4810 0005

(270)

Item 13

BIG MIKE ORE DEPOSIT

PERSHING COUNTY, NEVADA

A SUMMARY REPORT

Ward Carithers
Reno, Nevada
January 5, 1969

BIG MIKE ORE DEPOSIT

A SUMMARY REPORT

The Big Mike oreshoot consists of a broken, secondarily enriched pod of massive copper-iron sulfides enveloped by altered rock containing zones of secondary copper and iron mineralization. A study of drill-hole data developed on the accompanying plans and sections indicates the following:

1. With a 1 percent copper cut-off, the Big Mike oreshoot is calculated to contain

4. The massive sulfide ore of the Big Mike appears to exist in two bodies which are separated by a shear and breccia zone on the 5100 ft level, but which merge into one zone at depth on the 5000 ft level. (See horizontal sections.) The two pods are somewhat different in character, with the eastern one as delineated in holes 7 and 8 having a grade of more than 15 percent copper, and the western one in holes 19, 20 and 27 assaying from 7.21 to 9.77 percent copper. Most of the copper mineralization in the western segment is chalcocite and covellite, but that in the eastern pod also contains considerable chalcopyrite as well as the secondary minerals.

5. The Big Mike sulfide body, consisting originally of pyrite and chalcopyrite, was a much larger mass at one time, probably occupying much of the breccia zone between the two pods and extending upward and westward to the present surface at least. The leaching of this body by supergene water and a redistribution of copper (and iron) into adjacent rocks has formed the envelope of mixed oxide-sulfide ore. A halo of disseminated pyrite as well as calcite veining and limey greenstone all contributed to the fixing of the metals in these adjacent rocks. A considerable amount of acid was generated by the oxidation of the sulfide as evidenced by the quantity of altered rock surrounding the oreshoot, and as the neutralizing effect of the limey rocks was progressively outward, there has been some zoning of the copper minerals. Most of the copper carbonates now occur on the outer fringes of the deposit; copper silicates are probably next, followed inward by the secondary sulfides.

of jasper and more chert above the oreshoot

6. The Big Mike oreshoot has been completely delimited by the present drilling, and the only possibility for more ore at the property is to find another deposit. Hopes for this are somewhat dim at present, but all possibilities have not yet been tested:

(a) Geochemical prospecting with Air-trac holes is continuing west of the mine along the alluvium-covered pediment bordering Grass Valley. One small copper intersection was made last week and is presently being delineated. Also, a mercury vapor anomaly similar to the one around the Big Mike oreshoot has been found in the southwest part of the property and this will be further tested with the air-trac and by deeper holes later if this preliminary work is encouraging.

(b) The geophysical survey completed over the Big Mike property in November, 1968 disclosed several anomalies that were recommended for testing by the geophysists. Five of these have been tested by the air-trac or by diamond drilling with no success. However, one that is considered to hold the most promise has not yet been drilled. It is in greenstone on the southeast trend of the Big Mike shear zone, and it is associated with a geochemical anomaly. The area is 2,000 ft southeast of the mine and will require a drillsite and road. It should be drilled as soon as equipment becomes available.

Appendix

Big Mike Project, Summary of Ore Reserves, January 1, 1969

Tonnage factors:
Massive sulfide ore: 9 Ft^3 per ton
Mixed oxide-sulfide ore: 13 Ft^3 " "

Sulfide ore--Class I

Sections	% Copper	Tons	Grade-ton units
K and L	7.625	34,700	264,587
L " M	15.479	39,100	605,229
Total	11.786	73,800	869,816
Say:------------	11.78 % Cu	74,000 tons	

Oxide and mixed ore--Class II A (plus 1% Cu)

Section	% Copper	Tons	Grade-ton units
J	2.322	42,580	98,871
K	3.192	105,590	337,070
L	2.408	108,030	260,160
M	4.200	65,730	276,086
N	3.836	46,140	177,015
O	4.367	11,540	50,399
Total	3.160	379,610	1,199,601
Say:------------	3.16 % Cu	380,000 tons	

Total Sulf & Ox	4.564	453,410	2,069,417
Say:-------------	4.56 % Cu	454,000 tons	

Oxide-sulfide--Class II B (0.6 to 1% Cu)

Section	%Copper	Tons	Grade-ton units
J	0.820	22,360	18,342
K	.735	38,240	28,116
L	.707	2,310	1,633
M	.850	2,960	2,516
N	**	--	--
O	.634	4,040	2,561
Total	0.761	69,910	53,168
Say:--------------	0.76 %Cu	70,000 tons	

