fault below the Farren tunnel level.

A wedge of the upper conglomerate (Cbu) is exposed in the hanging wall of the Virgin fault on the Farren tunnel level; the wedge was not differentiated on figure 3 because it is small and does not affect the general geologic picture.

ORE DEPOSITS

The ore bodies that have been mined at Copper Canyon are gold-copper ore bodies from the lower member of the Battle formation and lead-zinc ore bodies from the middle member. These ore bodies were localized along bedding in crushed zones parallel to faults or at the intersections of

faults.

The ore minerals in the gold-copper bodies are mainly pyrite and chalcopyrite, the ore minerals in lead-zinc bodies are mainly pyrite, galena, and sphalerite. The gold-copper and lead-zinc ore bodies ranged from a few thousand tons to more than 100,000 tons. The average tenor of ore mined was low (see production table), but the metallization was fairly uniform and large blocks were mined with shrinkage stoping methods. Scheelite veins and pods were found locally in the lead-zinc ore bodies and in the calcareous hornfels of the middle member, but no persistent ore bodies were found in the stoped areas. One drill hole (DDH. 9) that extended below the 700 level had an intercept 100 feet long that assayed 0.56% WO_3; other drill hole cores also showed notable amounts of scheelite, but no ore grade material was found. The wide distribution of the scheelite so far from any known contact between calcareous beds and quartz monzonite raised the question as to whether larger bodies of higher grade material might not occur in favorable units near the contact.

There is no direct method of evaluating the likelihood of the discovery of commercial tungsten ore near the contact, but the project appears to be a good geologic bet. Many of the contact areas of the intrusive bodies in this part of Nevada contain tungsten bodies, and two areas, the Mill City and Osgood Mountain (Getchell) districts have notable productions. Tungsten ores in nearby areas such as the Osgood range are commonly within a few tens of feet of the contact. In view of the promising scheelite

showings found elsewhere in the Copper Canyon mine, the Chen-quartz monzonite contacts would appear to be a worthwhile objective.

PROPOSED EXPLORATION

The applicant proposed a drilling program from the 500 level to explore the Chen-quartz monzonite contact in the footwall of the Virgin fault. The holes were to be drilled along the strike of the middle hornfels to the quartz monzonite contact. This contact zone has not been previously explored in the workings because it is about 600 feet from the nearest stopes. The geologic reasoning followed by the applicant in setting up the project seems sound, but an alternate method for reaching the proposed objective should be considered.

There are two ways to reach the proposed objective which will be discussed below under two plans, Plan I and Plan II (figs. 2 and 3):

Plan I is to drill from the Farren tunnel near the point where it crosses the Virgin fault. Two holes are suggested for the initial stage; one is to be directed about N. 30° E., down 40°, and the other is to be directed about N. 63° E., down 40°. These holes will total about 650 feet; provision should be made for an additional 850 feet of drilling to be fanned out to explore promising areas along the contact. The locations of the additional holes should be determined by mutual agreement between representatives of the company, Bureau of Mines, and Geological Survey.

Plan II is to drill from the 500 level northward to the contact. This plan is a modification of the applicants plan taking into account Mr. Thayer's suggestions. Two holes are suggested for the initial stage; one is to be directed about N. 2° W., down 10°, and the other is to be directed N. 6° E., down 10°. These holes will total about 1500 feet; provision should be made for an additional 1500 feet of drilling to test other promising areas along the contact. The locations of the additional holes should be determined by mutual agreement between representatives of the company, Bureau of Mines, and Geological Survey.

Plan I has the advantage that the distance from the drill site to the target is shorter. Possibly a total of 1,500 feet of drilling would adequately test the contact area. The disadvantages of the plan would be that most of the drilling would be in chert and shale of the Pumpernickel formation; there would be little chance of the discovery of tungsten bodies in this formation.

Plan II would be more costly as the distance from the 500 level face to the target is greater than in Plan I, but would offer several advantages. Plan II would have the one major advantage that the drill holes would follow units that have been productive elsewhere in the mine, and which might contain tungsten ore bodies between the present faces and the contact. From this standpoint it therefore seems desirable to choose Plan II over Plan I, despite the greater cost. Moreover, there is some uncertainty about the

position of the Chm unit below the Chu unit in the Farren tunnel area, (see fig. 3). In the event that the contact between Chm and quartz monzonite dips to the southwest instead of being nearly vertical as shown, the initial holes might well miss the target area. In Plan II the holes will be drilled along the strike and will therefore be directed toward the contact. They will cut the contact objective regardless of the dip, and will give more information on the underground structure than any other approach.

COMPARISON OF COSTS OF METHODS I and II

Plan I - Farren Tunnel

The Farren Tunnel 1350 feet in length and said to have been driven in 1914 has not been in use since that time. The floor of the tunnel is covered with from one to two feet of muck the entire distance, and in two locations the back is caved up to 20 feet in height. Access to the face, however, was possible by crawling over these muck piles. Considerable excavation would also be necessary in blasting a diamond drill site at the face. Removal of this muck would necessitate the installation of a track and mine cars and hand tramming to the dump at the portal. This long tram can not be eliminated as there are no winzes or open stopes adjacent to the tunnel which could be used to dispose of the muck. Considerable timbering and lagging would also be required at the two badly caved locations. A rough estimate of the labor cost in performing the above work is as follows:

100 man shifts @ $12.50	$1,250

In addition, 1400 feet of air line and 1400 feet of water line would have to be purchased and installed.

1400 feet 2-inch pipe @ $0.78	$1,092	
1400 feet 1-inch pipe @ $0.31	434	
Labor installing & removing pipe 6 man days @ $12.50	75	
Total	$2,850	less salvage value of pipe

Plan II - 500-level

The track, air and water lines are installed and the old diamond drill station is believed to be large enough for the proposed drill holes. Except for cleaning the floor of the 500-level drift, estimated to cost $100, drilling could be started immediately after checking valves on company owned 350 c.f.m. air compressor - estimated cost of $200. Drilling would be done on a two 8-hour shift basis daily which will require two hoistmen @ $12.50 per day. The cost of the hoistmen will be incorporated into the per foot of drilling cost.

For a maximum of 3,000 feet of drilling, using an average of 30 feet of advance per day, 200 hoistmen shifts will be required.

200 shifts @ $12.50 = $2,500

Summary

Cleaning 500-level drift	$100
Checking air compressor	200
Hoistmen	2500
	$2800

The difference in costs of the two methods would be in favor of Plan I. However, it would be small - amounting to the salvage value of the pipe.

Estimated costs of amended application which was not furnished by the applicant

Summary for 3,000 feet of drilling

Cleaning 500-level drift	$100	
Checking air compressor	200	
Heistmen, 200 shifts @ $12.50	2,500	
3,000 feet of AX drilling @ $5.00	15,000	
Supervision - 3 months @ $500.00	1,500	
Total	$19,300	or $6.43 per foot of drilling

RECOMMENDATIONS AND CONCLUSIONS

The Bureau of Mines and Geological Survey concur in the following conclusions:

1. In view of the promising scheelite showing in DDH 9 (100 feet of 0.56% WO_3) and elsewhere in the Copper Canyon mine, the calcareous hornfels (Chm) - quartz monzonite (Chu) contacts would appear to be a worthwhile object. This contact zone has not been previously explored.

2. Plan II - 500-level is preferred rather than Plan I - Farren Tunnel for the following reasons:

a. Although Plan I may be less costly than Plan II, there would be a delay of possibly two months making the face of the Farren Tunnel accessible for drilling operations. Drilling could be started after cleaning debris from the 500-level tracks - possibly two or three days.

b. No drilling site excavation is necessary on the 500-level and air and water lines are installed.

c. The position of the Cbm-Cbu contact below the Farren Tunnel is unknown. Although the target area as shown on Exhibit C is a shorter distance from the Farren Tunnel than the 500-level, most of the drilling would be in chert and shale of the Pumpernickel formation with little chance of the discovery of tungsten bodies in this formation.

d. Drilling from the 500-level (Plan II) would have the advantage that the drill holes would follow calcareous hornfels (Cbm) that have been productive elsewhere in the mine.

e. Because of the uncertainty about the position of the (Cbm) unit below the (Cbu) unit, in the Farren Tunnel area (fig. 3), the initial holes from the Farren Tunnel (Plan I) might miss the target area and diamond drill footage would be increased.

f. In Plan II (500-level) the holes will be drilled along the strike and will therefore be directed toward the contact.

g. The proposed exploration is for tungsten and not for copper, lead or zinc.

h. The proposed exploration will be on Washington claim, Lot No. 1843 (patented).

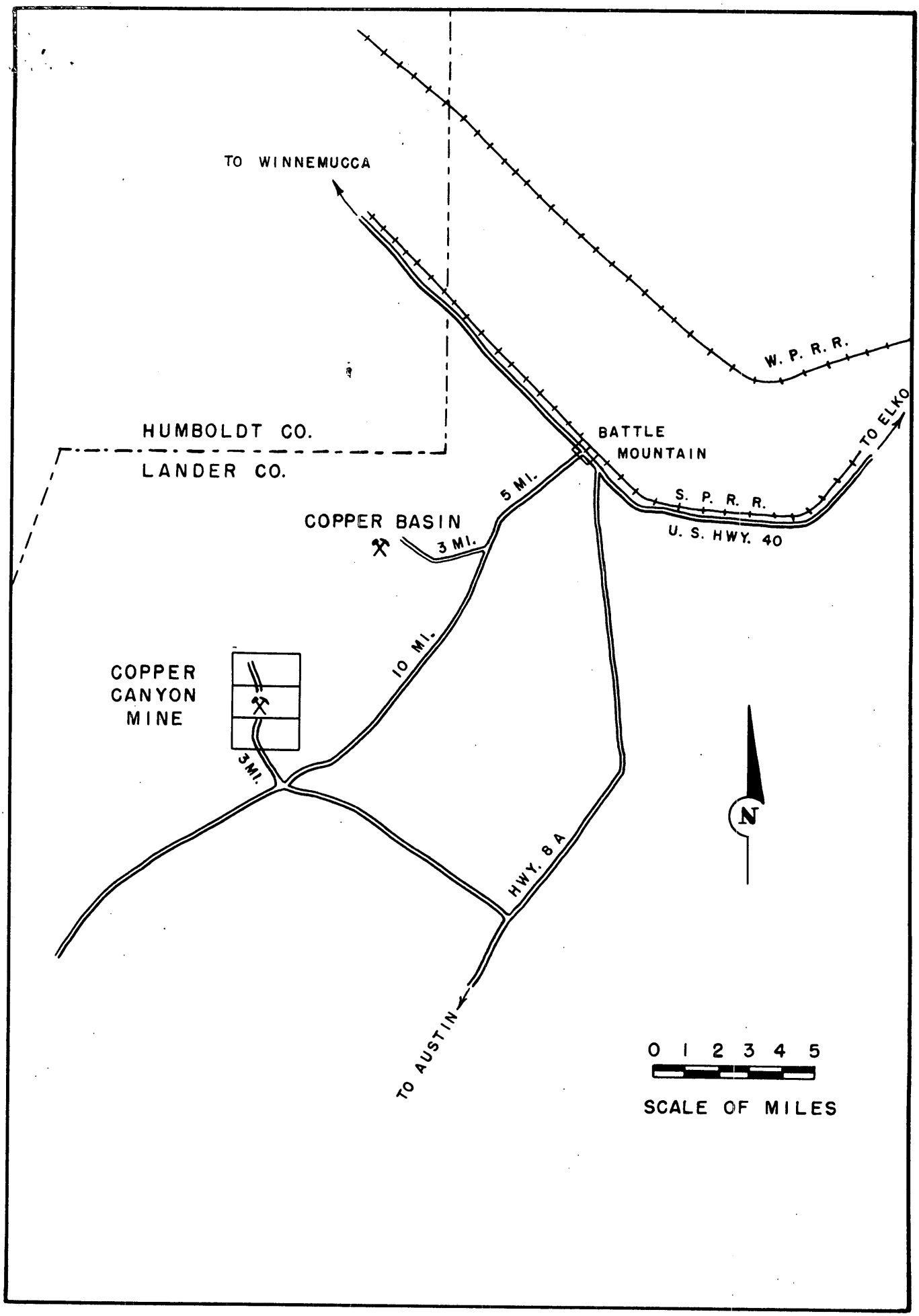

Figure 1.- Location map.

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3191

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APR 15 1954

Mr. Frank T. Ramsa
Director, Office of Lands
Reconstruction Finance Corporation
Washington 25, D. C.

Re: Copper Canyon Mining Company
Battle Mountain, Nevada

Dear Mr. Ramsa:

Reference is made to the correspondence relative to the application of the captioned company for an Exploration Project Contract with the Government, our Docket No. DMEA 3191 - Tungsten.

Enclosed is a copy of letter of April 6, 1954, from Mr. Robert H. Baring, of the Copper Canyon Mining Company, requesting that the referenced application be withdrawn. Accordingly we shall remove the application from our active files.

If, as suggested in the above letter, a new application covering the same property should be received later from another operator, we would then be better prepared to evaluate the request. Our Field Team has now prepared a report with recommendations which will be sent to us in the near future and kept in our files for use in such an eventuality.

Sincerely yours,

C. O. Mittendorf

Administrator

Enclosures

FARutledge:fcc
4-14-54
cc to: Docket
Code 400
FT. Reg. 3
Oper. Comm.
Adm. Reading File
R. W. Gaehan, USBM
T. P. Thayer, USGS

400

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

1012 Flood Bldg.
870 Market Street
San Francisco 2, Calif.

April 9, 1954

WSM

Air Mail

Memorandum

To: G. C. Selfridge, Chairman, Operating Committee, DMEA, Washington, D. C.

From: Executive Officer, DMEA Field Team, Region III

Subject: Docket DMEA-3191 - Tungsten
Copper Canyon Mining Company
Copper Canyon Mine, Lander County, Nevada

Answering your teletype of April 9, a joint field examination in connection with subject application was completed and a report submitted to this office on March 18. However, after the report was reviewed by H. C. Miller and Roscoe M. Smith, it was found necessary to return it to the field for several revisions and corrections. Up to this writing, the revised report has not been returned to this office, but as soon as it is received the required number of copies will be mailed to you.

We might mention that the engineer and geologist are in agreement that a drilling program is warranted to explore the Cbm-quartz monzonite contact in the footwall of the virgin fault.

In this morning's mail we received a letter, dated April 6, 1954, from Mr. Robert H. Raring, of the Copper Canyon Mining Company, requesting that subject exploration application be withdrawn. Two copies of Mr. Raring's letter are attached for whatever action you may wish to take.

S. RICKER

S. Ricker for
H. C. Miller, Executive Officer
DMEA Field Team, Region III

Attachment

Copy to: R. M. Smith, USGS
A. C. Johnson, Reno

Copper Canyon Mining Company
25 BROAD STREET
NEW YORK CITY

MINES: BATTLE MOUNTAIN, NEVADA

Battle Mountain, Nevada
April 6, 1954

Executive Officer
DMEA Field Team, Region III
1012 Flood Bldg.,
870 Market Street
San Francisco 2 California

Re: DMEA-3191, Tungsten
Copper Canyon Mine

Dear Sir:

With reference to cited Docket embracing DMEA assistance in diamond-drilling certain tungsten occurrences in the Copper Canyon Mine, please be advised:

That our New York Office seems reluctant to finance its share of cost of the program and we must, therefore, ask that the Application be withdrawn.

It now appears more than likely that the mine will be brought back into production within the near future, under different operating arrangement. It might develop that the new operator would desire to go ahead with the tungsten program and in such case, we would ask your cooperation in reactivating the Application.

Thanking you for your kind assistance with the Application and with assurances that we still hope to get the holes drilled, we are

Very truly yours,

COPPER CANYON MINING COMPANY

by Robert H. Raring

Robert H. Raring

cc - Mr. A. C. Johnson, Chief
Mining Division, Region III
USBM, Reno

400

Dept. of the Interior

Defense Minerals Exploration Administration

APR 9 1954

14X4401(01) Revolving Fund, Defense Production Act, Interior (Allocated Working Fund to the Office of the Secy.)

T E L E T Y P E

To: Mr. H. C. Miller, DMEA Executive Officer, Region III, San Francisco, California

Reourlet February 15, Copper Canyon Mining Company, Docket DMEA 3191-Tungsten. We understand from your February DMEA summary that you will send report we requested "in a few days." To assist us to cooperate with R.F.C., please teletype essential features of your recommendations if report not already mailed.

George C. Selfridge

G. C. Selfridge
Chairman, Operating Committee

Copy to: Docket
FT, Reg. 3 - confirmation
Code 400
Operating Committee
Adm. Reading File
Audits Division, Bur. Mines
R. W. Geehan, USBM
T. P. Thayer, USGS

WSMartin/ls
4/8/54

UNITED STATES
DEPARTMENT OF THE INTERIOR

140

DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

FEB 1 5 1954

Mr. H. C. Miller, Executive Officer
DMEA Field Team, Region III
1012 Flood Building
870 Market Street
San Francisco 2, California

Re: Docket No. DMEA-3191 (Tungsten)
Copper Canyon Mining Company
Copper Canyon Mine
Lander County, Nevada

Dear Mr. Miller:

Reference is made to the subject docket and to the copy sent you of our letter of November 5, 1953, to Mr. Leo Nielson, Secretary, Reconstruction Finance Corporation, concerning it.

The reply to the above letter stated that RFC's loan to Ord Mercury Mine, to which we referred, was of a different type from that Corporation's loans to Copper Canyon Mining Company. Consequently, we have been asked to advise RFC of the estimated cost of the proposed exploration, the Government's share which would be repayable out of production operations, and the estimated time that would elapse before such exploration could be completed and a determination made as to the existence of ore in commercial quantities. It will be appreciated, therefore, if you will send us a brief summary of the results, to date, of your review made in accordance with our letter to you of November 5, 1953. Such information is necessary in order to negotiate further with RFC.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee

HCRubin/emd 2/11/54
Copy to: Docket T.F.Thayer
Adm. R. File
Op. Comm.
W. S. Martin
R. W. Geehan, USBM

Approved:

J. H. Hedges

Member, Bureau of Mines

J.L.Hofflund H.C.Rubin

D. M. Barraboo

Member, Geological Survey

C O P Y

400

January 25, 1954

Memorandum

To: Robert W. Geehan, Ferrous Metals and Alloys Branch

From: Chief, Mining Division, Region III

Subject: DMEA 3191, Copper Canyon

Reference is made to your memorandum of January 19, 1954, to Mr. Russell R. Trengove:

The Bureau diamond drill cores were lamped by both Mr. Trengove and by Jacques F. Robertson, geologist of the U. S. Geological Survey. No scheelite was found in the cores. The cores are filed in the U. S. Bureau of Mines core library at Reno, Nevada.

Diamond drill hole No. 9 was drilled by the International Smelting and Refining Co. The 100-foot intercept of scheelite, assaying 0.56% WO_3, was lamped by Roscoe M. Smith, geologist of the U. S. Geological Survey. The core is filed at the Copper Canyon mine.

The report on the Copper Canyon DMEA application by Mr. Trengove is complete except for some expected information from Mr. Robert Raring, general manager, on a revised application which will eliminate some of the proposed charges. There is also some question, according to Mr. Raring, whether or not the Copper Canyon Mining Co. are in a position to assume 25 percent of the cost of the proposed exploration.

A. C. Johnson

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C
O
P
Y

DMEA 3191 - Tungsten

400

RECONSTRUCTION FINANCE CORPORATION

WASHINGTON 25, D. C.

November 24, 1953

Mr. C. O. Mittendorf, Administrator
United States Department of the Interior
Defense Minerals Exploration Administration
Washington 25, D. C.

Re: Copper Canyon Mining Co.
Battlemountain, Nevada

Dear Mr. Mittendorf:

Your letter of November 5, 1953, addressed to Mr. Leo Nielson, with reference to the captioned loan, has been referred to this Division for reply.

We regret that we are not, at this time, in a position to advise you with respect to the proposal outlined therein. Our Los Angeles Loan Agency has been requested to furnish us a report on the current status of the loan and immediately upon receipt of the requested information we shall advise you further.

Yours very truly,

/s/ H. R. Rutland

H. R. RUTLAND, Chief
Liquidation Division
Office of Loans

NOV 5 1953

Mr. Robert H. Haring
Vice President
Copper Canyon Mining Company
Battle Mountain, Nevada

Re: Docket No. DMEA 3191 - Tungsten
Copper Canyon mine
Lander County, Nevada

Dear Mr. Haring:

Reference is made to the above-docketed application for exploration assistance which has been reviewed by the Iron and Ferro-Alloys Division of the Defense Minerals Exploration Administration and referred to Mr. H. C. Miller, Executive Officer, DMEA Field Team, Region III, 1012 Flood Building, 870 Market Street, San Francisco 2, California, for review and possibly a field examination of the property.

Any assistance that you can render the members of the Field Team will be appreciated.

Sincerely yours,

C. O. Mittendorf

Administrator

FARutledge:foc
10-30-53

cc: Docket
Code 400
FT. Reg. 3
Operating Comm.
Admr. Reading File
R. W. Geehan, USBM
T. P. Thayer, USGS

400

NOV 5 1953

Mr. H. C. Miller, Executive Officer
DMEA Field Team, Region III
1012 Flood Building
870 Market Street
San Francisco 2, California

Re: Docket No. DMEA 3191 - Tungsten
Copper Canyon Mining Company
Copper Canyon mine
Lander County, Nevada

Dear Mr. Miller:

Reference is made to the above-docketed application for exploration assistance which is being referred to your office for review and a field examination of the property if required.

A memorandum by T. P. Thayer, Geological Survey, has been prepared and is enclosed for your information. As Mr. Thayer requested, a copy of this letter is being sent to Mr. R. J. Roberts in order that he may forward to the Field Team a recent geologic report on the subject property.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee

APPROVED:

J. H. Hedges

Member, Bureau of Mines

A. R. Kinkel, Jr.

Member, Geological Survey

FARutledge:foc 10-20-53
cc: Docket
Code 400
FT. Reg. 3
Admr. Reading File
Operating Comm.
R. W. Geehan, USBM
T. P. Thayer, USGS
R. J. Roberts

NOV 5 1953

3191

Mr. Leo Nielson
Secretary, Reconstruction
Finance Corporation
Washington 25, D. C.

My dear Mr. Nielson:

There is pending in one of our regional offices an application of the Copper Canyon Mining Company (Docket No. EMEA-3191) for an Exploration Project Contract with the Government for the property known as the Copper Canyon property located in Sections 21, 22, 27, and 28, T. 31 N., R. 45 E., Mount Diablo Base and Meridian, Lander County, Nevada. This property consists of 19 patented and 20 unpatented mining claims.

The applicant states:

> "The property is encumbered by an RFC exploration loan granted in December 1947 in principal amount of $130,000 for purpose of deepening the three-compartment vertical Julie shaft so as to permit mining of lead-zinc ore bodies that have been previously diamond drilled. A sum of $15,000 has been paid on principal of this loan, but the balance, with accrued interest, approximates $140,000."

A copy of our proposed Exploration Project Contract form on which this Exploration Project Contract may be drawn is enclosed for your inspection. The property is to be investigated, and the estimated cost of the project is as yet not determined, but the Government would contribute 75 percent of any cost. This contribution would be repayable to the Government only if the Government considers and certifies "that a discovery or development from which production may be made has resulted from the exploration work, and the Government has a lien upon the property and upon any production to secure this repayment.

Ordinarily, Defense Minerals Exploration Administration would require the subordination agreement of a prior encumbrancer as a prerequisite to entering into an Exploration Project Contract, because if all the proceeds from the

[illegible]
A. E. Kane
chron.
pending

operation of mining property for ten years were used to pay off the encumbrancer's loan, there would then be nothing remaining to pay any royalties to Defense Minerals Exploration Administration. However, in the case of the Reconstruction Finance Corporation, it would seem unnecessary to require any such formal subordination.

In your letter to me of October 27, 1952, in the case of Ord Mercury Mine, you wrote:

> 'I wish to advise that this Corporation interposes no objection to the proposed exploration project referred to in your aforesaid letter and in the event commercial production of ore results, this Corporation will not object to the payment from proceeds of production of royalties due the Government under the contract.'

It would be appreciated if you would write us at your earliest convenience if your response would be similar in this case, because we do not want to make an investigation of this property until we have first had such a reply from you.

Sincerely yours,

C. O. Mittendorf

Administrator

Enclosure

AEKane/ep/emd 11/3/53
Copy to: Docket
Adm. R. File
C. O. Mittendorf
Reg. III (2)
W. S. Martin
J. L. Hofflund
A. E. Kane
chron.
pending

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

402

October 26, 1953

Memorandum

To: W. S. Martin, DMEA

From: T. P. Thayer, USGS

Subject: 3191-Tungsten
Copper Canyon Mining Company
Battle Mountain, Nevada

The applicant proposes about 2000 feet of diamond drilling from a point on the 500-foot level to explore possibilities of tungsten ore in the middle member of the Battle formation near the contact with monzonite porphyry. The proposal has been discussed with Mr. R. J. Roberts of the Geological Survey, who is familiar with the mine.

Although the basis of the proposal seems geologically sound, that there is tungsten mineralization in the middle member of the Battle formation, the location of the exploration target is open to discussion. The section, through the Farren tunnel shows the monzonite porphyry contact, at a point apparently only 200 feet above the top of the middle member - the presumed tungsten horizon. If the situation is as shown 2000 feet of drilling from the end of the Farren tunnel in the footwall of the Virgin fault would give a great deal more footage in the promising zone near the monzonite porphyry. This area is not much farther from the present workings than the target proposed by the applicant.

The answer to the question involves three factors: (1) How well is the position of the Cbu-Cbm contact known below the end of the Farren Tunnel? (2) How well is the position of the porphyry contact known in the proposed target area, (3) How much of the proposed exploration is for metals other than tungsten?

Question 1. How closely can the position of the Cbu-Cbm contact be determined? If anywhere nearly correctly shown, the distance to favorable tungsten ground is much shorter than in the area proposed.

Copy retained on

Question 2. The map and sections show only four points on the monzonite porphyry contacts, two on the surface and two in the Farren Tunnel, on opposite sides of the Virgin fault. Presumably, the contacts on the plan are projected mainly from the surface, but this is not indicated. It seems rather important in prospecting for tungsten to understand the relations of the porphyry masses in the area 10750 to 11250 N and 9750 to 10250 E. The indicated trends of the contacts suggest two bodies or a narrow reentrant to the north. Whichever is the case, would not this area be the most promising place to look for tungsten?

If the contact swings as postulated, how much longer might the proposed drill holes have to be to reach it? The porphyry is shown as cut by the Virgin fault, so the position of the contact on the surface cannot be projected below the fault, where the proposed target area lies.

Question 3. The proposed drill holes lie within the productive lead-zinc horizon, and presumably it is hoped some ore will be found, although Bureau of Mines drill hole B-9 was essentially barren. Should not the Government participation be on the basis of partly for lead-zinc and partly for tungsten?

If more information is available on the porphyry contacts in the area described above, the Field Team should present it. If not, I believe more reasons should be given as to why drilling should not be done from the Farren Tunnel. Holes fanned from the tunnel north of the Virgin fault would quickly establish the position of the top of the Cbm and the porphyry, and would be directed to explore the thickness of the Cbm most advantageously. Any ore found in this area could be developed from the 500 level.

Recommendation:

The dockets should be referred to the Field Team for answers to the questions above, and setting up of cost figures.

If copies of the letter transmitting the docket to the Field Team and this memorandum are sent to Mr. R. J. Roberts, Room 208, 222 S. West Temple Street, Salt Lake City, Utah, he will forward a geologic report to Reno, saving some time in processing.

T. P. Thayer

October 12, 1953

Defense Minerals Exploration Administration
United States Department of the Interior
Washington 25 D. C.

Gentlemen:

Submitted herewith in quadruplicate is Application for assistance of your Agency in diamond drilling for tungsten in the Copper Canyon Mine, submitted under provisions of the Defense Production Act of 1950, as amended.

Very truly yours,

COPPER CANYON MINING COMPANY

by Robert H. Haring

Robert H. Haring

Encls: (in quad)

Form MF-103
Continuation Sheets (10)
District Claim Map - Exhibit "A"
Composite Plan, 500 & 700 Levels - Exhibit "B"
Longitudinal Section - Exhibit "C"
Tarren Tunnel Section - Exhibit "D"

cc - Mr. L. S. Whicher

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
OCT 19 1953

APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

Not to be filled in by applicant

Docket No. DMEA-319
Metal or Mineral Tungsten
Date Received 10-19-53
Estimated Cost
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address:

Copper Canyon Mining Company, Battle Mountain, Nevada

A Delaware corporation

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.