Oxide, Class II C (0.2-0.6%Cu)

Section	% Copper	Tons	Grade-ton units
J	0.538	6,150	3,308
K	.309	22,740	7,022
L	.332	27,400	9,089
M	.358	27,040	9,678
N	.481	20,930	10,074
O	.427	6,460	2,758
Total	0.379	110,720	41,929
Say:------------	0.38 % CU	110,000 tons	

Total, all classes	3.414	634,040	2,164,514
Say:---------------	3.41 % Cu	634,000 tons	

(c) Geologic mapping of the Big Mike property is to be completed as soon as snow conditions permit, and these data are to be correlated with the sub-surface drill-hole information. Clues might thus be found for targets having an environment similar to that of the Big Mike--namely, intersecting shear zones within greenstone units of the Pumpernickel formation. I expect that the mapping work will be completed sufficiently to make these speculations by early February, 1969.

Ward Carithers

VOK

1/2/69
WC.

Big Mike - Grade - Tonnage

Class A - Sulfide ore -

Section K - L.

Section area K - 3000 FT^2
" " L 1375 FT^2
" " 5100 2750 "
Average 2500 FT^2
Average length (taper) 125 FT^2
312,500 FT^3
$\div$ 9
34,700 Tons

1/2 2 Cones : $\frac{\pi}{3} r^2 h \cdot 2$
$1.047 r^2 \cdot 30$
1.047
10,000
10,470
30
314,100 FT^3

Grade.

Hole 20 · 40' 7.209
19 20' 7.330
27 10.5 9.770

7.625 % Cu

SECTION L - M.

Section area M - 3900 FT^2
" " 5100' 1900 FT^2
" " 5000' 1600 FT^2
Average area 2825 - FT^2
Average length taper 125
353,125 FT^3
$\div$ 9 FT^3/ton
39,100 Tons.

1/2 2 Cones
1.047
10,000 (R^2)
10,470
30 WIDTH
314,100 FT^3

Grade - Hole 7 · 10' 15.01
" 8 40' 17.30
31 9' 7.91

15.479

28	120'	4.59
51-	48	2.86
27	95^5	2.98
31	24^5	2.61

Big Mike Grade-Tonnage Calc — 1/2/69

SECTION J

Class II A (+1% Cu)

HOLE	FT	% Cu	AVER % Cu	AREA FT²	Length	Volume	Tons (÷13)	GRADE UNITS
56	45	3.443	3.028	1250	100	125,000	9,610	
2-35	18	1.990						
5	20	2.962						
25	20	1.843	2.402	1812	100	181200	13,940	
26	125	1.470	1.470	990	100	99,000	7,610	
26	25	2.198	2.198	1485	100	148,500	11,420	
Total			2.322				42,580	98,870

Class II B (.6 - 1% Cu)

HOLE	FT	% Cu	AVER % Cu	AREA FT²	Length	Volume	Tons (÷13)	GRADE UNITS
2-44	24		0.800	2187	x100 ~~218,700~~	218,700	16,820	
25	5	.737	.882	900	x80 ~~72,000~~	72,000	5,540	
26	14	.934						
TOTAL			0.820				22,360	18,242

Class II C (0.2 - .6% Cu)

HOLE	FT	% Cu	AVER % Cu	AREA FT²	Length	Volume	Tons (÷13)	GRADE UNITS
26	13½		0.538	800	100	80,000	6,150	3,308

WC

Big Mine Grade Tonnage Calculation 1/2/69

SECTION K

Class II A -or- +1% Cu

Hole	Ft	%Cu	Aver % Cu	Area Ft²	Length	Volume Ft³	Tons	Grade-Ton Units
2-14S	–	–	2.960	1537	50	76,850	5,910	
101	35	–	1.780	1750	100	175,000	13,460	
17	20	–	1.974	2062	100	206,200	15,860	
17	15	–	1.639	1290	87	112,230	8,630	
20	25	3.205	4.644	3625	100	362,500	27,880	
28	35	5.672						
20	10	3.458	3.423	2500	87	217,500	16,730	
28	28	3.411						
42	45	–	3.334	1750	87	152,250	11,710	
28	5	–	4.507	2812	100/4	70,300	5,410	
TOTAL			3.192				105,590	337,070

Class II-B (.06-1%)

Hole	Ft	%Cu	Aver % Cu	Area Ft²	Length	Volume Ft³	Tons	Grade-Ton Units
101	15'	–	.807	840	100	84,000	6,460	
17	15	–	.751	1000	100	100,000	7,690	
20	26	.570	.711	3600	87	313,200	24,090	
28	20	.895						
Total			.735				38,240	28,116

Class II C (.2-.6)

Hole	Ft	%Cu	Aver % Cu	Area Ft²	Length	Volume Ft³	Tons	Grade-Ton Units
101	10	.235	.230	800	100	80,000	6150	
2-14	12	.225						
17	30		.338	2875	75	215,625	16,590	
Total			.309				22,740	7,022

WC

Big Mike Grade-tonnage Calculations 1/1/69

SECTION L

Class II-A- +1% Cu.

Hole	Ft	% Cu	Aver % Cu	Area Ft²	Length	Volume	Tons	Grade tonnage Units
Z102A	20		1.77	1500	100	150000	11,540	
51	32		3.250	2070	~~85~~ 100	207,000 ~~175,950~~	15,920 ~~13,530~~	
51	16		2.074	1460	~~85~~ 100	146,600 ~~124,100~~	11,270 ~~9,550~~	
19	35	1.660						
27	15	5.285	2.454	2500	100	250,000	19,230	
27	9⁵	0.907						
19	30	2.26						
27	71	2.77	2.618	5250	100	525,000	40,380	
11	25	1.21	1.210	1260	100	126,000	9,690	
Total			~~2.394~~ 2.408				~~103,920~~ 108,030	~~248,835~~ 260,160

Class II B-(.6-1%)

Hole	Ft	% Cu	Aver % Cu	Area Ft²	Length	Volume	Tons	Grade tonnage Units
27	13'	-	.707	600	50	30,000	2,310	1,633

Class IIC-(.2-.6)

Hole	Ft	% Cu	Aver % Cu	Area Ft²	Length	Volume	Tons	Grade tonnage Units
19	18	-	0.41	1250	100	125,000	9,610	
51	14	-	.51	720	85	61,200	4,710	
19	36.5	-	0.21	1700	100	170,000	13,080	
Total			0.332				27,400	9,089

Big Mike Grade-tonnage Calculations 1/11/69

SECTION M.

Class II A.

Hole	Ft	% Cu	Aver % Cu	Area Ft²	Length	Volume	Tons ÷12	Grade tonnage Units
7	24	~~7.76~~	7.76	2550	100	255,000	19,610	
8	35	3.061	2.913	3685	100	368,500	28,350	
31	17	2.608						
~~8~~	22	2.243	2.243	1810	100	181,000	13,920	
31	7½	—	2.625	500	100	50,000	3,850	
			4.200				65,730	276,086

Class II B - (0.6 - 1.2)

Hole	Ft	% Cu	Aver % Cu	Area Ft²	Length	Volume	Tons	Grade tonnage Units
31	12		.850	385	100	38,500	2,960	2,516

Class II C (.2 - .6)

Hole	Ft	% Cu	Aver % Cu	Area Ft²	Length	Volume	Tons	Grade tonnage Units
8	22	.228	.302	2435	100	243,500	18,730	
31	5	.630						
8	17	.	.484	1080	100	108,000	8,310	
			0.358				27,040	9,678

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Big Mike Grade-Tonnage

SECTION "N"

Class II A- +1% Cu

Hole	FT	% Cu	Aver % Cu	Area Ft²	Length	Vol Ft³	Tons	Grade-ton Units-
22	20		2.383	1340	75	100,500	7,730	
20	45	4.634	4.129	5875	85	499,375	38,410	
10	10	1.857						
TOTAL			3.836				46,140	177,015

Class II C (.2 to .6)

Hole	FT	% Cu	Aver % Cu	Area Ft²	Length	Vol Ft³	Tons	Grade-ton Units-
21	15	.64	.50	2850	85	242,250	18,630	
10	25	.40						
22	7	.327	.33	400	75	30,000	2,300	
TOTAL			0.481				20,930	10,074.0

we
1/2/69

Big Mike Grade-Tonnage

SECTION "O"

Class II A - +1% Cu

Hole	FT	% Cu	Aver % Cu	Area Ft²	Length	Vol Ft³	Tons	grade-ton Units
9	23	5.18	5.180	1200	75	90,000	6,920	
12	11½	3.15	3.150	800	75	60,000	4,620	
TOTAL			4.367				11,540	50,399

Class II B (.6 - 1%)

Hole	FT	% Cu	Aver % Cu	Area Ft²	Length	Vol Ft³	Tons	grade-ton Units
12	21		.634	700	75	52,500	4,040	2,561

Class II C (.2 - .6)

Hole	FT	% Cu	Aver % Cu	Area Ft²	Length	Vol Ft³	Tons	grade-ton Units
9	23		.427	1120	75	84,000	6,460	2,758

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DDH-47, 82 FT.