(*c*) If a corporation, add to above statement, titles, names and addresses of officers.

(*d*) If a partnership, add to the above statement the names and addresses of all partners.

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract

See attached sheets

(*b*) State any mine name by which the property is known. Copper Canyon Mine

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise

Owner

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property.

(*e*) If you own the land, describe any liens or encumbrances on it

See attached sheets

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice.

See attached sheets

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes.

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades.

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you.

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points.

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.

5. *The exploration project.*—(*a*) State the mineral or minerals for which you wish to explore Tungsten (scheelite)

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contacts, veins, ore-bearing beds, etc.

(*c*) The work will start within 30 days and be completed within 90 days ~~months~~ from the date of an exploration project contract.

(*d*) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations.

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project:

(*a*) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.).

(*b*) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants.

(*c*) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel.

(*d*) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be.

(*e*) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project.

(*f*) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project.

(*g*) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes.

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in the estimate of costs.

7. (*a*) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)?

(*b*) How do you propose to furnish your share of the costs?

☐ Money ☐ Use of equipment owned by you ☐ Other

Explain in detail on acompanying paper.

CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated October 12, 1953

COPPER CANYON MINING COMPANY
(Applicant)

By Robert H Luring

Gen. Manager

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

COPPER CANYON MINING COMPANY
Battle Mountain, Nevada

Continuation Sheets to accompany DMEA Form MF-103

1.(c) Names and addresses of officers of the Company are:

Chairman of the Board: Mr. L. E. Whicher, Room 1636, 25 Broad Street, New York 4 N. Y.

President: Mr. Jack Maloy, address same as above

Vice President: Mr. Robert H. Haring, Battle Mountain, Nevada

Secretary: Mr. Sidney L. Sherman, Room 1636, 25 Broad Street, NY 4 NY

3.(a) Applicant's holdings are in the vicinity of Battle Mountain, Lander County, Nevada and are colored in red on map submitted as exhibit to this Application.

Specifically, the Applicant has two mining properties:

a. - Copper Basin Property located six miles southwest of Battle Mountain and comprising 27 patented lode mining claims, 28 lode locations, 16 placer locations, and 280 acres of patented agricultural land, totaling approximately 1200 acres. This property has developed copper orebodies but is not equipped for operation.

b. - Copper Canyon Property located 18 miles southwest of Battle Mountain, fully equipped with 350 ton flotation mill, power plant, shops, offices, housing, etc and comprising 19 patented lode mining claims, 17 lode locations, 3 placer locations and 720 acres of patented agricultural land, totaling approximately 1400 acres.

Application for the DMEA project as will be described herein relates to work at the Copper Canyon Property, located in Sections 21, 22, 27, and 28 of T 31 N, R 43 E, Mount Diablo Base & Meridian, Lander County, Nevada.

3.(b) See Form
(c) See Form
(d) Not pertinent; Applicant owns the Property.
(e) Currently a suit has been entered by the District Attorney of Lander County for collection of delinquent property taxes but settlement of same can be expected within near future.

The Property is encumbered by an RFC Exploration Loan granted in December 1947 in principal amount of $130,000 for purpose of deepening the three compartment vertical Julie Shaft so as to permit mining of lead-zinc orebodies that had been previously diamond drilled. A sum of $15,000 has been paid on principal of this loan but the balance, with accrued interest, approximates $140,000.

Copper Canyon Mining Company Battle Mountain, Nevada

3.(f) Listing of Patented Lode Mining Claims in Copper Canyon Group:

Claim	Sur. No.
Virgin Lode	Lot No. 37
Mary Louise Lode	Lot No. 38
Mountain Rook Lode	Lot No. 39
Ethel G. Lode	Lot No. 1842
Washington	Lot No. 1843
East Lake Superior	Lot No. 1844
Copper Queen	4175
Eagle	4175
Yellow Jacket	4175
Reona	4175
Salt Lake	4175
Salt Lake No. 1	4175
Salt Lake No. 2	4175
Salt Lake No. 4	4175
Salt Lake No. 5	4175
John John	4175
Blue Jacket	4175
Comet	4175
Lucy	4175

Listing of Unpatented claims, lode and placer, with recording data:

Claim	Recording Book	Recording Page
Southern Belle	14	150
Bayou	14	150
Tomahawk	13	343
Keystone	13	343
Tecumsah	13	346
Climax	13	344
Inspiration	13	344
Hecla	13	345
Last Chance	13	345
Polaris	13	346
Happy Thought #1	14	293
Happy Thought #2	14	294
Midas	13	103
Evening Star	13	102
Salt Lake No. 3	13	103
Washington Fraction	13	443
Salt Lake Fraction	13	476
Homestake Placer	8	40
Guy Davis Placer	8	40
July Fraction Placer	10	433

Above listing of filings on unpatented mining claims relate to office of the County Recorder at the Courthouse in Austin, Lander County, Nevada

4.(a) Currently mining operations are suspended at the Copper Canyon Mine. Shut-down was made October 15, 1952 as a result of declines in prices of lead and zinc.

Copper Canyon Mining Company
Battle Mountain, Nevada

September 30, 1953

4.(a) Cont'd. The Copper Canyon Mine is an old mine, having been discovered about 1864. Early production of high grade copper ore was shipped crude to Swansea, Wales. In 1916 present owners acquired property and worked it intensively during World War I. A long shut down period resulted from 1920-35 when the Mine was inactive except for small scale lessee work.

In 1935 the present Company retooled and undertook a development program that culminated in lease being taken by the International Smelting and Refining Company in Spring of 1941. International (Anaconda subsidiary) thereupon built a new and modern camp, sunk a new three compartment shaft (Julie Shaft), built a mill and all related facilities. The Mill began operation in February 1942 - shortly after Pearl Harbor.

The Mine was intensively worked during World War II by International but, upon expiration of the lease, the property with improvements reverted back to owners, the Copper Canyon Mining Company, on December 1, 1945. Copper Canyon continued the gold-copper work until July 1947 when, because of inflationary conditions and termination of the Premium Price Plan on copper, decision was made to sink the Julie Shaft to the previously diamond-drilled lead-zinc orebody. This involved 218 feet of sinking with several thousand feet of lateral work.

Lead-zinc milling began in October 1948 and continued - except for a suspension for repair of fire damage in summer of 1950 - up until October 1952. Lead-zinc ores are far from being exhausted but present day cost-price relationships makes working them unattractive.

No exact figures can be given on value of total production of the Copper Canyon Mine but it doubtless is in order of $15,000,000. Accurate records have been kept since 1935 and the period therefrom breaks down into three periods:

a. - Period from 1935 thru 1941: shipments of crude ore (no mill) totaled 23,099 dry tons containing 6,638.1 oz/Au, 46,189 oz/Ag and 2,231,677 lbs Cu.

b. - Period from February 26, 1942 thru 1947 (milling gold-copper ores) Total 422,179 dry tons milled recovering 30,937.6 oz/Au, 363,813 oz/Ag and 6,233,885 lbs Cu.

c. - Period from October 1948 thru to October 15, 1952 (milling lead-zinc ores) Total 196,266 dry tons milled recovering 3,873.4 oz/Au, 462,921 oz/Ag, 398,877 lbs Cu, 6,613,593 lbs Pb, and 3,124,345 lbs Zn.

The Mine is principally developed by the Julie three compartment vertical shaft, 728 feet deep, from which production levels have been cut at 200, 300, 500 and 700 intervals. Lead-zinc work is confined to bottom or 700 foot Level; upper levels produced gold-copper ores.

Mine plant consists of diesel power plant with three (3) Busch-Sulzer 600 hp diesel engines installed, a complete and modern 350 ton per day differential flotation mill, assay office, shops, offices, bunk and boarding house facilities for 53 single men and 27 modern family dwellings. Water supply is from wells and surface flow of Willow Creek

in adjoining canyon. Water supply is abundant at 200 gpm.

Applicant owns decsribed property except for encumbrances noted in 3(e).

Mine is completely accessible for examination down to and including the 500 Level. The bottom or 700 Level is now under water, mine pumping having been suspended when the Mine was shut down October 15, 1952.

4.(b) - For mine production, please note preceeding paragraph.

On present lead-zinc prices, ore reserves are very limited. Development is backward so that proved lead-zinc reserves are on order of 50,000 tons that will average

0.02 oz/Au per ton
2.50 " Ag "
0.20% Cu
2.00% Pb
1.00 % Zn

Probable and possible reserves of this type and grade of ore are considered great. Formal development, however, lags because markets have been (since March 1949) so unsteady that formulating and executing long range developments programs have been ruled out.

This application does not bear on lead-zinc exploration; it is atungsten project as will be explained later.

4.(c) Copper Canyon mineralization is related to a Mesozoic porphyry (locally called the "John John" porphyry) that lies just north of the Mine. This rock intruded upper Paleozoic sediments (Pennsylvanian and Mississippian) resulting in contact metamorphism, replacement and filling.

Mining to date has been confined to brecciated fault zone where the cementing chlorite of the breccia has been replaced by pyrite-chalcopyrite (as is case with gold-copper ore) or by galena and sphalerite (as is case with the lead-zinc ores. Lithology exercised dominant control in determining type of mineralization. In the siliceous facies, the pyrite-chalcopyrite mineralization is found whereas the galena-sphalerite metallization follows the limey members, as could be expected.

The breccia zones are formed in "trough"s formed by intersection of a northwest striking easterly dipping fissure system with bed strike northward on a steep westerly dip. These trough-like zones can become wide, in one instance running up to 200 feet in width. Vertical range of 100 feet or so is not unusual.

Mineralized bed is called the Battle Formation that averages about 800 feet thick. The basal member is a siliceous conglomerate of about 200 feet in thickness. In it is found the gold-copper mineralization. The middle member, about 400 feet thick, is an altered dolomtic limestone or hornfels and in it occurs the lead-zinc mineralization. The upper 200 feet of the Battle Formation is a rather even textured

quartzite that has not been highly productuve horizon.

In upper levels, secondary copper metallization was notable and was responsible for discovery of the Mine and its early spectacular production. Such secondary copper ores are now largely exhausted, however.

For more complete geologic description of the Mine, reference is made to geologic quadrangle map series of the U S Geological Survey, "Geology of the Antler Peak Quadrangle, Nevada" by R. J. Roberts (1951).

The Mine has also been described in U S Bureau of Mines Information Circular No. 7043 by William O. Vanderburg (1939) and a lead-zinc drilling program therein described by U S Bureau of Mines Report of Investigation No. 4774 "Investigation of Copper Canyon Lead-Zinc Deposit, Lander County, Nevada" by Russell R. Trengove (1951). This latter gives a much more up-to-date picture of the property and installation than the Vanderburg circular which is now somewhat out of date.

There is submitted herewith a plan and longitudinal prints covering proposed drilling for tungsten on which discussion will follow later. There is no need to return these prints.

4.(d) - The Copper Canyon Mine lies 18 miles southwest of Battle Mountain by road, 14½ miles of which are black-topped, all weather macadam. The final 3½ miles is by graveled county road in good condition.

Battle Mountain is the shipping nad mail point. It lies astride both the Southern Pacific and Western Pacific railroads and is on U S Highway 40, 312 miles west of Salt Lake City, Utah and 225 miles east of Reno, Nevada.

Weather conditions are good; climate is semi-arid and winter snowfalls rarely impede year-round work. Collar of the Julie Shaft is at an elevation of 5712 feet above sea level.

As noted previously, the Mine has accomodations for 55 single men and 27 families. Additional residence facilities exist at Battle Mountain and, in previous operation, some personnel commuted between town and the Mine as the drive requires but 30 minutes time. The Mine camp is served by a school bus and children and taken to Battle Mountain for school sessions.

4.(e) Manpower as needed for this project is available locally. The Mine is fully equipped and no additional equipment would be needed. Water and power facilities are installed and much more than adequate for requirements of this program.

5.(a) Tungsten (scheelite).

(b) During time when the International Smelting and Refining Company had the Copper Canyon Mine under lease, some attention was given to lamping for scheelite in diamond drill core, of holes that were drilled in exploration of copper-gold or lead-zinc orebodies. Notable tungsten content was uncovered in some holes drilled through the middle (hornfels) member of the Battle Formation even though the holes were 1,000 feet or so from the contact of hornfels with the monzonite.

Assays on intercepts of two of the holes, by Union Assay office of Salt Lake City, gave the following results:

Hole No.	Intercept	Assay
9	571.2 - 671.4	0.56% WO_3
24	20.9 - 36.6	0.43%

Seven samples of waste dump material from the Mine gave an average of 0.81% WO_3 and lamp surveys of the levels revealed widespread scheelite metallization, locally in commercial concentrations.

The mill at that time (1942) was busy treating copper and thus the above tungsten results were filed away as being matters of academic interest. Later, when the Julie Shaft had been sunk and the new 700 Level cut, the top of ore intercept of DDH 9, as reported above, was still 82 feet vertically below the 700 Level and thus would be inaccessible for mining unless the Shaft were deepened and a new and lower level cut, obviously a time-consuming and costly operation.

In view of the widespread tungsten showings in the Mine, it seems desirable to explore the middle (hornfels) member of the Battle Formation (colored green on accompanying maps) where it comes in contact with the Quartz Monzonite Porphyry (Mp - colored red on maps). The logical place to test this contact is north of the 500 Level working, vertically between the 500 and 700 foot Levels for discoveries made in this sector would thus be accessible by compartively short drives from existing faces.

The point might be brought up here that the Farren Tunnel offers logical point of attack. Objection on this score is that the greater part of the Farren Tunnel (all of it in hangingwall of the Virgin Fault) is in the upper plate of the Golconda Overthrust (of Roberts' discussion in text of Antler Peak Quadrangle Map) and thus stays in the overthrust Pumpernickel Formation, a member composed of cherty beds and quartzites, not especially favorable host rocks for scheelite occurrences. Furthermore, driving the Farren Tunnel ahead, in footwall of the Virgin, offers no guarantee that it would intercept the contact of the two critical members, the hornfels and monzonite porphyry. Tooling up for such a project would be more expensive than drilling from more convenient points and the results less certain.

It is proposed to drill three exploratory diamond drill holes into "target area" cross-hatched in black ink of the three section maps submitted herewith, marked Exhibits "B", "C", and "D". It is anticipated that the contact will be reached about 700 feet northward of face of 523 Drift (Coors 10,477N, 10,195E on 500 Level). The first hole should be drilled on line N 55 W at minus 17 degrees. It should be

terminated upon reaching the contact. If promising showings are encountered, then additional holes should be planned after consultation with U S Geological Survey and Bureau of Mines representatives.

The project, as outlined herein, embraces three (3) exploratory diamond drill holes of about 700 feet each for a total of 2100 feet of hole.

5.(c) See Form

5.(d) Applicant (Copper Canyon Mining Company) has controlled and intermittently operated the Copper Canyon Mine since 1916. During that time, metal production has approximated $10,000,000 of which 620,000 dry tons have been concentrated.

The work would be under supervision of Applicant's General Manager, Mr. Robert H. Raring. Mr. Raring has been associated with Applicant since 1936 except for period 1941-45 when he served with the Air Force. He is a graduate mining engineer, holdings B. S. and E. M. degrees from Lehigh University and a M.S. (Met) degree from School of Mines, University of Idaho. He has previously been associated with mining operations in British Columbia, Canada, and in Ecuador, South America.

6.(a) None.

6.(b) Labor, supervision, consultants: Estimated daily labor cost of this program is as follows: (one eight hour shift daily except Sunday):

	Estimated Daily Pay
Driller	$25.00
Helper	15.00
Hoistman-compressman	15.00
Cager-roustabout	12.50
Supervision	20.00
Total	$87.50

On average daily footage of 30 feet (based on past drilling), this breaks down to a cost of $2.92 per foot.

Of above personnel, hoistman-compressorman would run the hoist, providing access to 500 Level, start up and watch compressor, and attend to charging the electric cap lamps.

Cager-roustabout would "run errands" for the drill crew, facilitating their work by seeing necessary supplies are always on hand, etc etc.

Supervisor would attend to coordinating the effort, core and sludge handling, office work, etc.

6.(c) Operating materials and supplies: Daily power consumption (eight hour shift) is based on 35 KW rating on the compressor (500 cfm I-R) with power at $0.033 per Kwh. This calculates to 280 Kwh per 8 hr shift or $9.24 for power. Round this figure out to $10.00 for power.

Copper Canyon Mining Company Battle Mountain, Nevada

6.(c) Cont'd Thus daily power and water costs are estimated

	Cost
Power	$10.00
Water	1.00
Total	$11.00 or $0.37 per foot of hole

Bit cost is estimated at $1.00 per foot of hole. This might be somewhat high on basis of drilling experience in the Mine but should be allowed to stand to cover possible loss of a bit, etc.

The materials and power item thus summarizes:

	Cost per Foot
Power & water	$0.37
Bits	1.00
Total	$1.37 per foot of hole

6.(d)

6.(d) Operating Equipment: Applicant proposes use-allowance basis for equipment, as follows:

	Daily Cost
Drill & accessories	$10.00
Compressor	15.00
Total	$25.00

6.(e) Rehabilitation and Repairs: Certain preparatory work is necessary which is described as follows:

(1) - Stringing new power cable down Shaft to 500 Level. This involves hanging new 3-conductor #4-0 neoprene jacketed cable from power plant to 500 Station. The cable is on hand and will be furnished by Applicant. It is estimated that four men will require two shifts to complete this job for a cost of $125.00

(2) - Clean-up of 500 Level - estimate three men for two shifts preparing drill station, cleaning up track and ditch, etc. Estimate cost at $100.00

(3) - Compressor "tune-up." It is recommended that the compressor which would be used on this project (Ingersoll-Rand Model K-500, 500 cfm electric-driven, two stage) be "tuned-up." Mainly involved would be checking on compressor valves and valve springs, etc to insure unit is operating at good efficiency. Estimate cost of service plus possible replacement parts at $200.00. A factory mechanic would be called in for this job. (Mechanic available from Nevada Equipment Service Inc. at Reno).

6.(f) None.

6.(g) Miscellaneous. It is estimated that allowance should be made for sampling the final 100 feet of each hole. If sample is taken every five feet, provision should thus be made for 20 samples per hole at cost of $5.00 per determination or $100 total per hole.

Industrial insurance is at rate of $7.20 per $100 on underground (mine) labor which includes hoistman. Social security tax is 1½% and Nevada State Employment Security Tax is 0.1% for the Copper Canyon Mine. Thus the daily tax rate is

Industrial Insurance	7.20
Social Security	1.50
Unemployment	0.10
Total	8.80%

Since it is noted in 6.(b) that the daily labor cost will estimate at $87.50, the daily tax will be $7.70 or (on 30 foot daily average) $0.26 per foot of hole.

It is planned to drill the holes at AX, holding an EX bit in reserve. To extent possible, holes would be finished on AX but in those cases where casing would be necessary, request is made to drop down to finish on an EX bit. Practical consideration would have to govern on this point , idea being to get an AX hole is cost of such is not unreasonable.

There should be an initial stockage of four (4) AX bits and two (2) EX bits and, in addition, about 200 feet of AX casing. Estimate of this initial stockage (replacement being taken care of by bit allowance under 6.(c), is as follows:

Four AX bits at $125 each	$500.00
Two EX bits at $100 each	200.00
200 ft AX casing at $1.00 per foot	200.00
Total	$900.00

Amortized over the full 2,000 feet of hole, this initial stockage breaks down to $0.45 per foot of hole. Possibly this item should have been included under Par 6.(d).

6.(h) Contingencies. It is suggested that allowance be made at rate of $0.50 per foot for contingencies, items or breakdowns that cannot be predicted.

COST SUMMARY

The cost of the program, based on an "outside" total of 2,000 linear feet of hole, is as follows:

Copper Canyon Mining Company Battle Mountain, Nevada

Ref. Par.	Item	Cost per Foot
6.(b)	Labor, etc	$2.92
(c)	Op materials & supplies	1.37
(d)	Equipment	0.84
(e)	Rehabilitation & repairs	0.22
(f)	New buildings	0.00
(g)	Miscellaneous	0.71
(h)	Contingencies	0.50
	Total	$6.56 per foot of hole.

Of the above, attention is invited to certain of the items that are non-recurring in nature, i.e. - Item 6.(e) in amount of $0.22 per foot and Item 6.(g) for initial stockage of bits and casing in amount of $0.45 per foot. The bits and casing procured under this latter could, at termination of project, be turned back to DMEA or, if desired, Applicant would agree to buy same from DMEA at fair depreciated value.

7.(a) Yes.

7.(b) Applicant will furnish equipment and one of required personnel (supervision). A breakdown of cost propotionment between DMEA and Applicant is as follows: (basis per foot of hole):

DMEA Share	Ref Paragraph	Applicant Share
$2.25	6.(b)	$0.67
1.37	(c)	0.00
0.00	(d)	0.84
0.22	(e)	0.00
0.00	(f)	0.00
0.71	(g)	0.00
0.25	(h)	0.25
$4.80	Totals	$1.76

Above distribution is proposed, subject to approval by DMEA. Applicant is prepared to carry out its end on above basis.

Bureau of Mines
Report of Investigations 4774

INVESTIGATION OF COPPER CANYON LEAD-ZINC DEPOSIT, LANDER COUNTY, NEV.

BY RUSSELL R. TRENGOVE

United States Department of the Interior— April 1951

INVESTIGATION OF COPPER CANYON LEAD-ZINC DEPOSIT, LANDER COUNTY, NEV.

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* * * * * * * * * **Report of Investigations 4774**

UNITED STATES DEPARTMENT OF THE INTERIOR
Oscar L. Chapman, Secretary
BUREAU OF MINES
James Boyd, Director

Work on manuscript completed March 1950. The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Report of Investigations 4774."

April 1951

INVESTIGATION OF COPPER CANYON LEAD-ZINC DEPOSIT LANDER COUNTY, NEV.

by

Russell R. Trengove[1]

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1/ Mining engineer, Region III, Mining Division, U. S. Bureau of Mines, Reno, Nev.

INTRODUCTION AND SUMMARY

The Copper Canyon lead-zinc mine is in the Battle Mountain District, Lander County, Nev. It was discovered in 1866 and mined for copper until 1935 and for copper and gold until 1948, when the main production became lead-zinc ore.

The rocks in the area are carboniferous (Pennsylvanian and Mississippian) sedimentaries that have been intruded by quartz monzonite of Mesozoic age. They have been intensely folded, faulted, and tilted.

Lead-zinc ore occurs as sulfides disseminated along fractured zones in a conglomerate and hornfels.

Development was carried out by the Bureau of Mines in cooperation with the U. S. Geological Survey and comprised a study of the geology, making maps and cross sections, and exploring the deposit by diamond drilling from underground. Eighteen holes were drilled for a total of 2,594 feet.

This report contains a brief history of the property and a description of mining methods and beneficiation of the ore, geology, ore deposits and drilling done by the Bureau of Mines. It also contains detailed analyses of the ore samples taken and logs of the holes drilled.

ACKNOWLEDGMENTS

This project was under the general supervision of A. C. Johnson, chief, Reno Branch, Mining Division, Region III. Acknowledgment is also due J. B. Zadra, supervision engineer, and staff of the Hydrometallurgical and Ore Dressing Section at Reno, where the samples were analyzed.

The cooperation and assistance given by the officials of the Copper Canyon Mining Co., Robert H. Raring, general manager; Thomas M. Cahill, mining engineer; Elmer Snell, mine superintendent; and Ralph Hayden, mill superintendent, were greatly appreciated.

Jacques F. Robertson, of the U. S. Geological Survey, was assigned to the project as resident geologist and was of great assistance in logging diamond-drill cores, mapping and interpreting the geology and serving in an advisory capacity.

LOCATION AND PHYSICAL FEATURES

The Copper Canyon mine is in Lander County, Nev. (fig. 1), 18 miles south-southwest of Battle Mountain, a town on U. S. Highway 40 and on the Southern Pacific and Western Pacific Railroads. Battle Mountain is 220 miles northeast of Reno, Nev., and 310 miles west of Salt Lake City, Utah.

The property is in the Battle Mountain district, which is comprised of a series of steep northward-trending mountains bounded on the east by Reese River Valley and on the west by Buffalo Valley.

Altitudes range from 4,600 feet in the valley to 8,265 feet on Antler Peak, a few miles north. The mine is at an altitude of 5,700 feet in Copper Canyon, which is on the rugged west slope of a northward-trending ridge near the south end of the range.

Climate in the area is semi-arid, with hot, dry summers and moderately cold winters. Precipitation occurs usually as snow, with occasional rains during the fall and spring. Vegetation consists of sagebrush and desert grass.

Water for milling purposes is obtained from the mine. Water for domestic purposes is purchased from the Natomas Co., which operates a gold dredge to the south. It is pumped from their reservoir, 1 mile distant. They obtain their water from Willow Creek and also from a well in the valley. Water can also be pumped from a 203-foot well owned by the Copper Canyon Mining Co., through 15,600 feet of 6-inch pipe line to a 112,000-gallon storage reservoir situated above the mill.

The mine is accessible by 18 miles of gravel road from the town of Battle Mountain.

Freight and express shipments and telegraphic communications are handled through the railroad station at Battle Mountain. Daily postal service is maintained by truck from the Battle Mountain post office.

The camp can accommodate 27 families and 56 single men. It consists of 14 bunk houses for single men, 27 family homes, a boarding house capable of seating 90 men, a grocery store, office, and staff house.

Power for the mine and mill is obtained from three Diesel engines of 600 horsepower each direct-connected to 475-k.v.-a. generators.

PROPERTY AND OWNERSHIP

Property holdings comprise 19 patented lode claims, 17 unpatented lode claims, and 3 unpatented placer claims. The concentrator and mine are in the NW 1/4 SW 1/4 and the SW 1/4 NW 1/4, sec. 27, T. 31 N., R. 43 E. (figs. 2 and 3).

The Copper Canyon Mining Co. is the owner, with main offices at 25 Broad St., New York City. Principal officers are L. E. Whicher, president, New York City, and Robert H. Raring, vice president and general manager, Battle Mountain, Nev.

HISTORY AND PRODUCTION 2/

The first recorded mining operations at Copper Canyon were carried on by an English company, who purchased the property about 1870 and worked it continuously for a period of about 10 years. This company opened up two

2/ This section is from the files of the Copper Canyon Mining Co.

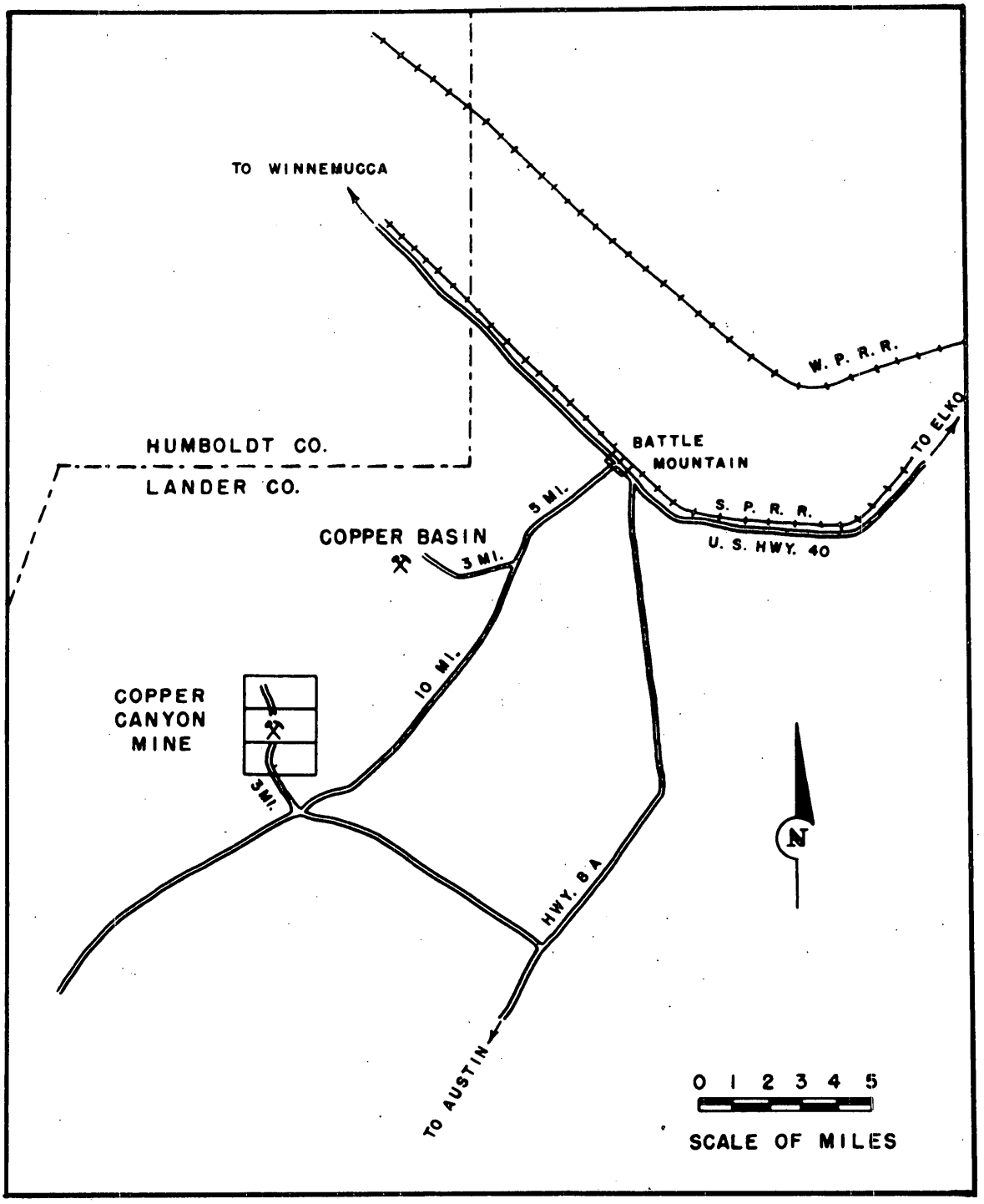


Figure 1. - Location map.

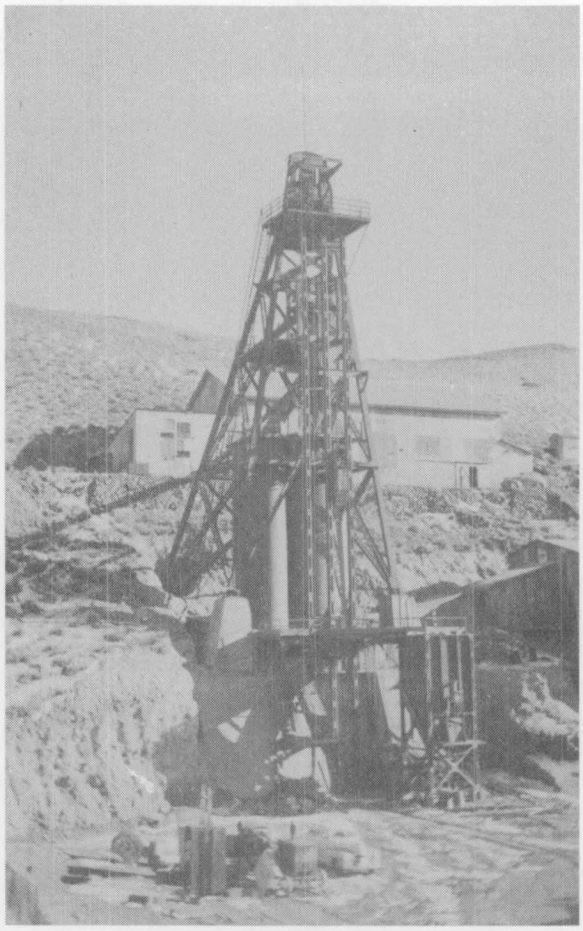


Figure 2. - Julie shaft headframe (looking east).

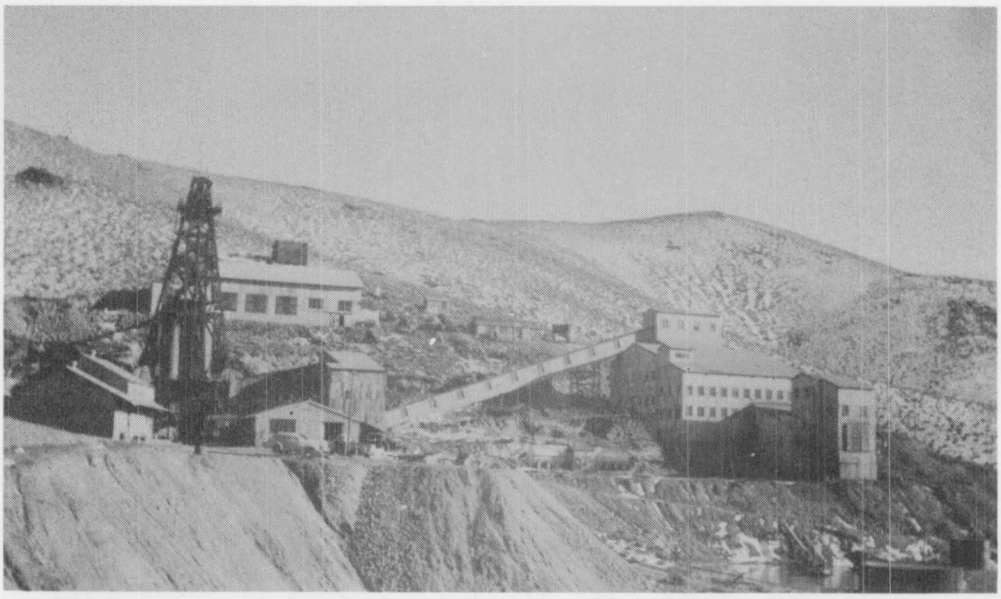


Figure 3. - Surface plant (looking east).

lodes - on one of which they sank a shaft to a depth of 590 feet. It is stated more than 40,000 tons of oxide ores were shipped to Swansea, Wales, and that these shipments averaged 50 percent copper. The company also owned and operated a concentrating plant, which was situated on Willow Creek, 2-1/2 miles from the mine. After remaining idle for a period of 5 years, the mine was sold to a local company. The local company sold the old mill and allowed the property to remain idle until 1897, when it was acquired by the Glasgow & Western Exploration Co., Limited, who reopened the mine, equipped it with new machinery, and commenced more or less active mining operations, stoping out the old pillars and other ore left standing by the previous operators. During the years 1898, 1899, and 1900, according to old company records, there was extracted about 2,000 tons of 12 percent copper ore from the old workings, and in 1907 the mine produced 844 tons of the same grade ore. In 1907, the mine was shut down and the machinery dismantled. The workings caved in and became inaccessible below the 90-foot level.

About 1912, the Glasgow & Western Exploration Co. erected a leaching plant at Copper Canyon to treat low-grade oxidized copper ores, but it was metallurgically unsuccessful, as an extraction of only 47 percent was obtained. In 1914 the Glasgow & Western Exploration Co. ceased operations, and in 1916 the newly formed Copper Canyon Mining Co. acquired the Copper Canyon mines. During World War I, between August 1916 and December 1918, the company shipped 22,481 tons of ore averaging 9 percent copper. This production was made from the Estes vein between the 188-foot level and the surface and from the Willow Creek dump. The ore was hauled to Dillon, a point on the Nevada Central railroad, and then by railroad to the smelters at Garfield, Utah.

After World War I, the mine was inactive until 1927, when lessee production started. In 1935, after the discovery of gold in 1932 by lessees, the company reorganized, and development was conducted by the Copper Canyon Mining Co. from 1936 to 1941. In 1941 the property was taken over by a subsidiary of the Anaconda Mining Co., the International Smelting & Refining Co., on an operating agreement basis. They did considerable development work and exploring by core drilling. The development included 30,000 feet of diamond drilling. This drilling disclosed a lead-zinc ore body, but no effort was made to mine it at that time. Production of copper, silver, and gold ore continued until December 1945, when the property, with all improvements and equipment, was returned to the Copper Canyon Mining Co. This company continued mining copper ore until the premium on copper was dropped in July 1947. At that time production ceased, and operations were started on sinking the shaft 218 feet to the 700 level. This was completed January 1, 1948, but the 700-level drift did not reach the lead-zinc ore in the hornfels until July 1948 because of the large flow of water encountered while the drift was being advanced. Mining the ore body started immediately, and the first lead-zinc ore was put through the mill August 9, 1948. From August 9, 1948, to December 31, 1949, 81,438 dry tons were milled.

The annual production since 1935 is as follows:

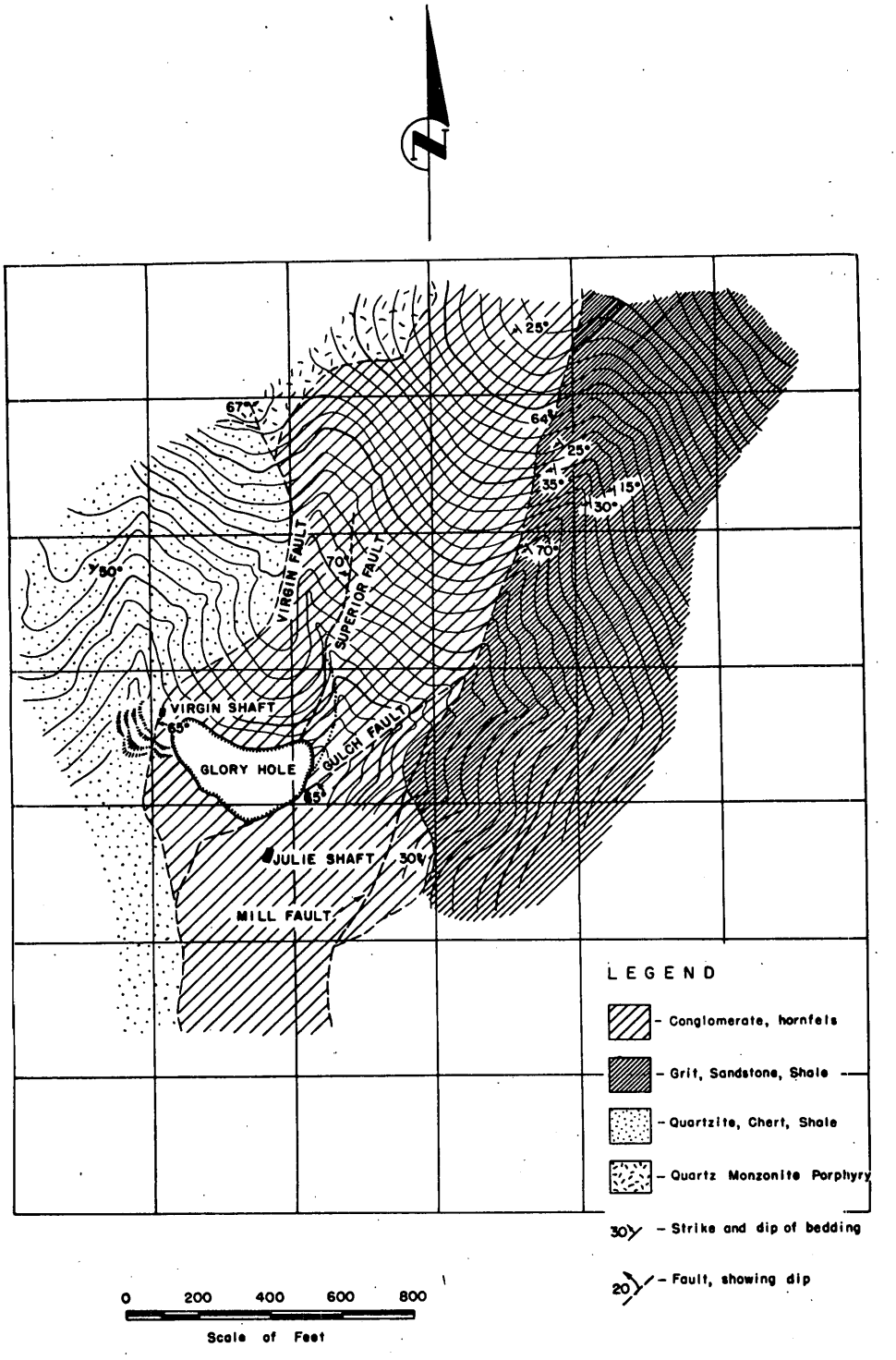
Year	Tons	Oz. Au	Oz. Ag	Lb. Cu	Lb. Pb.	Lb. Zn
1935.....	1,970	1,232.92	3,975.8	29.926		
1936.....	574	382.53	2,577.0	4,744		
1937.....	1,576	491.80	2,692.3	160,879		
1938.....	3,956	1,600.35	7,802.7	478,114		
1939.....	6,283	1,389.85	12,791.1	699,510		
1940.....	7,109	1,333.22	13,561.8	724,180		
1941.....	1,631	205.42	2,788.2	164,324		
1942 1/...	85,640	4,687.98	47,502.8	1,127,019		
1943.....	99,582	7,928.19	85,772.7	1,769,710		
1944.....	76,544	6,064.70	91,144.7	1,130,893		
1945.....	47,935	5,638.11	52,765.0	617,542		
1946.....	76,714	3,470.11	58,762.3	958,314		
1947.....	35,764	2,816.64	22,442.1	537,284		
1948.....	16,814	894.21	26,119.0	45,120	399,788	236,861
1949.....	72,132	1,213.80	194,077.0	126,197	2,808,904	1,343,658

1/ Mill started Feb. 26, 1942.

GEOLOGY

The following was excerpted from an unpublished report of the U. S. Geological Survey prepared by Ralph J. Roberts:

> The rocks in the Copper Canyon area (see fig. 4) are principally sedimentary rocks of Paleozoic age that have been intruded by quartz monzonite porphyry of Mesozoic age. The sedimentary rocks have been divided into 3 units: quartzite, argillite, and chert of the Pumpernickel formation, sandstone and shale of the Harmony formation, and interbedded conglomerate, sandstone, shale, calcareous shale, and limestone of the Battle formation. These rocks have been complexly faulted in the mine area and have been tilted and folded.
>
> The workings are principally in rocks of the Battle formation, which in the mine area consists of three parts: (1) a lower chloritic conglomerate, (2) a middle hornfels, and (3) an upper dense quartzite-conglomerate unit. The ore bodies are largely in the lower and middle parts, but in places the upper conglomerate contains copper-gold ore along faults. In the mine area, these rocks dip steeply westward on the upper levels and stand vertically or are overturned on the lower levels. On the west, chert and argillite of the Pumpernickel formation have been faulted down against the Battle formation; on the east, the Harmony formation underlies the Battle formation unconformably, but in most places the contact is sheared and faulted. Quartz monzonite dikes that are probably offshoots from the intrusive north of the mine area are cut in the workings.



FROM U.S.G.S. Topography by International Mining and Smelting Company
Geology by Ralph J. Roberts, U.S. Geological Survey

Figure 4. - Geological map of the Copper Canyon mine area.

The ore bodies thus far discovered lie between two parallel fault zones, the Virgin and Mill faults, which are about 800 feet apart. They strike north and dip 65° W. (fig. 4). The Gulch fault strikes northeast and dips 60° NW., cutting diagonally between the other faults. It, in turn, has in its hanging wall two faults that strike northwest and dip to the northeast and another one that strikes north and dips to the west.

Ore Deposits

The ore bodies that have been mined include oxidized, enriched, and primary bodies. The oxidized and enriched bodies were important during the early days of the district, but the primary ore bodies have been most productive since 1930.

The primary (hypogene) ore bodies at Copper Canyon are veins and disseminated deposits. The veins are composed of pyrite, arsenopyrite, chalcopyrite, pyrrhotite, galena, sphalerite, marcasite, and in places molybdenite and a little scheelite. The gangue minerals are quartz, calcite, and siderite. The minerals of the disseminated deposits are the same as those in the veins, although the relative proportions vary. The vein fissures were probably the channels along which the mineralizing solutions rose and spread out into the fractured rock.

The disseminated deposits can be divided into two types according to their predominant metal content - copper-gold ore bodies and lead-zinc-silver ore bodies. The copper-gold ore bodies are in the lower chloritic conglomerate. The tenor of the ore on the upper levels ranged from 1.0 to 4.0 percent copper and averaged 0.10 ounce of gold per ton; on the lower levels, the copper content decreased to 0.5 percent or less, and the gold content remained about the same. The lead-zinc-silver ore body (hornfels ore body) on the 700-foot level is in the middle hornfels; the ore minerals are principally argentiferous galena, sphalerite, pyrite, and pyrrhotite, with minor quantities of other sulfides. The ore mined is said to have averaged 2.5 percent lead, 1.5 percent zinc, and 3.0 ounces of silver per ton.

The oxidized ore was found at or near the surface and consisted of the copper carbonates, malachite and azurite, and the copper silicate, chrysocolla, in altered and leached rock; iron oxides were generally present, and in places the gold tenor was high.

The enriched ore bodies were chiefly along the fault zones, where the ore minerals were chalcocite and cuprite, with minor quantities of copper carbonates and sulfides. The enrichment only locally extended below to the 300-foot level. The copper tenor of the hypogene ore was generally too low for mining.

MINE WORKINGS

The mine was explored and developed through two shafts totaling over 1,400 linear feet and by several miles of drifts and crosscuts on four levels. These levels are at about 132, 258, 428, and 645 feet below the collar of the vertical Julie shaft, which is at an altitude of 5,712 feet.3/ This shaft was completed in the Fall of 1941. The old shaft, known as the Virgin, is inclined 60° and is 630 feet deep. It was used as a working shaft until 1941 and is used at present only as a second exit and for ventilation.

The ore is mined by shrinkage stopes, leaving 20-foot pillars. These pillars are mined by sublevel stoping. The ore body is continuous over several hundred feet in length, ranging from 20 to 200 feet in width, and seems to be found in "troughs" that plunge to the north at 30 to 60 degrees. The walls, of quartzitic conglomerate and hornfels, will stand over reasonable stope lengths without caving or excessive slabbing. Individual stopes are about 150 feet high, up to 200 feet long, and 20 feet wide. Preliminary development for sublevel stoping comprises driving a raise at about the center of the block to be mined, and stope limits are planned to leave a pillar around this raise. Sublevel drifts are driven each way from this central raise to the end limits of the ore shoot. Draw points are laid out on the haulage level so that all of the ore can be pulled when broken. The most satisfactory draw point consists of a crosscut driven at a right angle from the haulage drift, with a finger raise from the crosscut face (fig. 5).

Broken ore from the stope fills the floor of the crosscut and is picked up with a mucking machine. The length of the crosscut is planned to allow the mucking machine at least 5 feet of travel between the main-line track and the toe of the muck pile. The crosscut track is not a continuation of the main-line track, and the mucker dumps into the side of the cars as the train is pulled past the crosscut. A turn-sheet is used on the main-line track when the mucking machine is taken to another draw point. Side loading eliminates switching and uncoupling of cars. Oversize chunks are blasted by the mucking-machine operator between train trips.

The finger raises are belled out immediately above the haulage level until connected to form an undercut, which is mined to the first sublevel. The type of chute or drawpoint selected determines the elevation of the first or lowest sublevel. Sublevels above the first one are driven from the raise at vertical intervals of about 23 feet.

Stoping is started at the end of the block opposite the service raise by excavating a slot across the stope over the finger raises and extending upward to the top sublevel. The slot is started by driving a series of short raises connecting the ends of the sublevels. The raise is then enlarged by benching from the sublevels until a slot is excavated from wall to wall.

At each sublevel, curved benches or three-sided crosscuts 10 to 12 feet wide and 9 to 10 feet high are driven to both walls by slabbing into the open

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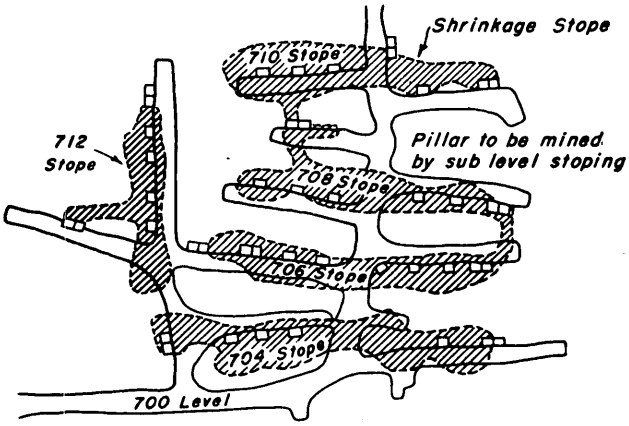
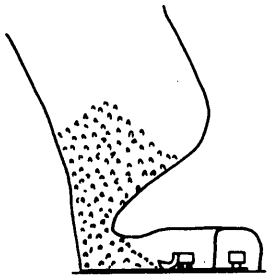
3/ For simplicity, these levels are known as 100-, 300-, 500-, and 700-foot levels.



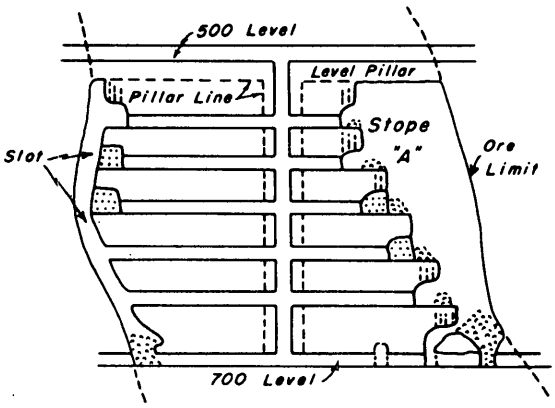
PLAN

Scale: 1" = 50'



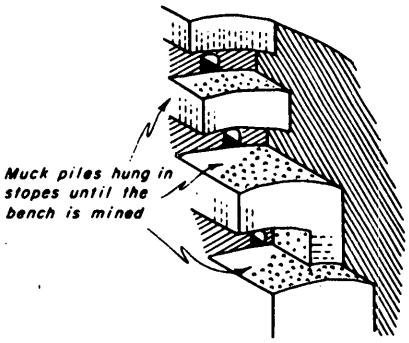
CROSS SECTION OF MUCKING MACHINE DRAWPOINT

(Not to scale)



SKETCH SHOWING SUB-LEVEL STOPING OF PILLARS

(Not to scale)



VIEW OF PORTION OF STOPE "A" FROM RIGHT

(Not to scale)

Figure 5. - Sublevel caving of pillars.

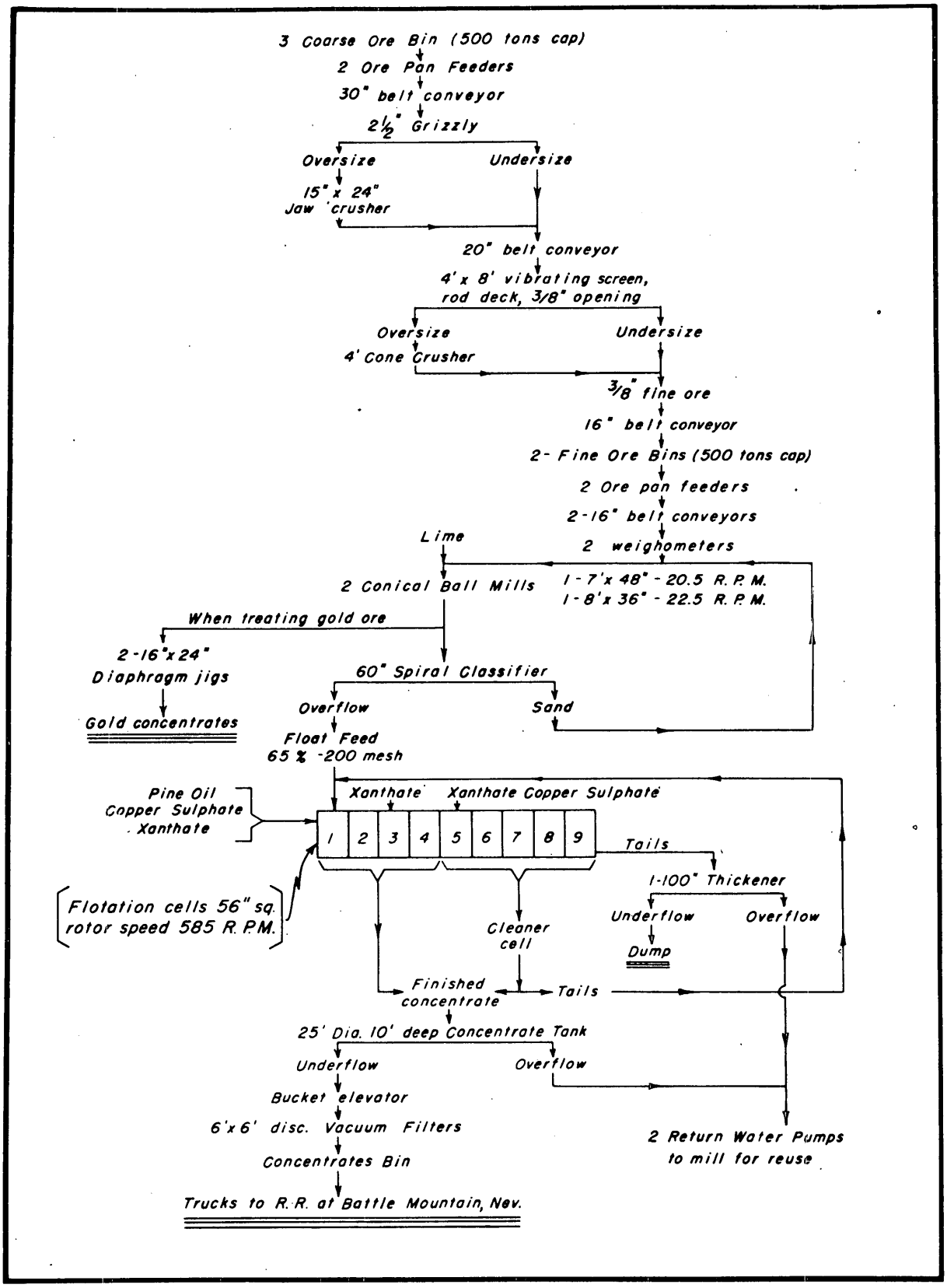


Figure 6. - Flotation mill flow sheet.

slot. The overhang between the top of one bench and the bottom of the bench above is broken by drilling 9-foot holes from below. Vertical spacing of sublevels to permit this procedure eliminates mucking off benches for down holes and allows all stope drilling to be done with one type of drill.

The first benching is made from the top sublevel, and thereafter each sublevel bench is kept at least one step ahead of the bench below (fig. 5). Some of the broken ore collects on the benches but is dropped into the open stope with the next blast from below.

Fragmentation in breaking the bench and overhang can be closely controlled by hole spacing and blasting practice.

Further detailed information on the Copper Canyon Mining Co.'s sublevel stoping can be obtained from an article[4] that was published in Mining Engineering.

MILL

A flotation mill (fig. 6) with a capacity of 350 dry tons per 24 hours was built in 1941. A concentrate averaging about 31 percent lead and about 14 percent zinc has been produced and shipped to the International Smelting & Refining Co., Tooele, Utah.

The mill is of the conventional all-flotation type; the equipment is standard and well-maintained. Mine-run ore is ground to 65 percent minus 200-mesh. Reagents added to the float circuit are approximately as follows:

	Lbs/ton dry ore
Quick lime (16-mesh)...	1.5
Pine oil.....	0.12 to 0.15
Z-4 (sodium ethyl xanthate).....	0.30 to 0.35
Copper sulfate.....	0.10 to 0.12

Dry 16-mesh quick lime is added to the ball-mill feed by means of a vibrator feeder. Pine oil, some xanthate, and some copper sulfate are added to the float circuit before it enters the first cell. The remaining xanthate is divided between the third and fifth cells, and the remaining copper sulfate is added at the fifth cell.

Analyses of the heads, concentrates, and tailings have been about as follows:

	Ounces		Percent				
	Au	Ag	Pb	Zn	Cu	Fe	Insol.
Heads.....	0.02	2.5	2.2	1.1	0.25	9.2	-
Concentrates.....	.22	40.0	31.0	14.0	1.50	18.0	2.7
Tailings.....	.005	.40	.21	.30	0.08	8.5	-

4/ Lillie, J. J., Sublevel Stoping in Small Mines: Min. Eng., vol. 1, No. 7. July 1949, pp. 235-238.