Q: A light colored olive green rock, dense to moderately crystalline, containing irregular black fragments. Would you assume that this was a flow?

The sample is made up of a chaotic mass of weakly altered plagioclase crystals (65-70%) and chloritic material (20-25%). Intergranular quartz is common but not abundant. Most plagioclase crystals are subhedral to euhedral, ranging between 0.1 mm and 4 mm, and averaging about 0.5 mm; the texture is somewhat porphyritic. Multiple twinning is well preserved in many crystals; the composition is sodic to intermediate oligoclase. The chloritic material is pale greenish to brownish yellow and weakly pleochroic. It forms highly irregular patches and discontinuous veinlets among the plagioclase crystals. In several places mutually parallel bundles of chlorite accompany calcite in veinlets (shear zones ?) up to 2-3 mm thick. The chlorite appears to replace a very fine-grained, volcanic matrix; there is no evidence of relict textures indicative of a former mafic mineral from which the chlorite could be derived. Calcite (3-4%), gray to yellowish white clay (2%), and colorless mica replace feldspar; some of the largest crystals of feldspar are intensely altered to mixed clay and clinozoisite.

This sample could well represent a volcanic flow or possibly a crystal-rich, tuffaceous rock of intermediate composition. The dark "fragments" appear to represent intensely altered and corroded phenocrysts of plagioclase.

Q: A light gray rock containing ¼" vesicles which are filled with a white mineral.

The matrix of the sample is composed of a somewhat felted mass of altered feldspar and chlorite with a ratio of about 2 to 1. The grain size ranges up to 0.7 mm, averaging about 0.1 mm. Multiple twinning is visible in some of the less altered feldspar; the composition generally is in the oligoclase range. Some of the chlorite grades into partially altered green hornblende, indicating that some if not all of the chlorite is derived from hornblende. In addition, a few of the crystals appear to be pseudomorphous after pyroxene. The sample also contains a few fragments (up to 4 mm) of altered volcanic rock. Clay, derived from feldspar, and epidote are common accessory minerals. The original rock apparently was andesitic.

A whitish beige zeolite mineral forms amygdules up to 6 mm across; these make up approximately 3-4 percent of the rock. The amygdules are irregular to crudely circular in section, with borders which are rounded in contour. Traces of carbonate and chlorite commonly occur within the amygdules and along amygdule boundaries. The amygdules are scratched easily with a knife blade. In thin section they show low relief, first-order white interference color, average refractive index somewhat below that of Canada balsam, uniaxial positive interference figure, and generally indistinct cleavage in two directions. The mineral may belong to the chabazite group (Ca,Na zeolite).

FSG-6-23

Q: A light gray rock with a slightly greenish cast and small dark specks.

The sample is composed largely of slender crystals of altered plagioclase which form a felted texture. Crystals are up to 0.7 mm long, averaging about 0.15 mm. The plagioclase shows minor differences in composition, but generally it appears to be within the oligoclase range. Multiple twinning is visible in many crystals. Intergranular quartz is rather common. Approximately 5 percent of the rock is made up of pale greenish to brownish yellow patches of chloritic material; these commonly are broadly lath-shaped, measuring up to 1.6 mm in the long direction. Other patches of chlorite are irregular in shape and ragged in outline. Calcite and a few minute, reddish grains of rutile(?) are common inclusions. In general, the chlorite appears to be derived from phenocrysts of an earlier mafic mineral, possibly biotite. Pale green chlorite (pennine), along with calcite (5-6%) and translucent, grayish white clay (3-4%) partially replace the felted matrix. Only a trace of magnetite-hematite occurs.

The evidence of earlier mafic phenocrysts (biotite ?) gives the rock a lamprophyric aspect. The original rock was probably near andesite, or possibly dacite, in composition.

Q: This is a dense dark gray rock with very, very sparse pyrite.