5/ Hayden, Ralph, mill superintendent, Copper Canyon Mining Co.

WORK PERFORMED BY THE BUREAU OF MINES

Diamond drill-hole data

Hole No.	Bearing	Dip	Feet drilled					Percent core recovered	Feet reamed, AX-BX	Feet cemented
			EX	AX	BX	NX	Total			
B- 1	N. 86° E.	-50		69	6		75	53	31	
B- 2	-	Vert.		54	6		60	33		
B- 3	N. 4° W.	-20		170	12		182	43		12
B- 4	Due west	-45		138	10		148	75	29	
B- 5	-	Vert.		137	23		160	68		
B- 6	S. 54° E.	-60		197	24		221	71	12	
B- 7	Due west	- 5	81				81			
B- 8	N. 75° W.	Hor.		238	5		243	67	25	
B- 9	N. 45° W.	-28		161	36		197	65		7
B-10	S. 30° W.	-60		48	8		56	67		
B-11	S. 55° E.	-15		219	27		246	84		
B-12	Due west	-30		48	12		60	52		
B-13	S. 15° E.	-45		88	12		100	49	16	
B-14	S. 45° E.	-40	128	47	28	4	207	63		
B-15	N. 45° E.	- 5		111	40		151	90		
B-16	N. 30° W.	- 5		158	22		180	61	19	
B-17	S. 10° E.	-45		67	20		87	86		
B-18	S. 10° E.	-75	42	86	12		140	61		
			251	2,036	303	4	2,594		132	19

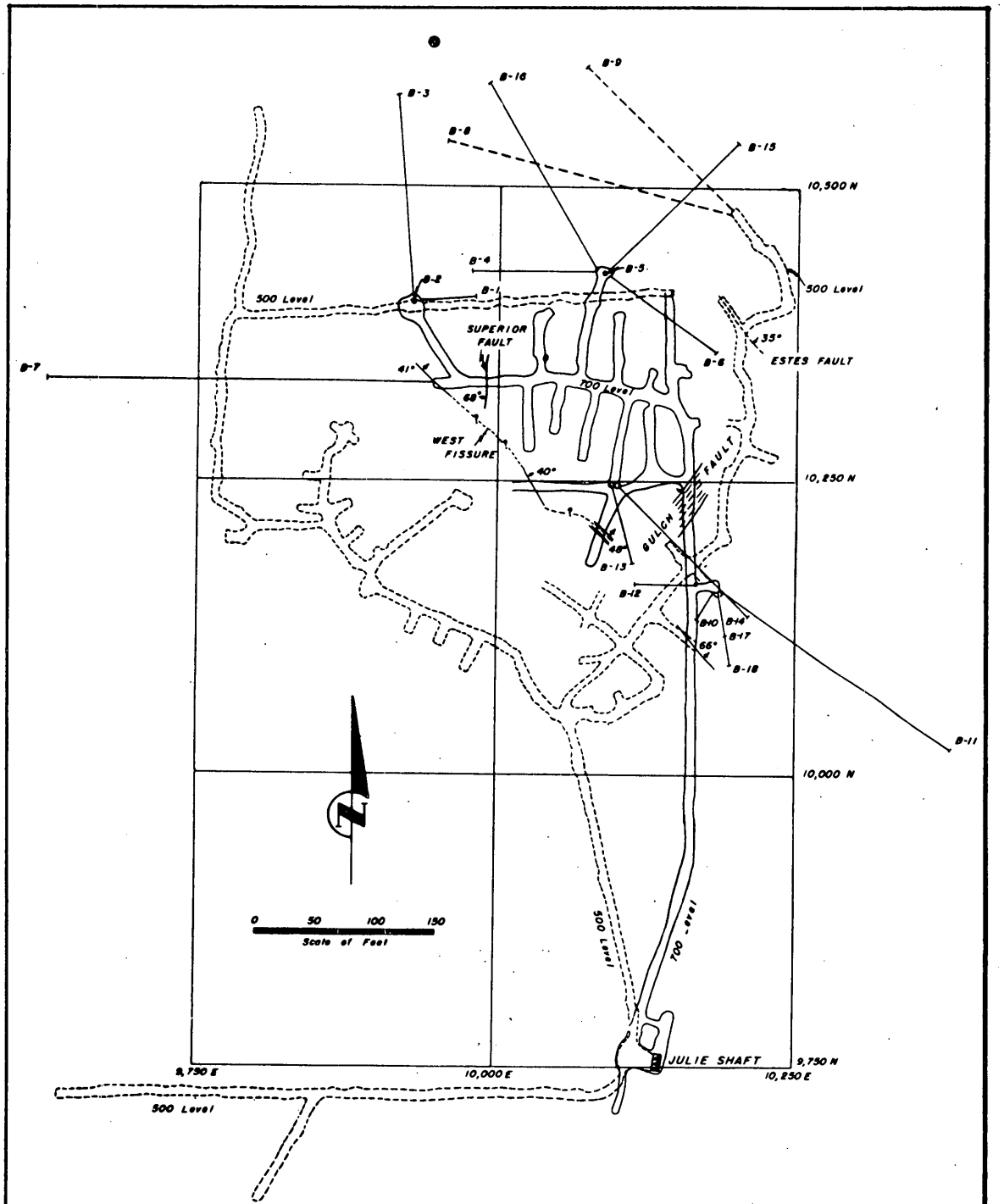
Mineralization, in the present mine workings on the 700 level is greatest near the intersection of the Gulch and West faults at the southern end of the ore body. The intersection plunges about 40° to 45° northward. The grade of lead-zinc ore decreases toward the north end of the mine on the 700 level as the distance increases away from the intersection of these faults.

The diamond-drill program (fig. 7) was undertaken with the objective of extending the lead-zinc ore body. Drilling was started November 29, 1949.

Holes B-1, B-2, and B-3, drilled from station 714 on the 700 level, tested the northward plunging trough structure produced by the intersection of faults near the west end of the hornfels ore horizon.

Holes B-4, B-5, B-6, B-15, and B-16, drilled from station 708 on the 700 level, explored for possible extensions of ore in the hornfels below the 700 level in the direction of likely ore structures. The rock was highly siliceous, chloritic hornfels, more or less brecciated, and recemented with quartz. Mineralization was scarce, with pyrite and chalcopyrite predominant and only traces of galena and sphalerite. Holes B-15 contains a few heavy concentrations of pyrite with minor chalcopyrite and sphalerite.

Hole B-7 was drilled as an extension of the Copper Canyon Mining Co. drill hole 108 at the face of 702 crosscut. It extended the hole westward from 241 feet to 322 feet to investigate the possibilities of ore on the Virgin fault.



HOLE NO.	LENGTH	BEARING	DIP
B- 1	78'	N 86° E	-50°
B- 2	60'	-	Vert.
B- 3	182'	N 4° W	-20°
B- 4	148'	West	-45°
B- 5	160'	-	Vert.
B- 6	221'	S 54° W	-60°
B- 7	322'	West	- 5°
B- 8	243'	N 75° W	Hor.

HOLE NO.	LENGTH	BEARING	DIP
B- 9	197'	N 45° W	-28°
B-10	56'	S 30° W	-60°
B-11	246'	S 65° E	-15°
B-12	60'	West	-30°
B-14	207'	S 45° W	- 5°
B-15	151'	N 45° E	- 5°
B-16	180'	N 30° W	- 5°
B-17	87'	S 10° E	-45°
B-18	140'	S 10° E	-75°
B-13	100'	S 15° E	-45°

Figure 7. - Composite map of 500 and 700 levels showing locations of diamond-drill holes.

Holes B-8 and B-9, drilled from station 523 on the 500 level in the hanging wall of the hornfels, explored for ore in the vicinity of the Superior fault (a major fault) and also the Estes fault. The Superior fault was intersected at 95 to 99 feet in hole B-8 and at 155 to 160 feet in Hole B-9. It is believed that hole B-9 also intersected the Estes fault at 104 to 114 feet.

Holes B-13 and B-14, drilled from station 705 on the 700 level, explored for ore in the proximity of the Gulch fault, particularly on the footwall side. This ground is below the richest part of the ore body at the south end of the mine workings. The rock is principally greenish-gray quartz pebble conglomerate and chloritic quartzite. When the hole entered unaltered reddish-gray biotite quartzite of Harmony Formation, drilling was stopped.

Holes B-10, B-11, B-12, B-17, and B-18 were drilled from station 701, a crosscut off the main haulage drift on the 700 level. Hole B-10 was directed to intersect at shallow depth a fissure that is mineralized where it transects the 700 main haulage drift. Hole B-11 was drilled southeastward to explore ore possibilities on the Mill fault. This fault can be seen on the surface but has never been intersected underground. The quartzite conglomerate of the Lower Battle formation extended to 100 feet, where it makes a fault contact with the Harmony formation. This could also be the Mill fault. Holes B-17 and B-18, dipping -45° and -75° respectively, were drilled southeastward. Their objective was to outline, if possible, a lead-zinc ore concentration found in diamond-drill hole 83, drilled by the International Smelting & Refining Co. The Bureau of Mines holes were in chloritic quartz conglomerate and reddish-gray impure quartzite of the Harmony formation.

The drilling was completed on February 6, 1950.

APPENDIX

Analyses of Diamond Drill-Hole Samples

From-	To-	Feet	Number Core	Number Sludge	Size	Percent recovery	Analyses: Core, Ounces Au	Core, Ounces Ag	Core, Percent Pb	Core, Percent Zn	Sludge, Ounces Au	Sludge, Ounces Ag	Sludge, Percent Pb	Sludge, Percent Zn
							Hole B-1							
0	6	6	1	-	1-5/8	28	0.005	8.90	2.9	7.5				
6	9	3	-	-		58	0.01	12.78						
							Hole B-2							
28	32	4	10			11	Tr	0.60	0.4	2.8				
32	35	3	11			21	Tr	1.70	1.5	4.7				
							Hole B-3							
0	5	5			1-5/8	85	0.04	5.94						
17	22	5	20	20		33	Tr	0.40	0.2	1.4	Tr	0.40	0.2	0.6
							Hole B-8							
0	5	5	30			50	0.04	0.80	0.2	0.5				
32	35	3	31			86	Tr	0.36	0.2	0.5				
							Hole B-9							
0	6	6	40	-	1-5/8	85	0.025	0.80	0.2	0.4				
11	15	4	43	43	1-5/8	96	0.01	1.20	0.4	1.6	0.015	0.70	0.2	0.4
62	67	5	41	41	1-1/8	92	0.005	0.36	0.2	0.3	Tr	0.60	0.2	1.0
67	72	5	42	42	1-1/8	87	Tr	0.90	0.2	0.7	-	-	0.2	0.6

Logs of Diamond Drill Holes

Hole B-1

Location: 700 level
Coordinates: 10,406 N., 9,934 E.
Bearing: N. 86° E.

Inclination: -50°
Completed length: 75 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	6	19	Greenish-gray, fine-grained, silicified hornfels. Contains concentrations of mineralization - high in galena, sphalerite, some chalcopyrite, and pyrite.
6	9	21	Greenish-gray, fine-grained, quartzitic rock containing seams of chlorite and fragments of green chloritic hornfels. Cavities in rock contain crystals of quartz, minor galena, and pyrite associated with chlorite.
9	12	28	Same as 6 to 9, but less mineralization.
12	17	60	Dark-green chloritic hornfels to light greenish-gray quartzitic hornfels containing seams abundant in pyrite and chalcopyrite. Poor showing of galena. Last 8 inches recrystallized, light-gray, quartzitic conglomerate, few seams of pyrite and chalcopyrite - chlorite poor.
17	20	17	Light greenish-gray, quartzitic rock containing some heavy seams of pyrite and chalcopyrite. Somewhat more chloritic toward 20 feet.
20	24	30	Greenish-gray chloritic conglomerate. Contains fragments of quartzite and chloritic hornfels. In more chloritic portions, some minor disseminations of galena and sphalerite, also pyrite. More quartzitic parts are barren.
24	27	10	Greenish-gray, silicified, chloritic hornfels containing drusy cavities of quartz crystals, little galena, sphalerite, pyrite, and chalcopyrite.
27	30	18	Same as 24 to 27.
30	34	25	Silicified, chloritc conglomerate, fine-grained and streaked with quartz veinlets, open-work cavities with quartz crystals, also weakly mineralized pockets of sphalerite and galena, also pyrite.
34	37	21	First 10 inches pebbly broken fragments of greenish-gray, silicified, chloritic hornfels. In more chloritic portion faint mineralization of galena, little pyrite. Rest of segment, medium light-gray, silicified conglomerate, poor disseminations of pyrite, trace of sphalerite.
37	42	3	Broken and fragmentary, medium grayish-green, silicified, chloritic hornfels. Faint pyrite and sphalerite dissemination.

Hole B-1 (Cont.)

Footage From-	Footage To-	Core recovery inches	Description
42	47	6	Same as 37 to 42, somewhat more quartzitic, little more pyrite and chalcopyrite. Less sphalerite.
47	52	3	Same as 37 to 42, from 37 to 52 may be in a fractured or faulted zone, though no other indication of gouge or alteration products present.
52	57	21	Greenish-gray quartzitic rock; parts are chloritic, barren, except for a few streaks of pyrite.
57	62	53	Greenish-gray, silicified conglomerate, minor amount of chloritic material, barren of ore minerals except some patches of pyrite.
62	65	36	Same as 57 to 62, pyrite disseminated throughout.
65	68	38	Same as 57 to 62.
68	75	72	Greenish-gray, silicified conglomerate, in some parts chloritic. Contains drusy cavities lined with crystals of quartz and pyrite. Some chalcopyrite present, also marcasite.

Hole B-2

Location: 700 level
Coordinates: 10,405 N., 9,930 E.
Bearing: Vertical hole

Inclination: Vertical
Completed length: 60 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	5	5	Light grayish-green, fine-grained, silicified, chloritic hornfels; no mineralization.
5	10	24	First 5 inches light-gray, recrystallized, quartzitic conglomerate, trace of pyrite in open space lined with quartz crystals. Rest is grayish-green, quartzitic, chloritic hornfels; no mineralization.
10	13	18	Light greenish-gray, medium- to fine-grained quartzite interbedded with dark-green, fine-grained, chloritic hornfels. Mineralization in chloritic parts fair, with sphalerite, chalcopyrite, and pyrite, no galena.
13	18	29	Greenish-gray, recrystallized, chloritic, quartz conglomerate; mineralization poor, with trace only of sphalerite, pyrite, and galena.
18	23	22	Same as 13 to 18, slightly more mineralization, chalcopyrite also shows.
23	28	18	Same as 13 to 18, but more chloritic; therefore, more mineralization with fair dissemination of sphalerite, pyrite, galena, and chalcopyrite.
28	32	11	Highly chloritic conglomerate, fiar to good mineralization with sphalerite, pyrite, trace of galena, no chalcopyrite visible.

Hole B-2 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
32	35	12	Grayish-green, fine-grained, chloritic hornfels with good mineralization. Pockets of highly concentrated minerals contains mostly sphalerite and pyrite, also galena in smaller amounts. Galena, pyrite, and chalcopyrite also finely disseminated through rock. Core broken up into small fragments.
35	40	12	Same as 32 to 35. Core broken up into small fragments. 32 to 40 may be infracture or fault zone.
40	45	15	Grayish-green, quartzitic conglomerate, chloritic in part. Light disseminations of galena and pyrite in fine crystals.
45	50	41	First 12 inches in light-green quartzitic, chloritic hornfels which is barren. Rest is grayish-green, chloritic, quartz conglomerate with mineralization in poor disseminations of sphalerite, galena, pyrite and chalcopyrite. Also pyrite and chalcopyrite occur in fine thread-like seams.
50	55	33	Same as latter part of 45 to 50.
55	60	5	Light-green, quartzitic, chloritic hornfels with some mineralization in pockets - pyrite, sphalerite, little galena. Core broken into small fragments.

Hole B-3

Location: 700 level
Coordinates: 10,410 N., 9,930 E.
Bearing: N. 4° W.

Inclination: -20°
Completed length: 182 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	5	51	Greenish-gray, siliceous hornfels. Rock is somewhat brecciated in part, but recrystallized. Chlorite occurs in fragments and in matrix of breccia. Fine and meager disseminations throughout of pyrite, pyrrhotite, sphalerite, trace of galena, and chalcopyrite. One minor pocket of sphalerite, pyrrhotite, and pyrite at one foot.
5	7	24	Greenish-gray, brecciated, silicified, chloritic conglomerate. Dissemination of pyrite, pyrrhotite, and chalcopyrite general but fine. Few fine seams of sphalerite and galena. Galena forms minor concentration in middle part of section associated with sphalerite and pyrite.

Hole B-3 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
7	12	34	Same rock as 5 to 7, with fine and meager dissemination of pyrite, sphalerite, less pyrrhotite and chalcopyrite; galena not apparent. Pyrite in few fine seams and in open cavities with quartz crystals.
12	17	30	Same as 5 to 7, a little more chloritic in part.
17	22	30	Grayish-green, chloritic hornfels, slightly brecciated and silicified in part. Mineralization fair, with sphalerite and pyrite occurring in seams, cavities, and concentrated patches. Galena is minor. Smithsonite occurs in open seams.
22	27	17	Light greenish-gray, slightly brecciated, fine-grained, recrystallized quartzite. Greenish color due to fine-grained minor chlorite. Contains some large fragments of dark reddish-brown, biotitic hornfels. Very finely disseminated throughout is chalcopyrite and pyrite.
27	32	41	Reddish-gray to light greenish-gray quartzite transected by many tight quartz veinlets. Barren except for minor showing of pyrite, and one thin, open work veinlet of quartz, sphalerite, chalcopyrite, and pyrite. Includes as alteration smithsonite.
32	36	29	Light reddish-gray, medium- to fine-grained quartzite, in part dark reddish-gray in color. Barren except for faint disseminations of chalcopyrite; one fine seam of pyrite.
36	40	29	Same as 32 to 36.
40	44	38	Same rock as 32 to 36 except last 7 inches of grayish-green, coarse-grained dike rock (quartz monzonite?) containing feldspar phenocrysts in groundmass of quartz, plagioclase, and dark-green unidentified mafic. Biotite grains lightly disseminated throughout the matrix. Appears to be brecciated with chloritic alteration of mafics and obscure alteration of feldspar. Pyrite in spotty traces.
44	47	33	First 2 feet in fresh, greenish-gray, coarse-grained dike rock (quartz monzonite?) containing bluish-green feldspar phenocrysts up to 1/2-inch in size, quartz, biotite, and locally patches of chlorite. Magnetite and pyrite occur as accessory minerals, lightly disseminated throughout. Last 9 inches in light reddish-gray, medium- to fine-grained quartzite, barren of mineralization.

Hole B-3 (Cont.)

Footage From-	Footage To-	Core recovery inches	Description
47	52	48	Light reddish-gray and greenish-gray, medium- to fine-grained quartzite. Last 14 inches in medium dard-gray, fine-grained quartzite, slightly brecciated and recemented with branching network of quartz veins. Mineralization barren minor chlorite seams.
52	57	39	Light to dark reddish-gray and light greenish-gray, medium- to fine-grained quartzite. Slightly brecciated and chloritized in part, recemented with branching quartz veinlets. Few faint seams of pyrite.
57	61	20	Light greenish and reddish-gray, medium- to fine-grained quartzite; barren of mineralization.
61	66	4	Same as 57 to 61, faint trace of pyrite and chalcopyrite. Poor recovery may indicate fault zone (?).
66	71	7	Light greenish-gray, slightly chloritized, medium- to fine-grained quartzite, no mineralization.
71	76	None	--------Perhaps in fault zone (?).
76	81	15	Dark reddish and greenish-gray, fine-grained quartzite, slightly brecciated and recemented by branching quartz veinlets. Pyrite concentration at end of section, in veinlet of fine crystals.
81	86	18	Light greenish-gray, fine- to medium-grained quartzite. Pyrite and chalcopyrite in faint dissemination.
86	91	14	Same rock as 81 to 86, many fine quartz veinlets, averaging about 2 mm. wide, are closely grouped like a horsetail. Thin veinlet of pyrite, which also include minor chalcopyrite, also small pocket of pyrite.
91	96	5	Light greenish-gray, medium-grained, slightly chloritized quartzite; no mineralization.
96	98	18	Same rock as 91 to 96, faint trace of pyrite.
98	100	22	Same rock as 91 to 96; in last 10 inches fair seam of pyrite and chalcopyrite parallel to the length of the core, from 2 to 3 mm. wide and splitting off into several fine slivers at the end of the section.
100	103	22	Greenish to reddish-gray, fine- to medium- grainted quartzite. Slightly brecciated in part and recemented by quartz and chlorite veinlets, and fair seams of pyrite and chalcopyrite. Sprinkled throughout with fine disseminations of pyrite and chalcopyrite.

Hole B-3 (Cont.)

Footage From-	Footage To-	Core recovery inches	Description
103	107	10	Same as 100 to 103; no mineralized seams.
107	110	8	Light greenish-gray, medium-grained quartzite. Sparse disseminations of fine pyrite.
110	115	14	Same as 100 to 103; few poor pockets of pyrite associated with quartz veinlets, trace of galena and chalcopyrite in fine crystals.
115	117	3	Same as 107 to 110; good showing of pyrite with chalcopyrite in open work veinlets of quartz, possibly minor pyrrhotite.
117	122	14	Same as 100 to 103; veinlets include pyrite and chalcopyrite.
122	127	13	Dark reddish-olive brown, slightly brecciated, fine-grained, impure quartzite, minor showing of pyrite little chalcopyrite in open seams. Dark color probably due to very fine-grained biotite.
127	132	8	Same as 122 to 127, minor showing of pyrite and pyrrhotite (?).
132	137	21	Light greenish-gray, coarse-grained, brecciated and slightly chloritized quartzite. Minor disseminations of pyrite, traces of sphalerite, galena, and chalcopyrite.
137	142	34	Light greenish-gray, medium-grained quartzite. Faint seam of sphalerite, disseminations of pyrite and chalcopyrite.
142	146	13	Same as 137 to 142; trace of galena.
146	149	20	Light greenish-gray and dark reddish-gray, fine- to medium-grained, impure quartzite. Slightly brecciated in part and recemented with branching quartz veinlets. Dark reddish color due to fine-grained biotite. Faint disseminations of pyrite and chalcopyrite.
149	152	27	Same as 146 to 149; no mineralization.
152	155	11	Dark reddish-gray, fine-grained, impure quartzite, containing biotite; slightly brecciated and recemented with quartz veinlets. Faint disseminations of pyrite.
155	158	23	Same as 153 to 155; thin seams of pyrite with possibly pyrrhotite (?).
158	162	12	Light greenish-gray to dark reddish-gray, fine-grained, impure, slightly brecciated quartzite; trace of pyrite.
162	165	31	Greenish to reddish-gray, fine-grained, impure, slightly brecciated quartzite; faint seams of pyrite and pyrrhotite (?).
165	168	17	Same as 163 to 165.
168	172	14	Same as 162 to 165.
172	177	27	Same as 162 to 168.

Hole B-3 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
177	182	33	Light reddish-gray, fine- to meium-grained quartzite, slightly brecciated and chloritized in part, and transected by thin quartz veinlets. Faint dissemination of minerals throughout, include pyrite, galena, chalcopyrite, and pyrrhotite (?).

Hole B-4

Location: 700 level
Coordinates: 10,428 N., 10,080 E.
Bearing: Due west

Inclination: -45°
Completed length: 148 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	4	48	Medium to dark grayish-green and red, chloritic hornfels, only slightly brecciated and silicified. Mineralization poor in seams and disseminations of pyrite and chalcopyrite.
4	6	21	Same as 0 to 4, shows some shearing and more brecciation with recementing by white drusy quartz. Sparse disseminations of pyrite, chalcopyrite, and pyrrhotite, trace of galena.
6	10	17	Same as 0 to 4, in part more silicified. Nearly barren except for trace of pyrite.
10	14	21	Dark grayish-green hornfels, brecciated, highly silicified and chloritized. Faint showing of pyrite.
14	19	52	Medium to dark grayish-green, in part dark grayish-red chloritic hornfels, slightly brecciated and recemented with white quartz. Nearly barren except for a few poor patches of pyrite and chalcopyrite.
19	24	62	Same as 14 to 19, in part well brecciated and highly silicified. Few poor concentrations of pyrite with chalcopyrite, trace of pyrrhotite and marcasite (?).
24	29	56	Same as 14 to 19, in part somewhat cherty. Contains two thin seams of sphalerite associated with pyrite and chalcopyrite, otherwise faint disseminations and seams of pyrite.
29	30	7	Dark grayish-green chloritic hornfels, highly quartzitic. Contains faint seams and disseminations of pyrite.

Hole B-4 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
30	35	43	Same as 29 to 30, although not quite so quartzitic. Contains faint seams and poor concentrations of pyrite, some chalcopyrite, trace of pyrrhotite.
35	39	36	Same as 29 to 30, in part somewhat cherty, in part highly chloritic. Contains one fair concentration of pyrite and chalcopyrite, otherwise faint disseminations of pyrite, trace of pyrrhotite.
39	43	31	Medium greenish-gray, highly siliceous hornfels. Nearly barren except for faint disseminations of pyrite, less chalcopyrite.
43	46	24	Same as 39 to 43.
46	50	25	Light greenish-gray, in part light-brown, impure quartzite, slightly chloritized. Barren of mineralization.
50	55	22	Medium greenish-gray, highly siliceous hornfels. Contains one poor concentration, faint disseminations of pyrite and chalcopyrite.
55	59	42	Same as 50 to 55, in part dark grayish-green and chloritic. Contains traces of pyrite.
59	64	51	Same as 50 to 55, in part well brecciated and recemented with quartz. Sparse mineralization of pyrite and chalcopyrite.
64	67	35	Same as 50 to 55, in part well brecciated and recemented with quartz. Few poor concentrations of pyrite with chalcopyrite.
67	70	12	Same as 50 to 55, almost a quartzite. Core broken into pebble fragments. Barren.
70	75	7	Same as 50 to 55, almost a quartzite. Core broken into pebble fragments. Barren. Poor recovery from 67 to 75 may indicate fault zone (?), no conclusive evidence.
75	80	52	Medium greenish-gray, slightly brecciated, fine-grained, impure quartzite, with chlorite films along seams. Barren except for one poor concentration of pyrite with some chalcopyrite, trace of sphalerite.
80	83	32	Same as 75 to 80, in part brecciated and recemented with quartz. Contains few faint concentrations of pyrite and chalcopyrite.
83	86	28	Same as 75 to 80, in part dark green, brecciated hornfels. Barren except trace of pyrite and chalcopyrite.
86	91	13	Same as 83 to 86. Contains thin seams and disseminations of chalcopyrite, less pyrite.

Hole B-4 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
91	96	28	Same as 75 to 80, contains few vugs lined with quartz crystals, chlorite, and smithsonite (?); sparse pyrite surrounds the smithsonite (?), and chalcopyrite partly fills cavaties. Trace of sphalerite, fine disseminations of pyrrhotite.
96	101	45	Same as 75 to 80, nearly barren except for few faint concentrations of pyrite and chalcopyrite.
101	106	42	Same as 75 to 80. Barren over first 26 inches. Rest contains heavy concentrations of pyrite along with quartz gangue as filling and replacement of breccia matrix. Chalcopyrite is very minor.
106	110	43	Same as 75 to 80, somewhat more brecciated and chloritized. Mineralization in poor disseminations and seams of pyrrhotite and chalcopyrite, less pyrite.
110	115	59	Medium dark grayish-green, highly siliceous hornfels, brecciated and recemented with white quartz. At 4-1/2 inches encounter dike of medium dark grayish-green, medium-grained quartz monzonite containing green plagioclase, biotite, quartz, and potash feldspar (?); measures 21 inches along the core. In wide border zone, feldspars altered to clay minerals, biotite altered extensively to chlorite, and pyrite forms disseminations. Nearly barren of mineralization, faint seams and disseminations of pyrite.
115	120	60	Light to medium-dark greenish-brown, fine- to medium-grained impure quartzite, somewhat brecciated and in part chloritized. Mineralization in faint seams and disseminations of pyrite, chalcopyrite, and pyrrhotite.
120	125	58	Highly brecciated and chloritized, medium greenish-gray, fine- to medium-grained quartzite. Contains poor seams and disseminations of chalcopyrite and pyrrhotite, less pyrite, one faint concentartion of sphalerite.
125	130	60	Medium dark grayish- to brownish-green, fine-grained, impure quartzite, somewhat brecciated, and in part well chloritized. Contains faint disseminations of chalcopyrite and pyrite.
130	133	30	Same as 125 to 130, more brecciated and not much chloritized. Barren except for trace of chalcopyrite and pyrrhotite.
133	138	60	Medium greenish-gray, medium- to fine-grained, brecciated quartzite, chloritized along thin seams. Nearly barren except for one poor concentration of pyrite.