The sample is made up largely of relict crystals, formerly of feldspar, which are intensely altered to clinozoisite(?), clay, calcite, and a trace of colorless mica. Slightly altered to nearly fresh feldspar is rare; multiple twinning is faintly visible in a few crystals. Quartz is uncommon. The relict crystalline texture generally is well preserved, although the textural difference between the larger crystals and the interstitial areas is absent in a few places, apparently obliterated by the alteration. Elongate, subhedral to euhedral crystals are up to 3 mm long, averaging about 0.8 mm; the original texture may have been porphyritic. The clinozoisite(?) which replaces the feldspar is colorless to very pale green and is weakly pleochroic (it lacks the anomalous interference color of clinozoisite, however). Minor, pale green chlorite accompanies clinozoisite(?) as a replacement of feldspar; chlorite, with calcite, also forms irregular patches which are sparsely distributed. Clear evidence for the identity of a former mafic constituent is lacking. Skeletal intergrowths of ilmenite-leucoxene are common (1-2%); a few minute grains of pyrite occur.

The original rock was plagioclase-rich and probably of andesitic composition. The grain size rather suggests a volcanic origin.

Q: A light gray rock with a dense to felt-like texture. In the outcrop area this rock appears to be intrusive. Is it?

The sample is a fine-grained, porphyritic igneous rock of intermediate composition. Anhedral to subhedral phenocrysts (1-2%) of altered feldspar occur in a matrix of subhedral to euhedral feldspar, intergranular quartz (5-10%), and chlorite (6-7%). A few of the phenocrysts measure up to nearly 1 cm long; average size is about 2 mm. The matrix, which is weakly felted, averages about 0.2 mm. Phenocrysts are intensely altered to pale grayish tan clay (transmitted light), colorless mica, and carbonate; the multiple twinning of plagioclase is not preserved. Plagioclase twinning is faintly visible in many of the altered feldspar crystals of the matrix. Chlorite, which averages about 0.2 mm, is largely irregular and ragged in form; some crystals are slender and may be derived from prisms of hornblende. Much of the chlorite appears to be derived from biotite, although unaltered biotite was not detected.

Evidence of a volcanic origin is lacking. The sample appears to be intrusive and approximately of quartz diorite or diorite composition.

Q: A weathered tan colored rock. Would it be the same rock type as Sample FS-31?

The rock is composed predominantly of a felted mass of very fine, slender microlites of feldspar averaging about 0.08 mm, with a few crystals up to 0.3 mm long; the texture is slightly microporphyritic. Intergranular quartz occurs, but the grains are too small to permit estimation of the total percentage; one quartz grain measures 0.17 mm. Calcite (3-4%) forms isolated grains and irregular aggregates up to 1 mm across, with a few elongated patches up to about 1.5 mm. Generally these aggregates definitely do not appear to replace phenocrysts of feldspar. It is not clear in all cases whether the calcite replaced the host rock, or whether at least some of these aggregates represent small amygdules. Pale greenish to brownish yellow patches of chlorite (2-3%), up to 1 mm across, are irregularly disseminated. These characteristically contain minute grains and crystals of rutile(?), along with minor quartz; a few of these patches are subhedral in form. It is tentatively concluded that the chlorite is derived from microphenocrysts of biotite. Yellowish brown iron oxide (5-6%) is disseminated, along with minor magnetite and traces of hematite. Feldspar microlites are altered to very fine, colorless mica.

Sample FS-36, compared with Sample FS-31, is finer-grained and less porphyritic, contains a lower proportion of original mafic material, and contains more secondary mica and less clay and carbonate as alteration products of feldspar. (Both samples apparently are altered to similar degrees of intensity.) Therefore, Sample FS-36 is somewhat less mafic, and may be more potassic, than Sample FS-31. The two samples definitely do not represent the same rock types.

Sample FS-36 may be of volcanic origin, based primarily on texture. Flow structure is absent.

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No info. on whose drill holes these are

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Polished Sections

Hole 31, 336 ft.; hole 8, 272 ft.

Q: Sulfide ore on which we would like paragenesis; could any of the chalcocite be primary? Also, is there any clue as to what the sulfide might have replaced?

The sulphide minerals in both samples are pyrite, chalcopyrite, and chalcocite. Sample 31/336 contains less than 0.5 percent copper-bearing sulphides; sample 8/272 contains approximately 0.5-1 percent chalcopyrite and 1.5-2 percent chalcocite. Chalcocite occurs in irregular patches and flecks, and in short, discontinuous veinlets, which replace chalcopyrite, and, to a lesser extent, pyrite and the silicate gangue minerals. Chalcopyrite, in virtually all cases, is partially or completely surrounded by chalcocite, and veinlets and embayments of chalcocite within the chalcopyrite are extremely common. Also, much chalcocite occurs which is not intergrown with even a trace of chalcopyrite. A few grains of chalcopyrite are enclosed within pyrite, suggesting that some of the chalcopyrite antecedes pyrite.

Etch reactions with HNO_3 reveal that the chalcocite is very fine-grained and lacks the regular, parallel etch cleavage usually reported for hypogene chalcocite. Therefore, available evidence suggests that the chalcocite is supergene.

In summary, chalcocite definitely replaces chalcopyrite.

Evidence of any other earlier sulphide mineral, besides pyrite, was not detected. The paragenesis can be shown as follows:

pyrite	________		
chalcopyrite		?________	
chalcocite			________

Thin Sections

Hole 20, 178 ft.

Q: Originally the rock was probably a greenstone tuff or flow or possibly a dike. Does the mineralogy or texture suggest anything? Also, can you tell if the alteration is hydrothermal or supergene?

The rock is definitely pyroclastic. Angular to subrounded fragments, which appear to represent devitrified glass, are abundant within a groundmass of volcanic glass and finely microcrystalline material. The fragments are grayish brown and translucent in transmitted light, and weakly birefringent. Also, corroded and untwinned crystals of feldspar are sparsely scattered. Grayish white, opaque patches are common and may represent intensely altered feldspar. The groundmass is made up of amber-colored glass, and partially devitrified glass, containing somewhat brecciated, finely microcrystalline volcanic material. Minute, crystalline spherulites (unidentified) are abundant. A crude flow structure is conspicuous. - While glass and devitrified glass are abundant in this sample, the finely crystalline rock material dominates. Therefore, a proper name for the rock would be crystal tuff; with a greater proportion of glass, vitric tuff would be more appropriate.

Determination of the mode of alteration appears highly uncertain. One possible lead lies in the occurrence of a few unaltered metallic grains (0.5-1.5 mm) scattered throughout the sample. The thin section intersects one of these grains; it is made up of an intergrowth of pyrite(?) and a black metallic mineral. Some of this material was dug out of the sample with a needle; it is not attracted to a hand magnet. In conclusion, it would seem that this opaque mineral must represent either a deuteric or hydrothermal event. Supergene alteration could be superimposed, of course.

Hole 52, 286 ft.

Q: Apparent intrusive into breccia. What is the intrusive? And the breccia fragments (limestone, black shale)?

The sample contains an irregular mass of gray to black chert within a matrix of argillaceous, fragmental limestone. The chert is very finely microcrystalline and markedly homogenous throughout. Veinlets of calcite are numerous within the chert, occupying fractures or possible shrinkage cracks. The enclosing argillaceous limestone (marl ?), which effervesces rather strongly in dilute (4:1) HCl, generally is darkly translucent in transmitted light. Angular fragments of coarser and somewhat clearer limestone are numerous within this enclosing limestone. The argillaceous limestone contains a wavy laminar structure which tends to wrap around the chert and enclosed limestone fragments. Relict textures of possible altered phenocrysts of feldspar, or other evidence of an igneous origin, are absent.

Pyrite is associated largely with limestone and veinlets of calcite within the chert; it is concentrated, within the argillaceous limestone, along one boundary between the limestone and chert. Very little pyrite replaces chert. The pyrite appears to be authigenic.

Hole 31, 331 ft.

Q: Brecciated shale (and chert) with secondary minerals. What are the minerals, particularly the grayish vein stuff.

Because of the coarse texture and friable nature of sample 31/331, two thin sections were cut in order to ensure adequate representation?

The sample consists of brecciated dark shale mixed with tuffaceous material. All of the gray and black shale is strongly laminar and pyritic; none of this has the appearance of chert. Fractures within the shale, and areas surrounding shale fragments, are occupied largely by sparsely devitrified volcanic glass. This glass, which megascopically is yellow, greenish yellow, and pale greenish gray, is pale brown and translucent in thin section. It appears to be only slightly altered. The glass contains a profusion of minute, greenish yellow spherulites, which are isomorphous, as well as a few microphenocrysts of potassic feldspar and quartz. In addition to this matrix of glass, the sample contains irregularly shaped, mottled grayish tan masses (up to several centimeters) of nearly cryptocrystalline volcanic rock. Microphenocrysts are absent; the color suggests a felsic composition. Flow structure within the glass conforms to contacts with the felsic(?) rock component, indicating that the glass was last to solidify.

While much of the pyrite is concentrated within the dark shale, minor pyrite does replace volcanic glass.

Hole 47, 485 ft.

Q: Dike rock with carbonate veining. A spectrographic analysis of similar material is enclosed. What is the mineralogy, particularly the green stuff (Ni, Cr ?) and the carbonate?