Hole B-4 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
138	143	60	Same as 133 to 138, although well-brecciated, recemented with white quartz, and more chloritized. Contains one poor concentration of pyrite, faint disseminations in matrix of pyrite, chalcopyrite, trace of galena and sphalerite.
143	148	58	Fine- to medium-grained, impure quartzite, in part medium dark brown, in part medium greenish-gray, brecciated and chloritized. Mineralization sparse in chalcopyrite, pyrrhotite, and pyrite, trace of sphalerite and galena.

Hole B-5

Location: 700 level
Coordinates: 10,428 N., 10,088 E.
Bearing: Vertical hole

Inclination: Vertical
Completed length: 160 feet

Footage From-	Footage To-	Core recovery inches	Description
0	1	8	Medium greenish-gray, highly siliceous hornfels, brecciated and chloritic, recemented with quartz. Contains one fair concentration of pyrite with minor sphalerite and chalcopyrite, otherwise barren.
1	3	28	Medium dark grayish-green, fine-grained, chloritic hornfels, in part well brecciated and recemented with quartz. Contains one fair concentration of pyrite, poor disseminations of chalcopyrite, pyrite, and pyrrhotite.
3	6	28	Same as 1 to 3, contains some slickensides, brecciated parts well recemented with quartz. Barren except for some faint pyrite.
6	8	12	Medium dark grayish-green to brown, fine-grained, highly siliceous hornfels. Barren except for traces of pyrite.
8	10	12	Same as 6 to 8, barren.
10	14	29	Medium light greenish-gray, fine- to medium-grained, impure quartzite, somewhat brecciated. Barren.
14	18	18	Same as 10 to 14. Barren except for trace of pyrite.
18	23	26	Same as 10 to 14. Barren except for one poor concentration of pyrite.
23	26	20	Medium dark grayish green, fine grained, brecciated, chloritic hornfels. Barren except for trace of pyrite and pyrrhotite.
26	29	20	Same as 23 to 26. Barren except for trace of pyrite.

Hole B-5 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
29	32	29	Same as 23 to 26, somewhate more siliceous. Contains fair concentrations of pyrite as replacement and filling of breccia matrix. Chalcopyrite is in association, trace of sphalerite.
32	37	49	Same as 23 to 26, in part almost cherty, mostly highly chloritic and well brecciated, recemented with much white quartz. Contains fair disseminations of pyrite throughout, traces of chalcopyrite, sphalerite, and pyrrhotite.
37	42	61	Same as 32 to 37. Contains heavy concentrations, in part solid core, of pyrite and chalcopyrite with minor sphalerite. Also fine disseminations of pyrite and chalcopyrite.
42	47	58	First half same as 32 to 37 with fair disseminations of pyrite, second half medium dark grayish to brownish green, fine grained, impure quartzite, barren of mineralization except traces of chalcopyrite and pyrrhotite.
47	52	46	Same as latter part of 42 to 47, contains one poor concentration of pyrite, poor disseminations of pyrite, chalcopyrite, and pyrrhotite.
52	57	58	Medium dark grayish green, fine grained, chloritic hornfels, in part highly siliceous, brecciated, and deformed. Contains fair disseminations, one concentration of pyrite, minor pyrrhotite and chalcopyrite.
57	62	58	Same as 52 to 57, in minor part almost cherty. Contains fair concentrations and disseminations of pyrite, minor chalcopyrite.
62	67	44	Same as 52 to 57, minor disseminations of pyrite and chalcopyrite.
67	72	52	Same as 52 to 57, well brecciated. Contains fair concentration of pyrite, faint disseminations of pyrite, chalcopyrite, and pyrrhotite.
72	76	34	Same as 52 to 57. Contains faint seams and disseminations of pyrite, chalcopyrite, and pyrrhotite.
76	81	19	Same as 52 to 57. Barren.
81	86	37	Medium to dark greenish-gray, medium- to fine-grained, impure quartzite, somewhat brecciated and chloritized. Contains faint disseminations and seams of pyrite and chalcopyrite.
86	91	22	Same as 81 to 86; contains clayey chloritic portion. Pyrite disseminations faint.
91	96	38	Same as 81 to 86, in part highly chloritic hornfels, somewhat brecciated. Sparse pyrite disseminations.

Hole B-5 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
96	100	35	Medium to dark grayish-green, medium- to fine-grained, siliceous chloritic hornfels, in part well brecciated and recemented with quartz crystals. Sparse disseminations and seams of pyrite.
100	102	26	Same as 96 to 100, sparse disseminations of pyrite and chalcopyrite.
102	106	29	Same as 96 to 100, poor disseminations of pyrite and chalcopyrite, trace of pyrrhotite.
106	110	38	Same as 96 to 100, somewhat more siliceous. Contains poor disseminations of pyrite, less chalcopyrite, trace of marcasite.
110	115	62	Same as 96 to 100, in part somewhat more siliceous. Contains sparse disseminations of pyrite, chalcopyrite, and pyrrhotite.
115	120	45	Same as 96 to 100. Contains poor disseminations of pyrite, less chalcopyrite and pyrrhotite.
120	125	42	Same as 96 to 100, in part highly brecciated. Contains one fair concentration of pyrite with galena, otherwise poor disseminations of chalcopyrite and pyrite, trace of galena.
125	130	37	Same as 96 to 100. Contains one small but heavy concentration of chalcopyrite with minor pyrrhotite and pyrite, also some fair concentrations of pyrite and chalcopyrite, trace of sphalerite.
130	135	58	Same as 96 to 100, in part more chloritic. Contains poor disseminations of pyrite and chalcopyrite.
135	140	22	Same as 96 to 100; contains poor pyrite, trace of chalcopyrite.
140	145	22	Same as 96 to 100. Contains one small but heavy concentration of pyrite with trace of galena, otherwise poor disseminations of pyrite and chalcopyrite.
145	150	11	Same as 96 to 100, trace of pyrite and pyrrhotite.
150	155	32	Same as 96 to 100, trace only of pyrite, chalcopyrite, and pyrrhotite.
155	160	30	Same as 96 to 100, somewhat more siliceous. Contains poor disseminations of chalcopyrite, less pyrite.

Hole B-6

Location: 700 level
Coordinates: 10,425 N., 10,093 E.
Bearing: S. 54° E.

Inclination: -60°
Competed length: 221 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	3	32	Dark grayish-green, fine-grained, soft chloritic hornfels, somewhat brecciated and recemented with white quartz crystals. Contains heavy concentrations of pyrite, replacing and filling breccia matrix. Associated in minor amounts are chalcopyrite, sphalerite, and galena. Smithsonite occurs as secondary mineral in fair amounts in open cavities.
3	5	22	Same as 0 to 3. Contains one fair concentration, poor disseminations, of pyrite with minor chalcopyrite and smithsonite, trace of galena.
5	10	58	Dark grayish green, fine grained siliceous hornfels, in part cherty. Contains locally soft chloritic hornfels, brecciated and recemented with quartz. Mineralization sparse in disseminations of pyrite, chalcopyrite, some smithsonite, trace of sphalerite and galena.
10	12	22	Same as 5 to 10, no cherty part. Faint disseminations of pyrite, minor smithsonite.
12	16	45	Medium light greenish gray, slightly brecciated, impure quartzite, locally soft chloritic hornfels. Barren except for traces of pyrite, chalcopyrite, and pyrrhotite.
16	18	27	Same as 12 to 16. Faint disseminations of pyrite, also chalcopyrite.
18	20	23	Light reddish to greenish gray, fine grained quartzite, slightly brecciated. Faint disseminations and concentrations of pyrite and chalcopyrite, trace of pyrrhotite.
20	22	10	Same as 18 to 20. Faint disseminations of pyrite and chalcopyrite.
22	24	19	Same as 18 to 20. Faint disseminations, one poor concentration, of pyrrhotite with chalcopyrite.
24	29	47	Same as 18 to 20. Faint disseminations, one poor to fair concentration, of pyrite with minor chalcopyrite, trace of galena.
29	33	22	Same as 18 to 20, chloritic along seams. Barren except for one faint concentration of pyrite with pyrrhotite.
33	36	16	Same as 18 to 20, locally chloritic hornfels. Barren except for faint concentrations along seams of pyrite, sphalerite, and chalcopyrite.

Hole B-6 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
36	41	21	Dark grayish green, fine grained, soft, chloritic hornfels in pebble fragments. Contains one fair, one poor concentration of pyrite with minor chalcopyrite, trace of sphalerite and galena, otherwise faint disseminations of pyrite.
41	46	31	Same as 36 to 41, in part dark reddish brown cherty quartzite. Brecciated and recemented with quartz. Barren.
46	50	24	Light greenish gray, fine grained impure quartzite, slightly brecciated. Barren except for one poor seam of pyrrhotite, trace of chalcopyrite.
50	52	13	Light to dark grayish green, fine grained chloritic hornfels, in part siliceous. Contains fair disseminations of pyrite with minor chalcopyrite and smithsonite, trace of sphalerite.
52	57	59	Same as 50 to 52. Contains poor seams and disseminations of pyrite, minor chalcopyrite.
57	60	39	Same as 50 to 52, well brecciated and recemented with abundant white quartz. Contains one fair concentration of pyrite, chalcopyrite, and smithsonite, otherwise poor disseminations of pyrite and chalcopyrite, trace of pyrrhotite.
60	63	33	Same as 50 to 52, with light quartzite part predominant. Barren except for locally faint disseminations of pyrite.
63	68	55	Light to dark grayish green, fine to medium grained, quartzitic-chloritic hornfels, locally brecciated and recemented with quartz. Mineralization weak in local disseminations of pyrite.
68	73	44	Same as 63 to 68. Contains poor to fair concentrations of pyrite and chalcopyrite, with trace of sphalerite, some smithsonite, also pyrite and chalcopyrite disseminations.
73	78	60	Same as 63 to 68, somewhat more siliceous, brecciated and recemented with white quartz. Contains one poor concentration of pyrite with chalcopyrite and smithsonite, trace of sphalerite.
78	82	42	Same as 63 to 68. Nearly barren except for faint disseminations of pyrite and chalcopyrite.
82	87	57	Same as 63 to 68. Contains poor to good concentrations of pyrite and chalcopyrite with minor sphalerite, trace of galena, otherwise poor seams and disseminations of pyrite and chalcopyrite.
87	91	47	Same as 63 to 68, well brecciated throughout. Contains faint disseminations of pyrite and chalcopyrite, trace of sphalerite.

Hole B-6 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
91	96	59	Same as 63 to 68, well brecciated throughout. Contains fair disseminations and seams of pyrite, very minor chalcopyrite.
96	100	41	Same as 63 to 68, well brecciated throughout. Contains one poor concentration of chalcopyrite with minor sphalerite, faint disseminations and seams of pyrite.
100	105	20	Highly siliceous, light greenish gray hornfels. Barren.
105	110	28	Medium to light grayish green, highly siliceous hornfels, contains faint seam and disseminations of pyrite.
110	114	28	Same as 105 to 110. Barren.
114	117	19	Same as 105 to 110, well brecciated and recemented with white quartz. Barren.
117	120	29	Light to dark grayish green, quartzitic-chloritic hornfels, in part altered to clayey minerals. Contains traces of pyrite, chalcopyrite, and galena.
120	125	43	Same as 117 to 120. Contains fair to good concentrations and fair disseminations of pyrite with minor chalcopyrite, sphalerite, trace of galena.
125	130	56	Same as 117 to 120. Contains poor seams and disseminations of pyrite and chalcopyrite.
130	135	60	Same as 117 to 120, locally well brecciated. Contains faint seams and disseminations of pyrite and chalcopyrite, one fair concentration of chalcopyrite with pyrite, minor sphalerite.
135	140	60	Same as 117 to 120, somewhat more siliceous and brecciated in part. Contains faint disseminations locally of pyrite and chalcopyrite.
140	145	50	Same as 117 to 120, in part highly siliceous, in part highly brecciated soft hornfels. Barren except for local faint disseminations of pyrite.
145	148	38	Same as 117 to 120, somewhat more siliceous. Barren.
148	152	30	Medium to dark grayish green, chloritic hornfels, in part more siliceous, and somewhat sheared and brecciated. Contains faint disseminations of pyrite and chalcopyrite, trace of sphalerite.
152	155	24	Grayish green, highly siliceous hornfels. Contains faint disseminations of pyrite, chalcopyrite, less pyrrhotite.

Hole B-6 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
155	160	30	Same as 152 to 155. Contains faint disseminations of pyrite and chalcopyrite, trace of sphalerite. Latter part of section in small fragments. (Fault zone?)
160	165	21	Same as 152 to 155, in part well brecciated. Contains poor seams and disseminations of pyrite and chalcopyrite. trace of galena.
165	170	22	Same as 152 to 155. Contains faint disseminations of pyrite and chalcopyrite.
170	174	23	Medium dark grayish green, chloritic hornfels, sheared and brecciated as in a fracture zone. Contains heavy concentrations of pyrite, trace of chalcopyrite.
174	176	17	Medium dark grayish green chloritic hornfels, slightly brecciated. Nearly barren except for trace of pyrite and chalcopyrite.
176	181	26	Same as 174 to 176, in part more siliceous, and well brecciated. Trace of pyrite and chalcopyrite.
181	185	24	Same as 174 to 176, strongly sheared and brecciated. Contains faint disseminations of pyrite, one poor concentration of pyrite and chalcopyrite.
185	188	15	Same as 174 to 176, slightly brecciated. Contains one heavy concentration of pyrite, minor chalcopyrite.
188	192	22	Same as 174 to 176, somewhat sheared and brecciated. Barren.
192	196	37	Same as 174 to 176, highly sheared and somewhat brecciated. Contains poor concentrations of pyrite with minor chalcopyrite, few thin disseminations.
196	201	56	Same as 174 to 176, in part highly siliceous. In part well brecciated. Contains two fair to poor concentrations of pyrite with minor chalcopyrite.
201	206	29	Medium to dark greenish gray, impure quartzite. In minor part chloritic. Barren except for faint seams and disseminations of pyrite and chalcopyrite.
206	211	48	Medium dark grayish green, highly siliceous, chloritic hornfels. Contains fair concentrations, poor disseminations of pyrite and chalcopyrite.
211	213	22	Medium grayish green, highly siliceous hornfels. Contains faint disseminations of pyrite and chalcopyrite.
213	218	31	Same as 211 to 213, in part more chloritic, and somewhat brecciated. Contains poor concentrations and disseminations of pyrite and chalcopyrite.

Hole B-6 (Cont.)

Footage From-	Footage To-	Core recovery inches	Description
218	221	16	Same as 211 to 213, in part more chloritic, and somewhat brecciated. Contains faint disseminations of pyrite and chalcopyrite.

Hole B-7

Location: 700 level
Coordinates: 10,335 N., 9,946 E.
Bearing: Due west

Inclination: -5°
Completed length: 322 feet (81 feet drilled by Bureau of Mines)

Footage From-	Footage To-	Core recovery, inches	Description
241	246	36	Dark reddish brown, fine to medium grained, impure quartzite, transected by white quartz veinlets. Trace of pyrite and chalcopyrite as thin films along fractures.
246	251	34	Same as 241 to 246 except for first 8 inches of light green altered clayey-chloritic quartzite containing thin seams of pyrite.
251	256	20	Same as 241 to 246 except for first 6 inches of light green, altered clayey-chloritic quartzite, containing no mineralization.
256	261	39	Same as 241 to 246. Poor pyrite disseminations along some quartz veinlets.
261	264	21	Same as 241 to 246, except for little local chloritization associated with minor pyritization along quartz veinlets. Trace of galena.
264	269	31	Same as 241 to 246, except for some local light chloritization. Contains one fair concentration of pyrite with galena and chalcopyrite.
269	274	49	Same as 241 to 246, in part slightly brecciated and locally chloritized. Contains thin films of pyrite, trace of galena.
274	279	58	Same as 241 to 246, in part somewhat brecciated and chloritized. Contains thin seams of pyrite. chalcopyrite, and pyrrhotite.
279	284	54	Same as 241 to 246, in part slightly brecciated. Contains thin films of pyrite along seams, some chalcopyrite.
284	286	18	Same as 241 to 246, somewhat brecciated with core partly broken in fragments. Slightly chloritized locally and contains films of pyrite and chalcopyrite.
286	288	17	Same as 284 to 286.

Hole B-7 (Cont.)

Footage From-	Footage To-	Core recovery inches	Description
288	293	27	Medium to dark reddish brown, fine to medium grained impure quartzite, transected by few thin quartz veinlets. Faint films of pyrite along seams.
293	297	18	Same as 288 to 293, half altered to clayey-chloritic rock, recemented with smithsonite (?). Core broken into small pebble fragments. Condition of rock indicates fault zone.
297	301	28	Same as 288 to 293. Contains few faint seams of pyrite.
301	306	30	Same as 288 to 293. Core locally broken into pebble fragments and slightly chloritized. Contains few faint seams of pyrite.
306	311	12	Same as 288 to 293, slightly brecciated. Barren.
311	316	26	Same as 288 to 293, slightly brecciated and recemented with smithsonite (?). Core locally broken in pebble fragments.
316	317	7	Altered clayey and chloritic quartzite, broken in small pebbly fragments.
317	322	58	Medium to dark reddish brown and gray, fine to medium grained quartzite, well brecciated, variously recemented by quartz, chlorite, and smithsonite. Last 6 inches soft, broken, and highly chloritic. Contains thin seams and faint disseminations of pyrite, trace of chalcopyrite.

Hole B-8

Location: 500 level
Coordinates: 10,477 N., 10,193 E.
Bearing: N. 75° W.

Inclination: Horizontal
Completed length: 243 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	5	60	Greenish gray, chloritic quartz pebble conglomerate, well brecciated and recemented. Mineralization good - predominantly pyrite, forming drusy, vesicular fillings and replacements of the ground up chloritic matrix among the rock fragments. Appears to replace some of the chloritic hornfels fragments also. Associated with it and in much smaller amounts are chalcopyrite and sphalerite. Galena occurs sparingly.

Hole B-8 (Cont.)

Footage From-	Footage To-	Core recovery inches	Description
5	10	53	Same as 0 to 5; in part, highly silicified. Contains drusy cavities lined with quartz crystals. Nearly barren of mineralization where silicified, otherwise only fair to poor with pyrite, chalcopyrite, and sphalerite.
10	13	25	Same as 0 to 5, except mineralization is poor.
13	17	48	Greenish gray, chloritic, quartz pebble conglomerate, strongly brecciated. Matrix, consisting of fine grained chlorite and medium grained quartzitic rock fragments, makes up about 1/3 of the rock. Mineralization poor to fair with disseminations of pyrite, chalcopyrite, sphalerite, and galena as fillings and replacement.
17	22	53	Same rock and mineralization as 13 to 17.
22	27	60	Greenish gray, chloritic, quartz pebble conglomerate, not quite so brecciated as 13 to 17, but more recemented with silica. Mineralization poor in pyrite, chalcopyrite, sphalerite, and galena.
27	32	46	Same as 22 to 27.
32	35	25	Same rock as 22 to 27, in part alteration of rock minerals has taken place with formation of clayey minerals. Limonite forms in open spaces from alteration of iron minerals. Mineralization fair to poor with pyrite predominatly and chalcopyrite in patches as replacement and filling, also in minor association are sphalerite and galena. Sphalerite and galena also form some thin seams. Pyrrhotite may be present in sparse amount.
35	38	16	Same as 22 to 27, nearly barren of mineralization except for fine disseminations and seams of pyrite and chalcopyrite, trace of galena and sphalertie.
38	42	30	Same as 22 to 27, contains minor disseminations of pyrite, chalcopyrite, sphalerite, and galena.
42	47	34	Same as 22 to 27, in part a little more chloritic. Mineralization minor in disseminations of pyrite and chalcopyrite. Trace only of sphalerite and galena.
47	52	36	Same as 22 to 27, in part a little more chloritic. One fair pocket of sphalerite with pyrite, minor disseminations of pyrite and chalcopyrite. Open cavaties are lined with quartz crystals.

Hole B-8 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
52	57	53	Greenish gray, chloritic, quartz pebble conglomerate, brecciated and recemented. Contains generally disseminated in small minor patches and crystals pyrite, sphalerite, galena, and chalcopyrite.
57	62	47	Same as 52 to 57, contains fair concentrations of pyrite as filling and replacement of matrix of rock. Chalcopyrite forms some fair but small concentrations. Associated with pyrite in minor amounts are chalcopyrite, sphalerite, galena, and possibly pyrrhotite (?).
62	65	10	Same as 52 to 57, sparse mineralization with same association as above.
65	70	23	Same as 52 to 57, but highly silicified, barren of mineralization.
70	72	9	Same as 52 to 57, in part highly silicified, mineralization sparse to barren, except for one heavy concentration of pyrite. Associated with it and in minor amounts are chalcopyrite and sphalerite.
72	76	13	Same as 52 to 57. Contains one havey concentration, also thin seams of pyrite. Chalcopyrite is sparse, trace of sphalerite in thin seam associated with pyrite.
76	80	18	Same as 52 to 57, somewhat siliceous. Contains fair concentrations and seams of pyrite; chalcopyrite and sphalerite, only a trace.
80	82	10	Same as 52 to 57. Locally contains fair seams of pyrite.
82	85	24	Same as 52 to 57, in part more siliceous. Contains minor concentrations of pyrite. In association are possible pyrrhotite (?) and marcasite (?).
85	90	25	Greenish gray, chloritic, quartz conglomerate transected by few quartz veinlets. More chloritic portions sparingly mineralized by pyrite, pyrrhotite, lesser amounts of chalcopyrite and sphalerite, trace of galena.
90	95	30	Same as 85 to 90, in part a little more chloritic, brecciated, and recemented with quartz. Pyrite mineralization good in concentrated pockets, replacing and filling matrix. Associated with it are fair amounts of sphalerite, minor chalcopyrite. Pyrrhotite deposited along seams.
95	99	7	Same as 85 to 90. Faint showing of pyrrhotite and pyrite. Poor recovery may indicate fault zone (?).
99	101	9	Same as 85 to 90. One fair pocket of pyrite, pyrrhotite in association.

Hole B-8 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
101	105	18	Same as 85 to 90. Poor disseminations of pyrite with pyrrhotite and chalcopyrite.
105	110	11	Same as 85 to 90. Nearly barren, except for trace of pyrite, pyrrhotite, and chalcopyrite.
110	115	13	Same as 85 to 90, except more siliceous. Trace only of pyrite, pyrrhotite, and chalcopyrite.
115	120	24	Greenish gray, chloritic, quartz conglomerate, well brecciated and recemented with quartz. Contains fragments of chloritic hornfels, few drusy cavities of quartz crystals, and minor amounts of pyrite and chalcopyrite.
120	124	18	Same as 115 to 120. Contains poor to fair showing of pyrite, with minor pyrrhotite and chalcopyrite.
124	127	24	Same as 115 to 120, in part more siliceous, few thin seams of pyrite, with minor pyrrhotite and chalcopyrite.
127	130	23	Same as 115 to 120, in part more siliceous, nearly barren except for trace of pyrite and pyrrhotite.
130	132	11	Same as 127 to 130.
132	133	10	Same as 127 to 130.
133	137	16	Greenish gray, quartzitic conglomerate, brecciated and recemented with silica. Contains thin seams of pyrite nearly length of section.
137	139	9	Same as 133 to 137. Contains pyrite, trace of Chalcopyrite in fine disseminations and in minor concentrations.
139	142	29	Same as 133 to 137. Contains few thin seams of chlorite, fine disseminations of pyrite, pyrrhotite, and chalcopyrite.
142	146	12	Same as 133 to 137. Pyrite forms heavy concentration with pyrrhotite. In association are minor chalcopyrite and marcasite.
146	150	26	Dark green, chloritic hornfels, slightly brecciated, altered in part along some seams to serpentine. Contains poor seams and concentrations of pyrite with pyrrhotite and chalcopyrite, drusy cavities of quartz.
150	155	16	Greenish gray, chloritic, quartz conglomerate, quite siliceous in greater part and nearly barren of mineralization.
155	160	48	Grayish green, highly chloritic conglomerate, somewhat brecciated and recemented with quartz. Contains some drusy cavaties lined with quartz. Few fair pockets of pyrite and chalcopyrite, trace of sphalerite. Mineralization occurs as filling and replacement of the matrix.

Hole B-8 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
160	165	25	Same as 155 to 160. Contains faint disseminations of pyrite and chalcopyrite, one fair pocket of pyrite and marcasite, minor chalcopyrite.
165	169	27	Medium dark grayish green, brecciated, soft chloritic hornfels. Mineralization poor with only faint disseminations of pyrite and pyrrhotite, one thin veinlet of pyrrhotite.
169	174	63	Same as 165 to 169, recemented with quartz, some of which is chalcedonic. Contains few poor to fair concentrations of pyrite and pyrrhotite, trace of chalcopyrite.
174	179	60	Medium dark grayish green, brecciated, chloritic hornfels, somewhat siliceous. Contains poor to fair pocketa of pyrite, disseminations of pyrrhotite and chalcopyrite.
179	184	60	Same as 174 to 179, in part well brecciated and recemented with quartz. Contains few poor to fair pockets of pyrite, some pyrrhotite, minor chalcopyrite in disseminations.
184	189	43	Same as 174 to 179, faint disseminations and poor seams of pyrite, pyrrhotite, and chalcopyrite, trace of marcasite.
189	194	60	Same as 174 to 179, in part well brecciated. Contains few fair pockets of pyrrhotite and pyrite, minor chalcopyrite, trace of sphalerite.
194	198	35	Same as 174 to 179, contains only faint seams and disseminations of pyrite, pyrrhotite, and chalcopyrite.
198	200	13	Same as 174 to 179, faint seams and disseminations of pyrite, pyrrhotite, and chalcopyrite.
200	205	61	Same as 174 to 179. Contains one fair concentration of pyrite, poor disseminations and seams of pyrrhotite and chalcopyrite.
205	210	60	In part same as 174 to 179. From 207.5 to 210 dark reddish brown quartzitic hornfels, slightly chloritized in part. Mineralization nearly barren in the latter part of section, but in chloritic hornfels one good concentration of pyrite and pyrrhotite, minor chalcopyrite, and trace of Sphalerite.
210	215	52	Medium dark grayish green, soft, chloritic hornfels in part well brecciated and recemented with dense white quartz. Few good concentrations of pyrite with pyrrhotite, minor amount of chalcopyrite.
215	218	26	Medium dark grayish green, chloritic hornfels, quite siliceous and little brecciated. Contains one fair to good pocket, otherwise sparse disseminations, of pyrite and pyrrhotite.

Hole B-8 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
218	221	38	Medium dark grayish green, soft, chloritic hornfels, well brecciated and recemented with thin quartz seams. Few poor to fair concentrations of pyrite and pyrrhotite, trace of chalcopyrite.
221	225	37	Same as 218 to 221, same mineralization.
225	228	36	Medium dark grayish green, quartzitic, chloritic hornfels, barren of mineralization except for one poor pocket of pyrite and pyrrhotite.
228	233	48	Medium dark grayish green, soft, chloritic hornfels, well brecciated. Nearly barren except for 2 or 3 minor pockets of pyrrhotite and pyrite. Contains many open cavaties, some lined with quartz crystals.
233	238	56	Same as 228 to 233, mineralization only trace of pyrite and pyrrhotite.
238	243	55	Same as 228 to 233, in part more siliceous. Contains minor disseminations of pyrrhotite and pyrite locally.

Hole B-9

Location: 500 level
Coordinates: 10,478 N., 10,196 E.
Bearing: N. 45° W.

Inclination: -28°
Completed length: 197 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	2	21	Greenish gray, chloritic conglomerate, brecciated and well recemented with quartz. Some chloritic fragments are soft, held together by open seams of quartz crystals. Fair mineralization, by replacement and filling of matrix and open spaces, of pyrite and sphalertie, minor chalcopyrite, trace of galena.
2	4	20	Same as 0 to 2, mineralization by replacement and filling of matrix, fair to good in two concentrations of pyrite, minor sphalerite, chalcopyrite, and galena.
4	6	20	Same as 0 to 2, though more siliceous. One fair pocket of pyrite, minor chalcopyrite, trace of sphalerite and galena.
6	11	59	Same as 0 to 2, though more siliceous. Mineralization poor to fair with two concentrations of pyrite, minor sphalerite, galena; pyrite and chalcopyrite, pyrrhotite are in fine disseminations.

Hole B-9 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
11	15	46	Same as 0 to 2, in part more siliceous. Two good concentrations of sphalerite and pyrite, galena and chalcopyrite in meager disseminations.
15	18	36	Same as 0 to 2. Mineralization poor with one thin pocket of sphalerite, fine disseminations of sphalerite, pyrite, chalcopyrite, and galena (?).
18	22	48	Same as 0 to 2. Mineralization meager with fine disseminations of pyrite and sphalerite, some chalcopyrite.
22	25	36	Same as 0 to 2, mineralization same as 18 to 22.
25	30	36	Same as 0 to 2, mineralization in fine general disseminations of pyrite, sphalerite, and chalcopyrite. One fine seam of sphalerite and chalcopyrite.
30	32	24	Same as 0 to 2, in part more chloritic. Mineralization poor with one thin patch of sphalerite, scattered small pockets of pyrite and chalcopyrite.
32	36	19	Same as 0 to 2, though more siliceous. Sparse mineralization with thin seams of sphalerite, pyrite, and chalcopyrite.
36	41	25	Light greenish gray to dark reddish gray, fine to medium grained, impure quartzite transected by chloritic seams. Greenish parts due to chloritization. Mineralization poor in fine disseminations of pyrite and chalcopyrite, one small patch of galena.
41	45	30	Same as 36 to 41, brecciated and recemented with quartz. Mineralization confined to fine disseminations of pyrite, chalcopyrite, sphalerite, and perhaps galena (?). One seam of sphalerite.
45	47	16	Same as 36 to 41, barren except for scattered grains of pyrite.
47	52	14	Dark reddish gray, fine grained quartzite, brecciated and recemented with quartz. Barren of mineralization.
52	54	22	Same as 47 to 52. Barren except for scattered disseminations of pyrite.
54	57	24	Same as 47 to 52, in parts chloritized. Mineralization meager in fine disseminations of chalcopyrite and pyrite, small patch of sphalerite.
57	62	49	Grayish green, chloritic, quartz conglomerate, brecciated and recemented with quartz. Mineralization poor in fine generally disseminated pyrite, chalcopyrite, sphalerite and possibly pyrrhotite and galena.

Hole B-9 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
62	67	55	Same as 57 to 62, in part highly chloritic. Mineralization fair to poor in general disseminations, few small concentrations, few small concentrations of sphalerite, galena, pyrite, minor chalcopyrite and pyrrhotite.
67	72	52	Same as 57 to 62, in part highly chloritic. Mineralization fair to poor in general disseminations, few small concentrations of sphalerite, pyrite, some chalcopyrite and galena.
72	75	29	Same rock and mineralization as 57 to 62.
75	80	63	Same as 57 to 62, though generally more siliceous. Barren except for poor disseminations of pyrite.
80	83	19	Dark greenish gray, quartzitic conglomerate, containing poor concentrations of pyrite with sphalerite and chalcopyrite in association.
83	88	60	Same as 80 to 83, well brecciated and recemented with much quartz. Many fragments are highly chloritic. Mineralization in poor disseminations of pyrite.
88	89	12	Same rock and mineralization as 83 to 88.
89	94	39	Grayish green, highly chloritic conglomerate, containing one poor, one fair concentration of pyrite with poor disseminations of sphalerite in association.
94	95	12	Same as 89 to 94, contains one fair concentration of pyrite with trace of sphalerite and chalcopyrite.
95	100	58	Same as 89 to 94, strongly brecciated, with the formation of slickensides in chloritic portions, developed more near lower part of section. Poor mineralization with concentrations of pyrite.
100	104	10	Same as 95 to 100, barren of mineralization; more evidence of shearing.
104	109	0	No core recovery. Fault zone probable with the foregoing additional evidence.
109	114	7	Core recovery poor. Fault zone indicated, as brecciation and shearing are strong. Minor disseminations of pyrite.
114	119	23	Light greenish gray, chloritic conglomerate, brecciated and highly silicified. Contains minor concentrations of pyrite with pyrrhotite.
119	123	29	Same as 114 to 119. Minor patches of pyrite with chalcopyrite, sphalerite.
123	127	35	Dark grayish green, fine grained, soft, chloritic hornfels. Mineralization sparse with disseminations of, and thin seams of, pyrite.

Hole B-9 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
127	132	6	Same as 123 to 127, somewhat silicified. Nearly barren except meager disseminations of pyrite.
132	134	6	Greenish gray, fine to medium grained, quartzitic sandstone. Contains one fair concentration of pyrite with trace of sphalerite.
134	137	10	Same as 132 to 134, highly silicified. Contains few thin seams of pyrite, locally disseminated fine white crystals (marcasite?).
137	139	21	Same as 132 to 134. At 137 feet recovered loose, medium grained quartzitic sand containing pyrite, may be sludge cuaght in core barrel. In remainder pyrite mineralization sparse.
139	142	20	Light greenish gray, quartzitic conglomerate, brecciated and highly silicified. Contains one fair concentration of pyrite, poor disseminations and seminations and seams of pyrite, trace of chalcopyrite.
142	147	46	Same as 139 to 142, in parts highly chloritic, but well recemented with white crystalline quartz. Contains meager disseminations of pyrite with pyrrhotite and chalcopyrite.
147	152	42	Same as 142 to 147, faint disseminations of pyrite.
152	157	9	Greenish gray, fine to medium grained, quarzite. One heavy concentration of pyrite, otherwise faint disseminations.
157	162	4	Same as 152 to 157, in broken pebble fragments, partly altered to clay minerals. A fracture or fault zone may be indicated, as also evidenced by poor core recovery from 152 to 162. Contains one poor concentration of pyrite, with minor sphalerite and chalcopyrite.
162	164	20	Greenish gray, chloritic conglomerate, brecciated and recemented with abundant quartz. Contains highly concentrated, in part nearly solid core, of pyrite. From its honeycomb texture is indicated filling and replacement of original breccia matrix. Contains traces of chalcopyrite in pyrite, also marcasite.
164	167	30	Same as 162 to 164, highly silicified. Mineralization same with high concentrations of pyrite, traces of sphalerite and chalcopyrite, some marcasite.
167	170	20	Same as 162 to 164. Contains one heavy concentration of pyrite, faint disseminations and seams of chalcopyrite.

Hole B-9 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
170	173	15	Grayish green, fine grained, brecciated, chloritic hornfels. Contains one poor concentration of pyrite, faint disseminations of chalcopyrite.
173	176	43	Grayish green, hornfels conglomerate, brecciated and silicified. In middle of section light gray, medium grained sandstone. Contains drusy cavaties of quartz crystals, one poor concentration of pyrite, and faint disseminations of pyrite and chalcopyrite.
176	180	48	Same as 173 to 176, in general highly silicified. Contains several fair to good pyrite concentrations, trace of chalcopyrite.
180	182	15	Same as 176 to 180, barren of mineralization except for traces of pyrite and chalcopyrite.
182	187	38	Greenish gray, in part dark olive gray, medium to fine grained, impure quartzite; minor chloritization, sparse pyrite disseminations.
187	192	50	Same as 182 to 187, in part weakly brecciated and recemented with quartz. Sparse pyrite disseminations.
192	197	54	Same as 182 to 187, in minor part hornfelsic. Sparse disseminations of pyrite and chalcopyrite.

Hole B-10

Location: 700 level
Coordinates: 10,159 N., 10, 184 E.
Bearing: S. 30° W.

Inclination: -60°
Completed length: 56 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	3	31	Light greenish gray, quartzite pebble conglomerate, brecciated and recemented with quartz and sparse chlorite. Contains one thin seam of molybdenite, sparse disseminations of pyrrhotite with lesser chalcopyrite and pyrite.
3	8	58	Same as 0 to 3. In part made up of soft chloritic hornfels fragments, which contain a heavy concentration of pyrite with minor chalcopyrite, and otherwise contains sparse disseminations of pyrrhotite, chalcopyrite, and pyrite, trace of sphalerite. One quartz veinlet contains fair amount of molybdenite.

Hole B-10 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
8	11	35	Same as 0 to 3. Contains one poor concentration, saparse disseminations, of pyrite with chalcopyrite, one poor concentration of smithsonite as filling..
11	15	30	Same as 0 to 3, with some drusy cavaties lined with quartz crystals from 5 to 10 mm in size. Contains few faint concentrations of pyrite with chalcopyrite, trace of sphalerite.
15	17	29	Medium grayish green, medium to fine grained quartzitic hornfels, in part altered and chloritized, slightly brecciated. Contains one poor concentration of sphalerite, faint disseminations of pyrrhotite, pyrite, and chalcopyrite.
17	21	30	Same as 15 to 17, in part chloritic hornfels. Well brecciated and recemented with quartz. Pyrite very sparse.
21	26	36	Same as 15 to 17, well brecciated and recemented with quartz. Contains faint disseminations of pyrite, pyrrhotite, and chalcopyrite.
26	31	42	Chloritic quartzite conglomerate, thoroughly brecciated. Contains films of molybdenite along seams, faint disseminations of pyrrhotite, pyrite, and chalcopyrite.
31	36	33	Same as 26 to 31, except last 8 inches of dark reddish brown, fine grained, slightly chloritized impure quartzite. Contains faint disseminations of pyrite and sphalerite, trace of galena.
36	41	30	Dark reddish brown, fine grained, impure quartzite, transected by fine quartz veinlets. Altered to soft chloritic hornfels from 15 to 25 inches, which contains poor disseminations of sphalerite. Otherwise contains sparse disseminations of pyrite.
41	46	15	Light to dark reddish brown, fine to medium grained impure quartzite, in part chloritized. Barren except for trace of molybdenite, pyrite, and chalcopyrite.
46	50	24	Same as 41 to 46. Contains faint disseminations of pyrrhotite, pyrite, and chalcopyrite.
50	53	32	Same as 41 to 46. Barren except for trace of pyrrhotite and pyrite.
53	56	30	Same as 41 to 46. Barren except for one thin seam of sphalerite, less pyrite.

Hole B-11

Location: 700 level
Coordinates: 10,161 N., 10,188 E.
Bearing: S. 55° E.

Inclination: -15°
Completed length: 246 feet

Footage From-	Footage To-	Core recovery inches	Description
0	5	58	Greenish gray impure quartzite conglomerate, brecciated, slightly chloritized, and recemented with quartz. Contains one fair concentration of pyrite and chalcopyrite, otherwise faint seams and disseminations of pyrite, chalcopyrite, and pyrrhotite.
5	9	46	Same as 0 to 5. Faint seams and disseminations of pyrite, chalcopyrite, and pyrrhotite.
9	12	26	Same as 0 to 5. Few faint seams and disseminations of pyrite and chalcopyrite.
12	15	36	Same as 0 to 5. Few faint seams and disseminations of pyrite and chalcopyrite, trace of sphalerite.
15	17	20	Same as 0 to 5. Contains a few drusy cavaties lined with quartz crystals, fine pyrite crystals, and minor smithsonite.
17	21	48	Same as 0 to 5. Few faint traces of pyrite, chalcopyrite, and pyrrhotite.
21	22	9	Same as 0 to 5. Contains one small drusy veinlet lined with waurtz crystals, fine pyrite, and trace of sphalerite.
22	27	59	Same as 0 to 5. One 5 inch zone of dark green, soft, chloritic rock contains a heavy concentration of pyrite with chalcopyrite. Otherwise faint disseminations of pyrite, chalcopyrite, and pyrrhotite.
27	31	48	Same as 0 to 5. Contains few traces of pyrite, chalcopyrite, and pyrrhotite.
31	33	24	Same as 0 to 5. Contains poor seams and disseminations of pyrite and chalcopyrite, trace of pyrrhotite and sphalerite.
33	37	36	Same as 0 to 5, except one 8 inch zone of soft clayey-chloritic rock; contains three poor concentrations of pyrite with chalcopyrite and bornite, also minor disseminations of marcasite and trace of pyrrhotite, and sphalerite.
37	42	60	Same as 0 to 5. One 8 inch zone contains soft clayey-chloritic rock which contains a fair amount of molybdenite with minor pyrite and sphalerite. Otherwise faint traces of pyrite and chalcopyrite.
42	47	55	Same as 0 to 5, in part apparently cemented with chlorite. Contains poor seams and disseminations of pyrite and chalcopyrite, trace of sphalerite.

Hole B-11 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
47	52	57	Same as 0 to 5. Contains poor disseminations of pyrite, chalcopyrite, and pyrrhotite.
52	57	57	Same as 0 to 5, somewhat more chloritic. Contains faint disseminations of pyrite, chalcopyrite, and pyrrhotite.
57	60	33	Same as 0 to 5. Contains one poor to fair concentration of chalcopyrite in chloritic portion. Otherwise faint disseminations of pyrite, chalcopyrite, and pyrrhotite.
60	63	31	Same as 0 to 5, with two inches of soft clayey-chloritic rock. Contains faint disseminations of chalcopyrite, pyrite, and pyrrhotite.
63	67	43	Same as 0 to 5, a little more chloritic. Contains poor disseminations of pyrrhotite, less pyrite, trace of chalcopyrite.
67	72	60	Same as 0 to 5, somewhat more chloritic. Contains poor disseminations of pyrite, pyrrhotite, and chalcopyrite.
72	77	42	Same as 0 to 5, in part more chloritic. Contains poor disseminations of pyrite, pyrrhotite, and chalcopyrite.
77	82	51	Same as 0 to 5, in part more chloritic. Contains faint disseminations of pyrite, pyrrhotite, and and chalcopyrite.
82	86	27	Same as 0 to 5, more chloritic in last 8 inches where broken in small fragments. Trace of pyrite.
86	90	36	Same as 0 to 5. Contains poor seams and disseminations of pyrite, trace of chalcopyrite.
90	95	36	Same as 0 to 5, strongly brecciated. Last foot of section altered and broken in small fragments. Contains poor disseminations of pyrite, faint chalcopyrite.
95	100	25	Same as 0 to 5, thoroughly brecciated and altered, in part broken in small fragments. Contains traces of pyrite and sphalerite. Character of rock and condition of core between 90 and 100 may indicate fault zone.
100	105	35	First 13 inches of section grayish green, medium grained, impure quartzite, altered, chloritized, and partly broken into small fragments, and containing trace of pyrite, and sphalerite. Last 22 inches light greenish gray to reddish gray, medium grained impure quartzite. Contains trace of pyrite. Boundary between Lower Battle conglomerate and Harmony formation at 100 feet.

Hole B-11 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
105	110	45	Greenish to reddish gray, medium grained impure quartzite, altered somewhat at 106 to 107 feet. Contains faint seams of pyrite and chalcopyrite.
110	114	35	Reddish gray, medium grained, impure quartzite. Contains faint seams and traces of pyrite and chalcopyrite.
114	117	33	Same as 110 to 114. Contains one faint seam of pyrite and chalcopyrite.
117	121	32	Dark reddish gray, medium to fine grained biotite quartzite, transected by thin veinlets of quartz. In part slightly chloritized. Contains faint seams of pyrite, sparse disseminations of pyrrhotite and pyrite.
121	125	34	Same as 117 to 121. Contains faint seams of pyrite, sparse disseminations of pyrrhotite, pyrite and chalcopyrite.
125	127	21	Same as 117 to 121. Barren except for sparse disseminations of molybdenite.
127	130	25	Same as 117 to 121, except for 6 inches segment altered to clay and chlorite which contains sparse pyrite and chalcopyrite.
130	133	30	Same as 117 to 121. Contains faint disseminations of pyrite, chalcopyrite, and pyrrhotite.
133	138	52	Same as 117 to 121. Contains faint seams and disseminations of pyrite and chalcopyrite.
138	142	39	Same as 117 to 121. Contains one poor concentration of pyrite and molybdenite, otherwise faint seams and disseminations of pyrite and pyrrhotite.
142	144	23	Same as 117 to 121. Barren except for trace of pyrite and molybdenite.
144	147	26	Same as 117 to 121. Barren except for trace of pyrite and molybdenite.
147	152	41	Sames as 117 to 121. Contains faint seams and disseminations of pyrite and pyrrhotite.
152	157	60	Same as 117 to 121. Contains trace of pyrite and pyrrhotite.
157	162	32	Same as 117 to 121. Barren.
162	167	34	Same as 117 to 121. Barren except for trace of pyrrhotite and pyrite.
167	172	45	Same as 117 to 121 for first 7 inches and last 9 inches. Rest of section is a flow breccia consisting of white quartz fragments squeezed, pulled out, and deformed in a matrix of dark reddish brown biotite quartzite. At 30 inches is a light gray portion altered to clayeychloritic rock and broken in small fragments. The character of the rock may indicate a minor fault zone. Contains sparse pyrite, chalcopyrite, and pyrrhotite, trace of molybdenite.

Hole B-11 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
172	177	60	First 6 inches consists of flow breccia rock. Rest of section is medium to dark reddish gray, fine to medium grained impure quartzite, transected by fine quartz seams and slightly chloritized. Contains faint seams and disseminations of pyrite.
177	182	60	Same as major part of 172 to 177. Barren except for trace of pyrite and molybdenite.
182	187	53	Medium to dark reddish gray, fine to medium grained impure quartzite, transected by fine quartz veinlets. Last 12 inches strongly brecciated. Barren except for trace of pyrite.
187	192	60	Same as 182 to 187. First 4 inches strongly brecciated. Barren except for trace of pyrite.
192	197	60	Same as 182 to 187. Barren except for two poor seams of pyrite.
197	202	60	Same as 182 to 187. Barren except for trace of pyrite and chalcopyrite.
202	207	60	Same as 182 to 187. Contains faint disseminations of pyrite, pyrrhotite, and molybdenite.
207	211	48	Same as 182 to 187. Contains trace of pyrite, pyrrhotite, and chalcopyrite.
211	216	53	Same as 182 to 187. Contains traces of pyrite, pyrrhotite, and chalcopyrite.
216	221	53	Same as 182 to 187. Contains traces of pyrite.
221	226	45	Same as 182 to 187. Contains faint seams of pyrite, trace of pyrrhotite.
226	231	60	Same as 182 to 187. Trace of chalcopyrite and pyrite.
231	236	46	Same as 182 to 187. Barren.
236	241	44	Dark reddish brown, medium to fine grained, biotite granulite, transected by white quartz veinlets, in part impure quartzite. Contains faint disseminations of pyrite and chalcopyrite.
241	246	42	Medium dark reddish gray, medium to fine grained biotite quartzite, transected by white quartz veinlets. Barren.

Hole B-12

Location: 700 level
Coordinates: 10,163 N., 10,168 E.
Bearing: Due west

Inclination: -30°
Completed length: 60 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	5	26	Medium greenish gray, quartz pebble conglomerate, brecciated and recemented with quartz and chlorite. Contains one fair concentration of molybdenite in fine disseminations with chalcopyrite and pyrrhotite, otherwise faint disseminations of same minerals plus pyrite.
5	10	49	Same as 0 to 5, in part chloritic hornfels containing some biotite. Contains poor disseminations of chalcopyrite, pyrrhotite, pyrite, and molybdenite.
10	12	16	Same as 0 to 5. Contains poor disseminations of chalcopyrite, pyrite, and pyrrhotite.
12	15	36	First 14 inches medium to dark reddish gray, medium to fine grained impure quartzite, unbrecciated and transected by fine quartz veinlets. Contains trace of pyrrhotite and pyrite. Rest of section medium greenish gray quartzite and quartz conglomerate, brecciated and chloritized. Contains faint disseminations of pyrite and chalcopyrite.
15	20	58	Medium to dark greenish gray, chloritic, quartz pebble conglomerate, containing in part some biotite, well brecciated and recemented with quartz and chlorite. Contains three poor concentrations, faint disseminations, of pyrite and chalcopyrite, traces of sphalerite and molybdenite.
20	25	40	Same as 15 to 20, in part highly chloritic. Contains faint disseminations of pyrite, traces of sphalerite.
25	30	23	Medium dark grayish green, thoroughly brecciated and altered chloritic hornfels. Contains faint disseminations of pyrite and sphalerite. Fault zone may be indicated.
30	35	17	Greenish to reddish gray, fine grained, impure quartzite. Core somewhat broken in fragments. Barren except for thin films of pyrite.
35	40	19	Same as 30 to 35. Core broken in small pebble fragments. Barren.
40	45	21	Dark reddish gray, medium to fine grained, biotite quartzite, transected by thin quartz veinlets. Contains traces of pyrrhotite and pyrite.
45	50	25	In part the same as 40 to 45, in part light to dark greenish gray, fine to medium grained, chloritic quartzite, slightly brecciated and altered, transected by thin quartz veinlets, and seams of pyrite and sphalerite.

Hole B-12 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
50	55	16	Dark reddish gray, fine grained biotite quartzite, transected by thin quartz veinlets. Barren.
55	60	31	Same as 50 to 55. Contains films of pyrite, chalcopyrite, and pyrrhotite, trace of molybdenite.

Hole B-13

Location: 700 level
Coordinates: 10,248 N., 10,096 E.
Bearing: S. 15° E.

Inclination: -45°
Completed length: 100 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	3	20	Light to medium greenish gray quartzite with minor siliceous hornfels, brecciated and recemented with quartz and chlorite. Contains thin seams of chalcopyrite and pyrite.
3	7	36	Light to medium greenish gray quartzite with minor chloritic hornfels, brecciated and recemented with quartz and chlorite. Contains a fair concentration of sphalerite and galena, sparse disseminations of the same plus chalcopyrite, pyrite, and pyrrhotite.
7	8	11	Medium to dark grayish green chloritic and siliceous hornfels. Contains some actinolite, with sparse pyrite and galena.
8	12	26	Same as 7 to 8, brecciated and recemented with quartz, in part somewhat altered to clayey rock. Contains poor concentrations and disseminations in breccia matrix, of pyrite, chalcopyrite, traces of pyrrhotite, sphalerite, and galena.
12	14	18	Medium greenish gray, siliceous hornfels, brecciated and recemented with quartz and chlorite. Contains poor disseminations and seams of chalcopyrite, pyrite, and sphalerite.
14	19	41	Medium greenish gray quartzite and medium grayish green chloritic hornfels, brecciated and recemented with quartz and chlorite. Contains two poor to fair concentrations of pyrite and chalcopyrite, otherwise nearly barren.
19	24	24	Medium greenish gray quartzite, brecciated and recemented with quartz and chlorite. Contains one fair concentration of pyrite with galena, chalcopyrite, otherwise sparse pyrite and chalcopyrite, trace of galena and pyrrhotite.

Hole B-13 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
24	26	13	Medium grayish green, brecciated, siliceous hornfels. Barren.
26	28	10	Same as 24 to 26. Contains sparse pyrite, trace of chalcopyrite and pyrrhotite.
28	30	8	Sheared, brecciated, and somewhat altered chloritic hornfels. Contains one poor concentration of pyrite, trace of chalcopyrite and pyrrhotite.
20	31	7	Same as 28 to 30. Contains sparse pyrite, pyrrhotite, chalcopyrite, trace of sphalerite.
31	33	20	Same as 28 to 30. Contains trace of pyrite and chalcopyrite. Nature of core rock from 28 to 33 indicates possible fault.
33	35	18	Medium greenish gray quartzite, in part well brecciated and recemented with quartz and chlorite. Contains sparse pyrite, trace of sphalerite.
35	36	10	Same as 33 to 35. Barren except for trace of pyrrhotite.
36	39	34	Same as 33 to 35, strongly brecciated. Contains poor disseminations of pyrite with sparse chalcopyrite and pyrrhotite, smithsonite in poor concentration, trace of sphalerite.
39	43	38	Medium greenish gray to dark grayish green impure quartzite, nearly chert in part, slightly brecciated and recemented with quartz and chlorite. Contains some actinotite, sparse pyrite, pyrrhotite, and smithsonite.
43	47	27	Same as 39 to 43, chloritic hornfels in part. Contains few poor seams of pyrite with trace of chalcopyrite and sphalerite.
47	52	38	Grayish green, chloritic quartzite and hornfels, well brecciated and recemented, and altered in part. Contains few poor concentrations of pyrite and chalcopyrite, trace of pyrrhotite.
52	54	24	Medium dark grayish green, highly siliceous, chloritic hornfels, thoroughly brecciated and recemented, sheared and altered generally throughout. Contains good concentration of pyrite with galena, chalcopyrite, and sphalerite, trace of marcasite.
54	59	23	Same as 52 to 54. Contains sparse pyrite, chalcopyrite, and marcasite.
59	64	16	Medium greenish gray, impure quartzite, brecciated and recemented with quartz and chlorite. Contains one poor concentration of pyrite, trace of chalcopyrite and sphalerite.
64	67	21	Same as 59 to 64, thoroughly brecciated and altered, chloritized, and recemented in part. Contains poor disseminations, on poor seam, of pyrite and chalcopyrite, trace of galena.

Hole B-13 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
67	70	15	Thoroughly brecciated and altered rock, chloritized and sheared with formation of slickensides. Undoubtedly fault gouge. Barren.
70	75	11	In part same as 67 to 70, in part dark reddish gray, impure quartzite.
75	80	3	Light reddish to greenish gray, fine to medium grained, impure quartzite; barren.
80	87	0	No core recovery. Interval 67 to 87 probably indicates intersection with the Gulch Fault.
87	90	24	Light greenish to reddish gray, fine to medium grained, impure quartzite. Barren.
90	95	21	Same as 87 to 90. Barren.
95	100	26	Same as 87 to 90, somewhat chloritized. Contains trace of pyrite.

Hole B-14

Location: 10,248 N., 10,100 E. - 700 level
Elevation of collar: 5,071
Depth: 207 feet

Inclination: -40°
Bearing: S. 45° E.

Footage From-	Footage To-	Core recovery, inches	Description
0	3	28	Medium dark grayish green chloritic hornfels, somewhat brecciated and recemented with quartz and chlorite. Contains several poor to fair concentrations of sphalerite and galena, sparse chalcopyrite and pyrite.
3	4	14	Same as 0 to 3. Contains fair concentration of pyrite, chalcopyrite, and galena, trace of pyrrhotite.
4	7	22	Dark grayish cherty rock, containing poor seams and disseminations of pyrite, less chalcopyrite.
7	8	10	Medium grayish green, highly siliceous hornfels. Trace of pyrite, chalcopyrite, sphalerite, and galena.
8	11	26	Same as 7 to 8, brecciated and recemented with quartz and chlorite. Contains one poor concentration of galena with pyrite, some smithsonite and chalcopyrite, otherwise barren.
11	12	11	Same as 8 to 11. Contains poor disseminations of of galena with pyrite.
12	16	22	Medium to dark grayish green chloritic quartzite, well brecciated and recemented with quartz and chlorite. Contains sparse chalcopyrite, pyrite, and pyrrhotite.

Hole B-14 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
16	19	22	Same as 12 to 16, contains sparse pyrite.
19	24	52	Same as 12 to 16. Contains sparse pyrite and galena.
24	28	40	Same as 12 to 16. Sparse pyrite.
28	32	43	Same as 12 to 16, in part strongly brecciated. Contains sparse pyrite in drusy cavaties with quartz crystals.
32	34	24	Same as 12 to 16, in part strongly brecciated. Contains traces of pyrite, chalcopyrite, and pyrrhotite.
34	39	21	Same as 12 to 16, in part more chloritic. Contains trace of pyrite.
39	42	11	Medium dark greenish gray breccia, sheared and generally altered to clayey minerals. Undoubtedly fault gouge. Contains sparse pyrite.
42	46	3	Few fragments of greenish gray chloritic quartzite.
46	56	0	No core recovery. Nature of core from 39 to 56 indicates probably intersection with Gulch Fault zone.
56	61	16	Medium to dark grayish green, highly chloritic quartzite, strongly brecciated and recemented with quartz and chlorite. Contains trace of pyrite.
61	63	6	Same as 56 to 61. Contains sparse pyrite.
63	66	23	Same as 56 to 61. Contains trace of pyrite. Character of rock from 56 to 66 indicates strong shattering and brecciation.
66	69	32	Medium dark greenish gray, chloritic quartzite, brecciated and recemented. Contains thin seams and poor disseminations of pyrite and chalcopyrite.
69	70	12	Same as 66 to 69. Contains faint disseminations of pyrite.
70	74	48	Same as 66 to 69, in part somewhat more chloritic and altered. Contains poor concentrations and seams of pyrite with chalcopyrite.
74	79	57	Same as 66 to 69, except last 30 inches strongly brecciated and recemented with quartz and chlorite. Breccia contains fragments of red-dish gray quartzite. Contains one fair, other poor concentrations of pyrite and disseminations of pyrite and chalcopyrite, trace of sphalerite.
79	84	58	Medium grayish green, highly chloritic hornfels-quartzite breccia, recemented with quartz and chlorite. Contains some poor disseminations of chalcopyrite and pyrite, faint seams and disseminations of sphalerite.
84	86	15	Medium greenish gray, chloritic quartzite, well brecciated and chloritized. Contains trace of pyrite.