The rock consists of approximately 15 percent altered feldspar phenocrysts in a groundmass composed largely of minute, slender, lath-like crystals of altered feldspar. In some areas the original texture of the groundmass is destroyed. The altered phenocrysts are anhedral to subhedral, averaging about 1.5 mm in diameter, and measuring up to 4 mm.

About two-thirds of the phenocrysts are altered to a cloudy carbonate mineral, and the rest are altered to fine sericite, or hydromuscovite, with minor kaolin and carbonate. The groundmass is altered to mixed sericite (or hydromuscovite), kaolin, and finely disseminated carbonate. Fresh feldspar is absent; a trace of original quartz occurs within the groundmass. Clear evidence of a former mafic mineral is lacking. The analysis shows an unusually high potassium content (9.7%), confirming the importance of sericitic and potassic clay alteration. - It is uncertain in thin section whether the sample comes from a dike, sill, or thick flow. Flow structure is absent, however. The original composition may have been dacitic or andesitic.

The grayish green mineral appears to represent densely-packed, fine sericite, or some clay mineral of similar composition. On sawed rock surfaces, the green color within a few of the altered phenocrysts shows a concentric pattern. This pattern probably reflects an original compositional zonation within the phenocrysts.

Both the disseminated and vein carbonate mineral effervesces very weakly in dilute (4:1) HCl, indicating that the mineral may be dolomitic in composition. The carbonate derived from alteration of the rock is pale grayish tan and is cloudy in transmitted light. It could be somewhat sideritic in composition, although the evidence for this is inconclusive. The vein carbonate is clearer and more nearly colorless in thin section. A few of these grains show multiple twinning. However, the orientation of the twin lamellae with respect to the rhombic crystal structure could not be determined in enough cases to distinguish between possible calcite and dolomite. The vein carbonate is accompanied by pyrite and introduced quartz.

Nickel and chromium may substitute within one or several of the principal minerals present. Electron microprobe analysis most likely would shed some light on the problem if sufficient concentrations of nickel and chromium could be obtained.

P. T. Moyer, Jr.
Golden, Colorado
December 15, 1968

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(270) Item 13

FORM NO. 45

CERRO CORPORATION
AND SUBSIDIARIES | NEW YORK

INTERNAL MEMORANDUM

SHOW NAME, TITLE AND CORPORATION OF ADDRESSEE AND ADDRESSOR

OTHER ADDRESSEES • FOR INFORMATION

TO: H. Reid Craig, Chief Expl. Geol.
Cerromin, New York

November 1, 1968
DATE

FROM: Ward Carithers, Consultant

SUBJECT: Cobalt analysis

Did I ever give you this data?

Composites from hole No. 8, from 240 to 280 feet assayed as follows:

Cu	16.898%
Co	0.176%
Zn	0.45%
As	0.09%
Cd	Nil
Pb	Nil

Ward Carithers

WC:prh

COPY

032

NEV-Pershing

FORM NO. 44

OTHER ADDRESSEES • FOR INFORMATION

270 Item 13

W. Carithers

CERRO CORPORATION
AND SUBSIDIARIES | **NEW YORK**

INTERNAL MEMORANDUM

SHOW NAME, TITLE AND CORPORATION OF ADDRESSEE AND ADDRESSOR

TO: H. R. Craig, Jr., Chief Expl. Geologist
Cerromin NY

October 1, 1969
DATE

FROM: T. W. Mitcham, District Expl. Geologist
Cerromin SLC

SUBJECT: Malachite-green Mineral
Big Mike pit, Pershing County, Nevada

Specimens of a green mineral which is abundant in the Big Mike pit have been x-ray analyzed by a graduate student at the University of Utah. According to Eugene Callaghan of the University staff, it is one of the three following minerals, probably one of the first two:

cornwallite	$Cu_5 (AsO_4)_2(OH)_4 \cdot H_2O$
clinoclase	$Cu_3 AsO_4 (OH)_3$
erinite	$Cu_5 (OH)_4 (AsO_4)_2$

Based on its color and an acid test, I erroneously identified (4/11/69) the mineral in the field as antlerite--$Cu_3(SO_4)(OH)_4$.

We do not have the specimens, which ordinarily should be chemically checked. The student ran the diffractometer tapes last spring, was drafted, and came marching by recently with the interpretation--well, it's a long story.