Hole B-14 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
86	91	26	Same as 85 to 86, in part highly chloritic. Contains faint disseminations of pyrite, trace of sphalerite.
91	96	26	Medium grayish green, chloritic hornfels, thoroughly brecciated and partly altered to clayey minerals. Contains trace of pyrite and sphalerite. Character of rock indicates possible fault zone.
96	101	53	First 19 inches same as 91 to 96, containing trace of pyrite and sphalerite. Rest of section light to dark reddish gray, fine to medium grained biotite quartzite and impure quartzite transected by thin veinlets of quartz, thin seams of pyrite and chlorite.
101	106	33	Same as latter part of 96 to 101, in minor part slightly altered to chloritic rock and transected by thin seams of chlorite and pyrite.
106	110	28	Same as latter part of 96 to 101. Barren.
110	115	32	Light reddish gray, medium grained, impure quartzite. Barren.
115	120	29	Dark reddish gray, fine grained biotite quartzite, transected by few thin quartz and chlorite veinlets; barren.
120	125	42	Light to medium reddish gray and dark greenish gray, medium grained quartzite, slightly chloritized and transected by few thin quartz and chlorite veinlets. Barren.
125	130	60	Same as 120 to 125, a little more chloritized in part. Contains faint disseminations of pyrite.
130	132	19	Same as 120 to 125. Barren.
132	137	55	Medium to dark reddish gray, medium to fine grained impure quartzite and biotite quartzite. Trace of chalcopyrite.
137	141	37	Dark reddish gray, fine grained biotite quartzite. Film trace of molybdenite.
141	146	47	Light to dark reddish gray, medium to fine grained, impure quartzite and biotite quartzite. Thin seams of chalcopyrite and pyrite.
146	147	6	Same as 141 to 146, in minor part altered to chloritic rock. Barren.
147	150	11	Same as 141 to 146, slightly altered to chloritic along seams, and core somewhat broken. Barren.
150	155	12	Same as 141 to 146, in part slightly brecciated, chloritized, and recemented with quartz. Barren except for one poor concentration, one seam, of pyrite.

Hole B-14 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
155	157	18	Medium greenish gray, medium grained, chloritic quartz granulite, well brecciated and altered, recemented with quartz and chlorite. Contains poor disseminations of pyrite.
157	161	27	Same as 155 to 157, in part highly altered to soft clayey rock which looks like fault gouge. Well brecciated and recemented with quartz and chlorite. Contains one poor concentration, some disseminations, of pyrite and chalcopyrite.
161	165	21	Same as 155 to 157, in part highly altered to soft clayey rock. Interval 157 to 165 may indicate fault zone. Barren.
165	170	27	Same as 155 to 157, in part more chloritic and altered. Contains one fair concentration of pyrite, poor disseminations of pyrite, chalcopyrite, and pyrrhotite.
170	175	20	Same as 155 to 157, generally well altered throughout to clayey minerals, and somewhat broken. Barren.
175	179	18	Same as 155 to 157, highly altered throughout to clayey minerals, broken into small fragments. Contains one poor concentration of pyrite with some chalcopyrite.
179	184	53	Same as 155 to 157. Barren.
184	186	24	Dark reddish gray, fine grained biotite quartzite, in part brecciated, chloritized, and altered to clayey minerals. Contains poor concentration of pyrite and galena with chalcopyrite. Gouge material last 3 inches.
186	190	42	Light to medium grayish green, medium to fine grained, clayey-chloritic quartz granulite, somewhat brecciated, altered, and recemented with quartz. Contains faint disseminations of pyrite and chalcopyrite.
190	192	22	Same as 186 to 190. Sparse pyrite.
192	197	60	Medium light to dark green, soft, chloritic hornfels, brecciated and recemented with quartz and chlorite. Contains good to fair concentrations and poor seams of pyrite with minor chalcopyrite, galena, sphalerite, and smithsonite. Also one pocket of molybdenite.
197	201	47	Same rock and mineralization as 192 to 197.
201	205	36	Same as 192 to 197, in part chloritic quartz granulite. Contains one good concentration, two fair seams of pyrite with minor galena, chalcopyrite, and sphalerite.

Hole B-14 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
205	207	23	Medium light to dark grayish green, chloritic, quartz granulite, with one fragment of dark reddish gray, fine grained, biotite quartzite. Contains one thin seam of pyrite.

Hole B-15

Location: 10,431 N., 10,093 E - 700 level
Elevation of collar: 5,073
Depth: 151

Inclination: -5°
Bearing: N. 45° E.

Footage From-	Footage To-	Core recovery, inches	Description
0	3	30	Medium dark grayish green, chloritic hornfels; deformed and sheared, transected by veinlets of crystalline white quartz. Contains poor seams and disseminations of pyrite and chalcopyrite, trace of molybdenite.
3	4	12	Same as 0 to 3. Contains sparse pyrite, trace of pyrrhotite.
4	6	17	Same as 0 to 3. Sparse pyrite.
6	7	12	Same as 0 to 3, in part more siliceous, slightly brecciated and recemented with white quartz. Trace of pyrite.
7	9	18	Same as 0 to 3, in part more siliceous. Contains fair seams of pyrite with very minor chalcopyrite and smithsonite.
9	12	25	Same as 0 to 3, although highly siliceous, in part well brecciated and altered, recemented with crystalline quartz and chlorite. Contains traces of pyrite, pyrrhotite, and chalcopyrite.
12	15	36	Medium to medium dark grayish green, fine grained, massive quartzite (nearly chert), and chloritic hornfels. Contains inclusions or remnants of former rock consisting of medium reddish brown, biotite granulite, which clearly illustrates the gradation in alteration from biotite to chlorite. Contains faint disseminations of pyrite, chalcopyrite, pyrrhotite, trace of sphalerite, galena (?), and molybdenite.
15	20	60	Light to medium dark grayish green, fine grained, massive quartzite and chert, slightly brecciated in part and transected by thin chlorite veinlets. Contains few inclusions of former rock as in 12 to 15, traces of pyrrhotite and chalcopyrite.

Hole B-15 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
20	25	60	Same as 15 to 20, except last 26 inches of dark grayish green, soft, chloritic hornfels, containing heavy concentrations of pyrite with minor chalcopyrite, sphalerite, and smithsonite. There is locally in the first part of this section, soft, clayey, altered rock.
25	28	34	Medium dark grayish green, chloritic hornfels, in part soft clayey-chloritic, in part siliceous, somewhat brecciated and recemented with quartz. Contains faint disseminations of pyrite, pyrrhotite, and smithsonite, trace of molybdenite.
28	31	36	Same as 25 to 28. Contains one heavy concentration (nearly solid core for 4-1/2 inches) of pyrite with minor sphalerite and chalcopyrite, otherwise poor disseminations of pyrite and chalcopyrite.
31	36	59	Same as 25 to 28, in part quartzite. Contains few fair to good concentrations of pyrite with minor chalcopyrite and sphalerite, also poor to fair disseminations of pyrite and chalcopyrite.
36	40	48	Same as 25 to 28, in part quartzite. Contains one fair concentration of pyrite with minor chalcopyrite. Quartzite barren.
40	44	44	Same as 25 to 28, in part cherty. Contains poor disseminations of pyrite and sphalerite.
44	49	60	Same as 25 to 28, in minor part cherty. Contains faint disseminations of pyrite and chalcopyrite.
49	52	36	Same as 25 to 28. Contains poor to fair concentrations of pyrite with minor sphalerite, chalcopyrite, and smithsonite.
52	56	33	Same as 25 to 28, well brecciated. Contains one poor concentration of pyrite with smithsonite, otherwise barren.
56	61	32	Medium greenish gray, impure quartzite and medium dark green breccia of quartzite fragments in chloritic groundmass. May indicate fault zone. Trace of pyrite.
61	65	36	First 10-1/2 inches medium reddish gray, fine grained, hornfels containing trace of pyrrhotite. Rest of section light greenish gray quartzite containing trace of pyrite and chalcopyrite.
65	69	32	Light greenish gray quartzite, in minor part chloritic and somewhat brecciated and having minor inclusions of light reddish gray quartzite. Contains trace of pyrrhotite, chalcopyrite, and pyrite.

Hole B-15 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
69	74	60	Mottled light reddish and greenish gray, impure quartzite, well brecciated and recemented with quartz and chlorite, in part more chloritic. Contains one poor concentration of pyrite, chalcopyrite, and smithsonite, otherwise faint disseminations of pyrrhotite, chalcopyrite, sphalerite, trace of galena.
74	78	46	Medium greenish gray, impure quartzite, in part chloritic, well brecciated and recemented with quartz and chlorite. Contains poor to good concentrations of pyrite with minor chalcopyrite and smithsonite, trace of sphalerite.
78	83	51	Medium greenish gray quartzite and siliceous hornfels, somewhat brecciated and recemented with quartz and chlorite. Contains sparse pyrite and chalcopyrite.
83	87	28	Same as 78 to 83 for first 15 inches, in sparse pyrite and chalcopyrite. Rest of section medium dark grayish green, soft, brecciated, altered, chloritic hornfels with heavy concentrations of pyrite, chalcopyrite, some sphalerite and smithsonite.
87	91	45	Same as latter part of 83 to 87, in part medium greenish gray, chloritic quartzite. Contains heavy concentrations of pyrite, chalcopyrite, and smithsonite, trace of sphalerite.
91	96	60	Same as latter part of 83 to 87, first 32 inches. Contains heavy concentrations of pyrite with smithsonite, minor sphalerite, chalcopyrite, and possibly rhodonite or rhodochrosite. Rest of section medium greenish gray quartzite, well brecciated and recemented with quartz and chlorite, and containing sparse pyrite.
96	101	60	Medium to dark grayish green quartzite and chloritic hornfels, somewhat brecciated and recemented with quartz and chlorite. Except for one fair concentration of pyrite, it is sparse with pyrite.
101	106	58	Same as 96 to 101, in part. Generally more quartzite, well brecciated and recemented with much white quartz. Contains faint disseminations of pyrite, chalcopyrite, and pyrrhotite.
106	111	54	Same as 96 to 101. Contains poor to fair concentrations of pyrite with chalcopyrite and smithsonite, possibly rhodonite or rhodochrosite, also minor patches of marcasite.
111	116	53	Same as 96 to 101, well brecciated and somewhat more siliceous. Contains sparse pyrite and chalcopyrite.

Hole B-15 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
116	121	60	Same as 96 to 101, well brecciated and somewhat more siliceous. Contains two poor concentrations of pyrite with minor chalcopyrite and sphalerite; otherwise faint disseminations of pyrite and chalcopyrite.
121	125	45	Medium greenish gray, chloritic quartzite, in part having tinge of reddish gray, well brecciated and recemented with quartz. Contains one poor concentration of pyrite with chalcopyrite.
125	129	48	Same as 121 to 125. Contains poor concentrations of sphalerite with minor pyrite, otherwise faint chalcopyrite and pyrite.
129	134	60	Same as 121 to 125, but more chloritic and strongly brecciated. Contains few fragments of reddish gray quartzite and much altered clayey-chloritic hornfels. Contains sparse pyrite, sphalerite, and chalcopyrite.
134	136	18	Same as 129 to 134. Contains sparse pyrite, sphalerite, and chalcopyrite.
136	141	60	Same as 129 to 134, except brecciated more intensely and containing more altered, clayey fragments. Contains sparse pyrite, sphalerite, and chalcopyrite.
141	146	48	Light to medium dark greenish gray, altered, clayey-chloritic hornfels and quartzite, in part strongly brecciated. Last 5 inches medium dark reddish gray, fine grained, impure quartzite. Contains sparse pyrite, trace of sphalerite.
146	151	60	Light to dark reddish gray, fine to medium grained, impure quartzite and hornfels, in part slightly brecciated and chloritic, and transected by thin quartz and chlorite veinlets. Barren.

Hole B-16

Location: 10,431 N., 10,081 E. - 700 level
Elevation of collar: 5,073
Depth: 180

Inclination: -50
Bearing: N. 30° W.

Footage From-	Footage To-	Core recovery, inches	Description
0	5	58	Medium dark reddish gray, massive biotite quartzite, in part slightly chloritized, and transected by few veinlets of quartz and seams of epidote. Contains few seams and poor general disseminations of pyrite and pyrrhotite.

Hole B-16 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
5	6	12	Same rock and mineralization as 0 to 5.
6	11	60	In first 28 inches dark reddish and greenish gray, impure quartzite. Greenish tinge, caused by chloritization of biotite, unevenly splotches the rock. Prominent quartz veinlet parallels length of core. Rest of core medium dark grayish green, siliceous chloritic hornfels, well brecciated and recemented with quartz. Contains one poor concentration of chalcopyrite and poor disseminations of pyrite, some smithsonite.
11	14	29	Medium greenish gray, slightly chloritized quartzite, in part well brecciated and recemented with quartz and chlorite; contains, one heavy, other poor, concentrations of pyrite with some chalcopyrite.
14	18	42	In part medium dark grayish green chloritic hornfels, in part dark reddish to greenish gray, impure quartzite. In part well brecciated and recemented and transected with quartz. Contains one fair to good concentration of pyrite with minor chalcopyrite and smithsonite, otherwise poor disseminations and seams of pyrite, trace of sphalerite.
18	22	32	Medium dark grayish green, chloritic hornfels, in part siliceous, strongly brecciated and recemented with quartz and chlorite. Contains poor to good concentrations of pyrite with minor chalcopyrite, sphalerite, and smithsonite as filling and replacement in breccia matrix.
22	26	39	Medium greenish gray, chloritic quartzite, in part highly chloritic hornfels, brecciated and recemented with quartz and chlorite. Toward bottom of section core broken in small fragments showing some slickensides. Contains some poor concentrations of pyrite with minor chalcopyrite and sphalerite, some limonite. Core includes some fragments of dark reddish gray quartzite.
26	28	19	Core broken into fragments, some altered and clayey, other dark grayish green, chloritic hornfels, and dark reddish to greenish gray, impure quartzite. Contains sparse pyrite and chalcopyrite.
28	31	10	Medium to dark greenish gray, chloritic hornfels and quartzite in broken fragments. Trace of pyrite.
31	36	12	Medium dark greenish gray, impure quartzite, slightly chloritized, altered, and broken into fragments. Contains sparse pyrite.
36	41	12	Same as 31 to 36, in part chloritic hornfels, broken into fragments. Trace of pyrite. Character of rock and nature of core from 25 to 41 indicates fracture or fault zone.

Hole B-16 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
41	46	19	Medium light gray and reddish gray quartzite, transected by thin quartz veinlets and faint seams of pyrite.
46	51	33	Light reddish gray quartzite, slightly brecciated and transected by thin quartz veinlets. Contains trace of pyrite, chalcopyrite, and pyrrhotite.
51	56	20	Light greenish gray quartzite, broken into fragments, with one fragment of chloritic hornfels. Contains thin seam of pyrite.
56	61	19	Light reddish gray quartzite, transected by few thin veinlets of quartz and seams of pyrite.
61	63	19	Medium light greenish and reddish gray, slightly chloritized quartzite. Contains one concentration of fine grained biotite, thin seams of pyrite.
63	66	25	Medium greenish and reddish gray chloritic quartzite, brecciated and recemented with quartz and chlorite. Contains trace of pyrite and chalcopyrite.
66	69	32	Medium dark grayish green, chloritic quartzite and hornfels, brecciated and recemented with quartz and chlorite. Contains one fair concentration, some poor seams, of pyrite with minor chalcopyrite and smithsonite, trace of sphalerite.
69	71	22	Same as 66 to 69. Contains sparse pyrite and chalcopyrite, film of molybdenite along seam.
71	74	34	Dark grayish green, chloritic hornfels, in part highly siliceous, well brecciated and recemented with quartz and chlorite. Contains poor to good concentrations and seams of pyrite with less chalcopyrite, minor smithsonite.
74	78	29	Medium greenish gray quartzite, somewhat chloritized and brecciated, and recemented with quartz and chlorite. Contains one good concentration of pyrite with abundant chalcopyrite.
78	83	35	Same as 74 to 78. Contains sparse pyrite and chalcopyrite.
83	86	34	Medium reddish to greenish gray biotite quartzite, slightly chloritized throughout in irregular patches, and but slightly brecciated. Contains sparse pyrite, one minor spot of sphalerite.
86	90	48	Light to medium dark grayish green chloritic quartzite and hornfels, brecciated and recemented with quartz and chlorite. Contains poor to fair concentrations and seams of pyrite with minor chalcopyrite, sphalerite, and smithsonite.
90	93	30	Medium gray and medium light reddish gray quartzite, only slightly brecciated. Contains faint seams of pyrite.

Hole B-16 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
93	98	60	Same as 90 to 93. Trace of pyrite, pyrrhotite, and chalcopyrite.
98	100	18	First 4-1/2 inches anhedral, massive, white vein quartz. Rest same as 90 to 93. Contains trace of chalcopyrite and pyrite.
100	105	29	Medium light reddish and greenish gray quartzite, slightly chloritized; and less medium dark grayish green, chloritic hornfels. Well brecciated and recemented with quartz. Contains sparse pyrite and smithsonite.
105	110	47	Medium greenish gray, chloritic quartzite except for last 8 inches of medium reddish gray quartzite. Well brecciated and recemented with quartz. Contains fair to good concentrations of pyrite, with trace of chalcopyrite.
110	113	24	Medium greenish gray, chloritic quartzite, well brecciated and recemented with quartz. Contains one poor concentration of pyrite with trace of chalcopyrite.
113	118	32	Same as 110 to 113. Contains poor tofair concentrations of pyrite, one fair seam of molybdenite, trace of chalcopyrite.
118	121	19	Same as 110 to 113. Contains one good concentration of pyrite.
121	124	20	Same as 110 to 113, in minor part chloritic hornfels. Contains poor to good concentrations of pyrite and chalcopyrite, minor smithsonite, trace of sphalerite.
124	128	29	In part same as 110 to 113, in part chloritic hornfels, and in part medium reddish gray quartzite. Core broken into fragments. Contains one fair concentration of pyrite with minor chalcopyrite.
128	130	21	Same as 110 to 113. Contains sparse pyrite except for one fair concentration.
130	135	19	Same as 110 to 113. Barren.
135	139	6	Same as 110 to 113. Contains trace of pyrite.
139	142	17	Medium light reddish and greenish gray quartzite, slightly brecciated. Contains sparse pyrite.
142	146	30	Medium greenish gray, chloritic quartzite, well brecciated and recemented with quartz. Contains one poor concentration of sphalerite, several poor concentrations of pyrite with minor chalcopyrite.
146	150	22	Medium light reddish and greenish gray quartzite, somewhat brecciated and recemented with quartz. Contains thin seams of pyrite with trace of galena.

Hole B-16 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
150	155	26	Same as 146 to 150. Contains one fair concentration of pyrite with minor chalcopyrite.
155	160	29	Same as 146 to 150. Contains few poor concentrations of sphalerite, little galena, sparse pyrites and chalcopyrite.
160	165	42	Medium greenish gray, medium grained chloritic quartz granulite, in part highly chloritic, well brecciated and recemented with quartz. Contains poor to fair concentrations of sphalerite, trace of pyrite.
165	170	40	Light reddish to greenish gray, medium grained clayey-chloritic quartz granulite. Trace of chalcopyrite.
170	175	11	Medium light to dark reddish gray, medium grained, impure quartzite. Barren.
175	180	42	Light reddish gray, medium grained quartzite. Barren.

Hole B-17

Location: 10,157 N., 10,184 E. - 700 level Dip: -45°
Elevation of collar: 5,069 Bearing: S. 10° E.
Depth: 87 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	5	50	Medium greenish gray, chloritic quartz conglomerate, somewhat brecciated and recemented with white quartz and chlorite. Contains one poor concentration of pyrite and sphalerite, otherwise faintly disseminated with chalcopyrite and pyrrhotite.
5	7	22	Same as 0 to 5. Barren except for trace of pyrite, chalcopyrite, and pyrrhotite.
7	10	30	Same as 0 to 5, as well cemented as quartzite. Barren except for trace of pyrite and pyrrhotite, little smithsonite.
10	15	50	First 29 inches same as 0 to 5, slightly more chloritic. Rest of section medium to medium dark greenish gray, medium grained chlorite quartz granulite, slightly brecciated and recemented with quartz, in part somewhat altered to clay minerals. Contains one fair concentration of pyrite with minor sphalerite and chalcopyrite, otherwise only traces of pyrite and chalcopyrite.

Hole B-17 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
15	20	59	First 9 inches same as latter part of 10 to 15. Rest of section medium greenish gray, chloritic quartz conglomerate, somewhat brecciated and recemented with quartz and chlorite. Contains poor disseminations of pyrite, pyrrhotite, and chalcopyrite.
20	23	36	Same as latter part of 15 to 20, slightly more chloritic. Contains poor to fair disseminations of pyrite with minor chalcopyrite and pyrrhotite.
23	28	60	In part same as latter part of 15 to 20, in part medium greenish gray, medium grained, chlorite quartz granulite. Contains one fair concentration of pyrite, poor disseminations of pyrite, sphalerite, and chalcopyrite.
28	31	24	Same as 23 to 28. Contains poor to fair disseminations of pyrite with trace of pyrrhotite, and sphalerite.
31	35	42	Medium greenish gray, chloritic quartz conglomerate, brecciated and recemented with quartz and chlorite. Contains few poor disseminations of pyrite, trace of pyrrhotite and chalcopyrite.
35	36	5	Medium greenish gray, medium grained chlorite quartz granulite. Few fragments. Trace of pyrite.
38	43	60	Medium to medium dark greenish gray, highly chloritic quartz conglomerate, brecciated and recemented with quartz and chlorite. Contains faint to poor disseminations of pyrite, sphalerite, trace of pyrrhotite, and chalcopyrite.
43	47	38	Medium to medium dark greenish gray, medium grained, chlorite quartz granulite, in part altered to clayey minerals, slightly brecciated and recemented with chlorite and quartz. Contains poor concentrations and seams of sphalerite, galena, and pyrite, trace of chalcopyrite.
47	50	27	Same as 43 to 47. Contains poor concentrations and seams of sphalerite and pyrite, with minor chalcopyrite.
50	55	60	Medium light to dark reddish gray, fine to medium grained, impure quartzite with faint seams of pyrite and chalcopyrite.
55	60	60	Same as 50 to 55, in part slightly chloritized along seams. Contains few poor seams of pyrite with minor sphalerite and chalcopyrite.
60	65	55	Same as 50 to 55, in part slightly chloritized and transected by thin quartz veinlets. Contains one poor concentration of pyrite, faint seams of pyrite with minor sphalerite, chalcopyrite, and pyrrhotite.

Hole B-17 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
65	70	60	First 12 inches dark reddish gray hornfels containing fine disseminations of pyrite and pyrrhotite. Rest of section altered to medium greenish gray, clayey-chloritic hornfels, somewhat broken and recemented with chlorite. Contains one heavy concentration other fair seams of pyrite with sphalerite.
70	74	33	Same as latter part of 65 to 70, generally more altered and somewhat sheared in part. Contains poor seams of pyrite with minor sphalerite and chalcopyrite.
74	77	34	Same as latter part of 65 to 70, in part somewhat sheared and broken. In part, and as inclusions, unaltered dark reddish gray hornfels. Contains poor seams and disseminations of pyrite and sphalerite, trace of chalcopyrite.
77	80	16	Medium dark reddish gray hornfels, transected by few quartz veinlets and in part altered to chlorite. Trace of pyrite.
80	85	45	Medium light greenish gray, medium grained, impure quartzite, slightly chloritic. Contains few faint seams of pyrite and sphalertie.
85	87	21	Medium light reddish and greenish gray to dark reddish gray, fine to medium grained, impure quartzite. Barren.

Hole B-18

Location: 10, 158 N., 10,184 E. - 700 level Dip: -75°
Elevation of collar: 5,069 Bearing: S. 10° E.
Depth: 140 feet

Footage From-	Footage To-	Core recovery, inches	Description
0	2	17	Light to medium greenish gray, chloritic quartz conglomerate, somewhat brecciated and recemented with quartz and chlorite. Contains poor disseminations of pyrite and chalcopyrite.
2	5	35	Same as 0 to 2, in part highly chloritic. Contains poor to fair disseminations of pyrite with minor chalcopyrite.
5	9	46	Same as 0 to 2, in part as well cemented as quartzite. Contains poor to faint disseminations of pyrrhotite, pyrite, and chalcopyrite.

Hole B-18 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
9	12	23	Same as 0 to 2, in part altered to clayey rock. Contains faint disseminations of pyrite.
12	16	48	Same as 0 to 2, in part more chloritic, well brecciated. Contains one good concentration, faint disseminations, of pyrite and chalcopyrite.
16	21	23	Same as 0 to 2, well brecciated. Contains one fair concentration of pyrite with minor chalcopyrite.
21	25	48	Medium light to dark greenish gray, medium grained, chlorite quartz granulite, well brecciated and recemented with quartz and chlorite. Contains one fair concentration of pyrite and chalcopyrite with minor sphalerite in seams.
25	30	50	Light greenish gray, medium grained quartzite. Contains few poor to fair concentrations of pyrite with faint seams of chalcopyrite.
30	35	52	In part same as 25 to 30, in part medium greenish gray, medium grained, chlorite quartz granulite, brecciated and recemented with quartz and chlorite. Contains faint dissemination of pyrite.
35	39	38	Medium greenish gray, highly chloritic quartz conglomerate, somewhat brecciated and recemented with quartz and chlorite. Contains few poor concentrations of sphalerite.
39	44	45	Same as 35 to 39. Contains faint disseminations of pyrite, sphalerite, and chalcopyrite.
44	47	20	Same as 35 to 39. Contains faint disseminations of pyrite, sphalerite, and chalcopyrite.
47	52	24	First part same as 35 to 39, latter part medium light greenish to reddish gray, medium to fine grained impure quartzite and hornfels. Trace of pyrite and sphalerite.
52	57	13	Same as latter part of 47 to 52, altered soft and clayey, broken in fragments. Characteristic fault gouge. Barren.
57	60	9	Medium light greenish gray, medium grained, clayey-chloritic quartz granulite, broken in fragments. Barren, Probable fault zone 52 to 60.
60	63	14	Same as 57 to 60. Barren.
63	68	36	Same as 57 to 60. Barren.
68	71	34	Medium light to dark reddish gray, fine to medium grained impure quartzite. Contains one faint dissemination of pyrite.
71	74	23	Same as 68 to 71. Trace of pyrite, molybdenite, chalcopyrite.
74	77	30	Medium light reddish gray, medium grained impure quartzite. Barren.

Hole B-18 (Cont.)

Footage From-	Footage To-	Core recovery, inches	Description
77	81	46	Same as 74 to 77, in part slightly chloritized. Contains one faint seam of chalcopyrite, film of molybdenite.
81	85	12	Same as 74 to 77, in part slightly chloritized. Trace of chalcopyrite and molybdenite.
85	88	4	Medium light reddish to greenish gray, medium grained impure quartzite. Trace of pyrite.
88	91	13	Same as 85 to 88. Barren.
91	94	11	Same as 85 to 88 except fine grained and somewhat brecciated and broken, and recemented with quartz. Trace of pyrite.
94	96	9	Medium dark reddish gray, fine grained impure quartzite, slightly chloritized along seams. Films of pyrite.
96	98	12	Fragmentary but consists of medium to dark reddish gray, fine to medium grained impure quartzite, in part slightly altered to chlorite, slightly brecciated and recemented with quartz. Contains two spots of sphalerite.
98	100	5	Medium gray, medium grained quartzite. Barren.
100	103	7	Medium light reddish gray, medium grained quartzite. Barren.
103	105	9	Medium light to dark reddish gray to gray, medium grained quartzite. Barren.
105	108	24	Same as 103 to 105. Trace of pyrite and chalcopyrite.
108	113	30	Same as 103 to 105, except fine to medium grained. Contains faint pyrite and molybdenite.
113	117	15	Medium gray and medium dark reddish gray, fine to medium grained quartzite. Faint pyrite.
117	120	13	Same as 113 to 117, transected by thin quartz and chlorite veinlets. Barren.
120	125	55	Medium dark reddish gray, fine grained, biotite granulite and hornfels, transected by numerous thin quartz veinlets. Trace of pyrite.
125	130	60	Light greenish gray and medium light to dark reddish gray, fine to medium grained quartzite, transected by thin quartz veinlets. Contains trace of pyrite and chalcopyrite.
130	132	9	Medium light gray, medium grained quartzite. Barren.
132	135	28	Same as 130 to 132, slightly altered to clayey minerals in inter-granular spaces. Few chlorite seams. Contains one poor concentration of pyrite, otherwise barren.
135	140	46	Same as 132 to 135. Contains few poor to fair seams and pockets of pyrite, trace of sphalerite and chalcopyrite.

Interior - Bureau of Mines, Pittsburgh, Pa.

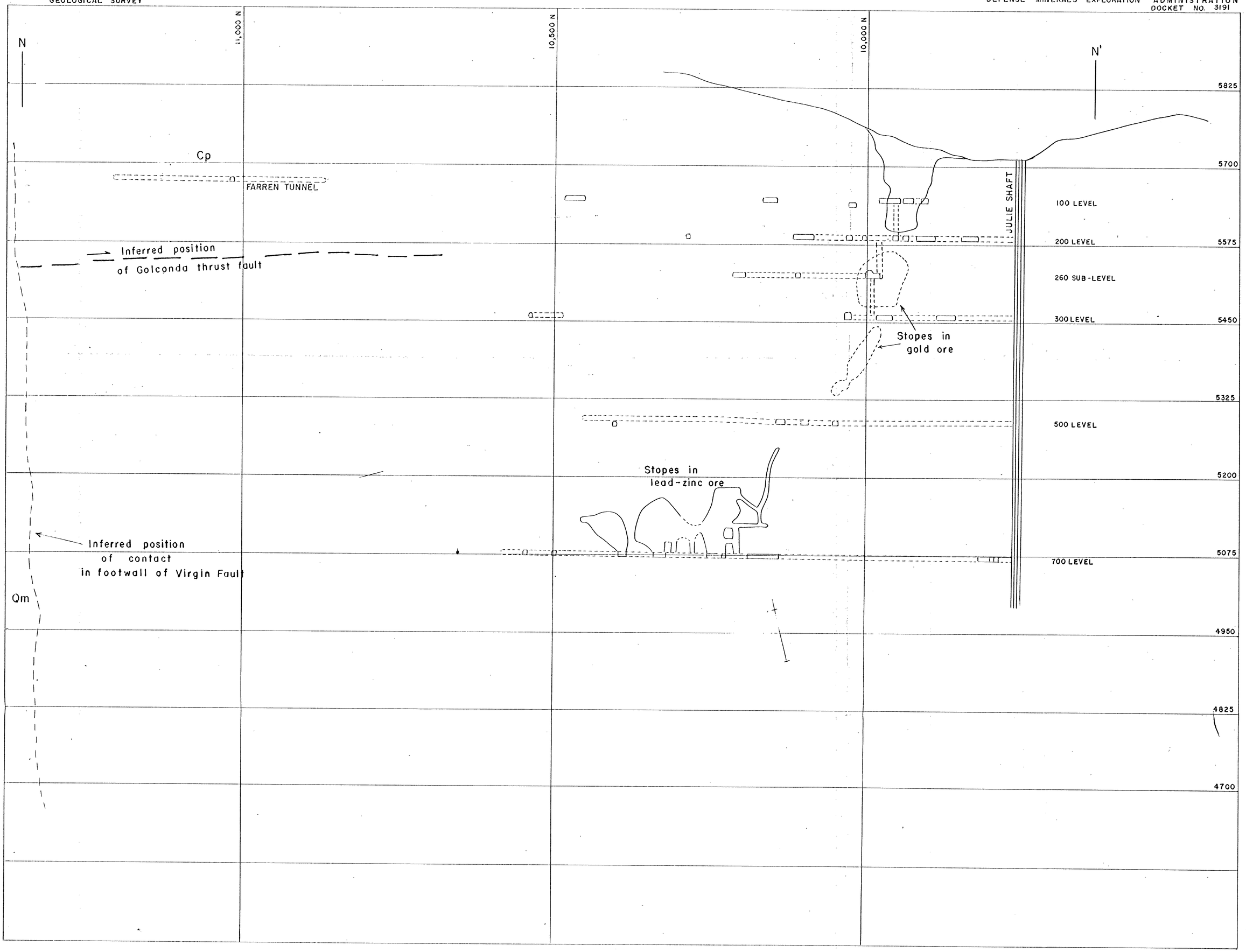


FIGURE 4

CROSS SECTION N–N'
COPPER CANYON MINE

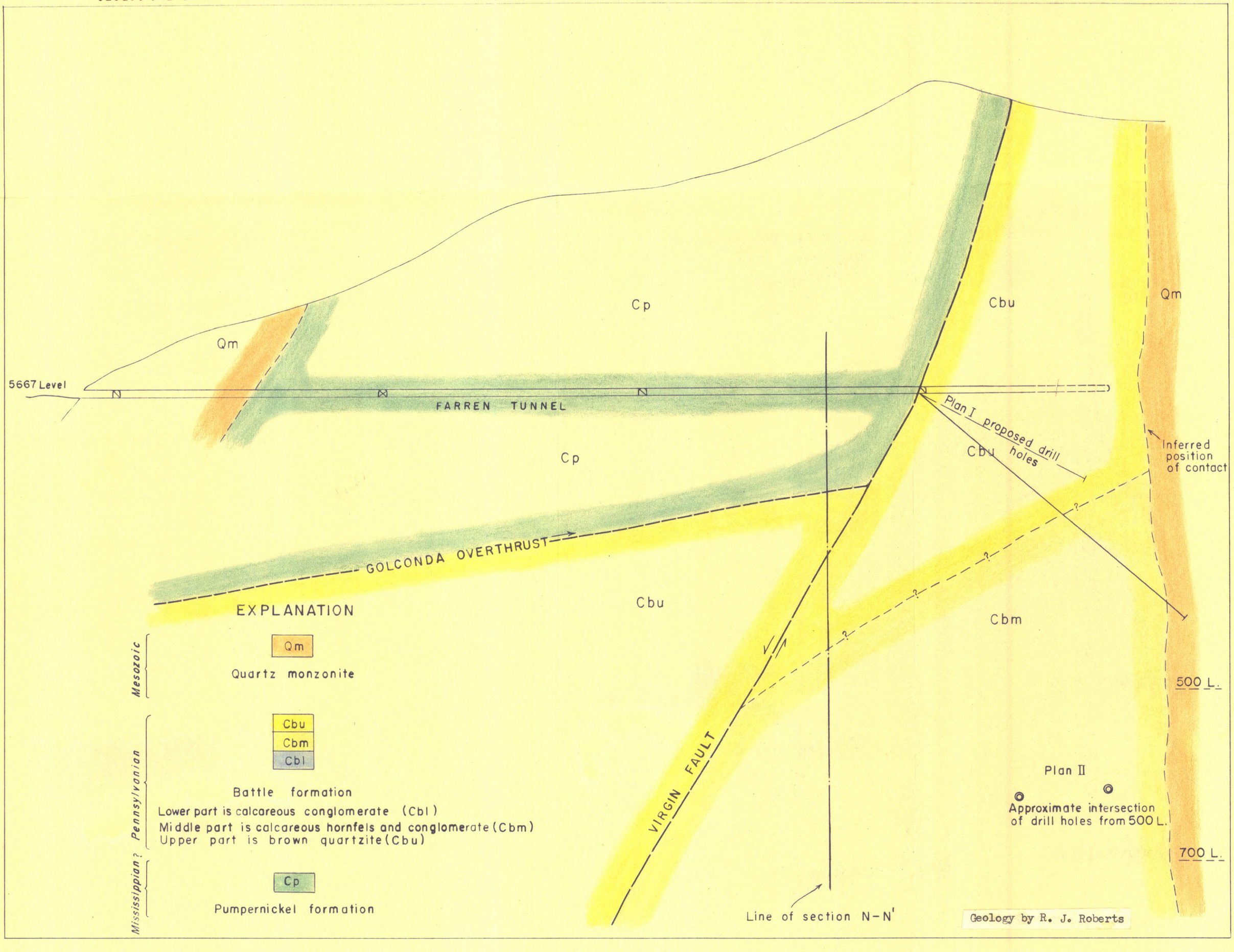
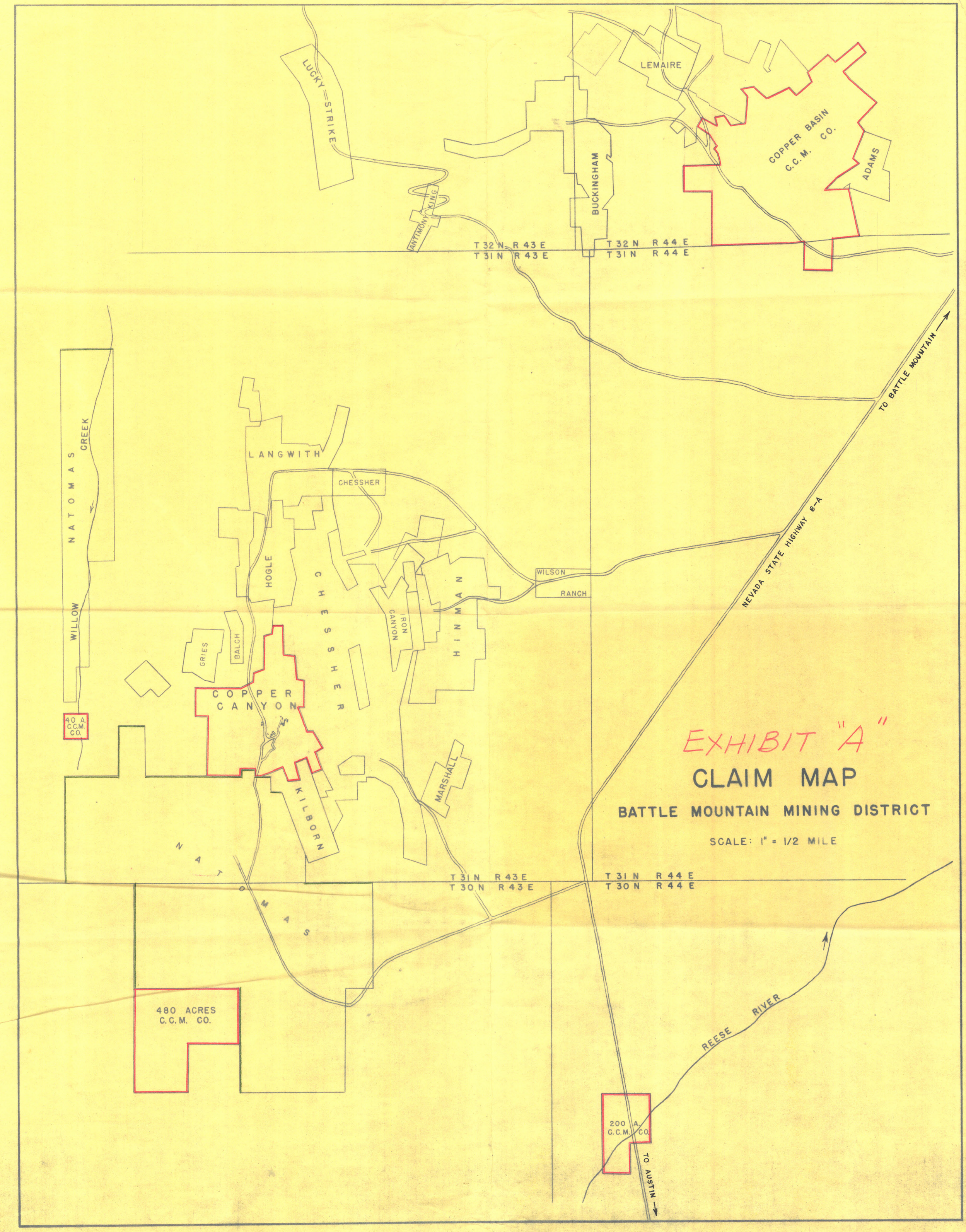


FIGURE 3

SECTION ALONG FARREN TUNNEL
COPPER CANYON MINE

100 0 100 FT.


LUCKY STRIKE
ANTIMONY KING
BUCKINGHAM
LEMAIRE
COPPER BASIN
C.C.M. CO.
ADAMS
T 32 N R 43 E
T 31 N R 43 E
T 32 N R 44 E
T 31 N R 44 E
TO BATTLE MOUNTAIN
NEVADA STATE HIGHWAY 8-A
NATOMAS CREEK
WILLOW
LANGWITH
CHESSHER
HOGLE
CHESSHER
IRON CANYON
HINMAN
WILSON RANCH
GRIES
BALCH
COPPER CANYON
40 A. C.C.M. CO.
KILBORN
MARSHALL
NATOMAS
T 31 N R 43 E
T 30 N R 43 E
T 31 N R 44 E
T 30 N R 44 E
480 ACRES
C.C.M. CO.
REESE RIVER
200 A.
C.C.M. CO.
TO AUSTIN
EXHIBIT "A"
CLAIM MAP
BATTLE MOUNTAIN MINING DISTRICT
SCALE: 1" = 1/2 MILE

COPPER CANYON MINE
COMPOSITE - 500 & 700 LEVELS
SCALE-1"=50'
Exhibit "B"
11,250 N
11,000 N
10,750 N
10,500 N
10,250 N
10,000 N
9,750 N
10,250 E
10,000 E
9,750 E
9,500 E
9,250 E
JULIE SHAFT
500 STATION ELEVATION 5284
700 STATION ELEVATION 5086
700 LEVEL
500 LEVEL
SECTION N
Chg
Cbl
Cbm
Cbu
Mp
Cp
GULCH FAULT
VIRGIN FAULT AT 500 LEVEL
VIRGIN FAULT AT 700 LEVEL
COLLAR D.D.H. 9 300 LEVEL
8-3 N 4° W 182' -20°
HORIZONTAL PROJECTION OF INTERCEPT D.D.H. 9 100'; - 0.56% WO3 82' BELOW 700 LEVEL
PROPOSED HOLES COLLAR AT THIS FACE - 523 DRIFT (500 LEVEL).
HORIZONTAL PROJECTION PROPOSED D.D.H. T-1 LINE N 35° W DIP - 17°
VIRGIN FAULT AT FARREN TUNNEL
FARREN TUNNEL
VIRGIN FAULT PROJECTED NORTHWARD ON 700 LEVEL.
INTERCEPT OF PROPOSED D.D.H. T-1 WITH 700 L. SILL.
"TARGET AREA" IN PLAN AT ELEVATION OF 700 L. SILL.
EXHIBIT "B"
D
LINE OF SECTION EXHIBIT "D"
PORTAL ELEVATION 5667
LEGEND
Color | Lower Plate Symbol | Number | Color | Upper Plate Symbol | Number
Red | Mp | Porphyry
Yellow | Cbu | Upper Member, Battle (horntfels)
Green | Cbm | Middle " "
Orange | Cbl | Lower " "
Brown | Chg | Harmony Grits | Purple | Cp | Pumpernickel

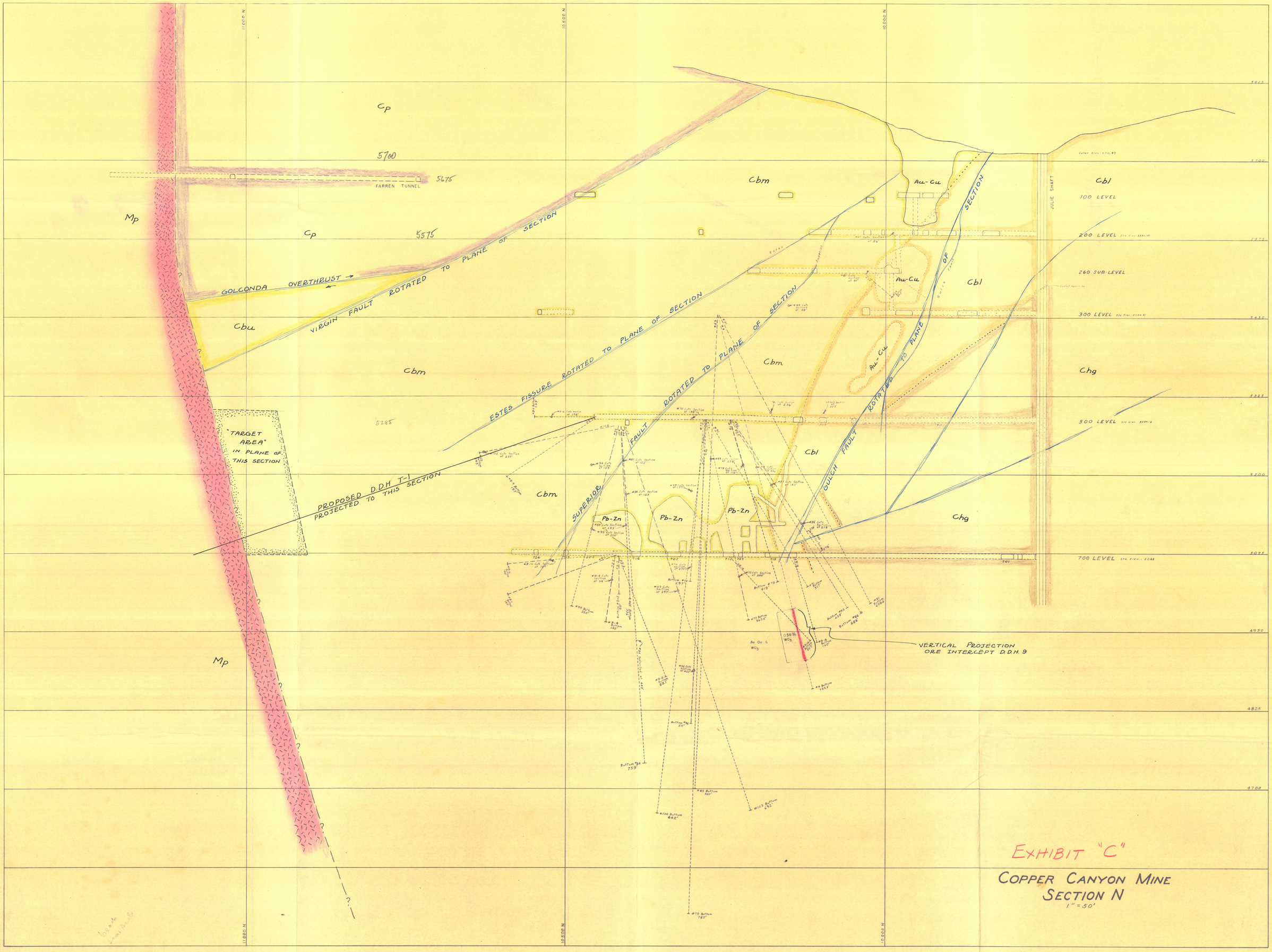
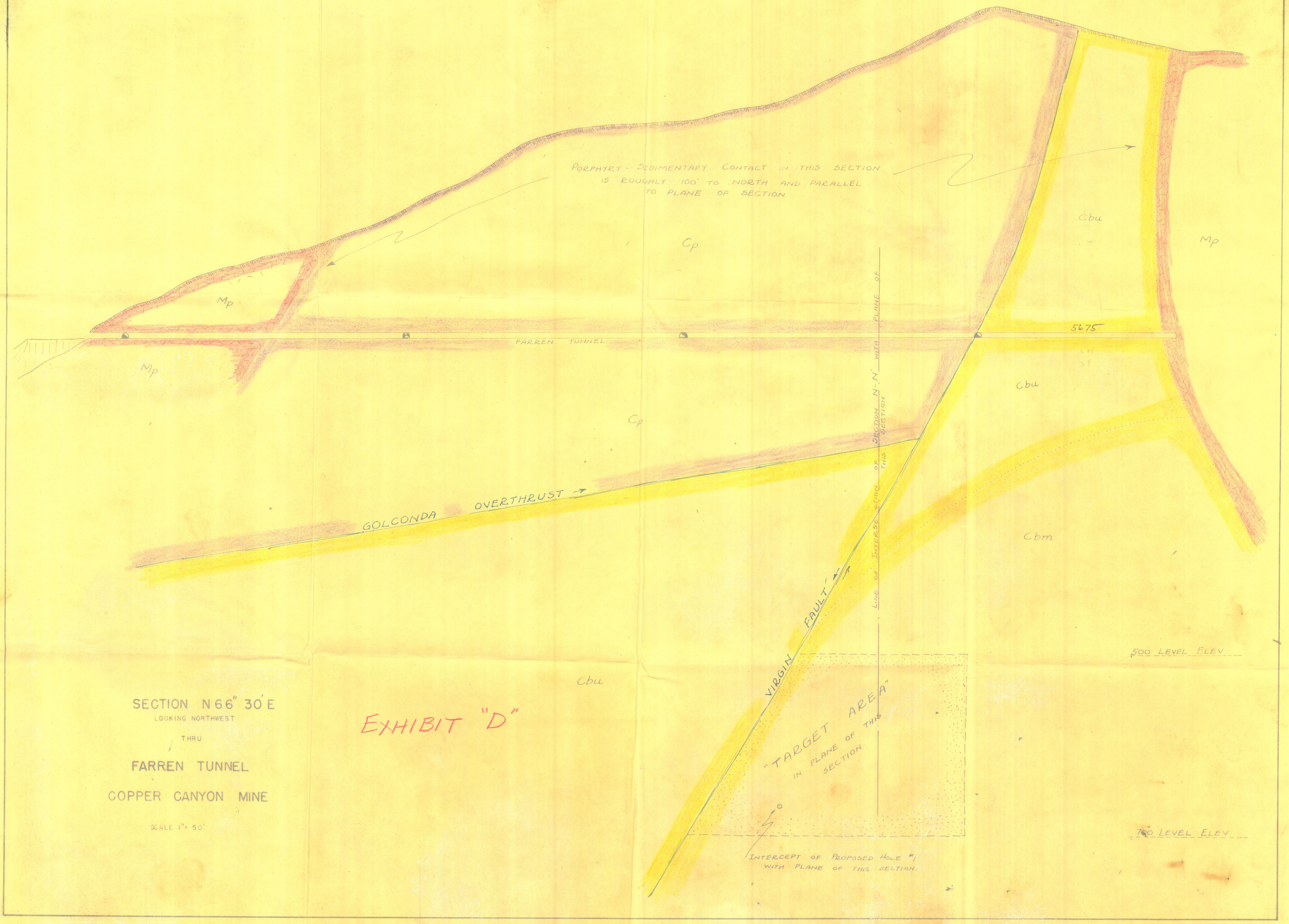


EXHIBIT "C"

COPPER CANYON MINE
SECTION N
1" = 50'


PORPHYRY - SEDIMENTARY CONTACT IN THIS SECTION
IS ROUGHLY 100' TO NORTH AND PARALLEL
TO PLANE OF SECTION.
Cp
Mp
Mp
Mp
Cbu
Cbu
Cbu
Cbm
5675
FARREN TUNNEL
Cp
GOLCONDA OVERTHRUST
LINE OF INTERSECTION OF THIS SECTION WITH PLANE OF SECTION N-N'
VIRGIN FAULT
"TARGET AREA"
IN PLANE OF THIS SECTION
INTERCEPT OF PROPOSED HOLE #1
WITH PLANE OF THIS SECTION
500 LEVEL ELEV
700 LEVEL ELEV
SECTION N 66° 30' E
LOOKING NORTHWEST
THRU
FARREN TUNNEL
COPPER CANYON MINE
SCALE 1" = 50'
EXHIBIT "D"

U. S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DEFENSE MINERALS EXPLORATION ADMINISTRATION
DOCKET NO. 3191

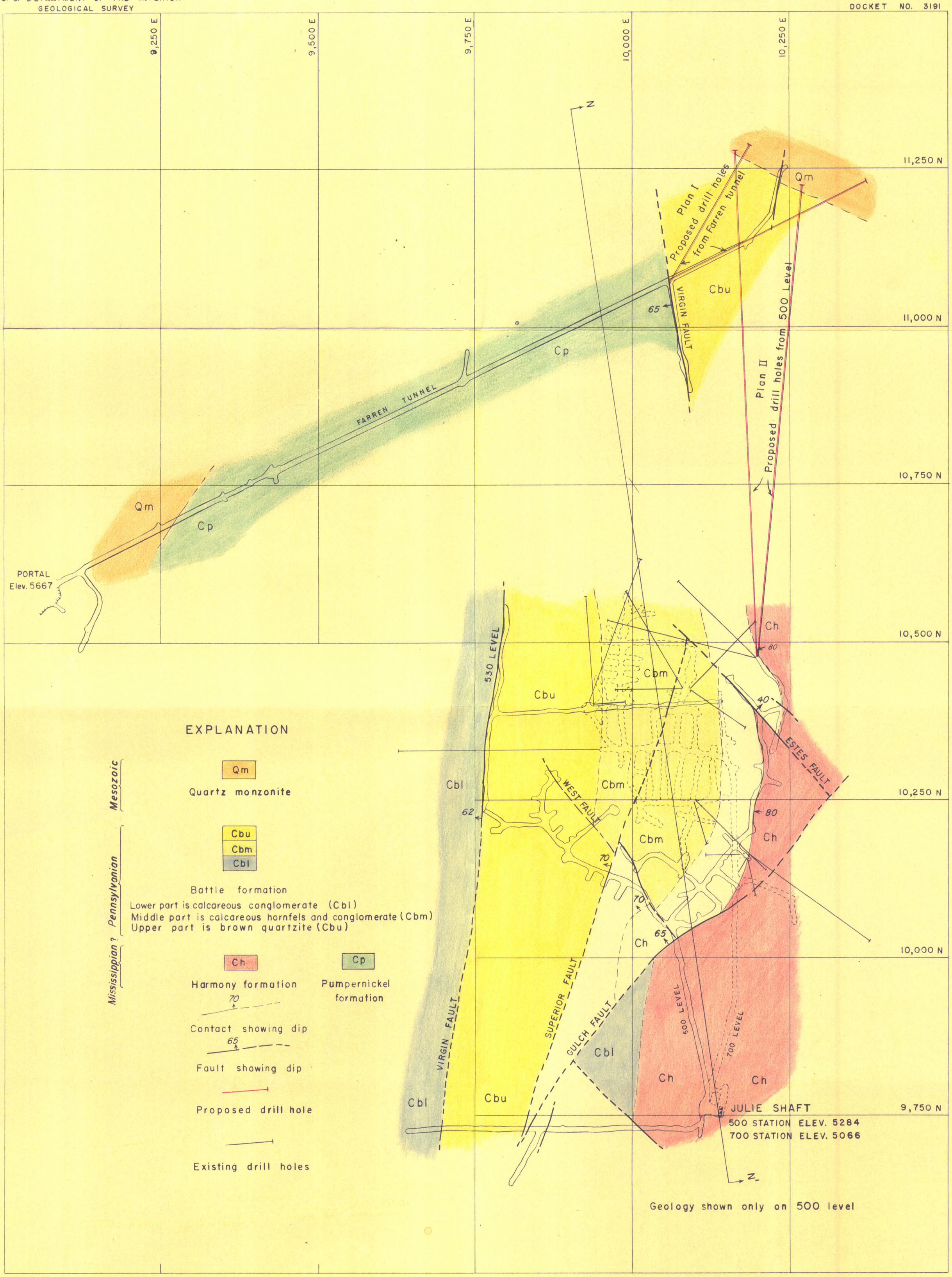


FIGURE 2

MAP OF THE 500, 700 AND FARREN TUNNEL LEVELS
COPPER CANYON MINE

100 0 100 200 FEET
SCALE