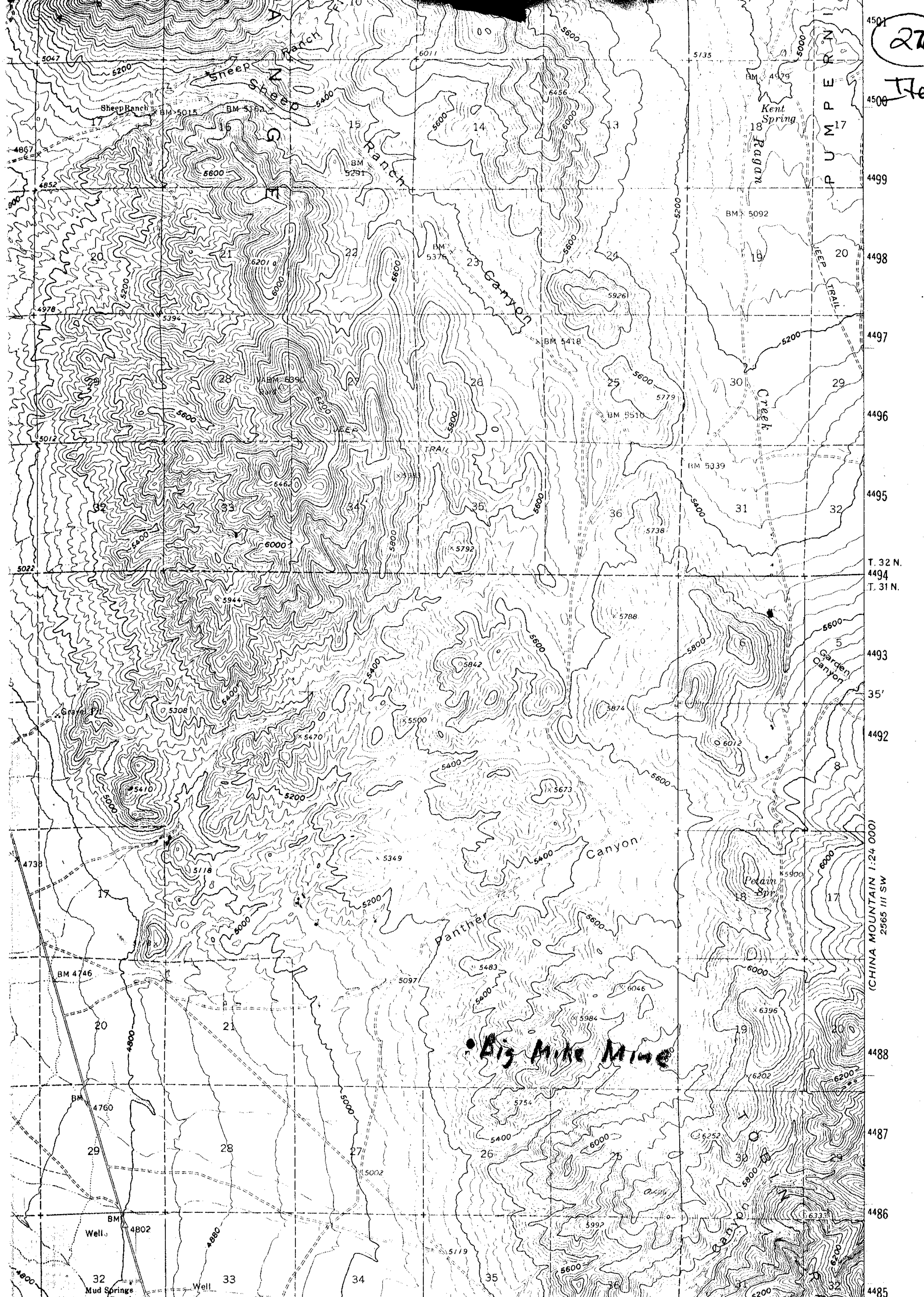
ORIGINAL SIGNED BY
THOMAS W. MITCHAM

Thomas W. Mitcham

TWM/lk

270

Item 13



(BUFFALO SPRINGS) 2564 IV

SCALE 1:62500

2 3 4 MILES

9000 12000 15000 18000 21000 FEET

2 3 4 5 KILOMETERS

INTERVAL 40 FEET
RESENT 20-FOOT CONTOURS
MEAN SEA LEVEL

ROAD CLASSIFICATION

Light-duty Unimproved dirt

NEVADA

QUADRANGLE LOCATION

TIONAL MAP ACCURACY STANDARDS
VER, COLORADO 80225 OR WASHINGTON, D. C. 20242
MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

LEACH HOT SPRINGS, NEV.

N4030—W11730/15

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